BRADWELL B PROJECT

Volume 1: Scoping Report and Appendices

October 2020

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1. INTRODUCTION

1.1 Background to the Project and Scoping Report

1.1.1 Bradwell Power Generation Company Limited ('the applicant') is proposing to build a new nuclear power station – the Bradwell B power station - comprising two UK HPR1000 nuclear reactors, together with associated buildings, structures and components ("the Project"). Located to the south-east of the Bradwell A nuclear power station, which ceased electricity generation in 2002, the Bradwell B power station would have an expected electrical output capacity of approximately 2.2 Gigawatts (GW).

1.1.2 The United Kingdom (UK) has a long history in nuclear generation and nuclear power plays an important role in electricity generation in the UK. It is government policy that nuclear power should play a role in the future generation of electricity in the UK and Bradwell is one of the eight potentially suitable sites identified by the Government as being appropriate for new nuclear power stations. The Project would make an important contribution to achieving the legally binding target of net zero carbon by 2050.

1.2 Intention to Apply for a Development Consent Order at Bradwell

1.2.1 The Project is a Nationally Significant Infrastructure Project (NSIP) under Part 3 of the Planning Act 2008 (Ref. 1.1) and therefore the applicant intends to submit an application to the Planning Inspectorate (PINS) for a Development Consent Order (DCO). In addition to the nuclear power station, the application will seek consent for on-site and off-site associated development that is necessary for the construction and operation of the power station. The application will comprise details of all development proposals and will be accompanied by an Environmental Statement (ES) conforming to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (hereafter referred to as 'the EIA Regulations') (Ref. 1.2) and other relevant documents.

1.3 Purpose of the Scoping Report

1.3.1 Scoping forms an important early stage of the Environmental Impact Assessment (EIA) process. This Scoping Report sets out the proposed content, methodologies to be adopted and the anticipated likely significant environmental effects that are proposed to be considered in the EIA.

1.3.2 A Scoping Opinion is requested from PINS, on behalf of the Secretary of State (SoS), to inform the ES which will be submitted as part of the application for development consent. Through the scoping process the views of the statutory consultees and other relevant organisations on the proposed scope of the EIA are sought.

1.3.3 This request for a Scoping Opinion aligns with the requirements of Regulation 10(3) of the EIA Regulations, as detailed in **Chapter 5: The EIA Process and Methods** and specifically **Table 5.1**.

1.4 The Applicant and the Project Team

1.4.1 This Scoping Report has been prepared on behalf of the applicant supported by a number of technical specialists. These specialists have undergone a rigorous Suitably Qualified and Experienced Persons approval process which addresses competence in the delivery of EIA.

1.5 The Consultation and Engagement Process

1.5.1 This section provides a summary of consultation that has been undertaken for the Project and the technical engagement that has also occurred since September 2019. A proportion of this engagement has been of relevance to scoping and it has also informed the technical content of the environmental aspect chapters (**Chapter 6** to **Chapter 24**), whereas other consultation was orientated primarily at providing stakeholders with an understanding of the overall project programme and the approach to iterative project design and master planning.

1.5.2 Aspect specific comments made by statutory consultees and other interested parties are provided within the relevant aspect chapters (**Chapter 6** to **Chapter 24**).

Consultation

1.5.3 The applicant has commenced pre-application consultation.

1.5.4 The pre-application consultation is being undertaken in stages with the local community, statutory consultees and other interested parties having regard to relevant guidance, including the PINs Advice Note Seven (Ref. 1.3). Stage One Consultation on the applicant's initial proposals and options commenced in March 2020 and was scheduled to finish in May 2020. This period was extended until July 2020 due to the COVID-19 emergency and the inability to hold public meetings without posing a significant risk to public health. Supplementary measures were put in place to enable the consultation to proceed including telephone surgeries which allowed members of the public to have direct discussions with the technical team working on the Project. Further consultation is planned for the Project, including a statutory stage of consultation which will be undertaken in accordance with the requirements of the Planning Act 2008. Feedback from these stages will aid the development of the Project proposals and subsequently allow the dissemination of more detailed information in relation to technical and environmental considerations.

1.5.5 Responses to aspect specific comments from a range of key stakeholders in relation to Stage One Consultation, grouped thematically, are presented in the individual environmental aspect chapters (**Chapter 6** to **Chapter 24**), whilst those which are more generic in nature are provided in **Appendix 1A**. Consultation comments raised

by other parties, including members of the public will be taken account of and addressed via the applicant's consultation response .

Technical engagement

1.5.6 In addition to the stages of pre-application consultation, the applicant has held and will continue to hold informal engagement with the key statutory consultees and other interested parties, as appropriate, in order to refine the Project, the EIA and assist in the development of any required mitigation. Engagement that has been undertaken to date is detailed in **Appendix 1A**.

1.5.7 Specific information on any feedback received is presented in the individual environmental aspect chapters (**Chapter 6** to **Chapter 24**).

1.6 Structure of the EIA Scoping Report

1.6.1 The Scoping Report is split into two volumes, as follows:

- Volume 1: Scoping Report and Appendices; and
- Volume 2: Figures.

1.6.2 The Scoping Report itself is structured as follows:

- **Chapter 2** describes the relevant legislation, national policy and regulatory regime for the Project and other assessments that will be undertaken in support of the application for development consent;
- **Chapter 3** sets out a description of the Project;
- **Chapter 4** summarises the alternatives considered;
- **Chapter 5** details the proposed approach to the EIA including:
  - a general description of what the EIA will cover;
  - how the scope of the assessment is determined;
  - the approach to the assessment of effects, including the evaluation of significance and the need for mitigation; and
  - cumulative effects.
- **Chapters 6** to **24** detail the proposed scope of the assessment for each environmental aspect including the study area, the baseline, assessment methodology, likely significant environmental effects to be scoped into the EIA, effects proposed to be scoped out and potential mitigation measures;
- **Chapter 25** presents the proposed structure of the ES; and

- **Chapter 26** presents the proposed next steps of the EIA process.

1.6.3 The appendices are located at the end of the Scoping Report in Volume 1.

1.6.4 The figures referred to in this Scoping Report are presented in Volume 2.

1.6.5 **Appendix 1B** provides a set of abbreviations and **Appendix 1C** a glossary of terms which are relevant to the Scoping Report.

1.7 Accessing the EIA Scoping Report

1.7.1 This Scoping Report is available online via the National Infrastructure Planning website at the following link - https://infrastructure.planninginspectorate.gov.uk/projects/eastern/bradwell-b-new-nuclear-power-station/.

1.7.2 Hard copies can be made available on request, from the applicant at feedback@bradwellb.co.uk or please ring 01621 451 451.

1.7.3 Responses and comments on this Scoping Report should be made directly to PINS, and not to the applicant.

REFERENCES

Ref. 1.1 Parliament of the United Kingdom. The Planning Act 2008 (London, 2008).

Ref. 1.2 Parliament of the United Kingdom. The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (London, 2017).

Ref. 1.3 The Planning Inspectorate. Advice Note Seven: EIA: Process, Preliminary Environmental Information and Environmental Statements, 2018. Bristol: The Planning Inspectorate.

2. POLICY AND REGULATORY CONTEXT

2.1 Introduction

2.1.1 This chapter explains the key legislation and national planning policy against which the Development Consent Order (DCO) application will be assessed and the local planning policies that will be taken into account in considering local impact. It also describes other key consents and permissions that are necessary for the Project to proceed.

2.1.2 With respect to the scope of the environmental assessment, other important documentation that is relevant to the assessment for particular aspects is also outlined.

2.2 Legislation

Nationally significant infrastructure projects

2.2.1 There is a wide range of primary legislation that is relevant to this Environmental Impact Assessment (EIA) more generally, but the Planning Act 2008 (Ref 2.1) and the Marine and Coastal Access Act 2009 (Ref 2.2) are of key relevance to the applicable consenting regimes.

2.2.2 Under the Planning Act 2008, Nationally Significant Infrastructure Projects (NSIPs) require an application for a DCO to be made by the promoter of the project. Applications for a DCO are determined by the Secretary of State (SoS), following a detailed examination of the Project by the Planning Inspectorate, acting on behalf of the SoS.

2.2.3 The Project meets the criteria of an NSIP under Section 15 of the Planning Act 2008, as it would bring forward a new onshore generating station in England with a capacity of over 50 megawatts (MW).

2.2.4 The Planning Act 2008 also defines the concept of ‘associated development’. The principles of associated development are set out in Planning Act 2008: Guidance on associated development applications for major infrastructure projects (Ref. 2.3).

2.2.5 The Marine and Coastal Access Act 2009 amends certain provisions of the Planning Act 2008, particularly in relation to the regard to be given to marine policy documents in considering NSIPs and the requirements for consulting the Marine Management Organisation (MMO).

Environmental impact assessment

2.2.6 An EIA is a tool for systematically examining and assessing the impacts and effects of a development on the environment. The objective of the EIA is to identify any likely significant effects which may arise from the Project and identify measures to prevent, reduce or offset any adverse effects. During the EIA process, opportunities

and management measures are identified and incorporated within the development proposals, to prevent or reduce any adverse effects and to enable sustainable design and construction principles to be embedded within the proposals. The outcome of the EIA process is reported within an Environmental Statement (ES).

2.2.7 For NSIPs, the requirements for an EIA are governed by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) (Ref. 2.4). Furthermore, works subject to a marine licence need to be assessed under the requirements of the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) (the 'EIA Regulations') (Ref. 2.5).

2.2.8 These sets of regulations are referred to as the Infrastructure Planning EIA Regulations, Marine Works EIA Regulations or the EIA Regulations collectively hereafter.

2.2.9 The need to carry out an EIA is determined against the criteria set out in the EIA Regulations, which divide development into two classes: Schedule 1 or Schedule A1 projects where EIA is always required, and Schedule 2 or Schedule A2 projects where EIA is required only if the particular project in question is judged likely to give rise to significant environmental effects by virtue of factors such as its nature, size or location.

2.2.10 The Project is classified as a Schedule 1 or Schedule A1 development, as identified in Schedule 1, Part 2(2) of the Infrastructure Planning EIA Regulations and Schedule A1, and Part 3 of the Marine Works EIA Regulations, respectively. Therefore, an EIA is required, and an ES needs to accompany the application for development consent.

2.2.11 The applicant has applied to the MMO for confirmation that the exception under Regulation 10(b) of the Marine Works EIA Regulations applies to the Project. The Regulation 10(b) exception does not remove the requirement to comply with the Marine Works EIA Regulations, but rather avoids the need for a separate assessment to be carried out by the MMO, where one is already being carried out by another consenting authority (in this case the SoS). Subject to confirmation, the ES will be prepared in accordance with the requirements of both EIA Regulations with the terrestrial elements of the Project being assessed against the Infrastructure Planning EIA Regulations and the marine elements (i.e. the marine licensable activities) being assessed against the Marine Works EIA Regulations.

Withdrawal of the United Kingdom from the European Union

2.2.12 As of 23:00 on 31 January 2020, the UK was no longer within European Union (EU) Member State. However, in accordance with the transitional arrangements provided for in Part 4 of the Withdrawal Agreement as implemented into domestic law by the European Union (Withdrawal Agreement) Act 2020 ("the 2020 Withdrawal Agreement Act") (Ref. 2.6), the UK has entered an implementation period. During this period, the UK continues to be treated by the EU as a Member State for many purposes, though it will not participate in the political institutions and governance

structures of the EU (except to the extent agreed). The UK must continue to adhere to its obligations under EU law (including EU treaties, legislation, principles and international agreements), and submit to the continuing jurisdiction of the Court of Justice of the EU, in accordance with the Withdrawal Agreement.

2.2.13 The European Union (Withdrawal) Act 2018 ('the 2018 Withdrawal Act') (Ref. 2.7) provides for the European Communities Act 1972 to be repealed from exit day. However, the repeal of the European Communities Act 1972 is subject to specific savings provisions to allow for the operation of the implementation period in UK domestic law. Key provisions of the 2018 Withdrawal Act, and associated Brexit-related legislation, are subject to amendments introduced by the 2020 Withdrawal Agreement Act where required to reflect the transitional arrangements. This includes deferring the adoption of retained EU law and commencement of related Brexit statutory instruments from exit day until the end of the implementation period, which is defined in the 2020 Withdrawal Agreement Act, section 39 as 23:00 on 31 December 2020.

2.2.14 In exercise of the powers in the 2018 Withdrawal Act, the government made the Environmental Assessments and Miscellaneous Planning (Amendment) (EU Exit) Regulations 2018 (Ref. 2.8) and the Environmental Statement of Plans and Programmes and the Environmental Impact Assessment (Miscellaneous Amendments) (Wales) (EU Exit) Regulations 2019 (Ref. 2.9). These regulations provide for the EIA Regulations to be amended with to ensure they function correctly after the implementation period. In particular, the amendments update references in the EIA Regulations to EU law, Member States and related terms to reflect the UK leaving the EU. The regulations do not make substantive changes to the way the EIA regime will operate in England and Wales following Brexit.

2.3 Policy

National policy context

National policy statements

2.3.1 The National Policy Statements (NPSs) that are relevant to the Project are the Overarching National Policy Statement (NPS) for Energy (EN-1) (Ref. 2.10) and the NPS for Nuclear Power Generation (EN-6) (Ref. 2.11). EN-1 and EN-6 were considered by Parliament and formally designated in July 2011.

2.3.2 Bradwell is one of the eight sites listed in EN-6 as potentially suitable for deployment for a new nuclear power station before the end of 2025. Whilst the applicant remains confident that the site identified in the NPS is suitable for the deployment of a new nuclear power station, it is no longer possible for deployment to take place by the end of 2025.

2.3.3 The Ministerial Statement on Energy Infrastructure published on 7 December 2017 ('2017 Ministerial Statement') (Ref. 2.12) states that for projects yet to apply for development consent and due to deploy beyond 2025, the Government continues

to give its strong in principle support to proposals at those sites currently listed in EN-6.

2.3.4 Each site listed in EN-6 was assessed by the Government by way of a Strategic Siting Assessment (SSA) and the Government's Appraisal of Sustainability (AoS) and Habitats Regulations Assessment (HRA). Annex C of EN-6 provides site assessments for the eight identified sites and paragraph C.2.146 advises that from the information provided by the nominators and an independent assessment, the Government is satisfied that Bradwell is credible as a potentially suitable site for a new nuclear power station. EN-6 also includes site boundaries for each identified site based on the site originally promoted by the nominator. The NPS site boundary for Bradwell comprises land to the south and east of the existing Bradwell power station (see **Figure 2.1**).

2.3.5 Between December 2017 and March 2018, the Government consulted on the siting criteria and process for a new NPS for nuclear power with single reactor capacity over 1 GW beyond 2025 (Ref. 2.13).

2.3.6 In July 2018, the Government published its response to the consultation on siting criteria (Ref 2.14). In the response, the Government concluded that:

> "*sites listed in EN-6 on which a new nuclear power station is anticipated to deploy after 2025 will continue to be considered appropriate sites and retain strong Government support during the designation of the new NPS*" (paragraph 3.10).

2.3.7 The Government confirmed that for those sites, decisions on whether to grant development consent will be made under Section 105 of the Planning Act 2008 and that both EN-1 and EN-6 *"incorporate information, assessments and statements which will continue to be important and relevant"* to such decisions (paragraph 3.11).

2.3.8 The applicant nominated Bradwell as a site that is suitable for the deployment of a new nuclear power station by 2035. The new NPS for Nuclear Power between 2026-2035 (new NPS) has not been published at the date of submission of the Scoping Report.

2.3.9 The Government stated that when designated, the new NPS will have effect for the purposes of Section 104 of the Act for listed sites capable of deploying between 2026-2035. The Government further stated that a published new NPS in draft form would be an important and relevant consideration under Section 105(2)(c) of the Act in relation to any development consent decision taken before the new NPS is designated (paragraph 3.12).

The national planning policy framework

2.3.10 The National Planning Policy Framework (NPPF) (Ref. 2.15) does not contain specific policies on NSIPs which it confirms at paragraph 5, which states that NSIPs are to be determined in accordance with the decision making framework of the

Planning Act 2008 and NPSs as well as other matters that are relevant (which could include policies in the NPPF).

Local planning policy

2.3.11 Maldon District Council (MDC) is the relevant local planning authority for the area in which the main development site is located. Local development plans may be a relevant consideration for NSIPs, although like the NPPF they are not the primary policy. The current adopted development plan that is relevant is the Local Development Plan (LDP) for Maldon District, which comprises the Maldon District LDP itself and accompanying policies map (Ref. 2.16).

2.3.12 Some off-site associated development sites may fall within the Chelmsford City Council (CCC) administrative area and as such the Local Development Plan for Chelmsford district may also be relevant. The Chelmsford LDP comprises the Chelmsford Local Plan 2013-2036 (2020) (Ref. 2.17) and accompanying policies map (Ref. 2.18).

2.3.13 Essex County Council is the relevant County Council responsible for strategic planning and certain other functions such as transport and waste. As the minerals and waste authority for Essex, it has a Minerals Local Plan (2014) (Ref. 2.19) and Essex and Southend-on-Sea Waste Local Plan (2017) (Ref. 2.20).

2.3.14 The Project also has the potential for effects beyond the administrative boundaries of MDC and CCC. Policies within adjoining local authority areas will therefore also be considered where they are relevant, including where they might be helpful in determining local impact.

2.3.15 Key policies are discussed within the respective environmental aspect chapters (**Chapter 6** to **Chapter 24**). Further details will be provided in the ES and Planning Statement accompanying the DCO application.

2.4 Other Relevant and Important Documentation

2.4.1 The Planning Inspectorate has published a number of advice notes that are intended to inform applicants on a range of processes and matters associated with the Planning Act 2008. Whilst these advice notes are non-statutory, they provide advice and information on a range of issues arising throughout the whole life-cycle of the DCO application. There are eighteen published advice notes, of which the following are directly relevant to the production of the Scoping Report, Preliminary Environmental Information (PEI) and ES which will support the wider application:

- Advice Note Three: EIA consultation and notification (Ref. 2.21);
- Advice Note Seven: Environmental Impact Assessment: Preliminary Environmental Information, Screening and Scoping (Ref. 2.22);
- Advice Note Nine: Rochdale Envelope (Ref. 2.23);

- Advice Note Ten: Habitat Regulations Assessment relevant to Nationally Significant Infrastructure Projects (Ref. 2.24);
- Advice Note Twelve: Transboundary Impacts and Process (Ref. 2.25);
- Advice Note Seventeen: Cumulative Effects Assessment (Ref. 2.26); and
- Advice Note Eighteen: The Water Framework Directive (Ref. 2.27).

2.5 Other Permits and Licences

Environmental permits

2.5.1 The applicant requires a number of operational permits, under the Environmental Permitting Regulations 2016 (as amended) (Ref. 2.28), granted by the Environment Agency, to operate the Project. The key permits are as follows:

- Radioactive Substances Regulations (RSR) permit;
- Water Discharge Activity (WDA) permit; and
- Combustion Activity (CA) permit.

Article 37 euratom treaty

2.5.2 Under Article 37 of the Treaty, Member States have to give the European Commission sufficient information about any plans to dispose of radioactive waste (to air, land or water) to allow the Commission to decide whether the plans could cause radioactive contamination of the water, soil or airspace of another Member State.

2.5.3 As a result of Brexit, from January 2021, the UK will no longer be required to submit information to the European Commission on plans for the disposal of radioactive waste. The requirement to consider transboundary impacts will remain and, although still in discussion, is likely to be required by the UK nuclear regulators, in particular in advance of issuing a new environmental permit.

2.5.4 The UK government is consulting with stakeholders on alternative measures to keep neighbouring states informed of radioactive waste disposal plans in the UK.

2.5.5 As a signatory to the Espoo convention the UK will be required to provide the same opportunity for consultation to other signatory states as it does to its local population. This applies where a significant adverse impact cannot be ruled out, and notification is currently an expectation in the context of new nuclear power stations.

2.5.6 There is likely to be an ongoing requirement to carry out a transboundary assessment and the connection to the granting of the RSR Permit is expected to be maintained. As such the applicant will need to develop the transboundary assessment in parallel with the development of the environmental permit

applications. This will need to be completed concurrently with the submission of the DCO and operational environmental permit applications.

Marine licences

2.5.7 Consents for marine structures such as the cooling water intake and outfall, and other works or structures in the marine environment will be assessed in accordance with the UK Marine Policy Statement (Ref. 2.29), the Marine and Coastal Access Act 2009 and any relevant marine plans and policies. A marine licence is required under the Marine and Coastal Access Act 2009 before carrying out any licensable marine activity.

Harbour empowerment order (HEO)

2.5.8 The Harbours Act 1964 (as amended) (Ref 2.30) includes powers to make different types of harbour orders. An HEO is one type of harbour order and is required under Section 16 of the Harbours Act *"for the purpose of improving maintaining or managing a harbour; constructing an artificial harbour; or constructing improving or maintaining a dock or wharf"* where the party wanting to undertake such actions does not otherwise have sufficient powers to do so effectively.

Other

2.5.9 Subject to further information there may be a requirement for further consents and permits (for example, a construction water discharge activity permit) and licences (for example, Protected Species Licences) to support the construction and commissioning activities to be incorporated into the DCO.

2.6 Other Relevant Consents

2.6.1 In addition to a DCO, before a new nuclear power station can be built and operated the operator must obtain a number of key site-specific permissions from regulators and Government. These include a Nuclear Site Licence (NSL) and relevant consents from the Office for Nuclear Regulation (ONR) and environmental permits from the Environment Agency. Separate consents, including planning permissions or highway work approvals may also be required for some works, including where it is planned to start those early than the main DCO works.

Generic design assessment

2.6.2 There are a number of different nuclear reactor designs used around the world to generate electricity. All reactor technology deployed in the UK must comply with the UK's robust nuclear regulatory requirements. The Project would use a third-generation pressurised water reactor called the UK HPR1000.

2.6.3 The UK HPR1000 is currently undergoing assessment as part of the Generic Design Assessment process (GDA). This process is independently controlled by the ONR and the Environment Agency and must be completed prior to the reactor technology

being deployed. It ensures that the design of new nuclear power stations proposed to be built in the UK meets high standards of safety, security, environmental protection and waste management.

2.6.4 The GDA process is lengthy, taking approximately 4-5 years to complete. The applicant began the GDA process for the UK HPR1000 nuclear reactor in January 2017 and is currently at Step 4 of the four-stage process.

Licensing

Nuclear site licence

2.6.5 The Nuclear Installations Act 1965 (as amended) (Ref. 2.31) requires a NSL, and associated consents, to be issued prior to the construction of a Nuclear Facility. The ONR is the responsible body which legislates and grants licenses for all nuclear activities from the time an application is first received to design and construct an installation, to long after the plant ceases electricity generation.

2.6.6 The NSL sets out 36 standard licence conditions for which the Licensee develops and implements arrangements. These conditions are available on the ONR website. Prior to being granted an NSL, the Licensee must demonstrate that it complies with its arrangements to meet the Licence conditions and have appropriate organisational capabilities and governance in place to ensure nuclear safety. Licensees must also be able to demonstrate they have control over the site in terms of security of tenure. The arrangements should be proportionate to the activities being carried out by the Licensee and as such will evolve and mature as the Project develops.

2.6.7 The NSL must be in place prior to any construction activity that may impact on nuclear safety since this requires ONR permission in the form of consents. Once granted, the NSL is an obligation until the site is de-licensed.

Transport

2.6.8 The ONR is responsible for regulating safety with regards to nuclear transport and security arrangements.

Security

2.6.9 The ONR includes a specialist Civil Nuclear Security and Safeguards (CNSS) division. The CNSS is the security regulator for the UK's civil nuclear industry, ensuring that the requirements of the Nuclear Industries Security Regulations 2003 (as amended) (Ref. 2.32) are met by operators. The ONR CNSS division approves Construction Site Security Plans, Nuclear Site Security Plans, Transport Security Plans and Temporary Security Plans.

Early works

2.6.10 In order to deliver the Project, it may be necessary to progress critical preliminary works in advance of development consent. These works could include, for example, preparing the main development site for the construction of the Bradwell B power station and also implementing a number of on-line and off-line highway works (see **Chapter 3: The Project**). These works are included in the DCO on the basis that should a separate consent not be granted, or the works are not implemented under that consent they can be delivered through the DCO.

2.6.11 Where there is a need for works in advance of the granting of development consent, separate consents may need to be progressed via the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, Harbour Empowerment Order or Marine Licencing regimes.

2.7 Related Assessments

2.7.1 In addition to the EIA, the Project will be subject to assessment pursuant to other regulatory regimes, including the Habitats Directive and Water Framework Directive. This section provides further information on these assessments.

Habitats regulations assessment

2.7.2 EU Directive 92/43/EEC (Ref. 2.33) on the conservation of natural habitats and of wild fauna and flora (known as the Habitats Directive (as amended)) provides, inter alia, a framework for the protection of European (wildlife) sites. The Habitats Directive is transposed into the law of England and Wales by The Conservation of Habitats and Species Regulations 2017, as amended (Ref. 2.34), also known as the 'Habitat Regulations'.

2.7.3 When considering the merits of the application, the SoS must consider potential effects on European (wildlife) sites. European sites are defined as Special Areas of Conservation (SACs), candidate SACs, Sites of Community Importance (SCI), Special Protection Areas (SPA) and European Marine Sites, which are marine areas designated as SACs and SPAs. UK policy extends the requirements pertaining to European sites to include Ramsar sites and potential SPAs, which would include proposed extensions or alterations to existing SPAs.

Marine conservation zone assessment

2.7.4 A Marine Conservation Zone (MCZ) Assessment will be submitted with the application for development consent. The MCZ assessment process is integrated into existing marine licence decision making procedures and is required for MCZ designated features potentially exposed to pressures from the Project. The EIA and HRA would work in parallel to the MCZ assessment to consider the relevant species and habitats.

Flood risk assessment

2.7.5 A Flood Risk Assessment (FRA) will be submitted, forming part of the application for development consent. The FRA will assess the flood risk both to and from the Project and demonstrate how that flood risk will be managed over the lifetime of the main development site and Associated Development sites. The FRA will give due regard to climate change and the effects of sea-level rise.

Water framework directive compliance assessment

2.7.6 A full Water Framework Directive (WFD) Compliance Assessment will be submitted with the DCO application for development consent and will comprise an appendix to the ES. This assessment will enable the SoS to be confident that the Project is compliant with the domestic objectives of the WFD, as set out in **Chapter 15: Water Environment**.

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Ref. 2.2 Parliament of the United Kingdom. Marine and Coastal Access Act 2009 (London, 2009).

Ref. 2.3 Department for Communities and Local Governments. Planning Act 2008: Guidance on associated development applications for major infrastructure projects. London: The Stationery Office, 2013.

Ref. 2.4 Parliament of the United Kingdom. The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (London, 2017).

Ref. 2.5 Parliament of the United Kingdom. The Marine Works (Environmental Impact Assessment) Regulations 2007 (London, 2007).

Ref. 2.6 Parliament of the United Kingdom. European Union (Withdrawal Agreement) Act 2020 (London, 2020).

Ref. 2.7 Parliament of the United Kingdom. European Union (Withdrawal Agreement) Act 2018 (London, 2018).

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3. THE PROJECT

3.1 Introduction

3.1.1 National Policy Statement (NPS) for Nuclear Power Generation (EN-6) (Ref. 3.1) identifies Bradwell B as a potentially suitable site for a new nuclear power station, for which there is an urgent national need (paragraph 2.2.1 and 2.3.2).

3.1.2 Against this background, this chapter describes the Bradwell B Project (hereafter referred to as 'the Project').

3.1.3 The overall development proposals are summarised in the four following sections:

- Project overview;
- The main development site;
- Off-site Power Station Facilities; and
- Off-site associated development.

3.1.4 In common with all large scale, Nationally Significant Infrastructure Projects, it is not likely to be possible or appropriate to define all aspects of the project design and practical implementation works in detail at the time that an application for a Development Consent Order (DCO) is made.

3.1.5 Recognising the need for some flexibility, the Environmental Impact Assessment (EIA) will therefore be based on the established principle of the 'Design Envelope'. This approach is set out in the cases of R v Rochdale Metropolitan Borough Council ex p Milne (No. 2) (2000) (Ref. 3.2) and R v Rochdale Metropolitan Borough Council ex p Tew (No. 1) (1999) (Ref. 3.3).

3.1.6 Planning Inspectorate (PINS) Advice Note Nine: Rochdale Envelope (Ref. 3.4) sets out a number of principles that describe the level of detail that a project must provide to enable a proper assessment of potential impacts and the subsequent development of mitigation, where necessary.

3.1.7 The Design Envelope is determined based on project design parameters, which in turn are used to assess the maximum adverse impact scenarios for each receptor (the 'worst-case scenario'). The worst-case scenario may differ between environmental aspects but will be based on the Design Envelope which will be set out in the Project Description chapter of the Environmental Statement (ES) and referred to with appropriate clarifications in the technical assessment chapters.

3.1.8 The approach to be adopted for the EIA will be to identify a realistic worst-case scenario(s), based upon the design parameters for the Project. The adoption of realistic worst-case scenario(s) will enable the Project's stakeholders and the Secretary of State to be confident that the environmental impacts of the Project

would be no greater than those identified in the ES. This approach is consistent with the objectives of the EIA Directive and EIA Regulations, as well as the guidance provided in PINS Advice Note Nine.

3.1.9 The description of the Project as set out in this Scoping Report will be refined further in response to project design development, further environmental information and consultation. This Scoping Report sets out where the applicant is still exploring options, for instance, in relation to the Transport Strategy. For the avoidance of doubt, this Scoping Report is not seeking an opinion at this time in relation to any potential new rail infrastructure which may be included as part of the Transport Strategy. Once this process is complete the applicant will consider whether re-scoping is required, depending on the extent of changes.

3.1.10 Where more flexibility is provided in the description of the Project in this chapter than has been described in the Stage One Consultation, this is principally to ensure that any further design development, including in response to consultation, can be accommodated, where appropriate. Where possible, comments raised during Stage One Consultation have been addressed, with respect to the technical scope of the EIA (see **Chapter 1: Introduction**). This is summarised in the relevant aspect chapters (see **Chapter 6** to **Chapter 24**).

3.2 Project Overview

3.2.1 The Project includes the following main elements:

- The power station permanent development - the proposed Bradwell B power station would be located on land within the main development site (adjacent to the existing Bradwell power station). The proposed Bradwell B power station would include two UK HPR1000 nuclear reactors with an expected gross electrical output of approximately 1,100 megawatts (MW) per unit, giving a total site output capacity of approximately 2,200MW.
- Temporary Construction Facilities - these are facilities required for the construction of the Bradwell B power station within the main development site.
- Off-site Power Station Facilities - these are permanent facilities located away from the main development site, which are essential for the safe operation of the Bradwell B power station.
- Off-site associated development – comprises development to support the construction and/or operation of the Bradwell B power station, for example park and ride facilities for construction workers, freight management facilities, worker accommodation, and both off-line and on-line road and junction improvements.

3.2.2 The location of the main development site is shown in **Figure 3.1**.

3.2.3 There are three main phases of the Project which broadly comprise: construction, operation and restoration of the main development site.

3.2.4 The construction phase of the Project is estimated to take 9 – 12 years to complete and is likely to be split into five phases, with indicative durations as follows:

- site preparation and enabling works, duration 24 - 36 months.
- civil construction, duration 29 - 38 months.
- installation, duration 27 - 33 months.
- commissioning, duration 14-20 months.
- site restoration, duration 24-36 months.

3.2.5 The operational phase of the Project is anticipated to last 60 years from the date of reactor commissioning. This phase will include the operation of the Bradwell B power station plant and systems for the generation of electricity, including the abstraction and discharge of water for cooling.

3.2.6 At the end of electricity generation, the power station permanent development would be decommissioned. The process of decommissioning would be conducted according to a phased programme of activities which would include the clearance of buildings and infrastructure and ultimately provide a delicensed site which could be made available for re-use. Decommissioning activities will not be included within the DCO application or ES and will be subject to a separate consent at the relevant time.

3.3 Site and Surroundings

Main development site

3.3.1 The main development site lies within the District of Maldon, in the county of Essex, approximately 15km east of Maldon and north-east of Bradwell-on-Sea, which is designated as a Conservation Area (see **Figure 3.1**).

3.3.2 The landscape is open, low-lying and coastal in nature. The dominant land use within the surrounding area is agricultural, comprising large fields which are used for arable cropping. These fields are often intersected by hedgerows, however there is also limited tree cover in the form of individual trees and isolated stands of woodland.

3.3.3 The main development site is located within an area known as the Dengie Peninsula. This peninsula is formed by the River Blackwater Estuary to the north and the River Crouch to the south. Large parts of the Dengie Peninsula are covered by international nature designations, whilst parts of the Estuary are covered by European and national designations. The Blackwater Estuary is also popular for sailing, with numerous marinas and sailing clubs along its shoreline. Notably, there is a marina at Bradwell Waterside.

3.3.4 Immediately to the north, east and west of the main development site is the existing Bradwell power station, which ceased power generation in 2002 and is currently being decommissioned. The facility has been in 'Care and Maintenance' since 2018, thus there are no physical decommissioning works being undertaken at the present time.

3.3.5 The main development site is also bounded by a number of other distinctive features. Along its northern and eastern boundaries, it is delineated by the features of the Borrow Dyke and the existing flood defence embankment. Landward of the flood embankment and Borrow Dyke, agricultural fields are intersected by ditches (dykes). Weymarks River, classified by the Environment Agency as a 'Main River', connects a network of land drains and ditches to the Borrow Dyke. This then drains to the foreshore via a culvert (Weymarks Sluice) which runs beneath the flood defence embankment. Along the top of the flood defence embankment runs a footpath (Public Right of Way 241-15 (PRoW)), which is part of the local Saltmarsh Coast Trail and the Burnham-on-Crouch to Maldon section of the proposed England Coast Path National Trail (ECP).

3.3.6 Within the main development site, is a redundant WWII airfield, formerly known as Royal Air Force (RAF) Bradwell Bay. Some of the former runways and buildings are still present, including the watch office (control tower which has been converted for residential use) and attached squadron headquarters, blister hangars and several pillboxes. Significant areas of these features have previously been removed, and new areas of hardstanding have been inserted, but the basic layout of the airfield is still discernible. Only the main runway is in its original form with both secondary runways having been largely removed, and surviving elements of hardstanding used for chicken sheds and a barn. There are also a small number of residential properties scattered across the main development site.

Off-site associated development and off-site highways works

3.3.7 The existing road network that is potentially affected by the Project lies predominantly within the administrative areas of Maldon District Council (MDC) and Chelmsford City Council (CCC). In this regard, it is not just the main development site itself that is of relevance, facilities such as the proposed project-provided accommodation, park and ride facilities, freight management facilities and off-site highways works all have the potential to affect the local and strategic road network.

3.3.8 The land to the west of the B1010 is gently undulating and includes small stands of woodland and agricultural fields, intersected by a number of watercourses To the west of the B1010 the local road network crosses predominantly agricultural land and provides access to the settlements of Danbury, Maldon, South Woodham Ferrers and Chelmsford and a number of smaller settlements including the villages of Purleigh, Chapel Row, Bicknacre, Cock Clarks, East Hanningfield and Howe Green. These settlements are interlinked by the A12, A132, A414, B1012 and a number of minor roads.

3.3.9 To the east of the B1010 the land use is predominantly agricultural, and within which lie the settlements of Latchingdon, Mayland, Althorne, Steeple, Tillingham, St. Lawrence, Bradwell-on-Sea and the small town of Southminster. These settlements are linked by the Maldon Road (B1018) and Southminster Road which also provide connectivity to a number of minor roads.

Highway network

3.3.10 The A12 is part of the strategic road network and links London to Lowestoft and the ports of Felixstowe and Harwich. It is a 'heavy load route' (as defined by Highways England) between the M25 and A14, near Ipswich.

3.3.11 Further notable routes include the A414 through Danbury terminating at Maldon, the A130 to the south-east of Chelmsford and the A132 Burnham Road. All are mainly single carriageways. In general, the geometry of these roads facilitates the two-way movement of Heavy Goods Vehicles (HGVs).

3.3.12 From these routes the main development site can be reached either by the B1021, B1010 and B1012 or the B1018 and then unclassified roads. These routes are single carriageway with one lane in each direction.

Rail network

3.3.13 Southminster railway station is located approximately 12km south of the main development site. The station provides access to Wickford with two services per hour with a 30-minute journey time. In addition, it provides one service per hour to London Liverpool Street with a 70-minute journey time. Wickford railway station can be used for rail travel further afield to Southend Victoria.

3.3.14 The branch line from Wickford to Southminster is single-track with a passing loop at North Fambridge. Some 27 passenger trains depart Southminster every weekday for Wickford or London Liverpool Street. The nearest existing points of access to the main development site for rail freight are at interchanges at Chelmsford and Southminster.

3.3.15 Further afield is Chelmsford rail station, which is approximately 40 kms by road to the west of the main development site.

3.3.16 Chelmsford is located on the Great Eastern Main Line (GEML) and has some 105 passenger trains departing to this destination every weekday from London Liverpool Street. Further enhancement of passenger services to and from London is anticipated with the opening of the Elizabeth Line between Shenfield and Reading in 2021.

3.3.17 The route between London and Southminster via Wickford does not form part of Network Rail's "Strategic Freight Network". The branch line continues to be used on occasion to move low-level nuclear waste associated with the decommissioning of the existing Bradwell power station.

Port infrastructure

3.3.18 The nearest existing commercial port facilities are located at Felixstowe and Harwich, to the north of the main development site, and Tilbury to the south. Between them they offer a range of facilities to handle bulk materials, containers, Abnormal Indivisible Loads (AILs) and general cargoes and could therefore operate as 'muster ports' for the Project's bespoke marine transport infrastructure, as part of the marine Transport Strategy for freight to be developed for the Project.

3.4 Main Development Site

Power station permanent development

3.4.1 **Figure 3.2** identifies the main development site and the location of power station permanent development. The power station permanent development within the main development site would include the following key operational elements:

- Nuclear Island – comprising two UK HPR1000 reactor units to generate high pressure steam, and associated buildings;
- Conventional Island – occupied by two turbine halls (one for each reactor unit) with electrical buildings and associated balance of plant. The turbine halls house the generators which convert energy from high pressure steam into electrical power;
- Balance of Plant – occupied by additional facilities and equipment that are required for the operation of the Bradwell B power station. Many of these buildings and structures are similar to those that would be found on a gas or coal fired power station;
- Cooling water infrastructure including forebay, pump houses, water treatment and cooling plant (including cooling towers);
- Power transmission infrastructure, including a connection to a new 400kV sub-station to be provided by National Grid;
- Fuel and waste storage facilities, including interim storage for nuclear waste and spent fuel;
- Offices, welfare facilities, security and emergency response facilities (some of the latter may also be located off-site); and
- Security facilities including fencing and security checkpoints to control access to different areas of the site, as well as security lighting.

3.4.2 In addition to the power station permanent development elements that will form the functional Bradwell B power station, there would be permanent infrastructure supporting the operation and maintenance of the power station. This infrastructure would include:

- cooling water infrastructure, including cooling water tunnels extending out from the Bradwell B power station into the estuary to abstract and discharge cooling water via intake and outfall structures;
- primary and secondary access roads, car parking and internal roads;
- flood defences surrounding a raised platform, which together would protect the Bradwell B power station from extreme flood events (taking into account future climate change);
- a marine transport facility for occasional use (once every 5 years or less on average) to bring large components to the main development site by sea; and
- a restored landscape extending across all areas impacted by construction, incorporating elements which would contribute to environmental mitigation, compensation and enhancement.

3.4.3 There will also be a requirement for a water supply to the Bradwell B power station during operation to meet the following needs:

- process water requirements;
- potable water requirements; and
- firewater requirements.

3.4.4 In addition, there may also be additional administrative buildings located on the main development site, including a simulator building or training centre and visitor centre.

3.4.5 The following sections provide further information in relation to certain components of the power station permanent development that are of relevance to the Scoping Report.

Location and layout of the power station permanent development

3.4.6 Certain elements of the Bradwell B power station are regarded as 'safety critical', such as the Nuclear Island. These elements of power station permanent development would need to be located on land at a sufficient height to enable their protection from extreme tide levels. An indicative optimal level of the platform would be approximately 7.5m Above Ordnance Datum (AOD) to protect these safety critical elements from a 1 in 10,000 year extreme sea level (as informed by the Environment Agency's published data and ONR (Ref. 3.5) and Environment Agency guidance (Ref. 3.6)), taking account of potential climate change. In the event of an extreme flood event, it would also be necessary to protect the Bradwell B power station from wave run-up and overtopping, which would require new flood defences (hereafter referred to as the 'Bradwell B power station flood defences'). Based on preliminary design work, the Bradwell B power station flood defences would need to have a crest level (top) up to approximately 10m AOD, subject to further investigations.

3.4.7 The new flood defence would be constructed with material sourced on-site (for example London Clay), or with imported material.

3.4.8 The power station permanent development would include those elements listed in paragraph 3.4.1. The tallest structures on the main development site would be the reactor units which are anticipated to be up to approximately 65m in height.

Cooling infrastructure

3.4.9 The heat energy from the reactors at the Bradwell B power station would be used to create steam, driving turbines to generate electrical power. This process requires a cooling system to condense the exhaust steam from the turbines.

3.4.10 The Project will use 'indirect' cooling methods, as opposed to direct cooling, whereby cooling water is re-circulated around the plant, losing heat to the atmosphere via evaporation in 'cooling towers'. Modern, low plume 'hybrid' cooling towers are proposed, of which two basic types (rectangular and circular) are being considered.

3.4.11 Six rectangular or two circular hybrid cooling towers would be required. The circular towers would be approximately 160m in diameter at the base and approximately 50-60m high. The rectangular towers would each be approximately 40m wide and 170m in length and would be approximately 25-30m in height.

3.4.12 Cooling water would be taken from and returned to the Blackwater Estuary through structures known as intakes and outfalls. Outfalls would be connected to the Bradwell B power station via tunnels located beneath the seabed. Intakes would either be connected to the power station using tunnels beneath the seabed or an intake on the coast. The intakes would draw in suspended sediment which would be settled out on arrival at the Bradwell B power station before the seawater is used in the cooling system. Sediment that is collected would either be returned to sea by the cooling outfall or taken off-site for re-use or disposal.

3.4.13 The cooling discharge would be more saline (saltier) than seawater, therefore there is the potential for discharged water to sink. This may require use of a diffuser at the outfall to improve mixing with the seawater, depending on the outcome of ongoing environmental studies.

3.4.14 In addition, the potential need (and effectiveness) of mitigation measures at the cooling water intakes to reduce impacts on fish will be investigated. This could include the potential use of a 'fish recovery and return system' (FRR) in which fish that are drawn into the intakes with seawater are intercepted and returned to sea via a dedicated pipeline(s).

National Grid 400kV sub station

3.4.15 A new 400kV sub-station is required to transmit the electricity generated by the Project to the National Grid, which it is anticipated would be positioned south of the Conventional Island. Within the power station permanent development, the

applicant would be responsible for the Project's connection to this new 400kV sub station, but National Grid would be responsible for building the sub-station and connecting it to the national grid.

Marine transport facilities

3.4.16 There would be a requirement for a permanent marine transport facility to transport very wide or heavy components - AILs - to the Bradwell B power station during maintenance shutdowns, or "outages". The currently preferred option to address this requirement during the operational phase for the Bradwell B power station is for a Beach Landing Facility (BLF). Marine transport capacity would also be a requirement during construction of the Bradwell B power station for importation of construction materials (see section on temporary development). Once the Bradwell B power station has been built a permanent BLF would be retained for operational use. It is anticipated that the permanent BLF would only need to be used occasionally during operation (approximately once every 5 years or less).

Temporary development

3.4.17 During the construction of the Bradwell B power station, temporary facilities would be required to facilitate the construction process. These would include the following and may include other temporary facilities required during construction:

- road access, including: an entrance plaza for HGVs and coaches, security and vehicle search facilities, and vehicle parking;
- construction site fencing and lighting (including security lighting);
- contractor working areas including materials laydown, workshops, module assembly, equipment storage; offices and welfare facilities;
- storage areas for soil and spoil from earthworks;
- temporary structures including cranes and concrete batching plant and associated facilities to stockpile aggregates and cement;
- construction production facility for on-site fabrication and storage of rebar and other non-concrete materials;
- temporary plant required for the construction of the Bradwell B power station and formation of the platform and new landscaped setting;
- marine works area for construction of cooling tunnels and headworks;
- internal construction and haul roads, fencing, lighting and security;
- collection, treatment and disposal facilities for surface water, ground water and sewage, including discharge pipes into the marine environment;

- potential infrastructure for the transport of marine dredged aggregate[1] to the main development site for raising the platform. This may include a conveyance pipeline for delivery to the main development site, settlement lagoons and a pipeline to discharge seawater back to sea;
- beach landing facilities for transporting bulk materials and AILs to the main development site by sea;
- temporary utilities including potable water supply, telecommunications, and electrical supplies including a temporary 132kv sub-station; and
- landscape features including earthworks and planting, including for visual screening, as well as other forms of environmental mitigation, compensation and enhancement.

3.4.18 There is the potential for temporary project-provided accommodation in close proximity to the main development site. Further information is provided in **Section 3.6**.

3.4.19 Following feedback from Stage One Consultation, and ongoing project development, the applicant is considering the potential opportunities for rail as part of the Transport Strategy for the construction of the Project. If new rail infrastructure forms part of the Project, the extent of the works will be defined, consulted on and rescoped if necessary. Further information is provided in relation to rail infrastructure in **Section 3.6**.

3.4.20 Prior to the commencement of full operation of the Bradwell B power station, land used temporarily during construction would begin to be restored in line with a Landscape Strategy.

Construction phase

Construction workforce

3.4.21 The peak construction workforce will depend on the final construction programme which is still to be finalised. At the current time (Summer 2020) it is anticipated that up to 9,100 construction workers is a likely realistic central estimate, with a worst-case scenario of up to 10,600 construction workers. This will be refined and confirmed in the relevant assessment.

Construction phasing

3.4.22 Construction of the Project is estimated to take between 9-12 years to complete, including works for the restoration of land used temporarily during construction. **Figure 3.2** shows the area in which construction working would take place.

[1] The nearest marine aggregate resources fall in the Outer Thames Estuary, approximately 60km to 90km from Bradwell and in the open sea.

3.4.23 The construction phase of the Project is currently anticipated to take place in five main phases as follows (approximate durations for each phase are provided, but these will be refined as the Project moves through consultation and design development):

- Site preparation and enabling works, duration 24 - 36 months: this would involve site levelling and excavation of major earthworks, as well as completion of temporary arrangements, for the main development site. These include water supply, drainage, electrical supply, roads, batching plant, materials laydown, workshops, module assembly, equipment storage, offices and welfare facilities and bulk material delivery facilities. Secondary facilities such as canteens, medical facilities and parking would also be included.

- Civil construction, duration 29 - 38 months: this would see the completion of major building construction, including installation of the reactor dome on the top of the reactor building and any necessary ground engineering. It is also anticipated that construction of the Bradwell B power station flood defences will take place as part of this phase. Other works would include the completion of main concrete construction works and structural steel buildings, as well as the cooling water infrastructure, tunnelling and intake and outfall structures.

- Installation, duration 27 - 33 months: this would deliver the integrated engineering of civil works, plant, and equipment to form functional systems. All systems including primary loop equipment, as well as power, water, and ventilation systems would be installed, ready for commissioning.

- Commissioning, duration 14 - 20 months: 'Cold' functional testing would commence in this phase, culminating in the commercial operation of the units. 'Hot' functional testing, containment testing, fuel loading, and synchronisation to the grid would also take place before handover to Bradwell B power station operations.

- Site restoration, duration 24 - 36 months: This would complete landscaping works for the Bradwell B power station and restore those parts of the main development site not required during the operational phase in accordance with the Landscape Strategy. Works would include removal of temporary construction phase infrastructure, ground reprofiling, subsoil and topsoil spreading and planting or seeding.

3.4.24 These phases are illustrated in the programme in **Plate 3.1**, which identifies where the phases would overlap.

Plate 3.1: Indicative construction phasing

Earthworks strategy

3.4.25 Initially, major excavations would be required to construct the Bradwell B power station's foundations. During construction, the land that would be permanently occupied by the Bradwell B power station would be raised to the appropriate platform level (currently assumed to be approximately 7.5m AOD, assuming a protected site and subject to further investigation) and enclosed by the Bradwell B power station flood defences. These major excavations and land raising works comprise the main elements of the overall earthworks requirements, noting that significant earthworks would also be required to prepare land for the construction facilities.

3.4.26 Topsoil and subsoil would be stripped from all working areas prior to carrying out deep excavations to construct the Bradwell B power station's foundations and to terrace the site west of Weymarks River for construction access and works. Some of this material, such as sand and gravel, may be suitable for re-use as engineered backfill. Other materials, such as London Clay, may be suitable for use in the Bradwell B power station flood defences. Some of the topsoil will be required after the Bradwell B power station has been built to deliver the landscape restoration.

3.4.27 Materials suitable for re-use in construction would be stored in 'working stockpiles' that would be actively used, as necessary, during construction for materials balancing purposes. Other materials, such as topsoil, that would not be required until the final site restoration, would be put into long-term storage in soil mounds that would be profiled and grassed until needed. Where possible, these storage mounds would be sited and managed in a manner that would help to protect the amenity of neighbouring properties and land users.

3.4.28 A proportion of excavated spoil may be unsuitable for re-use in construction. This material could be re-used on-site to deliver landscape and ecological mitigation and enhancement and also to help balance the earthworks within the main development site.

3.4.29 It is intended to use this material immediately as it becomes available in order to deliver a proportion of the permanent new landform outside the construction working area and to provide screening from residential areas, as well as to create new ecological habitat.

3.4.30 There may be a need to develop borrow pits associated with the main development site in order to source construction materials and help balance the earthworks. Any such borrow pits would be backfilled with arisings which are unsuitable for re-use as a construction material and would be restored.

Aggregate sourcing

3.4.31 A significant volume of bulk fill would be required to be imported to the main development site to raise the Bradwell B power station platform to approximately 7.5m AOD and to enable the wider construction preparation area to be terraced during the earthworks stage to facilitate platform development and internal site access. This material could either be sourced locally or transported to the main development site by sea or by other appropriate modes. The importation of marine-dredged aggregate to the main development site by sea is also under consideration.

Construction landscape strategy

3.4.32 The construction landscape strategy is in development and will continue to evolve to enable integration with construction planning and phasing to ensure that landscaping works can be delivered as early as practicable, leaving an established landscape following site restoration. A Restoration Plan will be developed to address planting and landform following completion of construction.

Marine transport

3.4.33 Large quantities of construction materials will need to be transported to the main development site to construct the Bradwell B power station. Sustainable transport modes would be used as far as practicable to help reduce HGV traffic on local roads. Some large items included within the definition of AILs must be transported by sea because they are too large or heavy to transport by road, although some AILs may also come to the site by road.

3.4.34 Marine facilities are proposed which would be capable of handling bulk materials such as fill for raising the platform of the Bradwell B power station and materials used in the manufacture of concrete. The facility would also be capable of transporting other cargoes such as steel reinforcement.

3.4.35 BLF's are currently proposed as the Project's preferred marine transport option. For logistical reasons two BLF facilities are anticipated to be required at this stage. Bulk materials would be offloaded by conveyor or truck; and cement, or other appropriate materials, would be offloaded by pipeline or trucked from the marine transport facility in sealed containers. AILs would be 'rolled off' flat-top barges using specialist vehicles, or by crane from the vessel to a suitable trailer unit for certain equipment such as containerised materials. A working area around these BLFs would need to be constructed, including land for materials storage or laydown, security and welfare facilities, and fencing.

3.4.36 Transfer of materials from the barges would require new infrastructure to connect the BLFs to the construction area and therefore a bridge is proposed that would

cross the existing flood defences. Given that the defences are at the same level or lower than the bridge deck, freight could be transported over the existing flood embankment without difficulty. The integrity of the existing flood defence embankment would be protected, and a monitoring programme would be implemented.

3.4.37 At this stage, whilst it may be possible to keep the existing footpath (and proposed England Coast Path) that runs along the embankment open when the facilities are not in use, for the purposes of the Scoping Report, it has been assumed that a suitable diversion would need to be in place throughout the construction period. Even if access could be maintained at other times, it would need to be closed during construction of the bridge across the existing coastal flood defences.

3.4.38 In addition to the preferred BLF option identified above, the Project is also considering use of an aggregate pipeline and settlement lagoon option for the movement of bulk fill and aggregate into the main development site. This option would comprise a vessel positioned offshore connected to a floating or sunken pipeline for hydraulic placement of bulk fill material. The vessel (a dredger) would source the material either offshore or from land sources via a muster port. The vessel would connect to the pipeline and pump sand and aggregate to a large (approximately 10 ha) on-site storage lagoon, using seawater as a transport medium. The sand and aggregate would settle out within the lagoon and the transport water would be treated as necessary and discharged back to sea via a pipeline.

Rail transport

3.4.39 The applicant is still considering the opportunity for rail and if this is shown to be realistic, will consult on options for potential rail infrastructure, including routes, at an appropriate stage.

Operation

Electricity generation

3.4.40 The proposed Bradwell B power station would have a design life of 60 years. The power generating capacity would be approximately 1,100MW for each UK HPR1000 reactor unit, giving a total site capacity of approximately 2,200MW. Electrical power generated in the two turbine halls would be converted by transformers to high voltage (400kV), before being exported from the main development site. Electrical connections from the Project would be made via underground or overhead cabling to a new National Grid 400kV sub-station. The sub-station would then feed electrical power from the nuclear power station to the national grid high voltage transmission system. Works to connect the power station to the transmission system will be required and these will be brought forward for consent under a separate DCO application to be made by National Grid.

Maintenance and refuelling

3.4.41 During the 60-year operational life, the Bradwell B power station would undergo refuelling and maintenance shutdowns (otherwise known as 'outages') at approximately 18-month intervals. The length of these outages would vary according to the maintenance and inspections required but would typically be up to three months in duration.

3.4.42 Maintenance outages would include 'preventative maintenance', incorporating inspections, tests, maintenance, repairs and replacements of equipment in order to ensure safety and comply with the Nuclear Site Licence and other regulatory requirements. Maintenance outages would normally be undertaken in conjunction with refuelling outages. The length of the maintenance outage would vary depending on the scope of the work required.

Cooling systems

3.4.43 For the UK HPR1000s there would be three cooling systems, comprising primary, secondary and a hybrid cooling system.

3.4.44 The primary circuit system is housed in the reactor building and is a closed water-filled pressurised system to extract heat from the reactor core. The water in this system also helps to control and sustain the fission reaction.

3.4.45 The secondary circuit system is a closed system that operates at a lower pressure. When heated by the primary system saturated steam is produced, which is used to power a large turbine-generator which produces electricity. After leaving the turbine the steam is cooled and condensed back to liquid water and the process is repeated.

3.4.46 A third hybrid cooling circuit system would reuse water around the plant, losing heat to atmosphere via cooling towers. It would be independent of the primary and secondary systems and would draw water directly from the sea to replace water lost through evaporation in the cooling towers and purge water released back to sea to prevent the build-up of salt within the cooling system. The cooling water would be screened, passed through condensers to cool the exhaust steam from the turbines, and then returned via the hybrid cooling system with a small discharge to sea.

Liquid discharges

3.4.47 In addition to the seawater volumes associated with the FRR system, the potential liquid discharges associated with the operation of the Bradwell B power station through the hybrid cooling water purge include:

- return of abstracted cooling water, which will be characterised by thermal content and will be dosed with biocides to prevent biofouling of the cooling water infrastructure;

- effluent associated with operations within the Nuclear Island, which will contain small amounts of radioactivity, which will be discharged on a batch basis after processing and monitoring to remove contaminants;
- demineralised water (known as 'blowdown') from the secondary cooling system. This would be processed and treated to remove non-radioactive corrosion products and dissolved salts before the water is recycled in the secondary circuit. As with the primary system, the non-recyclable blowdown effluent would be transferred to a separate system which monitors, and further processes effluents where required, before being discharged;
- effluent from the Turbine Hall and uncontrolled area floor drains would be discharged on a batch basis after monitoring and treatment, if necessary;
- storm water run-off from site drainage network which will pass through an oil interceptor prior to discharge;
- oily water from areas where oils or hydrocarbon fuels are stored or used will be segregated to prevent contamination and sent off-site for management at an appropriately licensed facility;
- sanitary effluent and other wastewater generated by on-site workforce will be treated in a Sewage Treatment Plant before being discharged to sea via the main cooling water system, subject to further studies; and
- non-radioactive water discharges associated with the operations of the Bradwell B power station. These will be managed through the Operational Water Discharge Activity Permit. Radioactive liquid discharges will be managed through the Radioactive Substances Regulation (RSR) environmental permit.

Gaseous emissions

3.4.48 The potential operational emissions to air arising from the operation of the Bradwell B power station would primarily include:

- formaldehyde (H_2CO), that may in turn produce carbon monoxide (CO), emitted by the thermal decomposition of insulation material during the return of the reactor to operation following maintenance outages;
- ammonia (NH_3) discharged as the temperature rises in the steam generators during start-up following a maintenance outage;
- sulphur dioxide (SO_2) nitrogen oxides (NOx), carbon monoxide (CO) and particulate matter (PM_{10} and $PM_{2.5}$) in the exhaust gases from engines of back-up diesel generators during periodic testing;
- SO_2, NO_x, CO, PM_{10} and $PM_{2.5}$ from other combustion plant on-site including firefighting and hydrant diesel pumps, and domestic heating boilers; and

- discharge of radioactive gaseous effluents arising from the degassing of primary coolant and maintenance and operations in building areas containing radioactivity, which would be subject to controls through the RSR environmental permit which is within the remit of the Environment Agency.

Workforce

3.4.49 During operation, it is expected that approximately 900 staff would be employed on the main development site. Approximately 1,000 additional staff would be employed during planned refuelling and maintenance outages.

Waste management

Conventional waste management

3.4.50 The Project aims to achieve best practice in waste management and performance. Accordingly, the following objectives have been developed for the management of conventional waste during both the construction and operational phases of the Bradwell B power station:

- to prevent and reduce the volume of waste produced through the application of the waste hierarchy in both design and construction;
- to maximise re-use and recycling within the Project; and
- to minimise the impact upon the existing waste management infrastructure.

3.4.51 The Waste Management Strategy will provide details of the estimated waste arisings produced through the various activities as the Project progresses. It will also identify methods for managing the wastes.

3.4.52 The strategy will aim to ensure that all waste management measures employed protect both the environment and people and comply with relevant policies.

Spent fuel and radioactive waste management

3.4.53 The Project would ensure that the management of spent fuel and radioactive waste generated by the Bradwell B power station protects both people and the environment and is consistent with UK policy and legislation.

3.4.54 Spent fuel removed from the reactor would initially be stored underwater in a fuel pool in the fuel building. Following this, the spent fuel assemblies would be transferred to the separate on-site Interim Spent Fuel Store (ISFS) where they would be safely stored until a UK Geological Disposal Facility is available and the spent fuel is removed for final disposal.

3.4.55 The ISFS would be designed for a life of at least 100 years, which could be extended if necessary. The ISFS would be designed to be capable of operating independently of other parts of the Bradwell B power station in recognition that its lifetime would,

under current assumptions, extend beyond the operational life and decommissioning of the other facilities on-site.

3.4.56 The design of the UK HPR1000 reactor planned for the Project includes a number of measures aimed at limiting the amount of radioactive waste generated. Radioactive waste generated at the Project would fall into two categories – Low Level Waste (LLW) or Intermediate Level Waste (ILW).

3.4.57 LLW would be disposed of as soon as reasonably practicable, following treatment to limit its volume and then appropriate conditioning or packaging to allow its safe transport and disposal.

3.4.58 ILW would be conditioned and packaged on-site throughout the operational phase. The packages would be safely stored in the ILW Interim Storage Facility on-site until a UK Geological Disposal Facility is available to accept waste from the Project for disposal.

Decommissioning

3.4.59 The expected operating life of the two reactors comprising the Bradwell B power station is approximately 60 years. Decommissioning will start immediately after the last unit ceases generating electricity and is likely to require specific structures to be built to accommodate the decommissioning works. Baseline conditions at the time may be substantially different from those which apply at present. Furthermore, decommissioning methods and associated technology are likely to have advanced over this period. Therefore, a robust assessment of Bradwell B power station's decommissioning cannot be completed at the present time.

3.4.60 Consequently, decommissioning activities will not be included within the DCO application or ES and will be subject to a separate consultation and consenting process, including a discrete EIA for all planned decommissioning activities which will be prepared in accordance with the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (or the appropriate legislation at the time) (Ref. 3.7).

3.5 Off-site Power Station Facilities

3.5.1 In addition to the permanent facilities on the main development site, there may be the need for additional facilities, such as emergency responses units, to be located off-site to ensure the safety and security of the operational Bradwell B power station.

3.5.2 These facilities would be located in accordance with ONR guidance, 'Safety Assessment Principles for Nuclear Facilities' relating to safety considerations and are likely to include the following, either individually or co-located:

- Mobile Emergency Equipment Garage (MEEG);
- Alternative Emergency Control Centre (AECC); and

- Environmental Survey Laboratory (ESL).

3.5.3 As well as the buildings required to accommodate these facilities, the off-site Power Station Facilities could include office, welfare, training and parking facilities to meet staff and operational requirements and appropriate security measures.

3.6 Off-site Associated Development

3.6.1 In order to facilitate the construction of the Bradwell B power station, there is the requirement for off-site associated development, which would include the following:

- Project-provided accommodation;
- Park and ride facility or facilities;
- Freight management facility or facilities; and
- Off-site highway works.

3.6.2 At this early stage of the Project, the applicant has not yet identified preferred sites for off-site associated development or defined the specific works that may be necessary in terms of the highway options. This will be refined according to project development, environmental information and consultation. Accordingly, reasonably wide search areas have been defined for the purposes of the Scoping Report. It is anticipated that these will be refined as further consultation is undertaken. The ES for the DCO application would be carried out on defined sites and works, with appropriate parameters using the Rochdale Envelope.

3.6.3 The sections below provide information on each type of off-site associated development for the purposes of the Scoping Report.

Worker accommodation

3.6.4 An Accommodation Strategy will be developed to ensure there is adequate accommodation for workers during the construction phase within a reasonable travelling distance of the main development site, whilst managing local impacts on accommodation capacity. This Strategy will include the provision of construction worker accommodation in the form of a temporary project-provided accommodation and caravan site within close proximity of the main development site. Indicative areas for such accommodation are shown in **Figure 3.2.**

3.6.5 Temporary project-provided accommodation proposed to support the main development site would include:

- accommodation for up to 4,500 workers;
- accommodation block buildings, up to 6 storeys in height with en-suite single bedrooms and shared kitchen and communal facilities for the caravans and formal temporary project-provided accommodation;

- a caravan site;
- car parking for residents (amount to be determined);
- a canteen or restaurant and kitchen facilities;
- health services;
- bars and recreational areas;
- a gym (on site);
- outdoor sports facilities, including sports pitches;
- central administration offices;
- waste recycling and facilities to supply energy to the site;
- site security area including fencing;
- access roads and appropriate lighting to ensure the safe and secure operation of the site;
- a shop;
- laundry service;
- refuse stores for each block;
- other utilities and services, including a foul water pump station; and
- landscaping.

3.6.6 In addition, there may be a number of additional smaller worker accommodation sites, located on the Dengie Peninsula, to the east of the A130, which may include temporary purpose-built accommodation, caravan sites or up to 500 permanent houses which could be used first as construction worker accommodation. The precise size and location of such facilities would be determined and consulted on with due regard to relevant local planning policy.

Transport strategy

3.6.7 The emerging Transport Strategy is presented below, followed by a description of the likely anticipated off-site associated development required in connection with that Strategy. The Transport Strategy will be refined through project development, an understanding of environmental effects and responses received through the consultation process.

3.6.8 The emerging Transport Strategy for the Project focusses on the following:

- Transport Strategy for the movement of freight including freight management facilities;
- Transport Strategy for the movement of construction workforce including park and ride facilities and direct buses; and
- highways improvements.

3.6.9 The Strategy has been developed to meet the following eight transport objectives:

1) Satisfy the construction and operational requirements of the Project including feasibility, efficiency, cost effectiveness and deliverability in accordance with the Project timescales;

2) Maximise the use of sustainable transport over road transport for the movement of freight;

3) Reduce the distance the construction workforce needs to travel and maximise the use of sustainable transport modes;

4) Deliver appropriate demand management measures, in preference to highway infrastructure improvements;

5) Minimise the impacts on journey times for both the local community and visitors to the area using the highway network;

6) Minimise the impacts on the safety and resilience of the highway network;

7) Provide long term sustainable legacy benefits for the local community from new infrastructure, where appropriate; and

8) Take all reasonable steps to protect the natural and built environment.

3.6.10 Further information on vehicle movements associated with the Project can be found in **Chapter 6: Transport**.

Transport strategy for the movement of freight

3.6.11 The development of the Bradwell B power station would require the movement of substantial volumes of construction materials to the main development site. This would include AILs, bulk materials such as aggregate and cement for the manufacture of concrete, as well as fill material for raising site levels, steel reinforcement and a range of other materials for example steelwork for the construction of temporary and permanent buildings, utilities, lighting and fencing materials.

3.6.12 An essential part of the proposed strategy for the movement of freight is the split between marine, rail and road transport modes during construction. It is anticipated that a significant proportion of bulk construction materials could be delivered to the

main development site by marine transport. The extent to which rail will be included in the Transport Strategy is still to be decided.

3.6.13 Whilst maximising the use of sustainable modes, there will still be a requirement for bringing freight to the main development site by road, and this would necessitate a range of highway improvements, options for which are set out below.

3.6.14 At this stage there are a number of uncertainties that could impact on estimates of the likely number of HGV movements. These include the platform height for the Bradwell B power station, the earthworks strategy, the construction sequence and schedule. Further work will be undertaken in these and other areas to confirm likely HGV movements.

3.6.15 A precautionary approach has been taken to the identification of HGV numbers that are likely to be required, with benchmarking against other nuclear new build projects. At this stage the number of HGVs estimated exclude any movements arising from the construction of any of the off-site associated developments (for example temporary project-provided accommodation, park and ride facilities and the construction of the highway works) as the proposals for these developments are still emerging.

3.6.16 Based on the work conducted to date, and the modal spilt described in the Stage One Consultation, it is estimated that there would be between 500-700 two-way HGV movements (250-350 movements each way) on average per day during the peak construction period, however this is to be confirmed subject to further transport assessment and confirmation of the proposed modal split.

3.6.17 Initial assessments suggest that the local roads between the main development site and the strategic road network (A12 and A130) are physically constrained in places and potential HGV routes pass through a number of communities that may require mitigation through a range of highway interventions, which are summarised in the following sections.

3.6.18 In addition to these potential highway interventions, development of temporary freight management facilities are proposed on or close to the designated HGV route to the main development site, with the potential to co-locate a freight management facility with a park and ride facility. Such facilities would be required to control the timing of deliveries to the main development site during the peak construction period and/or for the storage of material. In addition, such facilities would assist in managing HGV movements on local roads, such as to reduce movements during peak or sensitive hours. They could also provide a space where paperwork, vehicles, and goods can be checked prior to delivery to site; where HGVs are held while they wait to enter the site; and where HGVs are held temporarily in the event of an incident on the road network. Freight management facilities (or facility) would also provide welfare facilities for drivers and could provide space for the storage of materials and an opportunity for consolidation of non-construction materials, such as post and food, if required. They could further support the running of the bus fleet that will be used by the Project and provide vehicle washing and parking facilities.

3.6.19 A Construction Traffic Management Plan will be implemented to manage the HGV movements associated with the construction phase of the Project. This Plan will be subject to discussion with key transport stakeholders.

Transport strategy for the movement of construction workforce

3.6.20 The proposals would seek to achieve a sustainable modal split for the Project's construction workers. This would result from the provision of temporary workforce accommodation close to the main development site and through the provision of direct buses and park and ride facilities and the promotion of car sharing that will help minimise the daily use of single occupancy private cars by construction workers.

3.6.21 A Construction Workforce Travel Plan would be developed in outline as part of the application for development consent and would be implemented during the construction phase of the Project to encourage sustainable travel by the construction workforce.

3.6.22 Some construction workers would be allowed to drive direct to the main development site. This allowance would be limited to those living in areas which would not be served by direct buses or where it would not be practical to use one of the temporary park and ride facilities that would be developed as part of the Project. In addition, some workers would, for operational reasons, need to bring their car to the main development site to assist in the carrying out of their duties. The size of the construction car park will be informed by further traffic assessment however for the purpose of the Scoping Report this could be up to 1,500 vehicle spaces, excluding HGVs.

3.6.23 Park and ride facilities would play an important role during the construction of the Project: intercepting workforce trips by car, reducing the amount of worker traffic on local roads between the park and ride facilities and the main development site or project-provided accommodation, meeting health and safety requirements and reducing potential environmental effects. Bus transfer movements linked to the park and ride facilities will be included in the traffic modelling of the Project. These will assume regular movements to coincide with shift changeover times and a skeleton service outside these hours. Park and ride buses will be required to follow fixed routes to the main development site and project-provided accommodation. For the main development site, these are anticipated, where possible, to be the same as the HGV routes.

3.6.24 Dedicated direct buses would be provided by the Project to pick up construction workers from locations where there are enough workers to warrant such a service. This is expected to include local population centres and local rail stations such as at Southminster and Burnham-on-Crouch, in order to encourage construction workers to make use of rail passenger services.

Highways improvements

3.6.25 To manage the proposed number of vehicle movements on the local road network resulting from the construction and operation of the Project, a package of highway improvement works is needed. Proposed highways improvements are set out firstly for the 'early years' stage of the Project (1-2 years post commencement of construction, before major highway improvements have been completed) and secondly, interventions at peak construction required to establish an appropriate HGV route between the strategic road network and the main development site for use in the main construction period.

Highway improvements during early years (1-2 years)

3.6.26 The Transport Strategy during the early years will focus on utilising the existing highway network as far as possible alongside improvements to the existing highway and implementation of HGV management measures.

3.6.27 The following strategic options have been identified to enable the movement of freight on the existing road network during the early years:

- a Management Strategy for the movement of freight to implement several HGV management measures including timing of HGV movements and potential load consolidation. As part of this strategy there may be a requirement for provision of a freight management facilities to control and manage HGV movements into the main development site. The preferred location of the facilities will be informed by ongoing transport assessment work and consultation;
- on-line physical works within the designated highway boundary, to be agreed with Essex County Council (ECC), such as additional signage, improved signalling at junctions and additional pedestrian crossings through sensitive communities;
- provision of potential park and ride facilities to manage movement of the early years' construction workforce to the main development site. The preferred location of the facilities will be informed by ongoing transport assessment work, consultation and development of the workforce gravity model;
- localised junction and highway works at identified pinch points on the existing highway network, which may or may not require targeted third party land outside of the designated highway boundary; and
- environmental management measures to reduce potential impacts on communities and sensitive receptors, such as residential properties, community facilities, conservation areas and listed buildings.

3.6.28 Some of the above measures (for example signalling, signage, pedestrian crossings, traffic management measures, junction and certain highway improvements within the highway boundary) could be consented outside of the DCO if required and potentially implemented prior to commencement of construction on

the main development site. Further detailed work and engagement will be undertaken with ECC as the relevant highway authority and the relevant local planning authorities (MDC and CCC).

3.6.29 The early years' strategy has identified two preferred potential HGV route options as follows:

- Route A: 100% of HGVs via A130, A132 Burnham Road to the north of South Woodham Ferrers, Lower Burnham Road and north along Fambridge Road until reaching the Fambridge Road/ Latchingdon Road/Cold Norton Road junction. HGVs would then route via Latchingdon, Mayland and Steeple to the main development site. The outbound movement of HGVs from the main development site would follow the same route as the inbound traffic; and

- Route B: This route was consulted on as part of the Stage One Consultation. The inbound vehicles would approach the main development site via the A12 Junction 18, A414 through Danbury to the A414/B1018 junction at Maldon. HGVs would then route along the B1018 to the south of Maldon to B1010 Fambridge Road, upon which they would travel south until reaching the Fambridge Road/ Latchingdon Road/Cold Norton Road junction. HGVs would then route via Latchingdon, Mayland and Steeple to the main development site. Once ready to depart, outbound HGVs would route via Steeple, Mayland, and Latchingdon, and then travel along Route A (via South Woodham Ferrers) to re-join the A130.

3.6.30 **Figure 3.3** illustrates the potential preferred Early Years Routes A and B.

3.6.31 Within the indicative routes identified in **Figure 3.3**, there would be a combination of on-line physical works, localised junction and highway works and environmental management measures.

3.6.32 The route during the early years could change, subject to the potential for improvements to be delivered to the existing road network, under a section 278 highways agreement or included in an early works application(s) under the Town and Country Planning Act 1990 (as amended) (Ref. 3.8) to the relevant local planning authority prior to DCO submission.

Highway improvements during peak construction

3.6.33 A potential Strategic Route has been identified for access to the main development site from the highway network. Options to the Strategic Route are presented in specific areas, such as Latchingdon and Mayland, and will be subject to further optioneering.

3.6.34 The highways interventions would include a combination of the following strategic physical interventions which would sit alongside freight management measures and use of the existing highway network, where possible:

- Category 1: Upgrading of the existing highway network, where considered necessary and deliverable. Upgrades are expected to be principally associated with junction improvements and localised widening within the adopted highway, where possible, or where necessary within third party land;
- Category 1a: Localised highway realignments;
- Category 2: Bypasses around settlements and sensitive locations; and
- Category 3: New off-line sections of highways where upgrades of the existing highway or bypasses around settlements and sensitive locations are not considered viable or practical to deliver.

3.6.35 At this stage, it is not possible to identify specific alignments for the potential bypass routes and new off-line sections. Therefore, for the purpose of the Scoping Report, **Figure 3.4** identifies the proposed Strategic Route (including flexibility for elements of both routes known as Strategic Routes 1 and 2 as set out in the Stage One Consultation) and associated potential route options along with search areas (identified A – I) in which highways interventions, as identified in Categories 1 - 3, would be located, as described in the following paragraphs.

3.6.36 The Strategic Route comprises a route from the A130/A132 junction via the South Woodham Ferrers ring road, Lower Burnham Road, Fambridge Road, the B1018 and Steeple Road to the main development site. This Strategic Route is principally aligned to the use of the existing highway, with a series of potential bypasses around settlements and sensitive receptors, in addition to on-line highway and junction improvements.

3.6.37 The identified Strategic Route also includes options to incorporate a bypass to both Latchingdon and Mayland. The western bypass which connects Lower Burnham Road to Burnham Road could reduce traffic through Latchingdon. The second bypass to connect to the Strategic Route would involve creating a connection from Green Lane to Maldon Road to avoid traffic passing through Mayland. East of this new connection the route would then link back into the eastern part of Strategic Route to the west of Steeple. The options would require a combination of on-line highway improvements and new sections of off-line highway alongside junction improvements.

3.6.38 Within the Strategic Route, a combination of highway interventions would be proposed as described in the following bullets for each of the identified search areas. Please note this list and combination of interventions is not exhaustive and will be subject to further development and refinement as a result of ongoing design development, environmental information and consultation:

- Search Area A: Includes the Rettendon Turnpike roundabout and the Hawks Hill roundabout where the A132 and A130 connect with A125/Main Road/Woodham Road. Highway interventions are likely to comprise of junction improvements, localised widening, traffic signage and road markings.

- Search Area B: This area includes Burnham Road and its junctions with Willow Grove/Ferrers Road and the B1418/Old Wickford Road. Highway interventions are likely to comprise localised widening, traffic signage and road markings and potential alterations to the road layout subject to access arrangements for associated park and ride and freight management facilities.

- Search Area C: Relates to the 4-arm roundabout junction of Burnham Road/Woodham Road/Ferrers Lane/Hambers Road. Highway interventions are likely to comprise of junction improvements in the form of localised widening, road markings and signage.

- Search Area D: Covers the section of Lower Burnham Road (B1012) between its junctions with Hogwell Chase and Church Lane. Highway interventions are likely to comprise of localised highway widening and localised highway realignment.

- Search Area E: This area includes the section of Lower Burnham Road (B1012)/Fambridge Road/Lower Burnham Road (B1010). Highway interventions are likely to comprise of localised highway widening within the adopted highway and a potential off-line bypass located north of the existing road.

- Search Area F: This area includes Latchingdon and the B1018 (Cold Norton Road/Steeple Road. Highway interventions in this location are likely to comprise of localised widening within the adopted highway, junction improvements and a potential northern off-line bypass.

- Search Area G: This area includes Lower Burnham Road, Rectory Lane, Burnham Road and Green Lane. Highway interventions are likely to comprise of a new off-line bypass to the south of Latchingdon and associated junctions where the new section of highway ties in with the existing highway.

- Search Area H: This area includes Mayland and Steeple and the surrounding highway routes of Green Lane to the south and Steeple Road/Maldon Road to the east of Mayland and The Street/Bradwell Road through Steeple. Highway interventions in this area are likely to comprise of localised highway widening to the existing highway through Mayland and Steeple contained within the existing adopted highway. For the peak construction, the highway interventions comprise of a number of options that include a potential off-line southern bypass to Mayland and Steeple or improvements to Green Lane and a new section of off-line highway between Green Lane and Steeple Road to tie in to the bypass options for Steeple. This may potentially include improvements to existing junctions and provision of new junctions where the bypasses and new roads join the existing highway.

- Search Area I: This area covers Mill End. Highway interventions are likely to comprise of localised highway widening on the approaches to Mill End along with an option of a potential off-line southern bypass in the vicinity of the junction of The Street/Bradwell Road/Batt's Road junction or a new off-line section of highway to the north of Mill End.

3.6.39 Improvements on-line are estimated at this stage to be within 50m of the existing highway centreline and may use some third-party land.

3.6.40 Off-line improvements have been identified in **Figure 3.4** but will be refined further as the proposals develop and greater levels of assessment are undertaken.

Off-site rail infrastructure

3.6.41 The applicant is still reviewing the role that rail can play in the Transport Strategy, taking into account consultation, and the extent to which this could reduce the need for the road and/or marine infrastructure identified elsewhere in this chapter.

3.6.42 If new rail infrastructure forms part of the Project, the extent of the works will be defined, consulted on and rescoped if necessary.

Park and ride facilities

3.6.43 The Project would include park and ride facilities to enable worker's journeys to be intercepted at key points, before travelling by bus to the main development site. There would be one or more park and ride facilities, located within the search areas identified in **Figure 3.5** at South Woodham Ferrers, Maldon and/or Chelmsford.

3.6.44 The actual size and location of the park and ride facilities required by the Project will depend on a number of factors including the peak workforce numbers, the number of workers resident in any temporary project-provided accommodation, the size of the on-site car parking, the size and location of other park and ride facilities, and the capacity of the network to accommodate traffic. At this stage three search areas for park and ride facilities have been identified and are as follows:

- South Woodham Ferrers - car parking for up to 3,250 spaces;
- Maldon – car parking for up to 2,500 spaces; and/or
- Chelmsford – car parking for up to 2,600 spaces.

3.6.45 The park and ride facilities would generally include the following, although this may vary by size of facility and the nature of the site (for example, greenfield or brownfield):

- car parking areas (including accessible spaces and pick up only spaces) including off-site parking spaces associated with the temporary project-provided accommodation;
- spaces for minibuses or buses or vans;
- motorcycle parking spaces;
- secure cycle parking;
- secure bus terminus and parking, including shelters;

- perimeter security fencing and lighting;
- an amenity and welfare building comprising toilets, bus drivers' rest room, security and administration offices;
- a security building and booth; and
- external areas including roadways, footways, screening mounds, landscaping (including retention where practicable of existing vegetation screening), surface water management areas and drainage infrastructure.

Freight management facilities

3.6.46 The Project would also include freight management facilities to manage the flow of HGVs on the highway network and potentially the storage of material off-site. Park and ride facilities and freight management facilities may be co-located. There would be one or more freight management facilities, located within the search areas identified in **Figure 3.6** at South Woodham Ferrers and/or in the vicinity of Latchingdon.

3.6.47 The freight management facilities would generally include the following, although this may vary by size of facility, further optioneering and the nature of the site (for example, greenfield or brownfield):

- HGV parking areas for approximately 100 spaces;
- perimeter security fencing and lighting;
- an amenity and welfare building comprising toilets, HGV drivers' rest room, security and administration offices;
- a security building and booth; and
- external areas including roadways, footways, screening mounds, landscaping, surface water management areas and drainage infrastructure.

Construction of off-site associated development sites

3.6.48 It is expected that construction work for the off-site associated development would generally comprise the following stages:

- Phase 1 - Preparation works: Clearance of vegetation, mobilisation of site compounds and setting up of site boundary fence and access;
- Phase 2 - Earthworks and excavation: removal of top-soil (and potentially sub-soil) for potential bund formation;
- Phase 3 - Installation of building foundations, laying of roads and car parking, delivery of and laying of base materials and foundations, installation of drainage works and utilities;

- Phase 4 - where required, construction of buildings and associated facilities, installation of lighting, CCTV, signage; and
- Phase 5 - Final landscaping and finish layer to car parking areas and roads.

Operation

3.6.49 During the Project construction phase, it is anticipated that the off-site associated development facilities would be operational 24 hours a day, seven days a week.

Removal and reinstatement

3.6.50 Following the construction of the Bradwell B power station, the off-site associated development sites, with the exception of any permanent houses which would be used first as construction worker accommodation, would be removed and reinstated to their original use, unless otherwise specified in the DCO application.

3.6.51 It is possible that some of the facilities could be retained post-construction, but this would be subject to ongoing discussions with the relevant local planning authority and applications through the Town and Country Planning Act 1990 (as amended) as necessary or under subsequent application and consent from the relevant planning authority.

3.6.52 Key activities would include but are not limited to:

- formation of demolition site compound;
- demolition plant mobilisation and traffic movements;
- demolition and removal of structures and services;
- breaking up of concrete and surfacing;
- management of waste and other materials; and
- environmental mitigation works.

REFERENCES

Ref. 3.1 Department of Energy and Climate Change. National Policy Statement for Nuclear Power Generation (EN-6), 2011.

Ref. 3.2 Queen's Bench Division (Crown Office List). R. v Rochdale Metropolitan Borough Council ex p. Milne. (Online). Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010020/EN010020-001633-NRW%20DCO%20ISH%20Appendix%208.pdf (Accessed 2 September 2020).

Ref. 3.3 Queen's Bench Division (Crown Office List). R. v Rochdale M.B.C ex p. Tew and others. (Online). Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010020/EN010020-001619-NRW%20DCO%20ISH%20Appendix%207.pdf (Accessed 2 September 2020).

Ref. 3.4 The Planning Inspectorate. Advice Note Nine: Rochdale Envelope. Bristol, 2018.

Ref. 3.5 Office for Nuclear Regulation. Safety Assessment Principles for Nuclear Facilities. 2014 Edition (revision January 2020).

Ref. 3.6 Office for Nuclear Regulation / Environment Agency, 2017. Principles for Flood and Coastal Erosion Risk Management, Office for Nuclear Regulation and Environment Agency Joint Advice Note. July 2017.

Ref. 3.7 Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (London, 1999).

Ref. 3.8 Parliament of the United Kingdom. The Town and Country Planning Act 1990 (London, 1990).

4. ALTERNATIVES

4.1 Introduction

4.1.1 The Environmental Impact Assessment (EIA) Regulations (Ref. 4.1) make two specific references to the consideration of alternatives:

- Paragraph 14 (2)(d) states that an Environmental Statement (ES) should include:

  "*a description of the reasonable alternatives studied by the developer, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the significant effects of the development on the environment.*".

- Paragraph (2) of Schedule 4 also states that an ES should include:

  "*A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.*".

4.1.2 The consideration of alternatives for the Project generally fall into the following categories:

- Principle of the provision of new nuclear power at Bradwell: A number of decisions relating to the Project (including the need for nuclear power, geographical location and reactor design) are determined through other processes, policy or legislation and are therefore not considered as alternatives as part of the Development Consent Order (DCO) process.

- Strategic alternatives: the key strategies which influence site-specific decisions for the main development site (including location of the permanent development platform and choice of cooling methods) and the requirement for associated development (including, for example, strategies for the movement of people and freight and the accommodation strategy).

- Main development site options: considering the reasoned approach to determining the layout of on-site components within the main development site including: layout of the power station, other on-site development (for example, cooling tower design, site access, Bradwell B power station flood defence design, connection to the National Grid substation etc.), marine works (for example, marine transport options, marine construction area etc.).

- Off-site associated development alternatives and off-site Power Station Facilities: the reasoned approach to selecting sites and the design for the off-site associated development (project-provided accommodation, off-site

highways works, park and ride facilities, freight management facilities) and off-site Power Station Facilities.

4.1.3 There is no prescribed process for site selection set out in the National Policy Statements (NPSs). Paragraph 4.4.1 of the Overarching NPS for Energy, EN-1 (Ref. 4.2) confirms that, from a policy perspective, EN-1 does not prescribe any general requirement to consider alternatives or to establish whether the Project represents the best option. Paragraph 4.4.3 of EN-1 does, however, establish useful guiding principles in considering alternative strategies, sites and designs as follows:

- "*the consideration of alternatives in order to comply with policy requirements should be carried out in a proportionate manner;*
- *the decision maker should be guided by whether there is a realistic prospect of an alternative delivering the same infrastructure capacity in the same timescale as the proposed development;*
- *alternatives not among the main alternatives studied by the applicant should only be considered to the extent the decision maker thinks they are both important and relevant to the decision;*
- *an alternative proposal which would mean the development would not be in accordance with the relevant NPSs is unlikely to be important and relevant;*
- *alternative proposals that would mean the development could not proceed because they are not commercially viable or physically suitable are not important and relevant to decision making; and*
- *alternative proposals that are vague or inchoate can be excluded.*".

4.1.4 The ES will address the requirement of the EIA Regulations to provide a description of the reasonable alternatives which have been considered and a comparison of environmental effects related to these alternatives. The DCO application will include a separate, broader description of the site selection and optioneering process.

4.2 Principle of New Nuclear Power at Bradwell

Alternatives to new nuclear energy

4.2.1 Under EN-1 and the Nuclear NPS (EN-6) (Ref. 4.3) the Government has set out the need for all types of energy NSIPs, including new nuclear power stations. EN-6 makes clear that an application for development consent for a new nuclear power station should be assessed on the basis that *'the need for such infrastructure has been demonstrated'*.

4.2.2 As the Government has established this need, alternative options to nuclear power generation will not be considered for the DCO EIA.

Geographical location

4.2.3 EN-6 identifies eight sites, including Bradwell, as being potentially suitable locations for the deployment of new nuclear power stations in England and Wales by 2025. The identification of these sites in EN-6 was underpinned by a Strategic Siting Assessment (SSA) process and Appraisal of Sustainability.

4.2.4 EN-6 confirms that as a result of the SSA there are no alternatives to the eight listed sites capable of deployment before the end of 2025 (paragraph 4.4.3). The NPS also states that the Government considers that all eight sites are required to be listed in the NPS (paragraphs 2.4.4 and 2.5.4).

4.2.5 The boundaries of each of the listed sites are shown on a series of maps at Annex C of EN-6. This includes the nominated site boundary at Bradwell to the south-east of the existing power station (see **Figure 2.1**). The NPS recognises, at paragraphs 2.3.3 and 2.3.4, that the site boundary proposed in the application for development consent may vary from the NPS site boundary, as specific proposals are developed. The NPS confirms that the SSA was carried out on the basis that applications for development consent may also include additional land for elements of the power station including "*car parks, access roads or marine landing facilities, or for the construction and/or decommissioning of the nuclear power station".*

4.2.6 EN-6 advises the decision maker to "*judge an application on a listed site on its own merits and a comparison with any other listed site is unlikely to be important to its* decision". EN-6 makes clear that sites are not in competition against each other. So far, only one of the identified sites (Hinkley Point C) has secured a DCO for a new nuclear power station. Wylfa is currently under consideration by the Secretary of State with a statutory deadline for a decision set for 30 September 2020.

4.2.7 The Ministerial Statement on Energy Infrastructure (Ref. 4.4) published on 7 December 2017 concludes that in respect of matters where there is no relevant change of circumstances, it is likely that significant weight would be given to the policy in EN-1 and EN-6 in determining proposals at those sites listed in EN-6 that would not be deployed before 2025.

4.2.8 Between December 2017 and March 2018, the Government consulted on the siting criteria and process for a new NPS for nuclear power with single reactor capacity of over 1 gigawatt for deployment between 2026 and 2035. The applicant nominated Bradwell as a site that is suitable for the deployment of a new nuclear power station by 2035.

4.2.9 The Government Response (Ref 4.5), published in July 2018, confirmed that the proposed process for assessing and designating potential sites was to first carry the list of potentially suitable sites from EN-6 through to the new NPS, subject to each site meeting the updated siting criteria and updates of their environmental assessments. In the meantime, sites listed in EN-6 will continue to be considered appropriate sites. The approach adopted in EN-6, that the eight sites were not alternatives to each other, remains applicable now.

4.2.10 On this basis, alternative locations for the nuclear power station will not be considered for the DCO EIA.

Reactor design

4.2.11 All reactor technology deployed in the UK must comply with the UK's robust nuclear regulatory requirements. The Bradwell B power station will use a third-generation pressurised water reactor called UK HPR1000. The reactor design is currently undergoing assessment as part of the Generic Design Assessment process (GDA). The applicant began the GDA process for the UK HPR1000 nuclear reactor in January 2017 and is currently in Step 4 of the four-stage process. Step 4 began in February 2020.

4.2.12 No alternative reactor designs will be considered for the DCO EIA.

4.3 Alternative Strategies

4.3.1 The ES will describe the alternatives considered in relation to the key strategies that will influence the layout and development options at the main development site and the requirement for associated development necessary to facilitate and support the construction and operation of the Bradwell B power station.

Strategic design options

4.3.2 The ES will describe the main strategic design alternatives which influence the layout of the on-site elements within the main development site.

4.3.3 The Bradwell B power station would use the same nuclear reactor technology as another power station that is currently being built in China, known as 'Fangchenggang 3'. This power station is being used as the 'reference design' for the Bradwell B power station. As set out in **Chapter 3: The Project,** certain elements of the reference design such as the layout and buildings within the Nuclear Island underpin the GDA with limited scope for flexibility in design and layout.

4.3.4 There is some flexibility in other key aspects of the power station's design and layout, which are applied at the site-specific level, such as the cooling water infrastructure and the positioning of the Bradwell B power station within the nominated site.

Cooling strategy

4.3.5 The ES will describe the proposed cooling strategy for the Project and the alternative options considered.

4.3.6 The reference design (in common with most UK nuclear power stations) has a 'direct' cooling system in which water is abstracted from the sea, passed through the condensers and discharged straight back to sea. Significant volumes of sea water are abstracted and discharged as a result. The water returned to the sea is

warmer and contains low concentrations of chemicals that are added to prevent biofouling or to condition the water to make it suitable for use in the power station.

4.3.7 Much smaller volumes of seawater need to be abstracted and discharged in an indirectly cooled system compared to a directly cooled system. It is estimated that direct cooling at Bradwell B power station would require a seawater abstraction of approximately 130 cubic metres per second (m^3s^{-1}) with the same volume of discharge. Indirect cooling would require significantly less abstraction: approximately $9m^3s^{-1}$, with an even smaller discharge of approximately $7m^3s^{-1}$ (the difference being accounted for by loss through evaporation in the cooling towers).

4.3.8 In view of the environmental sensitivity of the local marine environment, notably on account of the protected native oyster, the environmental impact of a full range of cooling options has been assessed. This included fully direct cooling (in which both reactors were assumed to be directly cooled), fully indirect cooling, and a combination of cooling options (in which one reactor was assumed to be directly cooled and the other indirectly cooled). Different cooling water intake and outfall locations were also considered.

4.3.9 The assessment studies have benefitted from a series of technical discussions (see **Appendix 1A** and **Chapter 6** to **Chapter 24**) (workshops) with stakeholders such as the Environment Agency, Natural England, the Marine Management Organisation, Essex Wildlife Trust and representatives from the Essex Native Oyster Restoration Initiative.

4.3.10 Preliminary modelling has shown that direct cooling would result in a greater potential impact on the marine environment than indirect cooling methods, and direct cooling would likely require long outfall tunnels or at least 5 kilometres (km) in length to reduce thermal impacts on native oysters and fish in the Blackwater Estuary, including migratory fish, to acceptable levels. In addition, preliminary assessment outcomes indicate that direct cooling would require two very long intake tunnels (at least 11.5km in length) to minimise impacts on oyster larvae. Indirect cooling would minimise both impacts because the volume of seawater that would be abstracted and discharged would be relatively small and the associated thermal discharges to the marine environment from the Bradwell B power station with indirect cooling are significantly reduced.

Location within the nominated site

4.3.11 The ES will describe the alternative potential locations for the Bradwell B power station within the nominated site and the rationale for the strategic decision to locate the power station on the higher ground to the south and the west of the existing Bradwell power station. To date, decision making has been informed by a number of key influences on layout for the power station permanent development that have emerged from the design iteration process including founding geology, platform height requirements, construction access, efficiency of building configurations and environmental considerations including flood risk, landscape and visual impact and ecological impact.

4.3.12 Decisions on these strategic alternatives influence other design options for the main development site (including, but not limited to, internal layout of the Bradwell B power station, cooling tower design, site entrance location and the location of temporary construction areas) and other options for off-site elements of the Project (including options for temporary project-provided accommodation and the main development site access).

Accommodation Strategy

4.3.13 The ES will provide an overview of the final accommodation strategy for the Project and the alternative options considered for meeting the needs of the non-home based workforce during the construction phase.

4.3.14 This strategy will include making use of existing local accommodation where possible together with the requirement for additional project-provided accommodation which could include temporary and permanent elements. The ES will describe the decision-making process to provide accommodation in single or multiple locations and whether these should be proximate to, or remote from, the main development site. It is anticipated that the majority of the temporary project-provided accommodation will need to be located close to the main development site, which will deliver substantial benefits in relation to sustainable travel and reducing worker commuting times to maximise worker welfare.

4.3.15 The ES will also describe the need for additional temporary project-provided accommodation within caravans, other temporary purpose-built accommodation and the potential for permanent dwellings that could first be used to accommodate construction workers and subsequently released as additional housing stock.

4.3.16 These strategic decisions in relation to accommodation infrastructure will guide the number of locations, scale and broad siting of the temporary project-provided accommodation, which would then be used to inform a robust site selection process which will be subject to DCO pre-application consultation.

Movement of freight

4.3.17 **Chapter 3: The Project** provides an overview of the Transport Strategy for the movement of freight. The ES will explain the strategic alternative options related to the modal split for the movement of freight during the construction phase of the Project.

4.3.18 The Transport Strategy directly influences design decisions for the main development site, including the need for different transport modes, and the requirement for associated development, including the need for off-site highways works and freight management facilities.

Movement of workforce

4.3.19 The ES will outline the process undertaken to develop the strategies for the movement the construction workforce. It will explain the options considered to reduce the need for construction workers to travel and to minimise the daily use of private cars by construction workers who do need to travel via this mode.

4.3.20 The transport strategy for the movement of the construction workforce will directly influence design decisions for the main development site, including the need for on-site parking, and the requirement for associated development, including the need for off-site highways works and park and ride facilities.

4.4 Main Development Site Options

4.4.1 Engineering and construction practicalities, safety, security and commercial viability are key considerations in the site design optimisation process for the main development site.

4.4.2 The ES will set out the reasonable alternatives, and comparison of environmental effects, considered in relation to key alternative design options for which there is a greater level of design flexibility, including (but not limited to):

- layout of the Bradwell B power station;
- cooling tower design;
- marine transport infrastructure;
- marine based cooling infrastructure;
- Bradwell B power station flood defences;
- site access;
- infrastructure for electricity transmission to the grid;
- construction layout and methods;
- earthworks strategy; and
- landscaping and restoration.

4.4.3 The design process to date has taken into account the reference design and cooling options and explored a wide range of potential layouts for the power station permanent development in order to provide an evidence-based approach for making optimal decisions.

4.4.4 A broad initial ‘long-list’ of potential layout options was influenced by the following five key elements:

- orientation of the overall power station platform (i.e. rotation from North);
- location of the Nuclear and Conventional islands within the plot;
- rotation and arrangement of the Nuclear and Conventional islands relative to the primary orientation of the power station platform;
- location of the cooling infrastructure relative to the Nuclear and Conventional islands; and
- type of low plume hybrid cooling towers: rectangular and circular.

4.4.5 Each of these five elements was considered in a series of design steps to develop the long list of layout options to take through the optioneering process.

4.4.6 The long list options were subsequently evaluated against safety, security, functionality, constructability, environmental and cost criteria. Any layout arrangements with inherent safety issues were excluded from further consideration. Through this process, the long list was refined to a short list of ten layout plans that were developed in more detail in readiness for the next optioneering stage during which the shortlisted options were assessed in a greater level of detail. Environmental sub-criteria were developed to capture differences between the options in terms of potential impact on landscape and visual amenity; ecology; historic environment; flood risk; and residential amenity. The shortlisted options for the power station permanent development have been systematically reduced to arrive at an indicative layout.

4.4.7 The ES will set out the design evolution of the power station permanent development and explain this optioneering process in detail, including the rationale for final layout choices.

4.4.8 A number of different types of cooling towers are used throughout the world to deliver the required cooling. Generally, the use of 'Natural Draft' cooling towers often associated with coal fired power stations has been discounted because of their relatively large scale, with heights up to 180m and due to a highly visible plume of water vapour. Initial assessments for the Project have deemed that the physical scale of the 'Natural Draft' infrastructure and the plume visibility would give rise to unacceptable levels of visual impact. Traditional wet mechanical draft towers have also been discounted, because although smaller in scale than natural draft towers, they also have highly visible plumes.

4.4.9 Two types of low-plume 'hybrid' cooling towers (rectangular and circular) have been considered to date. As explained in **Chapter 3: The Project**, six rectangular or two circular hybrid cooling towers are anticipated to be required. The circular towers would be approximately 160m in diameter at the base and approximately 50-60m high. The rectangular towers would each be approximately 40m wide and 170m in length and would be approximately 25-30m in height. The ES will explain the comparative environmental benefits of the cooling tower options considered.

4.4.10 Various different options have been considered to date for the marine transport facilities including Beach Landing Facilities (BLFs), a bulk material jetty, a Marine Offloading Facility and, or an aggregate pipeline. The currently preferred option is for BLFs, which would handle the full range of freight including large Abnormal Indivisible Loads with the least environmental impact and could be available for use in the shortest possible time.

4.4.11 The ES will provide a description of the alternative considered and a comparison of the environmental effects for each of the key elements of the main development site that are subject to alternative design options.

4.5 Off-site Associated Development and Off-site Power Station Facilities Site Selection

4.5.1 The key strategies for the main development site (including layout and cooling methods) and the strategies for accommodating the temporary workforce and movement of freight and workers, identifies the requirements for off-site associated development. This would include:

- project-provided accommodation for the construction workforce;
- park and ride facility or facilities;
- freight management facility or facilities; and
- off-site highways works.

4.5.2 At this stage, only broad search areas and alternative options have been identified and the selection of preferred site options and highways routes or interventions will be subject to a detailed optioneering process to shortlist potential options and assess these against evaluation criteria including planning requirements, sustainability or environmental, transport and construction and operational needs.

4.5.3 The ES will provide a description of the alternative sites considered for each off-site associated development element and a comparison of the environmental effects. The same process will be carried out and presented for the Off-site Power Station Facilities.

4.5.4 Once preferred sites for the off-site associated development and off-site Power Station Facilities have been identified, alternative layout options will be considered based on similar evaluation criteria, which would inform appropriate parameters for assessment.

REFERENCES

Ref. 4.1 Parliament of the United Kingdom. The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. (London, 2017).

Ref. 4.2 Department of Energy and Climate Change. Overarching National Policy Statement for Energy (EN-1). London: the Stationery Office, 2011.

Ref. 4.3 Department of Energy and Climate Change. National Policy Statement for Nuclear Power Generation (EN-1). London: the Stationery Office, 2011.

Ref. 4.4 Department for Business, Energy and Industrial Strategy. Statement on Energy Infrastructure: Written statement - HLWS316. London, 2017.

Ref. 4.5 Department for Business, Energy and Industrial Strategy. Government response: consultation on the siting criteria and process for a new national policy statement for nuclear power with single reactor capacity over 1 gigawatt beyond 2025. London: the Stationery Office, 2018.

5. THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS AND METHODS

5.1 Overarching Approach

5.1.1 Environmental Impact Assessment (EIA) is a process to identify the likely significant effects of a project (often referred to as a 'proposed development') on the environment. It should be systematic, analytical, impartial, consultative and iterative allowing environmental issues to be addressed in the design of a project. Typically, a number of design iterations take place in response to environmental constraints and opportunities identified during the EIA process prior to the final design being achieved. The principal design alternatives that have been considered to date are summarised in **Chapter 4: Alternatives**.

5.1.2 The EIA process will identify the different methodologies used for the assessment and these will be based on recognised good practice and guidelines specific to each technical aspect as set out in **Chapter 6** to **Chapter 24**.

EIA scoping

5.1.3 Scoping is an important procedure, which sets the context for the EIA process (see **Chapter 1: Introduction**). It is intended to inform a proportional and robust approach to assessment through initial evaluation and reporting of identified likely significant effects in a scoping report. **Plate 5.1** highlights some of the key inputs into the scoping process.

Plate 5.1: Overview of the scoping process

5.1.4 Effective scoping enables agreement to be reached on the aspects and methodologies to be taken forward and assessed and reported in much greater detail in the Environmental Statement (ES). It also provides an opportunity for early interaction with stakeholders, strengthening the assessment evidence base and allowing active participation of interested parties in project development and decision making. This can in turn improve project design, environmental soundness and social acceptability.

5.1.5 The scope of the EIA may be progressively refined in response to comments from stakeholders, together with environmental information resulting from survey or assessment work carried out in relation to the EIA, and the evolution of the project proposals. This scoping report has been produced at a time whereby the Project is at a sufficient stage of maturity for the main development site within which the Bradwell B power station would be located. The enveloping principal has been applied for the off-site associated development for which a number of options with respect to location and functional requirements remain (refer to the Planning Inspectorate (PINS) Advice Note Seven for guidance). Scoping has taken account of comments from Stage One Consultation (see **Chapter 1: Introduction**) to enable early identification of likely significant effects and to agree where aspects and specific matters can be scoped out of the EIA.

Relevant guidance for scoping

5.1.6 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (hereafter referred to as the 'EIA Regulations') set out the procedure for EIA via a series of requirements (refer to **Chapter 2: Policy and Regulatory Context**, specifically **Section 2.2**). Whilst the regulations do not provide any guidance on the approach to assessment, they do specify, for example, what aspects should be considered, alongside any interactions between them. Schedule 4 identifies the aspects of the environment that should be considered, namely (Ref. 5.1):

> *"…factors… likely to be significantly affected by the development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape"*.

5.1.7 The EIA Regulations also state (Regulation 4(4)) that "*…the expected significant effects arising from the vulnerability of the proposed development to major accidents or disasters that are relevant to that development*." should be included.

5.1.8 To promote the application of EIA and aid the interpretation of these regulatory requirements, government and other institutions have published a series of guidance documents (see **Section 2.4**). For Nationally Significant Infrastructure Projects (NSIPs) advice notes have been published by PINS. These advice notes are non-statutory, however, they provide guidance and information on a range of issues arising throughout the whole EIA process. Of particular relevance to scoping is PINS Advice Note Seven (Ref. 5.2), which summarises the requirements of the Regulations in relation to scoping and provides guidance on the timing of scoping, the treatment of alternatives and it includes a list of information that a Scoping Report should provide.

5.1.9 **Table 5.1** sets out the requirements of the EIA Regulations and **Table 5.2** includes guidance provided by Advice Note Seven. Both tables describe where in this Scoping Report the requirements or guidance have been addressed.

Table 5.1: The EIA Regulations requirements for scoping

Requirement	Location in the Scoping Report
Regulation 10 (3) of the EIA Regulations (requests for scoping).	
A plan sufficient to identify the land.	**Plate 3.1**, **Figure 3.1** to **Figure 3.6** in **Chapter 3: The Project** identify the locations of the key elements of the Project.
A description of the Proposed Development, including its location and technical capacity.	**Chapter 3: The Project**.
An explanation of the likely significant effects of the development on the environment.	Contained in individual aspect **Chapter 6** to **Chapter 24**.
Such other information or representations as the person making the request may wish to provide or make.	Contained in individual aspect **Chapter 6** to **Chapter 24**.

Table 5.2: PINS Advice Note Seven requirements

Requirement	Location in the Scoping Report
An explanation of the approach to addressing uncertainty where it remains in relation to elements of the DCO Project for example design parameters.	**Chapter 3: The Project**.
Referenced plans presented at an appropriate scale to convey clearly the information and all known features associated with the Proposed Development.	**Plate 3.1**, **Figure 3.1** to **Figure 3.6** in **Chapter 3: The Project** identify the locations of the key elements of the Project.
An outline of the reasonable alternatives considered and the reasons for selecting the preferred option.	**Chapter 4: Alternatives**.
A summary table depicting each of the aspects and matters that are requested to be scoped out allowing for quick identification of issues.	Contained in individual aspect **Chapter 6** to **Chapter 24**.
A detailed description of the aspects and measures proposed to be scoped out of	Contained in individual aspect **Chapter 6** to **Chapter 24**.

Requirement	Location in the Scoping Report
future assessment with justification provided.	
Results of desktop and baseline studies where available and where relevant to the decision to scope in or out aspects or matters.	Contained in individual aspect **Chapter 6** to **Chapter 24**.
Aspects and matters to be scoped in, the report should include details of the methods to be used to assess impacts and to determine significance of effect for example criteria for determining sensitivity and magnitude.	Contained in individual aspect **Chapter 6** to **Chapter 24**.
Any avoidance or mitigation measures proposed, how they may be secured and the anticipated residual effects.	Contained in individual aspect **Chapter 6** to **Chapter 24**.
References to any guidance and best practice to be relied upon.	Contained in **Chapter 5: The EIA Process and Methods** and in individual aspect **Chapter 6** to **Chapter 24.**
Evidence of agreements reached with consultation bodies (for example the statutory nature conservation bodies or local authorities).	Contained in individual aspect **Chapter 6** to **Chapter 24**.
An outline of the structure of the proposed ES.	**Chapter 25: Proposed ES Structure**.

5.2 EIA Terminology: Impacts and Effects

5.2.1 For the purposes of the EIA and this Scoping Report, the term 'impacts' is used to describe the changes that arise as a result of the Project (for example, changes in drainage pattern) and the term 'effects' are the consequences of those changes (for example, habitat is affected by an alteration in the drainage pattern).

Types of effects

5.2.2 Paragraph 5 of Schedule 4 of the EIA Regulations states that:

> "*The description of the likely significant effects on the factors specified in regulation 4(2) should cover the direct effects and any indirect, secondary,*

cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development.".

5.2.3 The EIA will consider all of these types of effects in the environmental aspect chapters.

5.2.4 Whilst some terms are self-explanatory, a definition of effects has been provided to confirm how these terms will be applied throughout the EIA process.

Direct effects

5.2.5 Those effects that result directly from the Project.

Indirect and secondary effects

5.2.6 Indirect and secondary effects are those which are not caused immediately by the Project but arise as a consequence of it. An example would be where indirect employment is created as suppliers increase their activities and hire new workers to provide the additional goods and services required by the Project.

Transboundary effects

5.2.7 Transboundary effects are those effects that would affect the environment in another state within the European Economic Area (EEA).

Cumulative effects

5.2.8 There are two types of effect, in-combination effects and cumulative effects. The former occurs as a result of two or more project impacts acting together (i.e.) combined, to result in a new or changed effect on a single receptor. The latter arise as a result of the Project in combination with other large-scale developments or projects.

5.2.9 Cumulative effects are dealt with separately within **Section 5.5**.

5.3 Determination of the Scope of the Assessment

5.3.1 This EIA Scoping Report sets out how the aspects identified in Paragraph 5 of Schedule 4 of the EIA Regulations will be considered and assessed in the EIA. Issues that are scoped into the EIA are judged to have the potential to cause likely significant environmental effects. Where a request is made for an environmental aspect (or matter within an aspect) to be scoped out, a reason and justification for the request will be given. Where insufficient information is available in relation to a particular issue to make a reasonable judgement at this stage a precautionary approach is adopted, and that issue is scoped in.

Spatial scope

5.3.2 Spatial scope is the area over which changes to the environment as a consequence of the Project are predicted to occur.

5.3.3 The spatial scope for each environmental aspect assessment will depend on the nature of the potential effects and the location of receptors that could be affected. The spatial scope for each aspect assessment therefore takes account of:

- the physical area of the Project;
- the nature of the baseline environment; and
- the manner and extent to which environmental effects may occur.

5.3.4 Each of the environmental aspect chapters (**Chapter 6** to **Chapter 24**) describes the study area to be considered, providing a clear explanation as to why the study area has been adopted.

Temporal scope

5.3.5 The temporal scope covers the time period over which changes to the environment and the resultant effects are predicted to occur. These changes are defined as being either temporary or permanent, as follows:

- Permanent - these are effects that will remain even when the Project is complete, although these effects may be caused by environmental changes that are permanent or temporary. For example, an excavator that is temporarily driven over an area of valuable habitat could cause a level of damage such that the effect on this vegetation would be permanent (i.e. recovery would not be possible); and
- Temporary – these are effects that are related to environmental changes associated with a particular activity and that will cease when that activity finishes.

5.3.6 The time periods over which temporary effects may occur is outlined below. It should be noted that these periods may vary within environmental aspect assessments subject to consideration of aspect specific guidance.

- Temporary (short-term) – those impacts that would be experienced over a period of no more than 0-2 years;
- Temporary (medium-term) – those impacts that would be experienced over a period of no more than 3-5 years; and
- Temporary (long-term) – those impacts that would be experienced over a period of more than 5 years but less than 10 years.

5.3.7 The assessment will have regard to the project programme and will evaluate the environmental effects of the Project at construction operation and restoration of the main development site (refer to **Chapter 3: The Project** for discussion on decommissioning). These effects will be compared to the situation prevailing before the Project is commenced (the current baseline), and to the situation that would prevail in the future without the Project (the projected future baseline).

5.3.8 The future baseline is the theoretical situation that would exist in the absence of the Project. This is based upon extrapolating the current baseline using technical knowledge of likely changes to predict this (for example anticipated habitat change over time, climate change projections, traffic and waste volume growth over time, etc.).

5.3.9 Each environmental aspect chapter of the ES will define the baseline (current or future or both) against which the environmental effects of the Project will be assessed. The baseline conditions to be assessed for each environmental aspect are outlined in **Chapter 6** to **Chapter 24** of this Scoping Report.

5.3.10 Assessment scenarios that will be considered for the main development site will include:

- current or future baseline in the absence of the of the Project occurring;
- construction (including the removal and reinstatement of the temporary construction area); and
- operation.

5.3.11 Assessment scenarios that will be considered for the off-site associated development (including the project-provided accommodation and other associated development) comprise:

- current or future baseline in the absence of the off-site associated development;
- construction of the off-site associated development;
- operation of the off-site associated development; and
- removal of the off-site associated development and reinstatement of the existing land use, where relevant (see **Section 3.6**).

5.3.12 Where relevant, aspect chapters provide further information on the time elements within the project programme that will be considered for their assessment.

5.3.13 As previously noted, EIA is necessarily an iterative process and as such the spatial and temporal scope of each assessment may be refined for the ES in response to comments from consultees or as a result of design evolution, survey findings and assessment work.

5.4 Assessment of Effects and Determining Significance

5.4.1 For consistency, and to allow comparison between aspects, the methodology described in this section will be applied when preparing the ES. This methodology is designed to consider whether impacts of the Project would have an effect on any environmental receptors. Assessments broadly consider the magnitude of impacts and sensitivity of resources or receptors that could be affected in order to classify effects according to the categories shown in **Table 5.5**.

5.4.2 The conclusion that is made on whether an effect should be considered significant is based upon professional judgement, with reference to **Chapter 3: The Project**, and available information about:

- The magnitude and other characteristics of the potential changes that are expected to be caused by the Project;
- The sensitivity of receptors to these changes;
- The effects of these changes on relevant receptors; and (where relevant); and
- The value of receptors.

5.4.3 For each environmental aspect, the categories of resource or receptor sensitivity and magnitude of impact will be described or defined. The following sections therefore provide the generic criteria for the definition of resource or receptor sensitivity, magnitude of change and classification of effect.

5.4.4 The aspect chapters provide greater detail on the approach to the assessment and specific guidelines for the definition of impact magnitude and resource or receptor sensitivity. The approach to the assessment undertaken by each environmental aspect (**Chapter 6** to **Chapter 24**) will broadly follow the approach set out in the following sections. Variations from this approach may be applicable to specific environmental aspects whereby professional judgment in the application of standards mandated by professional bodies (for example Institute of Environmental Management and Assessment (IEMA) or the Landscape Institute) is applied. Where this is the case, further detail and justification will be provided.

Resource and receptor sensitivity

5.4.5 The sensitivity or value of a receptor is largely a product of the importance of an asset, as informed by legislation and policy, and as qualified by professional judgement. For example, higher value receptors for landscape, biodiversity or the historic environment may be defined as being of international or national importance; lower value resources may be designated as being sensitive or important at a county or district level.

5.4.6 The use of a receptor also plays a part in its classification. For example, when considering visual amenity, a receptor which is residential in nature may be valued

more than a place of work as the environmental quality of the residential receptor is more likely to be an important part of that receptor's use.

5.4.7 **Table 5.3** sets out the generic guidelines for the assessment of sensitivity of a resource or receptor.

Table 5.3: Generic guidelines for the assessment of sensitivity

Value or Sensitivity	Guidelines
High	Value: Feature or receptor possesses key characteristics which contribute significantly to the distinctiveness, rarity and character of the site or receptor (for example designated features of international or national importance). Sensitivity: Feature or receptor has a very low capacity to accommodate the proposed form of change.
Medium	Value: Feature or receptor possesses key characteristics which contribute significantly to the distinctiveness and character of the site or feature (for example designated features of regional or county importance). Sensitivity: Feature or receptor has a low capacity to accommodate the proposed form of change.
Low	Value: Feature or receptor possesses characteristics which are locally significant. Feature or receptor which is either not designated or is designated at a local or district level. Sensitivity: Feature or receptor has some tolerance to accommodate the proposed change.
Very Low.	Value: Feature or receptor characteristics do not make a significant contribution to local distinctiveness and not designated. Sensitivity: Feature or receptor is generally tolerant and can accommodate the proposed change.

Magnitude of change

5.4.8 The magnitude of change affecting a receptor that would result from the development proposals will be identified on a scale from minor alterations or change, up to major changes or the total or substantial loss of the receptor. For certain aspects, the magnitude of change would be related to guidance on levels of acceptability (for example, for air quality or noise), and is therefore based on numerical parameters. For others it will be a matter of professional judgement to determine the magnitude of change, using descriptive terminology.

5.4.9 **Table 5.4** sets out the generic guidelines of the assessment of the magnitude of change.

Table 5.4: Generic guidelines for the assessment of magnitude

Magnitude	Guidelines
High	Large scale changes over the whole development area and potentially beyond to key characteristics or features of the particular environmental aspect's character or distinctiveness.
Medium	Medium scale changes over the majority of the development area and potentially beyond to key characteristics or features of the particular environmental aspect's character or distinctiveness.
Low	Noticeable but small-scale changes over part of the development area and potentially beyond to key characteristics or features of the particular environmental aspect's character or distinctiveness.
Very Low.	Noticeable but very small-scale change or barely discernible changes over a small part of the development area and potentially beyond, to key characteristics or features of the particular environmental aspect's character or distinctiveness.

Determination of significance

5.4.10 The determination of significance is derived with reference to information about the nature of the Project, the sensitivity or value of receptors that could be affected, together with the magnitudes of change that are likely to occur. For many environmental aspects, significance can be determined by using a matrix (see **Table 5.5**). Variations to this matrix approach, which may be applicable to specific environmental aspects (for example, Biodiversity), are detailed within the respective aspect chapters (**Chapter 6** to **Chapter 24**), along with descriptions of receptor sensitivity, magnitude of change and levels of effect that are considered significant. Definitions of how the categories that are used in the matrix are derived for each environmental aspect are also set out.

5.4.11 In addition, professional judgement is applied in the assessment, as the lines between the sensitivities or magnitudes of change may not be clearly defined and the resulting assessment conclusions may need clarifying.

5.4.12 The overall significance matrix that will be used for the EIA is shown in **Table 5.5**. The generic definitions that will be used to determine the level of significance are shown in **Table 5.6**. Reference is made to:

- ‘Major’ effects, which will always be determined as being significant. These are highlighted green in **Table 5.5**.
- ‘Moderate’ effects can be significant, or not significant, based on specific scenarios and professional judgement.
- ‘Minor’ or ‘negligible’ effects, which will always be deemed as ‘not significant’.

5.4.13 Effects can be either positive or negative.

Table 5.5: Significance evaluation matrix

Magnitude of Change	Sensitivity of Receptor			
	High	Medium	Low	Very low.
High	Major (Significant).	Major (Significant).	Moderate (Significant or not significant).	Minor (Not significant).
Medium	Major (Significant).	Moderate (Significant or not significant).	Minor (Not significant).	Minor (Not significant).
Low	Moderate (Significant or not significant).	Minor (Not significant).	Minor (Not significant).	Negligible (Not significant).
Very low.	Minor (Not significant).	Minor (Not significant).	Negligible (Not significant).	Negligible (Not significant).

Table 5.6: Generic classification of effect definitions

Level of Significance	Description
Major	Very large or large change in environmental or socio-economic conditions. Effects, both negative and positive, which are likely to be important considerations at a national to regional level because they contribute to achieving national or regional objectives, or, which are likely to result in exceedance of statutory objectives or breaches of legislation.
Moderate	Intermediate change in environmental or socio-economic conditions. Effects that are likely to be important considerations at a regional or local level.
Minor	Small change in environmental or socio-economic conditions.

Level of Significance	Description
Negligible	No discernible change in environmental or socio-economic conditions. An effect that is likely to have a neutral or negligible influence.

Mitigation and residual effects

5.4.14 The ES will include a description of the "measures envisaged in order to avoid prevent or reduce and, if possible, offset likely significant adverse effects on the environment". The approach adopted for the Project will take the form of a hierarchy, whereby priority is given to preventing effects, and then (if this was not possible) to reducing or abating them followed, if necessary, through repair (restoring or reinstating) or compensation.

5.4.15 IEMA (Ref. 5.3) provides guidance on three categories of mitigation measures: primary, secondary and tertiary measures:

- primary – '*modification to the location or design of the development made during the pre-application phase that are an inherent part of the project, and do not require additional action to be taken'*. These are referred to as 'design measures', and will be embedded within the design of the Project;
- secondary – actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the planning consent or through inclusion in the ES. These are referred to as 'additional measures'; and
- tertiary – actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements or actions that are considered to be standard practice used to manage commonly occurring environmental effects. These are referred to as 'good practice measures' and are also embedded within the design of the Project.

5.4.16 Opportunities for design measures will be identified throughout the evolution of the design of and implementation strategy for the Project and the EIA process, whereby potential significant adverse environmental effects will be fed back into the design process to verify whether they can be avoided or otherwise mitigated in accordance with the hierarchy. Alongside this, good practice measures will be identified with reference to legislative requirement and measures of standard practice to manage commonly occurring effects. These design measures and good practice measures will be included within the Project plans and drawings and thus are integrated into the overall design strategy as embedded measures.

5.4.17 Following the application of embedded measures, where the potential for a significant environmental effect remains, 'additional measures' will be considered to avoid, reduce or compensate this effect.

5.4.18 The ES will report on the anticipated effects of the Project following the implementation of mitigation, known as 'residual effects'. A clear statement will be made as to whether the residual effects are significant or not significant in EIA terms. Residual effects may be beneficial as well as adverse.

5.5 Cumulative Assessment

5.5.1 Paragraph 5(e) of Schedule 4 of the EIA Regulations refers to the need to consider:

> "*the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources.*"

5.5.2 For the cumulative assessment, two types of effects will be considered:

- In-combination effects that occur as a result of two or more project impacts acting together (i.e.) combined, to result in a new or changed effect on a single receptor; and
- Cumulative effects that arise as a result of the Project in combination with other large-scale developments or projects.

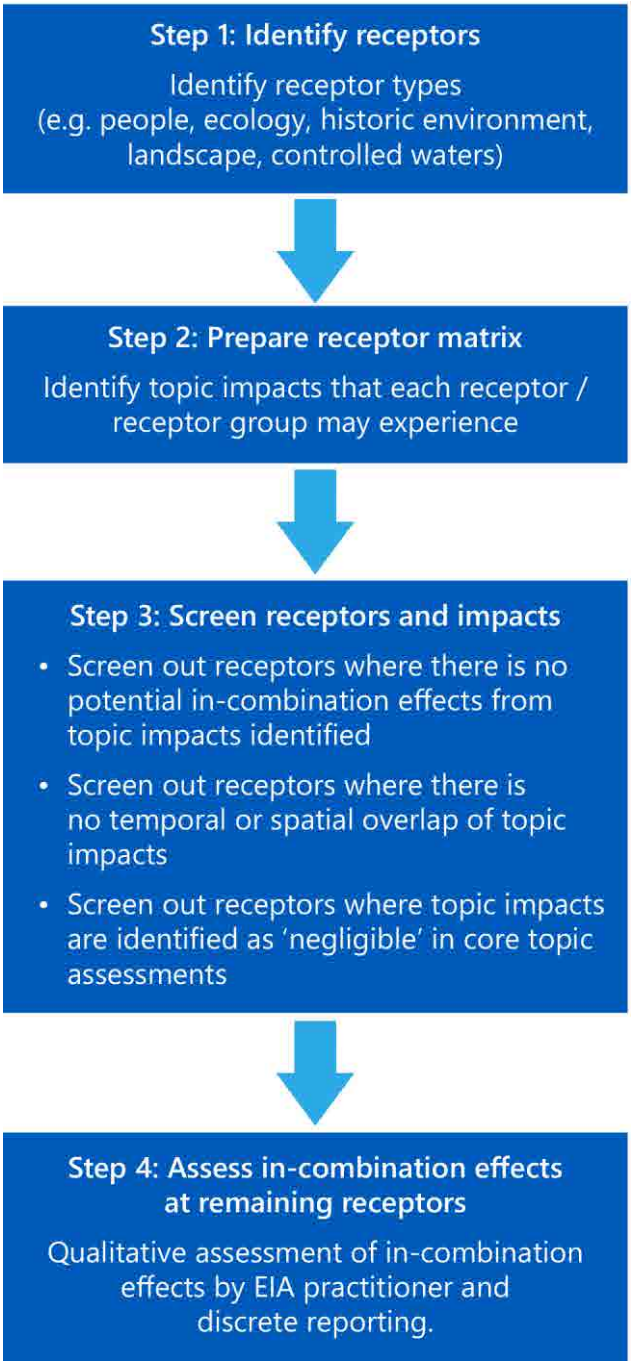
5.5.3 In addition, where any other developments are anticipated to be completed before the Project begins construction and the effects of those developments are fully determined, affects arising from those developments will be taken into consideration within the construction and operational assessments reported in the environmental aspect chapters and considered as part of the potential 'future baseline'. The ES will clearly distinguish between developments forming part of the baseline and those in the cumulative assessment.

In-combination effects

5.5.4 There is no standard approach to the assessment of in-combination effects although it should be carried out with reference to guidance and to professional judgement.

5.5.5 The proposed approach for the assessment of in-combination effects for the Project is shown in **Plate 5.2**. This follows a receptor-based approach for the consideration of in-combination effects.

Plate 5.2: In-combination effects assessment process



Cumulative effects

5.5.6 The EIA will follow the methodology for the assessment of cumulative effects defined in the PINS Advice Note Seventeen: Cumulative effects assessment (Ref. 5.4) which is relevant to NSIPs. This is a four-stage approach, as follows:

- Stage 1 - establish the project's zone of influence (ZoI) and identify a 'long list' of 'other development';

- Stage 2 - identify a 'shortlist' of 'other development' for the cumulative effects assessment;
- Stage 3 - information gathering; and
- Stage 4 – assessment.

5.5.7 The ZoI of the Project, within which any potential effects of the Project may combine with the effects arising from other developments, will be defined by the environmental aspect specialists and combined into a single area within which other development will be identified.

5.5.8 The Stage 1 'long list' of other developments will be grouped into three tiers, reflecting the likely degree of certainty attached to each development, with Tier 1 being the most certain. It is proposed that this 'long list' is refined and finalised in discussion with the relevant local planning authorities and statutory consultees.

5.5.9 In order to ensure that the cumulative effects assessment is proportionate, a shortlist of 'other development' will be prepared. Each of the developments and allocations will be considered in terms of whether they would be likely to generate impacts which could combine to result in cumulative effects in combination with the Project. Criteria used for this process will be specific to each discipline and will take account of scale, nature and timescales. As with the long list, this shortlist will be discussed and finalised with the relevant local planning authorities and statutory consultees.

5.5.10 It will be necessary to freeze the cumulative development list and relevant information on these developments prior to the DCO application submission to allow impact assessments to be completed and reported in the ES.

Transboundary effects

5.5.11 The context of a Transboundary Assessment is provided in **Chapter 2: Legislative and Policy Context**. To consider whether the project is likely to have a significant effect on the environment in other EEA states, the transboundary screening matrix will be completed as detailed in the PINS Advice Note Twelve: Transboundary Impacts and Process (Ref. 5.6). The assessment of transboundary effects will be included within the ES.

5.6 EIA Assumptions and Limitations

5.6.1 Assumptions and limitations are addressed under each environmental aspect as identified in the appropriate aspect chapters (**Chapter 6** to **Chapter 24**).

REFERENCES

Ref. 5.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (2017).

Ref. 5.2 The Planning Inspectorate. Advice Note Seven: Environmental Impact Assessment: Preliminary Environmental Information, Screening and Scoping, 2017.

Ref. 5.3 Institute of Environmental Management and Assessment. Environmental Impact Assessment. Guide to: delivering quality development, 2016.

Ref. 5.4 The Planning Inspectorate. Advice Note Seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects, 2019.

Ref. 5.5 The European Commission. Council Directive 2014/52/EU of 16 April 2014 on the assessment of the effects of certain public and private projects on the environment (2014).

Ref. 5.6 The Planning Inspectorate. Advice Note Twelve: Transboundary Impacts and Process, 2018.

6. TRANSPORT

6.1 Introduction

6.1.1 This chapter sets out the approach for determining the scope, and content the of assessment in relation to Transport. It contains:

- a summary of work undertaken to date;
- an explanation of the scope of assessment, including:
  - legislation, policy and guidance that inform the assessment;
  - a description of consultation and engagement so far relevant to transport;
  - study area for the assessment;
  - sources of data used in scoping;
  - baseline conditions, including current desk studies and surveys;
  - planned further surveys and studies;
- the receptors that are proposed to be assessed and the effects which have the potential to be significant;
- the effects that are proposed can be scoped out of the assessment; and
- potential mitigation.

6.1.2 When using the term transport, this relates to the assessment of road traffic related to the Project and the use of different transport modes where it affects the study area.

6.1.3 This chapter covers the proposed methodology for assessing the impacts of road traffic and the likely effects within the study area.

6.1.4 Marine freight is also a significant part of the Transport Strategy, with the use of marine infrastructure to deliver bulk materials and Abnormal Indivisible Loads (AILs) to the main development site. The potential effects related to the physical presence of marine freight will be considered in the following chapters - **Chapter 17: Coastal Geomorphology and Hydrodynamics, Chapter 18: Marine Water Quality and Sediments, Chapter 19: Navigation** and **Chapter 24: Marine Ecology and Fisheries**. However, the implications of marine freight on the road network will be considered where relevant within the Transport chapter of the Environmental Statement (ES), such as the use of muster ports and transport of freight from these to site using Heavy Goods Vehicles (HGVs) if applicable.

6.1.5 Following feedback from Stage One Consultation, and ongoing project development, the applicant is considering the potential opportunities for rail as part of the Transport Strategy for the construction of the Project. If new rail infrastructure forms part of the Project, the extent of the works will be defined, consulted on and rescoped if necessary.

6.1.6 This chapter should be read in conjunction with the project description provided in **Chapter 3: The Project**. In addition, this chapter and its associated figures and appendices, reference should be made to the following aspect chapters:

- **Chapter 7: Noise and Vibration**;
- **Chapter 8: Air Quality**;
- **Chapter 10: Socio-economics**;
- **Chapter 20: Landscape and Visual Amenity**; and
- **Chapter 21: Recreation.**

6.1.7 The methodology for the assessment of transport within this chapter is set out in **Section 6.4**.

6.1.8 The Transport chapter of the ES will be accompanied by a Transport Assessment (TA) which will set out the Transport Strategy. The scope of the TA will be agreed with the relevant authorities through the preparation of a TA Scoping Document. The TA will provide the detailed assessment of the potential impacts of the Project (construction and operational) on the transport network and will set out proposed mitigation measures to address these impacts. Detailed modelling assessments will be reported in the TA, whilst the Transport chapter of the ES will provide a summary of these assessments where required.

Work undertaken to date

6.1.9 The following activities have been undertaken to date to identify the transport baseline:

- Multiple site visits have been undertaken to review the transport network in relation to walking, cycling, public transport and highway network conditions, including the identification of sensitive receptors. Site visits were undertaken before March 2020 i.e. before the effects of the Covid-19 lockdown;
- Additional desktop review of sensitive receptors using GIS;
- Desktop review of historic accident data for the latest 5-year period for the study area;
- Analysis of available traffic count data and discussions with Essex County Council to identify other relevant data sources. It should be noted that historic

traffic data has been used as traffic surveys have not been able to take place in 2020 so far due to the effects of the Covid-19 lockdown;

- Review of LIDAR data and topographical survey to identify any potentially significant topographical issues on the transport network; and
- Initial discussions with Local Planning Authorities and the Highway Authority (Essex County Council) and Highways England to identify the study area and discuss the objectives of the Transport Strategy.

6.2 Legislation, Policy and Technical Guidance

6.2.1 This section identifies the relevant legislation, national and local policy and guidance which has informed the scope of the assessment relevant to transport. Further information on policies relevant to the Environmental Impact Assessment (EIA) and their status is set out in **Chapter 2: Policy and Regulatory Context**, which should be read in conjunction with this chapter.

6.2.2 The legislation and policy relevant to transport are detailed in **Table 6.1**. This review of local policies focusses on the host authorities where the main development site, and off-site associated development are located. As such the review has considered the policies from Maldon, Chelmsford and Essex Council areas.

Table 6.1: Legislation and policy

Relevant Legislation and Policy	Relevance to the Assessment
National Policy	
Overarching National Policy Statement for Energy (EN-1) (Ref. 6.1).	This document provides policy guidance for decision making in relation to applications for energy developments. In relation to transport impacts the guidance states that a Transport Assessment will need to be produced and that this document should follow the relevant NATA or Web TAG methodology (now referred to as TAG) provided in the Department for Transport guidance, or any subsequent guidance. The policy guidance states that the applicant should ensure that they adequately seek to mitigate any transport impacts, including during the construction phase. The document describes outline potential mitigation measures, particularly with respect to HGV traffic and parking or waiting. The potential transport impacts arising from the Project are evaluated in this scoping report chapter. The impacts will then be addressed through the EIA and mitigation measures will be proposed to minimise the impacts on the local transport networks.

Relevant Legislation and Policy	Relevance to the Assessment
National Policy Statement for Nuclear Power Generation (EN-6) (Ref. 6.2).	This document should be read in conjunction with the EN-1 and has been produced to provide specific policy guidance in relation to applications for nuclear power developments. Section 3.15 identifies that consideration should be given to the impact on local significant infrastructure and resources, which notably includes: motorways and major highways; strategic rail network; airports and ports. The guidance states that it should be demonstrated that the Project would not have an unacceptable adverse impact on the aforementioned significant infrastructure. The potential transport impacts from the proposals will be evaluated in this Scoping Report. The impacts will then be addressed through the EIA, with mitigation measures proposed in relation to these.
National Planning Policy Framework (NPPF) (2019) (Ref. 6.3).	The NPPF, first published in 2012 and most recently updated in 2019, details the planning policies for England and sets out how the government expects them to be applied. The document states that when *"assessing sites that may be allocated for development in plans, or specific applications for development, it should be ensured that:* *Appropriate opportunities to promote sustainable transport modes can be – or have been – taken up, given the type of development and its location;* *Safe and suitable access to the site can be achieved for all users; and* *Any significant impacts from the development on the transport network (in terms of capacity and congestion), or on highway safety, can be cost effectively mitigated to an acceptable degree.".* In response to these requirements, the development should seek to do the following: 1) Give priority to vulnerable road users and encourage sustainable transport use; 2) Plan for the needs of site users with disabilities and mobility requirements; 3) Create places which are attractive, safe and secure;

Relevant Legislation and Policy	Relevance to the Assessment
	4) Plan for the efficient delivery of good and access by other large vehicles (emergency and servicing vehicles); and 5) Incorporate the ability to charge electric vehicles. The main development site is located in a rural area and therefore has relatively limited existing access to sustainable transport services. Maximising these and the sustainability of the Project will need to be clearly demonstrated as part of the development proposals to mitigate the transport impacts of the Project.
National Planning Practice Guidance (NPPG) (Ref. 6.4).	On 6 March 2014, the Department for Communities and Local Government (DCLG) launched the NPPG web-based resource. One section relates specifically to Transport and is titled 'Travel Plans, Transport Assessments and Statements in Decision-taking' and this provides the overarching principles of Travel Plans, Transport Assessments and Statements. The guidance explains the principles which should be taken into account when preparing Transport Assessments and Travel Plans which include that they should be proportionate to the size of the development, be tailored to an individual development and should be undertaken collaboratively with local planning authorities, highway authorities and transport operators. The guidance demonstrates that Transport Assessments and Statements and Travel Plans can positively contribute to a development as they encourage the creation of sustainable communities with appropriate mitigation strategies which result in reductions to traffic generation, carbon emissions and reduce the need to increase road capacity. On this basis a TA will be submitted and assess the effect of the development and identify appropriate mitigation strategies.

Relevant Legislation and Policy	Relevance to the Assessment
Local Policy	
Essex County Council (ECC) Local Transport Plan (2011) (Ref. 6.5).	The Local Transport Plan sets out ECC's strategy for transport in terms of priorities, vision and means of funding proposed transport network improvements over the lifespan of the plan. The document has five broad planned outcomes which are intended to be achieved through the Council's Highways Strategic Transformation (HST) programme: • Provide sustainable travel choices to residents; • Improve safety and promote a safe travel environment on the transport network; • Encourage and implement lifestyle changes, innovation and technology, in order to reduce carbon emissions; • Support regeneration and economic growth by providing connecting to communities and international gateways; and • Ensure that all transport assets are secured and maintained so that the network is available for use. The area defined as 'The Heart of Essex' in the Plan covers settlements including Chelmsford, Brentwood and Maldon. Bradwell-on-Sea also falls within this area. The area is characterised as falling within the London commuter belt, which also has a strong economy of its own. Chelmsford has been identified in particular as having the potential for significant growth, however the potential for increased congestion is identified as a significant challenge for the area. Meanwhile the A12 and A130 routes are identified as Inter-urban routes which are subject to congestion

Relevant Legislation and Policy	Relevance to the Assessment
	on some sections, with unpredictable journey times. The A414 and other local roads suffer from peak time congestion. A series of policies are contained within the document which relate to transport and these are summarised here. Policy 3 – Congestion and Network Resilience, relates to how ECC will seek to improve the reliability of journeys and the related measures include investing in the network in a way which would benefit the economy and quality of life the greatest. Policy 4 – Public Transport, outlines how ECC will seek to improve local public transport routes in terms of accessibility and reliability, and to ensure that locations that attract significant numbers of people are served. Policy 5 – Connectivity, seeks to ensure that there are good links in the County, in the form of sustainable modes, with congestion reduction and park and ride facilities also identified. Policy 6 – Freight Movement, relates to freight movements and seeks to ensure that heavy goods vehicles and other freight vehicles use the most appropriate routes. A shift from road to rail transport of freight is also identified as a priority. Policy 8 – Promoting Sustainable Travel Choices includes requiring developments to have effective travel planning, promotion of sustainable modes and providing infrastructure to support sustainable travel. Policy 9 – The Natural, Historic and Built Environment, seeks for the impact on the environment from transport based visual and noise impacts to be minimised and for transport improvements to retain the integrity of the surrounding environment (whether natural, historic or built).

Relevant Legislation and Policy	Relevance to the Assessment
Maldon District Council (MDC) Local Development Plan (2017) (Ref. 6.6).	Policy D4 – Renewable and Low Carbon Energy Generation, this policy states that proposed developments for energy sites, should not adversely impact various land types and facilities, most notably the following; *"5) The safety of public footpaths, bridleways, highways…".* Policy T1 - Sustainable Transport, seeks for the Council to implement a range of measures in order to provide a sustainable transport network across the area. Such measures include ensuring new developments provide sustainable transport provision; prioritising non-private car modes; improving rail services, station facilities and interchange arrangements; enable new bus services; secure demand responsive and community transport schemes where appropriate and work towards providing a network of footpaths and cycle routes that are more comprehensive. Policy T2 – Accessibility, includes the following points which determine that development proposals should, where relevant: *"1) Be located where there is physical and environmental capacity to accommodate the type and amount of traffic generated, or locations where the impact can be suitably mitigated, taking in account the cumulative impact of development.* *2) Provide safe and direct walking and cycling routes to nearby services, facilities and public transport where appropriate […]* *5) Provide sufficient parking facilities having regard to the Council's adopted parking standards;* *6) Provide sufficient and safe access to service and emergency vehicles.".* The policies map show that there are some footpaths along the periphery of the main development site. A small parcel of land designated as parkland falls within the main development site.

Relevant Legislation and Policy	Relevance to the Assessment
Chelmsford City Council (CCC) Local Plan (2020) (Ref. 6.7).	The Local Plan provides a new planning framework to meet local development needs to 2036 and was formally adopted on 27 May 2020. It sets out 9 key strategic priorities and the key ones in relation to the Project are: • Strategic Priority 1 - Ensuring sustainable patterns of development. • Strategic Priority 3 - Fostering growth and investment and providing new jobs. • Strategic Priority 5 – Delivering new and improved strategic infrastructure. • Strategic Priority 6 – Delivering new and improved local infrastructure. There are also a set of strategic policies and the key ones in relation to Transport are: • Strategic Policy S9 – Infrastructure Requirements. • Strategic Policy S10 – Securing Infrastructure and Impact Mitigation. Strategic Policy 9 states: *“New development must be supported by the provision of infrastructure, services and facilities that are identified as necessary to serve its needs.”.* In relation to transport it states that: *“New development must be supported by sustainable means of transport to serve its need including walking, cycling and public transport modes. New highway infrastructure should help reduce congestion, link new development and provide connections in the strategic road network.”.*

Relevant Legislation and Policy	Relevance to the Assessment
	Strategic Policy 10 states: *"Infrastructure must be provided in a timely and, where appropriate, phased manner to serve the occupants and users of the development.* *Permission will only be granted if it can be demonstrated that there is sufficient appropriate infrastructure capacity to support the development or that such capacity will be delivered by the proposal. It must further be demonstrated that such capacity as is required will prove sustainable over time both in physical and financial terms.* *Where a development proposal requires additional infrastructure capacity, to be deemed acceptable, mitigation measures must be agreed with the Local Planning Authority and the appropriate infrastructure provider. Such measures may include (not exclusively):* • *Financial contributions towards new or expanded facilities and the maintenance thereof;* • *On-site provision (which may include building works);* • *Off-site capacity improvement works; and/or* • *The provision of land.* *Infrastructure will be secured through the use of planning condition and/or planning obligation and/or financial contributions through the Community Infrastructure Levy or its successor.* *Developers and landowners must work positively with the Council, neighbouring Local Planning Authorities and other infrastructure providers throughout the planning process to ensure that the cumulative impact of development is considered and then mitigated, at the appropriate time, in line with adopted policies and published guidance.*

Relevant Legislation and Policy	Relevance to the Assessment
	In negotiating planning obligations, the Council will take into account local and strategic infrastructure needs and financial viability. The Council will ensure that the cumulative impact of planning policy, standards and infrastructure requirements do not render the sites and development identified in the Local Plan unviable and therefore undeliverable.".

Technical guidance

6.2.3 Technical guidance that has been used to define the assessment is set out in **Table 6.2**.

Table 6.2: Relevant technical guidance

Guidance reference	Implications
Guidelines for the Environmental Assessment of Road Traffic (1993) (Ref. 6.8).	The guidance sets out that the estimated traffic to be produced by the Project should include both the anticipated traffic volumes along key routes to the site, with the anticipated proportions of HGVs and their movements to be provided separately. The guidance identifies two rules by which the study area and extent of assessment can be defined, they are as follows: *"include highway links where traffic flows will increase by more than 30%"* *"include any other specifically sensitive areas where traffic flows have increased by 10% or more".*

Guidance reference	Implications
Design Manual for Roads and Bridges (Volume 11) (DMRB) (Ref. 6.9).	The DMRB guidance is applied to assist in the identification of road users that are potentially sensitive to changes in traffic flows associated with the development.
Manual for Streets (MfS) (2007) (Ref. 6.10) and Manual for Streets 2 (MfS2) (2010) (Ref. 6.11).	Manual for Streets (MfS) is a document setting out principles which can be applied to streets which are not trunk roads (where DMRB applies). MfS 2 includes the wider application of the principles set out in 'MfS' and extends its practices beyond residential streets to encompass both urban and rural situations. It is intended to assist those in the planning, construction and improvement of streets to deliver more contextually sensitive designs. MfS 2 fills the gap in design advice that lies between MfS and the design standards for trunk roads as set out in the DMRB.
New Approach to Appraisal (NATA) (Ref. 6.12).	The New Approach to Appraisals is referenced within the Department for Transport (DfT)'s Guidance on Transport Assessment document, March 2007. The key elements and principles of the NATA framework remain in the DfT's Transport Analysis Guidance (TAG), however the term NATA is no longer in use.
TAG (Transport Analysis Guidance) (2013) (Ref. 6.13).	TAG is the DfT's Transport Analysis Guidance which provides information on the role of transport modelling and appraisal. It should be noted that TAG has previously been referred to WebTAG. The guidance includes or provides links to advice on how to: • *"set objectives and identify problems* • *develop potential solutions* • *create a transport model for the appraisal of the alternative solutions*

Guidance reference	Implications
	• *how to conduct an appraisal which meets the department's requirements".* Projects or studies that require government approval are expected to make use of this guidance in a manner appropriate for that project or study. For projects or studies that do not require government approval, TAG should serve as a best practice guide. In relation to the Transport Appraisal Process set out in WebTAG May 2018, the three stages in the Transport Appraisal Process are as follows: • Stage 1 – Option Development. This involves identifying the need for intervention and developing options to address a clear set of locally developed objectives which express desired outcomes. These are then sifted for the better performing options to be taken on to further detailed appraisal in Stage 2. • Stage 2 – Further Appraisal of a small number of better performing options in order to obtain sufficient information to enable decision-makers to make a rational and auditable decision about whether or not to proceed with intervention. The focus of analysis is on estimating the likely performance and impact of intervention(s) in sufficient detail. • Stage 3 – Implementation, Monitoring and Evaluation. The Transport Appraisal Process guidance document provides guidance on identifying the need for intervention and developing options through an objective-led and evidence-based approach. A key part of this is to undertake appraisal in a proportionate manner and enabling a lighter touch approach, where appropriate. This will enable Sponsoring Organisations to ensure interventions have been developed in a robust manner, supported by fit for purpose and proportionate analysis, providing a sound basis for identifying problems and developing solutions.

6.3 Consultation and Engagement

6.3.1 This chapter has been informed by engagement and discussion with various stakeholders.

6.3.2 **Table 6.3** details technical engagement to date which has occurred outside of statutory consultation.

6.3.3 Stage One Consultation commenced in March 2020 with the purpose of setting out the vision and emerging proposals for the Project. This non-statutory consultation sought views and feedback on the aims of the Project and the overall proposals including the potential locations of off-site associated development sites and Transport Strategy.

6.3.4 **Table 6.4** provides a summary of the statutory consultee comments arranged by theme arising from Stage One Consultation, along with a response to identify how the matter is dealt with.

Table 6.3: Technical engagement

Consultee	Points of Discussion
ECC MDC Natural England. Royal Society for the Protection of Birds (RSPB).	Discussions with ECC, MDC, Natural England and RSPB on 7 November 2019 at the first Transport Workshop. The purpose being to consult with officers on the Transport Strategy to maximise sustainable transport modes; receive feedback on key constraints; decision making process and to present 'Long List options'.
Highways England. ECC MDC Environment Agency. Natural England.	Further discussions with Highways England, ECC, MDC, Environment Agency, Natural England on 28 November 2019, at the second Transport Workshop. Purpose of workshop to review long list options (Marine and Highways) and details of shortlisting for Early Years and Peak Construction
ECC	Meeting held on 24 March 2020 with ECC to discuss the approach to the highway network assessment and modelling methodology
CCC	Meeting held on 15 April 2020 to update the Council on the Stage One Transport Strategy, the proposed next steps in developing preferred proposals and the approach to traffic modelling
ECC	Meeting held on 28 May with ECC to provide an update on traffic modelling and agreeing next steps in developing the traffic model.

Table 6.4: Stage One Consultation comments

Theme	Summary of Consultee Comments and Considerations	How This is Accounted for
Transport Strategy.	A number of consultees comment on the Transport Strategy, key points raised include: • More information required (Natural England). • Environmental concerns over marine transport (Natural England). • Maximise sustainable transport (Natural England, MDC, ECC and South Woodham Ferrers Town Council). • Transport Strategy not defined (MDC and ECC). • Suitability of highway network and congestion (MDC, ECC and South Woodham Ferrers Town Council). • Consideration of Local Plans and Neighbourhood Plans (South Woodham Ferrers Town Council). • Environmental impacts (South Woodham Ferrers Town Council). • Inclusion of rail as a mode of transport (South Woodham Ferrers Town Council).	ECC are currently being consulted with in respect of the Transport Strategy. The Transport Strategy will set out key objectives along with freight and workforce strategies which will seek to maximise sustainable modes of transport. The highway network will be assessed, and mitigation proposed in accordance with the assessment scope set out and will be set out within the TA Scoping Documents. A TA will be produced to support the Development Consent Order (DCO) application. Environmental impacts associated with increased traffic and off-site associated development will be assessed within the EIA. The scope of the EIA is set out in this chapter.

Theme	Summary of Consultee Comments and Considerations	How This is Accounted for
	• Extend Southminster branch line to site (South Woodham Ferrers Town Council). • Transport Strategy is too road dominant (South Woodham Ferrers Town Council).	
Assessment Scope.	Not currently supported by Transport Assessment (East Suffolk and Suffolk County Council).	A full TA and EIA will be produced to support the DCO application. The scope of the TA will be set out in the TA Scoping Documents. The scope of the Transport chapter of the ES is set out in this chapter. The scope of these assessments will be discussed and agreed with the relevant authorities.
Stakeholder Engagement.	A number of consultees commented on the Stakeholder Engagement, key points raised include: • Road dominant (UK Innovation Corridor). • Maximise sustainable transport including rail (UK Innovation Corridor). • Engagement with National Grid to enable impact of new connection to be assessed (South Woodham Ferrers Town Council).	All key stakeholders will be consulted throughout the DCO pre-application process on matters raised by stakeholders and those elements which evolve from the ongoing consultation. This will consist of technical working groups and meetings.

Theme	Summary of Consultee Comments and Considerations	How This is Accounted for
Mitigation	A number of consultees commented on the mitigation Measures, key points raised include: • Assessment of impact on highway network (UK Innovation Corridor). • Maximise sustainable transport (UK Innovation Corridor). • Highway network currently unsuitable or mitigation required (UK Innovation Corridor). • Highway safety (UK Innovation Corridor). • Protection of Historic Environment (UK Innovation Corridor).	The Transport chapter of the ES and the TA will assess the potential effects of the Project and identify mitigation where necessary, including a Construction Traffic Management Plan (CTMP). An ES and TA will be produced to support the DCO application. This will include a multi-modal Transport Strategy.
Off-site associated development.	• A number of consultees commented on the off-site associated development, key points raised include: • Objection to inclusion of Wycke Hill North site within Park and Ride Search Area 4 (Dartmouth Park Estates). • Transport Assessment or modelling required (Dartmouth Park Estates).	Off-site associated development will be a key part of the Transport Strategy and will be fully considered as part of the ES and TA, which will be produced to support the DCO application.

Theme	Summary of Consultee Comments and Considerations	How This is Accounted for
	• Park and Ride Search Area 4 – Environmental impacts including Air Quality and Noise assessments to be undertaken (Dartmouth Park Estates). • The size and capacity of smaller Park and Ride sites is not identified (Dartmouth Park Estates). • Park and Ride Search Area 4 – does not allow for the co-location with a Freight Management Facility (Dartmouth Park Estates). • Park and Ride Search Areas 3a and 3b and Freight Management Facility Search Area 3 – congestion (South Woodham Ferrers Town Council).	
Cumulative Effects.	A number of consultees commented on cumulative effects of the Project, key points raised include: • South Woodham Ferrers Town Council raised the following comments on Cumulative Effects: ▸ Housing developments not considered. ▸ Concerns raised in respect of the suitability of highway network.	The details of cumulative assessments are subject to further discussions with the relevant authorities. Cumulative assessments, where required and relevant in line with **Chapter 5: The EIA Process and Methods**.

Theme	Summary of Consultee Comments and Considerations	How This is Accounted for
	• ECC and MDC raised the following comment on Cumulative Effects in their joint response: ▸ Cumulative impacts will also need to be addressed. • Highways England raised the following comment in their response: • There is a suggestion that the proposed freight management facility could be co-located with other facilities, including a park and ride. Whilst centralising facilities could yield benefits, consideration should also be given to whether this would lead to a more significant concentration of development traffic impacts on parts of the highway network.	

6.4 Data Gathering Methodology

Study area

6.4.1 This section presents the study area for the assessment of transport effects within the ES. In accordance with the Institute of Environmental Management and Assessment (IEMA) guidelines (Ref. 6.8), the study area has been defined by considering the geographical extent of potential changes in traffic as a result of the Project and where these may result in changes (either beneficial or adverse) to the character of the location or existing links. This has been undertaken by identifying any link or location where it is considered that potential significant impacts may occur as a result of the Project and areas where potential interventions may be necessary.

6.4.2 The extent of the study area has also been based on discussions with Jacobs, on behalf of ECC, regarding the spatial extent of microsimulation modelling assessments. The study area was agreed with ECC as being appropriate to address the objectives of the transport studies.

6.4.3 While some of the chapters of this scoping report have broken down the study area into distinct areas, such as the project-provided accommodation, this is not possible for the transport study as each element of the Project has a wider impact than the local area surrounding it. Therefore, a specific study area has been developed for the transport work and this is shown on **Figure 6.1**.

6.4.4 The Study Area includes but is not limited to, Strategic Routes and Early Years Routes. These routes are described in **Chapter 3: The Project**.

Assessment screening

6.4.5 Within the IEMA Guidance (Ref. 6.8), changes in traffic flows of less than 10% will be considered negligible according to Rule 1 and Rule 2 of the Guidance, which seeks to appropriately limit the scale and extent of assessments.

6.4.6 These rules are listed as follows:

- Rule 1: include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%); and
- Rule 2: include any other specifically sensitive areas where traffic flows have increased by 10% or more.

Sources of data used in scoping

Desk based

6.4.7 The EIA scoping exercise has been undertaken with reference to **Chapter 3: The Project** supported by a number of data sources. The principal desk-based data

sources which have been used to inform the identification of potentially significant effects are identified in **Table 6.5**.

Table 6.5: Desk-based data sources

Source	Data
Traffic survey data.	A standalone data report has been produced. This is included at **Appendix 6A.**
Google Maps (Ref. 6.14).	'Traffic' function within Google Maps provides an overview of traffic conditions, for key road links. The data is available for both current conditions and 'typical' conditions using historic data. 'Typical' traffic conditions data has been used (to best represent traffic prior to the Covid-19 pandemic). Links within the study area were examined, for a neutral weekday (Wednesday), across the day for the times available (each hour between 06:00-22:00).
ECC	Personal Injury Collision data has been used to identify where there are existing accident clusters, suggesting where there may be issues with the road network, which contribute to the occurrences of road traffic accidents in those locations.
Crash Map website (Ref. 6.15).	Supplementary Personal Injury Collision data for additional links, cross checking of information and more recent information.
ECC Public Rights of Way (PRoW) definitive map. (Ref. 6.16).	Information on the various PRoWs in the study area, from the definitive map which ECC maintains.
Traveline South East and National Rail. (Ref. 6.17).	Existing public transport services and provisions.

6.5 Baseline Information

Current baseline

6.5.1 The baseline information has been broken down into the following sections:

- Accessibility by Non-Car Modes:
  - Walking;

- Cycle; and
- Public Transport (including rail).

- Highway Network;
- Traffic Flow Data; and
- Personal Injury Collision Data.

6.5.2 Baseline information regarding marine transport and facilities within the Blackwater Estuary can be found in **Chapter 19: Navigation** and is therefore not repeated here.

Accessibility by non-car modes

6.5.3 This section provides a description of the walking, cycling and public transport facilities in the vicinity of the study area and the interactions of these with the local highway network.

Walking

6.5.4 The study area benefits from walking routes. ECC have published a definitive map which sets out the location of all PRoW. Please refer to **Chapter 21: Recreation**, for more detail regarding the PRoW.

Facilities within proximity of main development site

6.5.5 The main development site is surrounded by numerous PRoW. **Figure 6.2** provides a small section of the definitive map which encompasses the main development site.

6.5.6 **Figure 6.2** indicates that it is possible to reach a number of local destinations from the main development site on foot using PRoW including areas such as Tillingham, St Lawrence and Asheldham.

PRoWs adjacent to Strategic Route(s) and/or Early Years Routes

6.5.7 **Table 6.6** identifies the PRoW within the study area which either cross or run adjacent to the proposed Strategic Routes and Early Years Routes. The PRoW generally run through farmland and fields and therefore do not benefit from streetlighting and may be subject to poor quality ground beneath foot.

Table 6.6: PRoW crossing or adjacent to strategic routes and early years routes

PRoW Code	Location
Chelmsford	
FP 61 217.	Located alongside the A414 Main Road, west to Well Lane.
FP 24 229.	Cuts across A132 Burnham Road.
FP 27 229.	Cuts across A132.
FP 19 237.	Cuts across B1418 Main Road.
FP 5 217/ FP 4 217.	Cuts across A414 Main Road.
FP 41 217/ FP 40 217.	Cuts across Maldon Road.
FP 42 217.	Approximately 44.8 metres (m) of this footpath runs alongside B1418 Hyde Lane.
FP 26 232.	Runs alongside the A12, commencing at Hall Lane and connecting to FP 5 232.
FP 5 232.	Connects to FP 26 232, commencing on Molrams Lane eastwards across A12.
FP 27 299.	Partly runs along the A130 from the Southend Road/A12/A130 junction.
FP 45 299.	Runs alongside the A130 connecting to FP 83 299.
FP 83 299.	Cuts across the A130 and runs northbound alongside the A130.
FP 41 299.	Connects to FP 83 299 and runs alongside the A130 and eastwards to Southend Road.
FP 23 232.	Cuts across the A130, and runs southbound alongside the A130, connecting to Southend Road at Old Southern Road.
FP 27 218.	Runs alongside the A130, commencing at Church Road northwards to Douglas Hill Pattens Farm, connecting to FP5 218.

PRoW Code	Location
FP 5 218.	Across the A130 south of Douglas Pattens Farm, then north alongside the A130 and east connecting to Southend Road. This diagonally connects to FP 7 218.
FP 12 218.	Runs alongside the A130, approximately 0.5 kilometres (km) south of Church Road, connecting to FP 15 218.
FP 15 218.	Connects to FP 12 218, cutting across the A130 linking to Southend Road to the east of the A130.
BR 25 298/ BR 46 298.	Cuts across Burnham Road B1012.
Maldon	
FP 10 269.	Alongside Southend Road B1418.
FP 16 243/ FP 2 256.	Footpath – cuts diagonally across B1021.
FP 5 240.	Footpath – Alongside Tillingham Road B1021.
FP 8 240.	Footpath – alongside Southminster Road/Tillingham Road – B1021.
FP 11 262/ FP 4 244.	Footpath – cuts diagonally across B1021.
FP 28 262/ FP 40 262.	Footpath – cuts across South Street B1021.
FP 8 241.	Footpath – Cuts across Maldon Road B1021.
FP 11 257.	Cuts across B1018 Hackmans Lane.
FP 11 240.	Cuts across B1021.
FP 16 243/ FP 2 256.	Diagonally cuts across B1012.
FP 52 253/ FP 8 253.	Cuts across B1018.
FP 54 253/ FP 3 253.	Cuts across A414.
FP 44 253.	Cuts across A414.

PRoW Code	Location
FP 11 253.	Cuts across A414.
FP 55 253.	Runs alongside A414.
FP 17 257.	Diagonally cuts across B1010 Chelmsford Road.
FP 22 269.	Slightly runs alongside B1010.
FP 48 257.	Slightly runs alongside B1010 Barons Lane.
FP 10 259.	Cuts across B1021.
FP 11 259.	Cuts across B1021.
BR 24 296.	Cuts across A414.

6.5.8 Whilst the area benefits from several PRoW, the roads in more built-up areas benefit from footways on at least one side of the road. It is noted that the more urban areas with footway provision have a speed limit of 30 miles per hour (mph) in most cases.

Pedestrian crossing facilities within study area

6.5.9 **Figure 6.3** shows the location of crossing facilities within the study area. **Appendix 6B** provides a description of the crossing facilities.

6.5.10 A number of walking and rambling groups operate within the study area, this includes the Maldon and Dengie Ramblers Association and Maldon Fitsteps. Both groups undertake walks in the area with Maldon Fitsteps undertaking shorter walks of up to 4 miles around Maldon and Tillingham, while Maldon and Dengie Ramblers undertake longer walks of up to 12 miles three days a week. These and other local walking groups in the area will be consulted regarding the walking network.

Cycling

6.5.11 A review of the cycle routes that surround the main development site has been undertaken. Currently, the only identified cycle route is the Two Rivers' Way: Bradwell-on-Sea cycle route. The route is illustrated in **Figure 6.4**. The cycle route operates mostly on-road however the roads are generally rural in character.

6.5.12 There are parts of the cycle route which operate off-road. In places, there are shared pedestrian and cycle paths, with one being located along Southend Road to the north east of East Hanningfield Road/Southend Road junction. Another shared footway and cycleway is located on the eastern side of the A414 Wycke Hill

continuing through onto Spital Road. Additionally, there is a shared footway and cycleway on the western side of Fambridge Road.

6.5.13 The area surrounding the main development site does not benefit from any National Cycle Network (NCN) Routes. However, it is important to note that to the west of the Dengie Peninsula, NCN1 is both a traffic free and an on-road route which connects London to Ipswich via Chelmsford and Colchester. NCN 1 at its closest point to the main development site is approximately 20km away. **Figure 6.4** shows the NCN map and the location of the closest routes.

6.5.14 Whilst there is a limited supply of dedicated cycling facilities in the area surrounding the main development site, the majority of nearby roads are conducive for cycling due to the rural character of the highway network.

6.5.15 Despite the lack of cycle routes in the area surrounding the main development site, there are a few cycling groups which operate frequently in the area. Maldon Cycle Club have published a number of their popular cycle routes on their website, these include a route through Steeple, Bradwell-on-Sea and Tillingham which indicates further that the roads surrounding the site are used for cycling. Chelmer Cycling Club operates from Chelmsford and undertakes road cycle rides frequently in the area surrounding the main development site. Their website does not provide popular routes however it is likely that members of the club use routes around the Dengie Peninsula.

6.5.16 As part of the Stage One Consultation, these groups were consulted with and as part of ongoing public consultation, these groups will be continued to be engaged with to inform a study into the cycle network within the study area.

Public transport

6.5.17 Public transport surrounding the main development site is limited due to the rural location, with limited bus services and the closest railway station located in Southminster.

Off-site rail infrastructure

6.5.18 Southminster railway station is located approximately 12km south of the main development site. The station provides access to Wickford with two services per hour with a 30-minute journey time. In addition, it provides one service per hour to London Liverpool Street with a 70-minute journey time. Wickford railway station can be used for rail travel further afield to Southend Victoria.

6.5.19 The branch line from Wickford to Southminster is single-track with a passing loop at North Fambridge. Some 27 passenger trains depart Southminster every weekday for Wickford or London Liverpool Street. The nearest existing points of access to the main development site for rail freight are at interchanges at Chelmsford and Southminster.

6.5.20 The route, frequencies and times of the services that operate from Southminster railway station are provided in **Table 6.7**. Only direct services which require no changes have been shown, in reality there are more services per peak hour to London Liverpool Street which would require changing trains at Wickford.

Table 6.7: Rail Services from Southminster

Destination	Peak Hour Frequency	Journey Time	First / Last Train
Wickford	2	30 mins.	05:26 / 22:56.
London Liverpool Street.	1	1hr 10 mins.	06:07 / 22:56.

6.5.21 Further afield is Chelmsford rail station, which is approximately 40km by road to the west of the main development site.

6.5.22 Chelmsford is located on the Great Eastern Main Line (GEML) and has some 105 passenger trains departing to this destination every weekday from London Liverpool Street. Further enhancement of passenger services to and from London is anticipated with the opening of the Elizabeth Line between Shenfield and Reading in 2021.

6.5.23 The route between London and Southminster via Wickford does not form part of Network Rail's "Strategic Freight Network". The branch line continues to be used on occasion to move low-level nuclear waste associated with the decommissioning of the existing Bradwell power station.

6.5.24 Southminster railway station provides access to Wickford and London Liverpool Street. Wickford railway station can be used for rail travel further afield to Southend Victoria, whilst London Liverpool Street provides connections to several locations around London and further afield, including regular trains to Shenfield and Chingford.

Bus services

6.5.25 Two infrequent bus services operate from the 'Down Hall' bus stops located to the north of High Street which is located approximately 650m from the main development site.

6.5.26 A more frequent bus service operates from The Kings Head bus stop, which is located approximately 1,300m south of the entrance to the main development site.

6.5.27 **Table 6.8** sets out the route and frequency of the bus services which operate close to the main development site**.**

Table 6.8: Bus Service Frequency

Service	Distance to Bus Stop	Route	Frequency
3	650m	Chelmsford – Danbury – Cold Norton – Mayland – Bradwell-on-Sea – Tillingham.	1 per week.
104	650m	Tillingham – Bradwell on Sea – Southminster – Burnham on Crouch.	1 per day (weekdays only).
D1	1,300m	Bradwell on Sea – St Lawrence – Maylandsea – Cold Norton – Maldon.	5 per day (Monday-Saturday).

6.5.28 As shown in **Table 6.8** there are limited bus services serving the area surrounding the main development site with the most frequent service operating only five times per day, whilst being located a notable walking distance from the main development site. As part of the Project proposals, contact will be established with the local bus operators to discuss the possibility of more frequent bus services.

6.5.29 In addition to these current services and through discussions with local bus operators, the possibility of diverting nearby bus routes and adding stops closer to the main development site will be explored.

Highway network

6.5.30 This section of the report describes the highway network in the study area. As described previously the study area is shown on **Figure 6.1.**

6.5.31 The study area in relation to the highways network comprises four parts as illustrated on **Figure 6.5**:

- Strategic Highway Network;
- Western Area;
- Eastern Area; and
- Bradwell-on-Sea.

6.5.32 The following section describes each element of the highway network.

Strategic highway network study area

6.5.33 The links within the Strategic Highway Network are listed and **Figure 6.6** illustrates the links which form the Strategic Highway Network.

- **A12** - The A12 is part of the strategic road network and links London to Lowestoft and the ports of Felixstowe and Harwich. It is managed by Highways England.

The A12, between the M25 and the A14 near Ipswich, is shown as a 'heavy load route' on Highways England's map of Heavy and High Routes (Ref. 6.18). Through the study area, it passes to the west of the Dengie Peninsula and to the east of Chelmsford and comprises a dual carriageway road with two lanes in each direction. The road is subject to the national speed limit (70mph). The A12 is the main approach route to the study area.

- **A130** - The A130 is a primary route, forming part of the strategic road network that links Little Waltham, near Chelmsford, with Canvey Island. It is managed by ECC. The A130 is located to the west of the study area and to the south-east of Chelmsford. It comprises a dual carriageway road with two lanes in each direction and is subject to the national speed limit (70mph).

Western area

6.5.34 **Figure 6.7** illustrates the links which form the Local Highway Network in the western section of the study area and these are also described in this section.

- **A414** - The A414 is a major road running from the west of the A41 junction in Hemel Hempstead in Hertfordshire to Maldon in Essex. It is managed by ECC. It is located to the north-west of the study area, consisting of a single carriageway, with one lane in each direction. On some approaches to junctions, there are lane flares depending on the desired traffic destination. The national speed limit applies along the route where there are no population centres. On approach to population centres such as Danbury, and to the north-west of Oaks Corner the speed limit reduces to 40mph. The A414 runs through Danbury itself, including through residential areas, where the speed limit reduces to 30mph.

- **Langford Road B1019 leading to B1018 Maldon Road** - Langford Road connects Maldon to Witham via Maldon Road B1018 from the roundabout of Heybridge Approach / Langford Road to the junction of Station Road / B1018 / Langford Road. Langford Road provides a single lane in each direction. In parts along the link, there are signs advising that horseback riders and pedestrians are present and to proceed with caution. The majority of the link is subject to a speed limit of 40mph. Sections along the link do not provide central dashed lines and two-way traffic is not clearly separated. Langford Road goes past many residential dwellings.

- **Hatfield Road leading to Maldon Road B1019 -** Hatfield Road begins at the junction of Maldon Road / Langford Road and connects Maldon with Hatfield Peverel. A single carriageway is provided in both directions. The road is subject to a speed limit of 40mph for its majority, however it has sections where the national speed limit applies. Drivers are alerted in certain areas to Farm Traffic on the road. On approach to Hatfield Peverel the speed limit is 30mph. Langford Road passes through several settlements, including the outskirts of Heybridge and through Langford and Hatfield Peveral.

- **Goldhanger Road** - Goldhanger Road is situated to the east of Heybridge and connects with Goldhanger. It runs through part of the settlement of Heybridge,

continuing east from the junction of B1022 Colchester Road / B1026 Goldhanger Road and becomes Maldon Road B1026 just east of the junction with Osea Road. The road provides a single lane in each direction. The road is subject to a 40mph speed limit.

- **Colchester Road leading to Broad Street Green Street B1022** - Colchester Road and Broad Street Green Street B1022 connect Heybridge to Great Totham and runs through both of these settlements. The route is considered suitable for HGVs based on the posted signage on-street. The road is subject to the national speed limit in sections and reduces to 30mph in the vicinity of Heybridge and Great Totham. The road provides a single lane in each direction.

- **A132 -** The A132 connects South Woodham Ferrers to the A130. The link does not pass directly through any settlements or residential areas, although its alignment means that it passes close to existing commercial properties and some residences. The A132 is located to the south-west of the study area, providing a link to the A130 to the west, and to the B1012 Burnham Road and Lower Burnham Road to the east. It comprises mainly a single carriageway, with one lane in each direction. In the vicinity of the Rettendon Turnpike and the Ferrers Road Roundabout, the A132 widens to two lanes in each direction and the speed limit is reduced to 50mph due to uneven carriageway surface. The A132 is subject to a speed limit of 50mph for the most part but is subject to speed limits of 30mph and 40mph on approach to urban areas.

- **B1010** - The B1010 Burnham Road commences at the Oak Corner roundabout, travelling to the east to Purleigh bypass and becoming Barons Lane. The B1010 Fambridge Road starts at the Limebrook Way roundabout and meets the B1010 Barons Lane to the south. The B1010 then runs south and east toward Burnham on Crouch. It consists of a single carriageway, with one lane in each direction. The national speed limit along this B-road applies outside population centres. On approaches to population centres such as Purleigh, the speed limit reduces to 40mph and within the residential area itself this reduces once again to 30mph. The speed limit is also 40mph on the approaches to junctions such as Fambridge Road/B1018 Cold Norton Road/Latchingdon Road junction. The link passes through the settlements of Woodham Mortimer, Hazeleigh and Purleigh (outskirts).

- **B1012 -** The B1012 commences to the east of the A132 forming part of the northern bypass of South Woodham Ferrers, extending to the east connecting to the B1010 Fambridge Road/B1010 Lower Burnham Road. It comprises of a single carriageway, with one lane in each direction. The route is predominantly subject to the national speed limit. However, it is important to note that a maximum speed limit of 20mph has been applied to multiple bends such as the bend following the B1010 Fambridge/B1010 Lower Burnham Road/B1012 Fambridge Road junction, and the double bend to the west of Church Lane. Additionally, on the approach to junctions such as the B1418/B1012/Old Wickford Road/Burnham Road junction, the speed limit reduces to 40mph.

- **B1418 -** The B1418 commencing from B1418/B1012 Burnham Road/Old Wickford Road junction has the national speed restriction in place. The national speed limit applies for most of the route except for 30mph speed limits, in areas where population centres are located, which includes Woodham Ferrers and Bicknacre. Additionally, a 20mph speed limit temporarily applies when the light is shown below a school sign, to the south approaching St Marys Church of England Aided Primary School, whose playground is located towards the B1418, but increases to 30mph shortly after. The link passes directly through the residential settlements of Woodham Ferrers and Bicknacre.

- **Southend Road** - Southend Road between the A12 Junction 17 Howe Green Interchange and the junction with East Hanningfield Road is single carriageway, with one lane in each direction and is predominantly subject to the national speed limit. A 30mph speed restriction applies upon entering the residential area of Howe Green. Along this road there are two areas where vehicles must give way to oncoming traffic due to there being a priority gate. One for eastbound traffic and the other for westbound traffic. Therefore, at these two points the road momentarily becomes a single lane.

- **East Hanningfield Road** - East Hanningfield Road through Howe Green between its junctions with Southend Road and Great Gibcracks Chase/Main Road junction is single carriageway with one lane in each direction. A 30mph speed limit is present on this road as it passes through Howe Green. Upon exiting Howe Green on the eastern side, the national speed limit applies.

- **Main Road -** Main Road between its junctions with East Hanningfield Rd/Great Gibcracks Chase and The Common is single carriageway with one lane in each direction. The national speed limit applies for most of the road, and only alters to 30mph on approach to The Common, in East Hanningfield. The road passes several residential dwellings.

- **The Common** - The Common between Main Road and Bicknacre Road, located in East Hanningfield, is a residential road passing through East Hanningfield, with one lane in each direction and subject to a 30mph speed limit. However, parking is not restricted on this road which can result in the road width being reduced to one lane.

- **Bicknacre Road** - Bicknacre Road between its junctions with The Common (East Hanningfield) and Priory Road is single carriageway with one lane in each direction. It passes through the northern residential area of East Hanningfield and a small number of individual residential dwellings outside of the main settlement areas. It is subject to a 30mph speed limit in the population centres of East Hanningfield and Bicknacre, with a national speed limit in between. A give-way to northbound travelling traffic is located to the South of Highfields Mead at a priority gate.

- **Priory Road** - Priory Road between its junctions with Bicknacre Road and Priory Road/B1418 Junction is single carriageway with one lane in each direction. It is

subject to a 30mph speed limit, as it only routes within the population centre of Bicknacre.

- **A414 Wycke Hill** - The A414 Wycke Hill is located to the north of the A414 Maldon Road/Limebrook Way. It is to the North West of the study area, consisting of a single carriageway, with one lane for each traffic flow direction. A 40mph speed limit applies to the A414 Wycke Hill.

- **Spital Road** - Spital Road continues to the north of the A414 Wycke Hill and ends at the London Road/Fambridge Road/Spital Road junction. It is to the North West of the study area, consisting of a single carriageway, with one lane for each traffic flow direction. A 30mph speed limit applies to Spital Road, as it goes through the residential area, Maldon.

- **Fambridge Road** - Fambridge Road is located to the south of London Road/Fambridge Road/Spital Road junction. It is to the north west of the study area, consisting of a single carriageway, with one lane for each traffic flow direction. A 30mph speed limit applies to Fambridge Road, as it goes through the residential area, Maldon. To the south of the Fambridge Road /Limebrook Way roundabout the speed limit increases to 40mph then the national speed limit applies before again reducing to 40mph in the vicinity of The Round Bush public house.

- **Marlpits Road** - Marlpits Road is located to the south of the B1010 Burnham Road/Marlpits Road junction. It is a single carriageway, with two lanes, one for northbound traffic and the other for southbound traffic. The national speed limit applies to this road.

- **Hackman Road** - Hackman Road is located to the south of Marlpits Road/Goat House Lane/Hackmans Lane/ Slough Lane junction. Between Marlpits Road/Goat House Lane/Hackmans Lane/ Slough Lane junction and to the south-east of Hackmans Lane/Birchwood Road junction. Hackman Road then becomes a single-track road for the remainder of the road. The road has a speed limit of 30mph upon entering Cock Clarks population centre. For the remainder of the road, the national speed limit applies.

- **Latchingdon Road** - Latchingdon Road is located to the east of Howe Green Road/Latchingdon Road/Stow Road/Hackmans Lane junction. It is to the south-west of the study area, consisting of a single carriageway, with one lane for each traffic flow direction. A 30mph speed limit applies to the road where it travels through Cold Norton, residential area. Upon exiting Cold Norton and on the approach to Station Road/Latchingdon Road junction, the speed limit increase to 40mph.

Eastern area

6.5.35 **Figure 6.8** illustrates the links which form the Local Highway Network in the eastern section of the study area and these are described in this section.

- **B1018** - The B1018 links Braintree to Southminster, via Witham and Maldon. It consists of a single carriageway, with one lane in each direction and is predominantly subject to the national speed limit although the speed limit reduces to 40mph between the north western approach to B1018 Limebrook Way/Fambridge Road roundabout and the Limebrook Way/Fambridge Road roundabout. Additionally, on the approach to population centres such as Latchingdon, Althorne and Southminster, the speed limit reduces to 40mph then 30mph within the residential areas.

- **B1021** - The B1021 commences at Bradwell Waterside and extends southwards bypassing Bradwell-on-Sea. It then runs through Tillingham and Asheldham and into Southminster, ending at the junction with the B1018. The B1021 starts again to the west of Southminster and travels south to Burnham-on-Crouch. It comprises a single carriageway, with one lane in each direction. It is predominantly subject to the national speed limit, although several changes to the speed restrictions are found along this route. Through population centres such as Bradwell Waterside, Tillingham and Southminster, the speed limit is 30mph, with approaches to these residential areas being predominantly 40mph. Additionally, there is also a 30mph speed limit in the vicinity of the quarry access point (Tillingham Road).

- **Maldon Road / Steeple Road / Bradwell Road** - These unclassified roads commence at Latchingdon, connecting the B1018 eastwards to Mayland and Steeple, and ending at the junction of Maldon Road/B1021. It comprises of a single carriageway, with one lane in each direction. The national speed restriction is in place along this route, with reductions to 40mph and 30mph predominantly occurring on approaches and through population centres such as Mayland and Steeple. This link is the primary signed HGV route to Bradwell-on-Sea within the Dengie Peninsula.

- **Unnamed Road** - This unnamed road connects Bradwell Road to St Lawrence Road/St Lawrence Hill. The road is a single-track road with a national speed limit.

- **St Lawrence Hill / Southminster Road** - St Lawrence Hill/Southminster Road connects to the unnamed road described previously. It is a single-track road with a national speed limit.

- **Brook Road / Reddings Lane** - Brook Road/Reddings Lane between its junctions with the B1021 Bradwell/B1021 North Street and the B1021 Tillingham has a national speed limit for most of the route. A 30mph speed limit applies on the east of Brook Lane where the road passes through Tillingham.

- **Batt's Road** - Batt's Road between its junctions with The Street/Bradwell Road and Foxhall junction is a single-track road predominantly subject to the national speed limit.

- **Steeple Road** - Steeple Road between its junctions with Foxhall and the B1018 Scotts Hill is a single-track road with a national speed limit.

- **Foxhall Road** - Foxhall Road is located to the west of B1021 Southminster Road/B1021 Tillingham Road/Foxhall Road junction and Highlands Hill. It is single carriageway, with two lanes, one for eastbound traffic and the other for westbound traffic. The national speed limit applies to this road.

- **Highlands Hill** - Highlands Hill is located between its junctions with Foxhall Road and Mayland Hill/Green Lane. It is a single carriageway, with one lane in each direction. The national speed limit applies to this road. However, there is a maximum speed limit of 40mph Highland Hill on the double bend on the eastern approach to Green Lane/Highlands Hill/Mayland Hill.

- **Green Lane** - Green Lane between its junctions with Highlands Hill/Mayland Hill and the B1018 Burnham Road is a single carriageway, with one lane in each direction. The national speed limit applies to this road. However, there is a maximum speed limit of 40mph Highland Hill on the double bend on approach to double bend to the east of B1018 Burnham Road/Green Lane.

- **Mayland Hill** - Mayland Hill is located to the south of Green Lane/Highlands Hill/Mayland Hill junction. It is a single-track road with a national speed limit.

- **Old Heath Road** - Old Heath Road is located between the B1021 Burnham Road and Dairy Farm Road/ The Endway junctions. It is a single-track road where the national speed limit applies.

- **The Endway** - The Endway is located between the Dairy Farm Road/Old Heath Road junction and the B1010 Burnham Road junction. This is a single-track road where the national speed limit applies. However, there is a maximum speed limit of 20mph on the bend located at the Dairy Farm Road/The Endway, Burnham Road junction.

- **Summerhill Burnham Road** - Summerhill Burnham Road is located between the B1018 Burnham Road/ B1018 Southminster Road junction and the B1010 Burnham Road/B1010 Fambridge Road junction. This is single carriageway, with one lane in each direction. A 30mph speed limit applies to this road, as it goes through the residential area, Althorne.

- **Rectory Lane** - Rectory Lane is located to the south of B1018 Burnham Road. It is single track road with a national speed limit.

- **Dairy Farm Road** - Dairy Farm Road is located to the south of Mayland Hill/Southminster Road junction. It is a single-track road with a national speed limit.

Bradwell-on-Sea area

6.5.36 **Figure 6.9** illustrates the links which form the Local Highway Network in the Bradwell-on-Sea section of the study area and these are listed in this section.

- **B1021** - The B1021 runs north from Asheldham, through Tillingham and then northeast through the outskirts of Bradwell-on-Sea and north to Bradwell Waterside. The link provides a single lane in each direction. Between Asheldham and Tillingham, the B1021 is subject to the national speed limit. Where it passes through Tillingham the speed limit reduces to 30mph before revertng back to the national speed limit to the north of the B1021 / Brook Road junction in Tillingham.
- **Woodyards** - Woodyards runs between Waterside Road and the High Street. It is a single- track providing access to agricultural fields along either side of the link. Woodyards is subject to the national speed limit.
- **High Street** - High Street runs from Trusses Road in the north down to Bradwell-on-Sea, where it becomes South Street at the southern end of the village. High Street is subject to the national speed limit to the north of the village. On the approach to Bradwell-on-Sea and within the village itself, the speed limit is 30mph.
- **Trusses Road** - Trusses Road is located to the south-west of Bradwell Waterside, commencing at B1021 Waterside Road and ending on the approach to the RAF Bradwell Bay War Memorial. It consists of a single carriageway, with one lane in each direction. Trusses Road is subject to the national speed limit.
- **Unnamed road leading from Trusses Road to the site** - This road follows Trusses Road and continues northwards to the existing Bradwell A power station. The national speed limit applies at the commencement of this route, to the south, and reduces to 40mph shortly followed by 20mph on the private road to the Bradwell A site.

Traffic flow data

6.5.37 Available traffic flow data is reviewed within **Appendix 6A**. At this time, a selection of data is available and further data has been requested where necessary. It should be noted that historic traffic data has been used as more recent traffic surveys have not been able to take place in 2020 due to the effects of the Covid-19 lockdown. The traffic flow data will be used to determine the traffic flows on each link in the Study Area, as shown on **Figure 6.1**. The following time periods will be assessed:

- 24-hour Annual Average Daily Traffic;
- Network peak hours subject to further liaison with the Local Highway Authority; and
- Hour of greatest change in traffic flows.

Personal Injury Collision data

6.5.38 Personal Injury Collision Data has been collected to inform the Transport chapter of the ES. Data has been collected for links within the study area, as shown at **Figure 6.1**.

6.5.39 The data has been collected for the most recent 5-year period available (up to 21st December 2019) and will be analysed to determine if there are any existing issues on the local highway network that may be due to deficiencies within the highway layout.

Future baseline

6.5.40 The approach to cumulative assessment is set out in **Chapter 5: The EIA Process and Methods**.

6.5.41 As described previously, the future baseline assessment year for transport network is currently subject to technical discussions with ECC. Discussions are currently ongoing with ECC regarding the cumulative schemes (both development and infrastructure) that will be included within the Future Baseline scenario.

6.5.42 The future baseline will take into account planned changes on the transport network along with changes as a result of committed developments which will be complete at that time. These issues will be subject to consultation with the local authorities and ECC.

Planned further surveys and studies

6.5.43 To assist with the assessment of transport a number of further surveys and studies will be undertaken to inform the assessment. These are set out in **Table 6.9**.

Table 6.9: Further Surveys and Studies

Future Surveys and Studies	Proposed Date
Additional site visits to the study area.	September 2020 ongoing.
Additional targeted topographic survey where necessary.	October 2020 ongoing.
Accident Study.	Autumn 2020.
Study of Walking and Cycling based on site visits, online sources such as Strava and consultation with local cycle groups.	August 2020 ongoing.

Future Surveys and Studies	Proposed Date
Additional traffic surveys (where necessary).	Autumn 2020 at earliest as this depends on the ongoing Covid-19 situation. Surveys will not be undertaken when traffic levels will not be considered to be representative. Timing of the additional traffic surveys will be agreed with ECC.
Strategic Highway Network Model.	Autumn and Winter 2020.
Development of a Gravity Model.	Autumn 2020 ongoing.
Development of a Paramics traffic model.	Winter 2020 and Spring 2021.

6.6 Proposed Approach to the Assessment

Assessment methodology

6.6.1 The following sections describe the methodology which will be used for the assessment of likely significant effects due to construction and operation of the Project in relation to Transport.

6.6.2 The applicant is still reviewing the role that rail can play in the Transport Strategy, taking into account consultation, and the extent to which this could reduce the need for the road and marine infrastructure identified elsewhere in this chapter.

6.6.3 If new rail infrastructure forms part of the Project, the extent of the works will be defined, consulted on and rescoped if necessary.

Trip generation and distribution methodology

6.6.4 The following paragraphs provide a summary of the approach taken to determine the traffic associated with the Project during the construction and operational phases. At this stage, the approach is still evolving and as such, a brief methodology is set out, subject to further liaison with the relevant authorities and statutory bodies.

Trip generation

6.6.5 At this stage, trip generation requires a number of inputs, which are still being refined. These include:

- Workforce numbers;
- Workforce profiles;

- Quantity of material required and method of delivery (by transport mode);
- Source of material; and
- Construction programme.

6.6.6 Initial work on developing the construction methodology has been undertaken by the Project and will continue as the Project progresses. Further work will be undertaken to determine the supply chain opportunities and the implications of these on workforce and freight trip generation. The methodologies adopted for both the workforce and freight trip generation assessments are summarised in the forthcoming sections.

Workforce trip generation

6.6.7 Initial work on developing the socio-economic parameters of the Project has been undertaken. This includes work to establish the likely number of workers and anticipated skills profile that will be needed to construct and operate the Project (the workforce profile). The peak construction workforce will depend on the construction programme which is still to be finalised. At the current time (Summer 2020) it is anticipated that up to 9,100 construction workers is a likely realistic central estimate, with a maximum (worst-case) scenario of up to 10,600 construction workers. These estimates will be refined and therefore they could be subject to change. The relevant assessments will adopt the appropriate workforce numbers.

6.6.8 Further information is provided within **Chapter 10: Socio-economics**.

Workforce shift profile

6.6.9 At this stage, the shift profiles are being determined based on a range of factors including:

- The construction programme;
- The phase of the Project within the construction programme or during operation;
- The type of construction process and materials being used within that phase; and
- Experience from other similar projects.

6.6.10 Initial work has taken place to inform these profiles and this is being refined as the supply chain opportunities are evaluated.

Gravity model

6.6.11 To determine the distribution of the workforce a gravity model is being built and a brief methodology explaining the model is provided. The gravity model is currently being developed and will continue to be refined as the Project evolves.

6.6.12 The existing skills profile in the local area does not fully meet the specialised requirements of the construction of the Project. There would be two types of workers as follows:

- home-based workers who would commute to and from work on a daily basis from their home address; and
- non-home-based workers who would not feasibly be able to commute to and from work on a daily basis from their home address and would therefore require temporary accommodation in the vicinity of the main development site.

6.6.13 The approach set out in this section draws on similar gravity models that have been prepared to support the assessment of impacts at the new nuclear developments at Hinkley Point C, Sizewell C and Wylfa Newydd.

Gravity model form

6.6.14 There are two types of gravity model deterrence functions; power functions or exponential functions.

6.6.15 The DfT WebTAG Unit M2 guidance on Variable Demand Modelling (May 2019) (Ref. 6.19) paragraph C.5.4 states "*In a true gravity model the deterrence functions are power functions…. (and originally zone pair distance was used instead of G), but it is standard now to use an exponential form*.".

6.6.16 The deterrence proposed to be used for the gravity model is a function of cost using the negative exponential:

$f(c) = e^{-ßC}$

Where:

- f(c) is the function of cost;
- ß is constant; and
- C is cost (journey time in minutes).

6.6.17 The ß constant is proposed to be used to calibrate the model.

Travel time catchments

6.6.18 Prior to the distribution of construction workers being estimated, it is important to establish a catchment area for the home-based and non-home-based construction workers.

6.6.19 This section summarises the travel time catchments proposed to be used for the gravity model and the reasons for using the travel times. It also provides the methodology and data proposed to be used to estimate journey times in the gravity model.

Home-based workforce

6.6.20 It is assumed that the home-based workforce will travel up to 90 minutes to work at the main development site.

6.6.21 The 90 minute travel time for home-based workers is based on survey evidence on journey to work distances for construction sector workers (BMG Research for Construction Industry Training Board (CITB), Workforce Mobility and Skills in the UK Construction Sector 2018/19 April 2019 (Ref. 6.20). The CITB research shows that the vast majority of UK and Eastern region construction workers travel 50 miles or less to their workplace, which has been equated to 90 minutes.

6.6.22 The 90-minute travel time catchment also relates to travel allowances for construction workers. The Construction Industry Joint Council (CJIC) agreement (Ref. 6.21) sets out national standards for pay and conditions for workers on major building and infrastructure sites in the UK. The agreement, which took effect in June 2008, sets out rates for daily travel and fare allowances. These are currently payable on a sliding scale based on the distance travelled, up to a maximum of 75km (circa 47 miles). Workers can live beyond this distance but would not be paid a travel allowance for any distance travelled in excess of 75km. As such the travel allowance acts as a real incentive for workers to live within 75km or 47 miles of their workplace.

Non-home-based workforce

6.6.23 It is considered that the non-home-based workers will tend to live closer to the main development site as they are moving into the area primarily for work and the travel time to work will be a material factor when choosing accommodation.

6.6.24 It is proposed that the gravity model will assume that non-home based workforce would move to a location that ensures that they do not have to travel beyond 60 minutes to work at the main development site.

Road network calibration

6.6.25 The gravity model is proposed to be developed using GIS software. It is therefore important that the GIS road network reflects observed travel times in order for the travel time catchment to be as true to reality as possible.

6.6.26 TomTom travel time data is proposed to be used for the 60-minute catchment area. Beyond the 60-minute catchment area, HERE travel time data is proposed to be used to estimate the journey time on roads.

Gravity model calibration

6.6.27 The statistic used to calibrate the β value for the gravity model is the statistic of 89% of construction journeys to work in the east of England being within 50 miles of the main development site, which has been equated to a 90 minute journey time. This statistic is based upon the 'Workforce Mobility and Skills in the UK Construction Sector' (2018-2019) BMG Research from a commission for CITB (Ref. 6.20).

Model inputs

6.6.28 Whilst the gravity model can be used as a tool to provide a distribution of the construction workforce during any stage of the construction phase of the Project, the inputs would need to be altered (e.g. number of workers, split between home-based and non-home-based workers, number of campus bed spaces etc). The datasets would not change, but the distribution of the workforce may as a result of the changes to inputs.

6.6.29 In addition to the project-provided accommodation (which includes temporary project-provided accommodation and additional small worker accommodation sites) the applicant proposes to utilise spare capacity within the following accommodation sources for the remaining non-home based workers:

- Tourist Accommodation – there is a supply of tourist accommodation in the area consisting of serviced rooms, self-catering, hostels, caravans and camping.
- Private Rented Sector (PRS) – there is also a private rented market within the local area consisting of rented houses and flats.
- Owner Occupied - some, mainly professional and project management staff, are expected to move to the area and these individuals are more likely to seek permanent housing in the local area.

Home-based datasets

6.6.30 The production and/or attraction value proposed to be used for the home-based element of the gravity model is the Working Age Population. The definition of Working Age taken from the Office for National Statistics is 16-74 years. The 2011 Census Working Age Population data (Ref. 6.22) is proposed to be used based on ward level data.

Non-home based workforce data-sets

6.6.31 This section summarises the datasets used for the non-home-based workforce element of the gravity model. The gravity model is being developed jointly with the Socio-economic assessment (as set out in **Chapter 10: Socio-economics**). As described previously, the model will generate a likely spatial distribution of the construction workforce. The potential accommodation effects of this distribution will be considered by the socio-economic assessment and mitigation strategies will be implemented where appropriate.

Tourist accommodation

6.6.32 The gravity model is proposed to use the latest available database of existing tourist accommodation 'Accommodation Stock Audit' published by Visit Britain in 2016 (Ref. 6.23). This provides the number of tourist bed spaces by local authority, including hotel and caravan accommodation. Further work is ongoing to investigate whether more refined local data could become available.

Private rented sector

6.6.33 To provide a distribution of those workers living within the private rented sector (PRS) accommodation, the number of private rented bed spaces based on 2011 Census ward-level data is proposed to be used.

Owner occupied accommodation

6.6.34 The gravity model includes workers moving into the area and living in owner occupied housing. This element of the gravity model is proposed to be based on the total number of owner-occupied dwellings based on 2011 Census ward data for each ward within the 60-minute travel time catchment.

Freight trip generation

6.6.35 The quantity of material required, method and the profile of delivery over the construction period is being calculated and will be subject to further analysis.

6.6.36 The methodology for assessing the quantity of freight movements will include the following variables:

- Programme;
- Material type;
- Material quantity;
- Source of material; and
- Method of delivery (by transport mode).

6.6.37 Initial work on developing the construction methodology has been undertaken by the Project. Further work will be undertaken to determine the supply chain opportunities and the implications of these on freight trip generation. The outcome of the assessment of these variables will determine the level of freight movements on the transport network and the location of those movements.

Traffic modelling

6.6.38 This section summarises the proposed approach to the traffic modelling to assess the residual transport effects of the Project.

Essex county-wide traffic model

6.6.39 A County-wide strategic VISUM model has been built by ECC. Use of the highway assignment model was primarily intended to:

- Allow for the strategic re-routing impacts of interventions to be considered.

- Ensure that areas outside the main area of interest, which are potential alternative destinations, are properly represented.
- Ensure that the full lengths of trips are represented for the purpose of deriving realistic travel costs required for the demand modelling.

6.6.40 These are typical objectives which trigger and/or inform the need for a strategic model to be developed. As a result, the level of detail achieved through the model network and calibration or validation checks is appropriate for these stated objectives. The model network and zone system, documented within Figure 2.2 and Figure 4.4 of the County-wide Model Development report is provided, for information, within **Figure 6.10** and **Figure 6.11** respectively.

6.6.41 These figures show that, outside of the urban areas, the network detail is limited to B-roads and there is a relatively coarse zone system in place to control the trip assignment within the immediate area of the main development site.

6.6.42 Furthermore, whilst the level of calibration and validation achieved within the County-wide model is appropriate, neither the screen line and cordon calibration checks or the journey time validation checks consider the immediate Project study area. This is because that part of the network is rural and unlikely to impact upon the strategic schemes (Ref. 6.24) which have been considered within the County-wide model to date.

6.6.43 The County-wide model has also been developed with a focus on the AM and PM peak hours as well as an average interpeak, which is appropriate considering the size and scope of the model.

6.6.44 The County-wide model, therefore, is an appropriate tool to estimate the strategic impacts of the Project arising from the assignment of traffic flows within the peak hours covered by the model. However, it is unlikely that the County-wide model will be able to consider the following:

- Localised traffic effects arising from the delivery of transport interventions;
- Impacts outside of the network peak hours;
- Impacts on the local road network (e.g. B and unclassified roads) not currently included within the County-wide model.

6.6.45 Therefore, it is proposed that the County-wide modelling will need to be supplemented with further modelling in order that it can be used to inform the assessment of the Project. Further details on how additional modelling is proposed to be used to supplement the County-wide modelling is outlined within the following section.

Supplementary traffic modelling

6.6.46 An independent micro-simulation model will be developed, which is hierarchical to the County-wide strategic model, but also enables both the necessary level of local network detail to be included and allows multiple time periods to be modelled and not just the network peak hours.

6.6.47 The area that it is proposed to model using micro-simulation is illustrated within **Figure 6.12**.

6.6.48 The model will be developed to cover a full 13-hour period from 06:00 to 19:00 from Monday to Friday (working week) to enable impacts and mitigation to be considered within the development traffic peaks rather than just the network peaks.

6.6.49 The purpose of developing a model which encompasses this extent means that the options for both capacity and route improvements between the strategic road network and the main development site can be tested, as well as informing an assessment of any residual impacts identified following the assignment of the development traffic on the network.

6.6.50 Trip distribution within the micro-simulation model will be informed via an interrogation of the County-wide model and the distribution of trips between zones therein. The nature of the zoning system and network within the County-wide model does mean that some trips will be internal to a strategic model zone and may not be fully captured within any cordoning derived from the strategic modelling. In such instances, census and other data sources will be reviewed and applied to overcome any gaps in routing information.

6.6.51 The County-wide model will also be used to identify an initial figure for growth in traffic volumes across the sectors within the microsimulation model. The County-wide model will also enable any strategic redistribution and other potential effects outside the extent of the micro-simulation model to be considered through interrogation of the County-wide model and then either development of bespoke micro-simulation models or isolated junction modelling as necessary and to be agreed with the relevant highway authorities.

Modelling approach summary

6.6.52 A modelling approach is proposed, which adopts the following principles:

- A bespoke gravity model is produced to identify the origin and destination of trips associated with the Project.
- The County-wide model will be run inclusive of the Project trips to establish the area of influence.
- Outputs from the County-wide model will be provided, which will then be able to inform elements of the micro-simulation modelling such as the Origin/Destination (O/D) matrices and traffic growth. These will include:

  - Cordon demands of the micro-simulation area from base and future year strategic model scenarios.
  - Select Link Analysis of development trips across the County-wide model network.
  - Link and junction volume/capacity (V/Cs) for each scenario run to inform any wider impact assessments not included within the micro-simulation modelled area.

- Whilst the County-wide modelling is ongoing, the base micro-simulation model will be developed. This will achieve a higher level of calibration and validation within the immediate area and allow for extended periods to be modelled.
- The outputs from the County-wide model, as well as any other appropriate considerations, will be included within the micro-simulation model to inform the future year base (i.e. reference case) scenarios development.
- Development scenarios will then be derived to test the effects of the Project and any proposed highway interventions as well as traffic routing strategies and the impacts of park and ride and freight management facilities.
- Areas of potential impact outside of the proposed extent of the micro-simulation model will be identified through the interrogation of the County-wide model outputs and then, subsequently, through a separate modelling exercise using either isolated junction modelling or targeted microsimulation.

6.6.53 Positive discussions regarding this approach are currently ongoing with the relevant authorities and these will continue throughout the TA Scoping process.

Rail summary

6.6.54 The applicant is still reviewing the role that rail can play in the Transport Strategy, taking into account consultation, and the extent to which this could reduce the need for the road and marine infrastructure identified elsewhere in this chapter.

6.6.55 If new rail infrastructure forms part of the Project, the extent of the works will be defined, consulted on and rescoped if necessary. Any works would also be addressed as part of the Transport Strategy and included in the Transport Assessment as appropriate.

Marine summary

6.6.56 The implications of marine freight on the road network will be considered where relevant within the Transport chapter of the ES, such as the use of muster ports and transport of freight from these to the main development site using HGVs.

Assessment years

6.6.57 The Transport chapter of the ES will assess the baseline, future baseline and future baseline + development scenarios for road transport only. The year(s) used for each assessment year is currently being derived and is subject to future technical discussions with ECC.

Temporal scope

6.6.58 The temporal scope of the study is essential to consider within the assessment and will identify whether the resultant effects of the Project will be permanent or temporary in nature and categorised as follows:

- Permanent - these are effects that will remain even when the Project is complete, although these effects may be caused by changes that are permanent or temporary.
- Temporary – these are effects that are related to changes associated with a particular activity and that will cease when that activity finishes. Temporary effects can be further categorised by the time period of which they will last; short-term (0-2 year impact), medium-term (3-5 year impact) and long-term (5-10 year impact).

6.6.59 The assessment to be provided within the ES will consider the effects of the Project against the baseline (current or future) scenario. The construction, operation and in some cases removal of the off-site associated development will be considered.

Defining the sensitivity of receptors

6.6.60 The sensitivity of affected receptors will be considered on a scale of high, medium, low or very low (see **Table 6.10**). The sensitivity of a road can be defined by the vulnerability of the user groups who may use it, e.g. elderly people, or children. A sensitive area may be where pedestrian activity may be high, for example in the vicinity of a school or where there is already an accident issue. It also takes account of the existing nature of the road e.g. an existing 'A' road is likely to have a lower sensitivity than a minor residential road as it is already used by a larger volume of traffic therefore a small increase would have a smaller change in the nature of the road.

6.6.61 The sensitivity of marine will be assessed in terms of the implications of marine freight on the road network, such as the use of muster ports and transport of freight from these to site using HGVs if applicable. Therefore, for the Transport chapter of the ES, the sensitivity of receptors will be the sensitivity of the road network where marine freight transport could have an effect. The potential effects related to the physical presence of marine freight will be assessed in other chapters, as set out in paragraph 6.1.5.

Table 6.10: Sensitivity of receptors

Receptor Sensitivity	Receptor Type
High	Receptors of greatest sensitivity to traffic flow: schools, colleges, playgrounds, accident clusters, retirement homes, roads without footways that are used by pedestrians.
Medium	Traffic flow sensitive receptors: congested junctions, doctors' surgeries, hospitals, shopping areas with roadside frontage, roads with narrow footways, recreation facilities.
Low	Receptors with some sensitivity to traffic flow: places of worship, public open space, tourist attractions and residential areas with adequate footway provision.
Very low.	Receptors with low sensitivity to traffic flows and those sufficiently distant from affected roads and junctions: links where no pedestrian activity occurs and where there is no provision for pedestrians. For example, strategic roads such as motorways and trunk roads or rural roads where there are no pedestrian-generating land uses within the vicinity.

Determining the magnitude of change

6.6.62 Magnitude of change has been derived as follows:

Severance

6.6.63 Severance is defined as the perceived division that can occur within a community when it becomes separated by a major traffic artery and describes a series of factors that separate people from places and other people. Such division may result from the difficulty of crossing a heavily trafficked road and a physical barrier created by the road itself.

6.6.64 The measurement and prediction of severance is difficult, but relevant factors include road width, traffic flow, speed, the presence of crossing facilities and the number of movements across the affected route.

6.6.65 IEMA guidelines refer to the DfT's 'Manual of Environmental Appraisal' (Ref. 6.25), which states that "changes in traffic flow of 30%, 60% and 90% are regarded as producing slight, moderate and substantial changes in severance respectively." It is advised that these broad indicators should be used with care and regard paid to specific local conditions. These indicators will be used as the basis of assessing the significance of the effect, along with the application of professional judgement to take account of local conditions and the character of each link.

Pedestrian delay

6.6.66 IEMA guidelines note that changes in the volume, composition and/or speed of traffic may affect the ability and time required for people to crossroads. Typically, increases in traffic levels result in increased pedestrian delay, although increased pedestrian activity itself also contributes. The guidelines do not set any thresholds, recommending instead that assessors use their judgement to determine the significance of the effect.

6.6.67 The IEMA guidelines refer to a report published by the Transport Research Laboratory (TRL) (Ref. 6.26) as providing a useful approximation for determining pedestrian delay. The TRL research concluded that mean pedestrian delay was found to be 8 seconds at flows of 1,000 vehicles per hour and just below 20 seconds at 2,000 vehicles per hour for various types of crossing condition.

6.6.68 A two-way flow of 1,400 vehicles per hour has been adopted as a lower threshold for assessment (equating to a mean 10 second delay for a link with no pedestrian facilities) in the TRL report. Below this flow pedestrian delay is unlikely to be a significant factor and therefore will be discounted from further assessment. This flow will be used to determine which links require further assessment, taking into account the characteristics of each link i.e. motorways and trunk roads with no pedestrian facilities and where pedestrians are not permitted will not be assessed. These will be assessed in further detail and professional judgement will be used to determine the significance of the effect on each link. Justification for all conclusions will be provided within the Transport chapter of the ES.

Pedestrian amenity

6.6.69 IEMA guidelines (Ref. 6.8) define pedestrian amenity as the relative pleasantness of a journey and can include fear and intimidation if they are relevant. As with pedestrian delay, amenity is affected by traffic volumes and composition along with pavement width and pedestrian activity. The guidelines suggest a tentative threshold for judging the significance of change in pedestrian amenity where traffic flow and/or HGV flow is halved or doubled, which would be considered a high change in magnitude. A change of less than half or double would be low and will therefore be discounted from further assessment. These thresholds will be used as the basis of assessing the significance of the effect along with professional judgement. Links where pedestrians are not permitted i.e. motorways, trunk roads etc. and where there are no pedestrian facilities will not be taken forward for further assessment.

Driver delay

6.6.70 IEMA guidelines note that driver delay can occur at several points on the network, although the effects are only likely to be significant when the traffic on the highway network is predicted to be at or close to the capacity of the system.

6.6.71 The TA will contain a detailed assessment of the highway network. This will include journey times along key routes, network statistics including average delay within the

study area and localised effects on the network. These assessments will be summarised in the Transport chapter of the ES where necessary and used to determine the significance of the effect, whilst applying professional judgement.

Accidents and safety

6.6.72 The IEMA guidelines do not include any definition in relation to accidents and safety, necessitating professional judgement to assess the implications of local circumstance, or factors which may increase or decrease the risk of accidents. Professional judgement has therefore been applied when assessing existing accident records and whether the Project will have any effect which may increase or decrease the risk of accidents. A review of recorded accidents within the study area will be undertaken within the TA and will be summarised in the Transport chapter of the ES in order to make a professional judgement regarding the significance of the effect.

Summary of magnitude of change derivation

6.6.73 Based on the definitions of each impact, a summary of the criteria that have been used to determine magnitude of change from the baseline conditions as a result of the Project are set out in **Table 6.11**.

6.6.74 It should also be noted however, that the absolute effect is also important e.g. the total flow of traffic or HGVs on a link. This is because an increase of 100% in the traffic flow on a road is likely to lead to an insignificant impact if the existing flows are low. Where this is applicable, professional judgement will be applied and commentary will be clearly provided within the Transport chapter of the ES.

Table 6.11: Definitions of magnitude of change

	Very Low	Low	Medium	High
Severance	Change in total traffic or HGV flows of less than 30%.	Change in total traffic or HGV flows of 30-60%.	Change in total traffic or HGV flows of 60-90%.	Change in total traffic or HGV flows over 90%.
Pedestrian Delay.	Two-way traffic flows <1,400 vehicles per hour.	A judgement based on the road links with two-way traffic flow exceeding 1,400 vehicles per hour in context of the individual characteristics.		
Pedestrian Amenity.	Change in total traffic or HGV < 100%.	A judgement based on the routes with > 100% change in the context of their individual characteristics.		
Driver Delay and Passenger Delay.	A judgement based on the journey time assessment within the traffic model for driver delay. A judgement based on the detailed assessment of passenger delay as set out in the TA.			
Accidents and Safety.	A judgement based on quantitative analysis as set out in the TA and summarised in the Transport chapter of the ES.			

Determining the significance of effects

6.6.75 The following terms will be used to define the significance of the effects, and these relate to all modes of transport including the assessment of road traffic and marine-related impacts, as set out in paragraph 6.1.2:

- Major effect: where the Project is likely to cause a considerable change from the baseline conditions and the receptor has limited adaptability, tolerance or recoverability or is of the highest sensitivity. This effect is considered to be 'Significant';
- Moderate effect: where the Project is likely to cause either a considerable change from the baseline conditions at a receptor which has a degree of adaptability, tolerance or recoverability or a less than considerable change at a receptor that has limited adaptability, tolerance or recoverability. This effect is considered more likely to be 'Significant' but will be subject to professional judgement;
- Minor effect: where the Project is likely to cause a small, but noticeable change from the baseline conditions on a receptor which has limited adaptability,

tolerance or recoverability or is of the highest sensitivity; or where the Project is likely to cause a considerable change from the baseline conditions at a receptor which can adapt, is tolerant of the change or/and can recover from the change. This effect is considered to be 'Not Significant' but will be subject to professional judgement; and

- Negligible: where the Project is unlikely to cause a noticeable change at a receptor, despite its level of sensitivity or there is a considerable change at a receptor which is not considered sensitive to a change. This effect is 'Not Significant.'

6.6.76 The significance of the effect is judged on the relationship of the magnitude of impact to the assessed sensitivity and/or importance of the receptor. The predicted significance of the impacts is summarised in **Table 6.12**.

Table 6.12: Significance evaluation matrix

Magnitude of Change	Sensitivity of Receptor			
	High	Medium	Low	Very low
High	Major (Significant).	Major (Significant).	Moderate (Significant or not significant).	Minor (Not significant).
Medium	Major (Significant).	Moderate (Significant or not significant).	Minor (Not significant).	Minor (Not significant).
Low	Moderate (Significant or not significant).	Minor (Not significant).	Minor (Not significant).	Negligible (Not significant).
Very Low	Minor (Not significant).	Minor (Not significant).	Negligible (Not significant).	Negligible (Not significant).

6.6.77 Potential effects are therefore concluded to be of negligible, minor, moderate or major significance. For each effect, it has been concluded whether the effect is 'beneficial' or 'adverse'. Major significance effects are considered to be significant in terms of EIA guidance. Moderate significance effects require further investigation to determine whether they are significant in terms of EIA guidance.

6.7 Scope of Assessment

Potential receptors

6.7.1 Sensitive receptors that have been identified which are relevant to transport within the study will be based on the principles set out within **Table 6.10.** As set out in

paragraph 6.1.2, the assessment of transport relates to the assessment of the increase in road traffic related to the Project and the potential use of alternative methods for the transport of freight.

6.7.2 A review of each highway link in relation to the key factors which affect the sensitivity of that link will be undertaken as a desktop study.

6.7.3 The sensitivity of each link will be summarised into four categories as per **Table 6.10** and will be presented as a figure within the Transport chapter of the ES, along with a plan showing the classification of each link:

- Red = high sensitivity.
- Amber = medium sensitivity.
- Yellow = low sensitivity.
- Green = very low sensitivity.

Likely significant effects

6.7.4 This section details the receptors that have the potential to be significantly affected and therefore need further assessment. These are summarised in **Table 6.13.**

Table 6.13: Likely significant effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Construction of the Project including main development site, temporary construction facilities, off-site Power Station Facilities and off-site associated development.	Construction traffic (staff and goods vehicles on road) leading to increased traffic on highway links. Use of the existing rail network by construction workers to access stations such as Southminster.	Severance, Pedestrian Amenity, Pedestrian Delay, Driver Delay and Accidents and Safety. Delay to rail passengers related to capacity.	Road Links. Rail users
Operation of the Project.	Operational traffic.	Severance, Pedestrian Amenity, Pedestrian	Road Links.

Element of the Project	Activity	Effect	Receptor or Receptor Group
		Delay, Driver Delay and Accidents and Safety.	

Effects to be scoped out

6.7.5 It is proposed to scope out any assessment of marine transport on off-site associated developments as these are likely to be terrestrial based or without the requirement for marine transport facilities.

6.8 Potential Mitigation

6.8.1 The Stage One Consultation proposed a range of measures for reducing and managing the impacts of the construction of the Project in relation to transport.

6.8.2 The range of mitigation measures that would be included as embedded mitigation have been described in detail in the **Chapter 3: The Project** and are summarised as follows:

- A facility to allow the delivery of materials by sea to the main development site;
- Park and ride facilities;
- Project-provided accommodation;
- Freight management facilities;
- Off-site highways works including:
  - Widening within adopted highway;
  - Realignment;
  - Bypasses;
- Direct bus services to the main development site; and
- Potential management measures such as Travel Plan and Construction Traffic Management Plan.

6.8.3 It should be noted that due to the ongoing effects of the Covid-19 pandemic, any future mitigation measures will be designed to be flexible, in order to accommodate

changing demands as part of any potential future pandemics. These will be managed through either the Travel Plan or Construction Traffic Management Plan.

6.9 Assumptions and Limitations

6.9.1 At the scoping stage there are several assumptions and limitations which apply as follows:

- Desktop studies have been used to inform aspects of scoping and these will be refined prior to the assessment.
- Data has been sourced (as per **Appendix 6A**) to gain data to inform the build of the base traffic model for the study area.
- Ordnance Survey mapping has been used to assess and define the study area. Where further detail is required, LiDAR and/or topographical survey data may be used where relevant and appropriate.
- Further data has been requested as described within this chapter, where required, and will be used to inform the assessment.
- Estimates of trip generation and construction related effects at this stage will be based on analysis from other similar projects and advice from experts on construction.
- At this stage committed developments have not been identified by the Local Authorities to inform any future year assessments. Discussions will be held with the relevant authorities and these will be included where relevant based on professional judgement and agreement of the long and short list to information the wider cumulative assessment.

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7. NOISE AND VIBRATION

7.1 Introduction

7.1.1 This chapter describes the approach which has been applied for determining the scope, and content of the noise and vibration assessment. **Chapter 5: The EIA Process and Methods** introduces the overall Environmental Impact Assessment (EIA) process including the methodology for assessing affects and determining significance. The topic specific methodology for determining receptor value, sensitivity and impact magnitude for noise and vibration is provided in **Section 7.6**. The chapter contains:

- a summary of work undertaken to date;
- an explanation of the scope of assessment, including:
  - legislation, policy and guidance that inform the assessment;
  - a description of consultation and engagement so far relevant to noise and vibration;
  - study area for the assessment;
  - sources of data used in scoping;
  - baseline conditions, including current desk studies and surveys;
  - planned further surveys and studies;
- the receptors that are proposed to be assessed and the effects which have the potential to be significant;
- the effects that are proposed to be scoped out of the assessment; and
- potential mitigation.

7.1.2 The chapter should be read in conjunction with the project description provided in **Chapter 3: The Project.**

7.1.3 The main focus of this chapter is the scope of the assessments required to determine the likely significant effects due to the construction and operation of the Project on human receptors. The scope of the assessment required to address likely significant effects upon ecological receptors is provided in **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**.

Work undertaken to date

7.1.4 Work undertaken to date has consisted of desk-based review of satellite imagery of the main development site and surrounding area. The desk-based review has been

undertaken to identify the required extent of the study area and the receptors potentially affected by the construction and operation of the Project.

7.1.5 A site visit by an acoustic specialist was undertaken in 2017 consisting of a walkover and familiarisation in the locality of the main development site to provide context for the ground investigation works to be undertaken for the Project (outside the scope of this EIA).

7.1.6 It is proposed that a further site reconnaissance visit will be carried out in advance of the Project baseline surveys in order to fully understand the current acoustic context of the main development site and surroundings.

7.2 Legislation, Policy and Technical Guidance

7.2.1 This section identifies the relevant legislation, national and local policy and guidance which has informed the scope of the assessment relevant to noise and vibration. Further information on policies relevant to the EIA and their status is set out in **Chapter 2**: **Policy and Regulatory Context**, which should be read in conjunction with this chapter.

7.2.2 The legislation and policy relevant to noise and vibration are detailed in **Table 7.1**.

Table 7.1: Legislation and policy

Relevant Legislation and Policy	Relevance to the Assessment
Legislation	
Control of Pollution Act 1974 (CoPA) (Ref. 7.1).	This Act provides powers to local authorities to take action against noise from construction sites. It defines Best Practicable Means to minimise noise (including vibration), as a defence against noise abatement action taken by a local authority (Section 60). The Act also provides for i) persons responsible to seek prior consent for works (Section 61) on construction sites including Best Practicable Means steps to minimise noise and ii) the basis for defining codes of practice (the Secretary of state (SoS) has approved BS 5228:2009+A1:2014 as the Code of Practice for noise and vibration control on construction and open sites, part 1 refers to noise (Ref. 7.2) and part 2 refers to vibration (Ref. 7.3)). The legislation will be used to inform the embedded noise control measures for construction.
Environmental Protection Act 1990 (EPA) (Ref. 7.4).	This legislation deals with statutory nuisance and contains a definition of Best Practicable Means to minimise noise (including vibration). The legislation will be used to inform the embedded noise control measures for construction.
European Union (EU) Outdoor Noise Directive 2000/14/EC (Ref. 7.5).	The Directive sets out the noise requirements for equipment outdoors, including construction plant. A sound power level must be established for plant covered by the Directive before it can be introduced onto the market. The Directive will influence the noise levels used within the assessment.

Relevant Legislation and Policy	Relevance to the Assessment
National Policy	
National Policy Statement for Energy (EN-1) (Ref. 7.6).	EN-1 sets out overarching planning policy for energy infrastructure, setting out high level issues and guidance on assessment rather than significant technical detail. EN-1 section 5.11 presents policy on noise and vibration (referred to generically as noise), with reference to the Noise Policy Statement for England (Ref. 7.7). EN-1 states that noise can adversely affect quality of human life, health (via annoyance or sleep disturbance) and use and enjoyment of areas of value, for example, quiet places and areas with high landscape quality. It also identifies that noise can have adverse effects on wildlife and biodiversity. EN-1 sets out the factors that will determine the likely noise impact as: • operational noise and its characteristics; • proximity of the development to noise sensitive premises; • proximity to quiet areas and spaces valued for their acoustic environment or landscape quality; and • the proximity of the Project to designated sites where noise may have an adverse impact on protected species or other wildlife. EN-1 sets out the elements that should be provided in an assessment including: • description of noise generating aspects, including characteristics of the noise, how this may change during day, evening, or night; • identification of noise sensitive receptors and areas;

Relevant Legislation and Policy	Relevance to the Assessment
	• the nature of the existing noise environment and how this may be changed by the Project in both the short-term (during construction) and the long-term (operation); and • assessment of the effect of predicted changes, and measures which may be implemented to mitigate noise. Noise generated by ancillary developments such as road traffic movements should be assessed. Operational and construction noise should be assessed in accordance with the relevant British Standards and other guidance on mitigation strategies. With respect to ecological receptors, the need for consultation with relevant bodies is stated, as the results from the noise assessment may help inform the ecological assessments. EN-1 highlights that the nature and extent of the noise assessment should be proportionate to the likely noise impact. EN-1 states that good acoustic design is important in providing mitigation, and that this should be demonstrated. It also states that the use of measurable requirements, or specific mitigation measures should be considered to ensure consent limits are not exceeded. Mitigation is addressed, and described as available via engineering, layout and administrative measures (restrictions or limits etc.). Further, in certain situations (only when all other forms of noise mitigation have been exhausted), EN-1 states that it may be appropriate for the decision maker to consider requiring noise mitigation through improved sound insulation to dwellings. With respect to human health and well-being, EN-1 identifies noise as having the potential to impact on health as a single factor or by contributing to cumulative effects with other environmental factors. It states that an Environmental Statement (ES) should assess these factors, and identify measures to avoid, reduce or compensate for these impacts as appropriate.

Relevant Legislation and Policy	Relevance to the Assessment
National Policy Statement for Nuclear Power Generation (EN-6) (Ref. 7.8).	EN-6 states that the operation of a new nuclear power station is unlikely to be associated with significant noise or vibration impacts, although local impacts from transport and associated activities during construction may occur. It identifies that cooling towers, particularly forced draught towers, may have greater potential to result in impacts than alternative cooling methods, but that with appropriate mitigation, the effect of these potential impacts on human health is unlikely to be significant.
National Planning Policy Framework (NPPF) (Ref. 7.9).	The NPPF advises that significant adverse impacts on health and the quality of life as a result of noise from new development should be avoided. It also advises that other adverse impacts on health and quality of life arising from noise from new development should be reduced to a minimum. Paragraph 170 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by, (amongst other considerations):*"Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.".* The NPPF further states in Paragraph 180 that *"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:* • *mitigate and reduce to a minimum, potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life; and* • *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.".* Paragraph 182 advises that *"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs,*

Relevant Legislation and Policy	Relevance to the Assessment
	music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.". This should be taken into account when considering whether the Project is an acceptable use of land.
Noise Policy Statement for England (NPSE).	The NPPF document does not refer to any other policy documents specifically regarding noise other than the NPSE. The NPSE introduces concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation (WHO). They are: • No Observed Effect Level (NOEL) – this is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to noise; and • Lowest Observed Adverse Effect Level (LOAEL) – This is the level above which adverse effects on health and quality of life can be detected. Extending these concepts for the purpose of the NPSE is stated as leading to the concept of a significant observed adverse effect level: • Significant Observed Adverse Effect Level (SOAEL) – This is the level above which significant adverse effects on health and quality of life occur. It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times.

Relevant Legislation and Policy	Relevance to the Assessment
	The aims of the NPSE are stated, "*within the context of Government policy on sustainable development"* as: *"Avoid significant adverse impacts on health and quality of life from environmental…. Noise";* *"Mitigate and minimise adverse impacts on health and quality of life from environmental … noise";* "*Where possible, contribute to the improvement of health and quality of life through the effective management andcontrol of environmental… noise".* Further guidance on the different effect levels is provided in Planning Practice Guidance – Noise (PPG-N), revised 2019 (Ref. 7.10).
Local Policy	
Maldon District Council (MDC) Local Development Plan (2017) (Ref. 7.11).	Policy D1.4 states that all development must *"Protect the amenity of surrounding areas taking into account … noise …"* Policy D2.6 states that *"All development must minimise its impact on the environment by incorporating the following principles: … Minimising all forms of possible pollution including air, land, water, odour, noise and light. Any detrimental impacts and potential risks to the human and natural environment will need to be adequately addressed by appropriate avoidance, alleviation and mitigation measures;* *In principle, support will be given for the delivery of large-scale renewable and low carbon energy projects, excluding wind energy, provided adverse social, economic and environmental impacts have been minimised to an acceptable level. …* *Development proposals will be approved where it can be demonstrated, to the Council's satisfaction, that the development will not have an adverse impact, either individually or cumulatively, on the following: …*

Relevant Legislation and Policy	Relevance to the Assessment
	4) Neighbouring amenity, in respect to visual impact, flicker, vibration, glare, overshadowing, active or background noise levels and any other emissions; … *Proposals must have full consideration of individual impact or cumulative impact where there are more than one existing or proposed renewable energy projects.* *The Council will strongly support the principle of the development of a new nuclear power station at Bradwell-on-Sea.*".
MDC Construction Site Noise Requirements (Ref. 7.12).	The Council's main control is through *"restricting the hours that noisy work is carried out from:* • *7:30am until 6pm Monday to Friday; and* • *8am until 1pm on Saturdays* *No noisy works should be carried out on Sundays and Bank Holidays.* *These times do not restrict other work activities that may result in noise disturbance at neighbouring noise sensitive premises, for example internal work like electrical wiring, fixing doors.* *In some circumstances (such as emergencies or the delivery of large plant and equipment where congestions and risks to safety prevent roads being used during working hours) noisy construction works may be necessary outside these hours.* *Contractors should also do everything reasonably possible (using best practical means) to ensure noise from works within these hours is also kept to a minimum. This includes using well-maintained and silenced plant and equipment including compressors, generators and power tools.* *Contractors planning to undertake construction and demolition work can consult environmental health to ask for their requirements.* *Alternatively, contractors could formally apply for a Prior Consent under Section 61 of the Control of Pollution Act 1974 (Ref 7.1), which covers all the aspects described above".*

Relevant Legislation and Policy	Relevance to the Assessment
Chelmsford City Council (CCC) Local Plan (2020) (Ref. 7.13).	States *"Planning permission will be granted for development proposals provided the development:"*: *i. "…shall also not result in excessive noise, activity or vehicle movements; and* *ii. is compatible with neighbouring or existing uses in the vicinity of the development by ensuring that the development avoids unacceptable levels of polluting emissions by reason of noise…vibration or other issues, unless appropriate mitigation measures can be put in place and permanently maintained".*
Essex County Council Minerals Local Plan (2014) (Ref. 7.14).	Policy DM1 states *"Local amenity (including demonstration that the impact of noise level, air quality and dust emission, light pollution and vibration are acceptable)".* Policy 10 states *"Local amenity (including demonstration that the impact of noise level, air quality and dust emission, light pollution and vibration are acceptable)".*

Technical guidance

7.2.3 Technical guidance that has been used to define the assessment is set out in **Table 7.2.**

Table 7.2: Relevant technical guidance

Guidance Reference	Implications
BS 5228–1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Part 1: Noise.	Standard for construction noise prediction and control, and identification of potential significant effects.
BS 5228–2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Part 2: Vibration.	Standard for construction vibration prediction, control and identification of potential significant effects.
BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound (Ref. 7.15).	Standard providing methods for rating and assessing industrial and commercial sound, for determining magnitude of impact of operational noise on local receptors.
BS 7445-2:2003 Description and measurement of environmental noise – Part 2: Guides to quantities and procedures (Ref. 7.16).	Provides guidance on the measurement and description of environmental noise.
BS 7385-2:1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration (Ref. 7.17).	This standard is relevant to the assessment methodology for vibration generated by construction activities.
Calculation of Road Traffic Noise (CRTN) (1988) (Ref. 7.18).	CRTN provides methodology for predicting noise levels due to road traffic. Mandated by the Noise Insulation Regulations 1975 (Ref. 7.19).
LA111: Noise and Vibration (2020) (Ref. 7.20).	Provides guidance on the assessment of impacts from noise and vibration that may result from road projects.

Guidance Reference	Implications
Guidelines for Environmental Impact Assessment (2016) (Ref. 7.21).	Presents guidelines on how the assessment of noise effects should be presented within the EIA process. The Institute for Environmental Management and Assessment guidelines cover aspects such as scoping, baseline, prediction and examples of significance criteria.
ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors: Part 2 General method of calculation (Ref. 7.22).	Details a method for calculating the attenuation of sound during propagation outdoors. Part 2 provides the general method of calculation.
NANR116: Open/Closed Window Research – Sound Insulation through Ventilated Domestic Windows (2007) (Ref. 7.23).	Presents results of research carried out in order to determine sound reduction due to windows in different states of opening and will be referred to when considering likely internal sound levels due to a particular external sound level.
Guidelines for Community Noise (1999) (Ref. 7.24).	Presents guideline noise levels for community noise in residential environments. The criteria presented in this guidance are largely superseded by more recent WHO publications, however they are still the relevant reference for criteria for potential noise impacts in residential amenity areas, and for sources and time periods not covered by the more recent WHO documents.
Night Noise Guidelines for Europe 2009 (Ref. 7.25).	WHO and Europe's guidelines for night noise provide guidance on desirable (and also interim) noise limits for night-time. They will be used as reference for assessment of absolute noise levels at night.
Environmental Noise Guidelines for the European region 2018 (Ref. 7.26).	Provides recommendations for protecting human health from exposure to environmental noise originating from various sources including road traffic. The 2018 Guidelines partially superseded the WHO Community Noise Guidelines 1999 but do not supersede Night Noise Guidelines, 2009.

Guidance Reference	Implications
MDC Supplementary Planning Document: Planning and Noise (Ref. 7.27).	Notes the use of BS 4142:2014 for assessing sound from industrial facilities.
BS 6472-1:2008 'Guide to Evaluation of Human Exposure to Vibration in Buildings. Part 1: Vibration Sources Other than Blasting. (Ref. 7.28)	Presents information on thresholds of perception, and criteria for adverse comment, associated with vibration affecting occupants of buildings

7.3 Consultation and Engagement

7.3.1 This chapter has been informed by engagement and discussion with various stakeholders. **Table 7.3** details technical engagement to date which has occurred outside of formal statutory consultation. **Table 7.4** provides a summary of consultee comments arising from Stage One Consultation, along with a response to identify how the matter is dealt within this report.

Table 7.3: Technical engagement

Consultee	Points of Discussion
Royal Society for the Protection of Birds (RSPB). Environment Agency.	At a masterplan workshop meeting on 16 October 2019, it was stated that: "*It is imperative that the impacts of construction and operation of works necessary for the function of BRB, in-combination with any other plans or projects, carries out a full assessment on designated habitats and the species for which they are notified. This should include: ….* *4. the impacts of noise, dust, and lighting during construction and operation…".* A noise assessment will be undertaken in conjunction with **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**. The Environment Agency also noted that impacts to biodiversity and ecosystems should be appropriately mitigated with appropriate measures forming an integral part of the design. In the Appraisal of Sustainability it was noted that there is "*Potential to avoid noise, visual and light disturbance on protected species through careful design and site layout*

Consultee	Points of Discussion
	including shielding to reduce light pollution, locating noisy activities away from sensitive zones, using acoustic screening and providing protective buffer zones around sensitive habitats.". If noise impacts are identified in **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**, noise measures where appropriate will be utilised to reduce the impact.
Essex County Council (ECC).	At the Masterplan Workshop on 09 December 2019, it was stated that siting of construction campus adjacent to dwellings west of the site will be highly contentious. Noted that significant work still required to consider impacts of noise. Keen to see opinions from residents following Stage One Consultation on proposed landscaped areas to the rear of existing dwellings in East End Road, intended to mitigate against visual impact, noise and potentially light. The construction noise assessment will include the new noise sensitive receptors introduced by project-provided accommodation. Mitigation measures will also be identified if necessary.
MDC CCC ECC	An Emissions workshop was held on the 16 June 2020. The ECC environmental and health officer questioned whether noise levels during the baseline surveys will be recorded during the night-time period as the site will be operational during both daytime and night-time periods. The applicant clarified that night-time noise monitoring is proposed. The ECC environmental and health officer also queried whether noise monitoring would be undertaken at Mersea Island due to the capacity of noise to travel over water. The applicant clarified that noise travelling over water does not reduce as it does over soft ground conditions. The applicant also specified that baseline monitoring in Mersea Island is currently not considered but would be reconsidered if any issue of concern are identified from the results of noise predictions. MDC environmental and health officer raised concern over the justification to scope out vibration from road traffic. The applicant clarified that the Design Manual for Roads and Bridges (DMRB) guidance scope out vibration from road noise assessments as maintained road surfaces should be

Consultee	Points of Discussion
	free of significant irregularities. Therefore, vibration is only appropriate to scope out if roads are well maintained. ECC environmental health officer raised concerns around the locations of the short-term noise monitoring locations for road traffic noise measurements. The applicant clarified that at this time, short term monitoring locations have only considered route to the main development site and not the associated developments. Once more clarity on the associated development sites advances, more noise monitoring locations will be identified.

Table 7.4: Stage One Consultation comments

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
Assessment methodology.	Natural England will need to be provided with information detailing peak and average noise emission levels from the cooling towers and noise modelling outputs to illustrate the temporal and spatial distribution of differing noise levels around the main development site.	The predicted noise level envelope will be provided in the ES to support the Development Consent Order (DCO) application and will be shared with Natural England prior to this if available sooner. The peak and average noise levels will be presented using the metric A-weighted, equivalent continuous sound level (L_{Aeq}), for the extreme of operation that is predictable, and for typical (i.e. 'average') conditions. It is unlikely that it will be possible to predict an L_{Amax} value.
Marine works.	Table 3.3 states that for a Beach Landing Facility 0-30 piles will be used. The exact number of piles is important as there will be habitat loss regarding the footprint over a European site. The amount of noise generated during piling must also be taken into consideration when assessing the impact of	Underwater noise will be considered in **Chapter 24: Marine Ecology and Fisheries**.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
	different options. The Marine Management Organisation (MMO) encourage this figure to be finalised as soon as possible. In addition, Table 3.3 uses low, medium, minimal descriptors. It is unclear what these values represent or how they have been arrived at.	

7.4 Data Gathering Methodology

Study area

7.4.1 As the design and consultation processes progress and the Project is refined, the exact geographical scope of study areas may continue to evolve to accommodate any changes. If the study areas change, data collection will also be reviewed and updated.

Main development site

7.1.7 The study areas defined in the following paragraphs for the main development site are based on the main development site plan at **Figure 3.1**.

7.4.2 For the construction of the main development site, study areas have been defined for both noise and vibration emissions from construction related activities:

- construction noise: up to 300 metres (m) from any construction activity or extent of identification of exceedances of the LOAEL if this is beyond 300m;
- construction vibration: up to 100m from any construction activity or extent of identification of exceedances of the LOAEL if this is beyond 100m; and
- construction traffic noise: where an increase or decrease in road traffic volumes or traffic types caused by the construction of the Project would be likely to cause a change in noise level exceeding 1dB$L_{Aeq,\ T}$ during either day (07:00 to 23:00) or night-time (23:00 to 07:00).

7.4.3 The noise and vibration study area for the operation of the main development site has been based on a buffer zone which extends 1km from the main development site boundary. This study area has been identified using professional judgement, as there is no current authoritative guidance on how far a noise study area should extend from operational noise sources.

7.4.4 It is considered unlikely that operational noise arising from the main development site would yield any significant effects to receptors at distances over 1 kilometre (km), the buffer zone of 1km has been adopted to provide a robust approach and consider noise sources at a substantial height. This area is considered appropriate in order to include locations of likely affected noise sensitive receptors.

7.4.5 After initial modelling, where it is identified that likely significant effects could occur outside of the defined study areas, the distance will be revised so that the areas are larger than the area where the forecast exposure exceeds the relevant LOAEL.

Off-site associated development

7.4.6 The study areas for off-site associated development are described in **Table 7.5**.

Table 7.5: Off-site associated development study areas

Site	Study Area (Upper Bound)	Rationale
Highways including off-site highways works.	600m	Preliminary study areas which are considered appropriate in order to include the locations of likely affected noise sensitive receptors: • Operational noise: 300m either side of road centreline in accordance with the DMRB guidance; • 300m beyond the off-site highway works construction site boundary for construction noise; and • 100m beyond the off-site highway works construction site boundary for construction vibration.
Park and ride facilities.	300m	Preliminary study areas which are considered appropriate in order to include the locations of likely affected noise sensitive receptors: • Operational noise: 300m beyond the operational site boundary; • 300m beyond the construction site boundary for construction noise; and • 100m beyond the construction site boundary for construction vibration.

Site	Study Area (Upper Bound)	Rationale
Freight management facilities.	600m	Preliminary study areas which are considered appropriate in order to include the locations of likely affected noise sensitive receptors: • Operational noise: 600m beyond the operational site boundary; • 300m beyond the construction site boundary for construction noise; and • 100m beyond the construction site boundary for construction vibration.
Off-site Power Station Facilities.	300m	Preliminary study areas which are considered appropriate in order to include the locations of likely affected noise sensitive receptors: • Operational noise: 300m beyond the operational site boundary; • 300m beyond the construction site boundary for construction noise; and • 100m beyond the construction site boundary for construction vibration.
Project-provided accommodation.	300m	Preliminary study areas which are considered appropriate in order to include the locations of likely affected noise sensitive receptors: • Operational noise: 300m beyond the operational site boundary; • 300m beyond the construction site boundary for construction noise; and • 100m beyond the construction site boundary for construction vibration.

7.4.7 After initial modelling, where it is identified that likely significant effects could occur outside of the defined study areas, the distance will be revised so that the areas are larger than the area where the forecast exposure exceeds the relevant LOAEL.

7.4.8 No specific distance-based scope has been identified for properties very close to roads used for construction traffic which may be subject to vibration impacts from heavy vehicles. Buildings that could potentially be at risk will be identified and be subject to analysis tailored to the specific situation on a case by case basis.

7.4.9 The study areas specified in **Table 7.5** may be amended for consideration of both cumulative effects and inter-relationship effects.

7.4.10 For inter-relationship effects, the study area for noise or vibration may be extended if other environmental aspects study areas fall outside the noise scoping area. This will ensure the determination of significant environmental effects from the proposed project considers noise in all areas where a potential significant effect is identified.

Temporal scope

7.4.11 The noise assessment will consider different phases of the Project and will use a number of 'reasonable worst-case' scenarios.

7.4.12 The various phases of construction will be assessed for both day and night-time periods. The main phases of construction that will be assessed in isolation and cumulatively (where phases overlap) are as follows:

- Phase 1 – Site preparation and enabling works;
- Phase 2 – Civil construction;
- Phase 3 – Installation;
- Phase 4 – Commissioning; and
- Phase 5 – Site Restoration.

7.4.13 The assessment and baseline years for construction traffic impacts are yet to be finalised, but the peak traffic flows during the early years and main construction phases will be considered. Any infrastructure upgrade works would also be assessed.

7.4.14 It is not anticipated that the noise emitted by the Bradwell B power station will vary with time, only by operational scenario. The operational phase will be assessed for the normal power station operating conditions during electricity generation, during planned outages, and under maintenance of fault conditions. Additional scenarios may be added if, during design evolution, it becomes evident that there are further operational modes that could result in likely significant effects due to noise that have not already been identified for the 'reasonable worst-case' scenarios.

7.4.15 Operational road traffic will consider the power station opening year and the future year (defined as 15 years from the opening year). An additional assessment will also be undertaken for the year where peak traffic movements are anticipated while off-line improvements are under construction.

7.4.16 Assessment years for the off-site associated development will follow the same logic as described in this section.

Sources of data used in scoping

Desk based

7.4.17 The principal desk-based data sources used to inform this chapter for potential effects are shown in **Table 7.6**.

Table 7.6: Sources of data for the desk-based assessment

Source	Data
Google Earth Pro (Ref. 7.29).	Aerial photography resources.
Site Visit 17 August 2017 'walk around' to inform the Preliminary Ground Investigations planning application. (Ref. 7.30).	Informed existing baseline conditions.
MDC Local Development Plan (2017) Policy D. (Ref. 7.31).	Methodology for defining assessment criteria.
Bradwell Site, Issue 3 Strategic Environmental Assessment, Site Specific Baseline (2014) (Ref. 7.32).	Informed existing baseline conditions.

7.5 Baseline Information

7.5.1 This section addresses the investigation into baseline conditions for the Project. It draws upon desk studies of online mapping resources, previously undertaken field studies and proposes additional field studies required to quantify baseline conditions.

7.5.2 The section considers the noise baseline around the main development site for which the setting is considered to be rural in character. It also addresses the baseline noise in the locality of the off-site associated development, insofar as this is possible at this stage of the project.

7.5.3 The existing and proposed baseline monitoring data provide the context for characterising the noise environment close to the various Project sites and informs the assessment and where baseline levels are particularly quiet, directs how the operational noise shall be assessed.

Historic baseline

7.5.4 Desk studies have been undertaken to examine existing noise information which is in the public domain. The following assessments are referred to as they provide additional context on the local acoustic environment and inform the baseline noise survey and monitoring plan with respect historic sources, receptors and meteorological conditions.

The Bradwell Power Station Intermediate Level Waste (ILW) Store Environmental Statement March (2004) (Ref 7.33)

7.5.5 Noise monitoring was undertaken in 2000 and 2003 to support the planning application for the decommissioning of the existing Bradwell power station. A summary of the results of the December 2000 noise survey is given in **Table 7.7.** The monitoring locations can be seen in **Figure 7.1**.

Table 7.7: Noise monitoring results from the December 2000 noise survey

Location	Daytime L_{Aeq} (dB)	Night-time L_{Aeq} (dB)	Daytime L_{A90} (dB)	Night-time L_{A90} (dB)
(1) Downhall Beach Estate.	52	43	46	37
(2) Down Hall and Trusses Road.	52	36	37	27
(3) Coastal Footpath.	55	49	52	45
(4) Bradwell Waterside.	48	31	41	26
(5) West Mersea.		47		44

7.5.6 The noise survey observations from the monitoring presented in **Table 7.7** identify the dominant noise source at that time as being a constant 'hum' from the existing Bradwell A power station for receptors 1 and 3. It was also noted that a bird scarer was fired at intervals every 3 minutes throughout both the day and night. It is therefore concluded that whilst both locations 1 and 3 are located in a rural setting, they would not have been considered particularly 'quiet'.

7.5.7 For locations 2 and 4, the operational power station was audible only on occasions when weather conditions were calm. The power station was not audible at location 5.

7.5.8 Although this survey was undertaken 20 years ago, the data has been presented to demonstrate that the local area does have an industrial history in noise terms.

7.5.9 A survey was also undertaken in September 2003 after electricity generation ceased and the existing Bradwell A power station was being decommissioned. This survey does not provide any additional context for EIA scoping with respect to baseline conditions and is therefore not considered further.

7.5.10 The background (L_{A90}) levels at the locations around the main development site are considered to be low, despite the observation presented in paragraph 7.5.6 that locations 1 and 3 are not quiet rural areas.

Bradwell windfarm environmental statement (Ref. 7.34)

7.5.11 It is likely that noise from the windfarm will contribute to the existing baseline conditions in the locality of the main development site, as some noise sensitive receptors in the village of Bradwell-on-Sea are within 600m of the windfarm.

7.5.12 A planning application was submitted in February 2006 for the windfarm (Bradwell Windfarm). The development was completed in August 2013 and therefore, the noise monitoring results outlined in **Table 7.7** do not include the potential noise arising from the operation of the windfarm. The noise monitoring locations used during the baseline measurements for the Bradwell Windfarm application are illustrated in **Figure 7.2**.

7.5.13 Noise monitoring was undertaken in 2005 as part of the planning application for Bradwell Windfarm. A total of eight monitoring locations were agreed with the local authority as being representative of the background noise environment around the wind farm. These measurements were made over approximately two 4-week periods at each location and, in most cases, the noise sensitive receptor nearest to the windfarm has been selected as the measurement location. The measurements were co-located with a meteorological station.

7.5.14 It is unlikely that the noise conditions around Bradwell Windfarm have altered substantially, although the now operational turbines will have some additional impact above the preceding baseline levels. The long-term nature of the measurement data, along with correlated wind data mean that the windfarm noise measurements are considered appropriate to use to help establish baseline conditions.

7.5.15 A summary of the results of the noise survey for the noise receptors relevant to this baseline assessment is given in **Table 7.8**. It should be noted that the background sound level exceeded for 90% of the time ($L_{A90,10\,\mathrm{mins}}$) here have been measured in accordance with ETSU-R-97 (Ref 7.35).

7.5.16 **Table 7.8** also includes the predicted noise levels for the proposed wind farm, using a wind speed of $5\mathrm{ms}^{-1}$.

Table 7.8: Noise monitoring results from the 2005 noise survey and predicted noise levels for a 5 (m/s) wind speed

Location	Typical Measured Daytime Background Noise Levels $L_{A90,10\ mins}$ (dB)*	Typical Measured Night-time Background Noise Levels $L_{A90,\ 10\ mins}$ (dB)*	Predicted $L_{A90,T}$ (dB) with a wind speed of 5 ms^{-1} measured at a height of 10m**
(A) Eastlands	25 – 33	23 – 32	36
(B) Hockflete	26 – 31	21 – 27	39
(C) Delameres Farm.	32 – 37	21 – 32	31
(D) Linnet's Cottage.	25 – 33	23 – 32	31
(E) Munkins Farm.	25 – 33	23 – 32	38
(F) Bacons Chase.	26 – 31	21 – 27	36
(G) Fairview	26 – 31	21 - 27	38

**The range stated here is the range between 0 and 5 ms^{-1}, with values taken from the regression curve.*

***The $L_{A90,T}$ noise indicator for the prediction has been obtained by subtracting 2dB(A) from the calculated $L_{Aeq,T}$.*

7.5.17 There is a potential for the windfarm to be audible at some noise sensitive receptors under some wind conditions. This will be investigated further during the noise monitoring baseline survey.

Current baseline

7.5.18 At this scoping stage baseline noise information is based on a desk study, using available information and observations. Baseline noise surveys will be carried out as part of the EIA. The methodology and locations will be developed in consultation with relevant stakeholders (notably the local authorities).

7.5.19 **Figure 7.3** illustrates the spatial area of the noise and vibration study for the main development site. At this stage of the Project the off-site associated development locations have not been finalised however, search areas have been defined and these are shown on **Figure 3.3**, **Figure 3.4**, **Figure 3.5** and **Figure 3.6**.

Main development site

Ground investigations planning application 2017

7.5.20 An acoustic engineer undertook a site visit and 'walk around' on 17 August 2017, during which several observations were made regarding the existing acoustic climate; observations are summarised in **Table 7.9**. Although the site visit dates back to 2017, it is considered that it is unlikely that a substantial change in the acoustic climate has occurred during this time and therefore, the site observations are still considered representative of the existing conditions.

Table 7.9: Observations from the site visit and 'walk around' to inform the ground investigations noise appraisal 2017

Time	Operation	Observation Note
10:00	Arrival on-site and induction.	Old control tower now converted into 2 or 3 storey dwellings and several workshops in old airfield hangers and buildings. No significant sources of noise observed from the latter during the site visit however, several Heavy Goods Vehicles (HGVs) and other vehicles were parked up in yards indicating some commercial or industrial type activities occurring at these locations. Site very flat with no major topographical features capable of acoustic screening other than the sea (flood defence) wall running parallel with the estuary to the north.
10:20	Parked up at north-east end of old runway and site walkover commenced.	Peartree cottages (pair of semi-detached, 2 storey properties); New Weymarks Cottage (2 storey property) and Weymarks Farm (2 storey property). Small single storey cottage behind Nissen hut and old hanger to south-east. Main sources of noise were birdsong and wind in trees with occasional voices and activities from dwellings. Adjacent wind farm inaudible at these dwellings. Existing coastal flood defence and south along footpath towards Othona Community. Very few sources of noise other than birdsong and wind in vegetation. Occasional sound of boats in estuary. Existing power station and wind farm inaudible. Some grass cutting in progress at

Time	Operation	Observation Note
		Othona Community using petrol driven machine. Othona Community comprising of generally single storey wood and brick-built buildings. Very little activity observed at time of site visit. Existing coastal flood defence and north towards existing power station. Sources of existing noise the same as above. Existing Bradwell A power station just audible at northern extremity of walkover on sea wall (approximately 500 – 600m from the existing Bradwell A power station).

7.5.21 It is noted that the final observation in **Table 7.9** refers to a noise source thought to be the Bradwell A power station at some distance. As Bradwell A ceased power generation in 2002 and has been in 'Care and Maintenance' since 2018, it is possible that the source was related to the decommissioning works or plant associated with the remaining buildings.

7.5.22 The main development site is located immediately to the south and west of the remaining elements of the Bradwell A power station. The nearest substantial areas of residential housing lie in the villages of Bradwell Waterside to the west, and Bradwell-on-Sea, and East End to the south. In addition, Eastland Meadows Caravan and Country Park and the Othona Community lie to the south and east of the main development site respectively. There are also isolated properties in the vicinity, situated off of East End Road.

7.5.23 The existing noise climate (based on to the previous noise monitoring and site visit in the vicinity) in the area immediately surrounding the main development site is characterised by road traffic movements, and noise associated with rural areas, such as agricultural machinery, birdsong and wind rustling in trees.

7.5.24 For the noise sensitive receptors located in Bradwell Waterside, noise from the sea and boats in the estuary may also be audible on occasions. Waterside Road is also likely to contribute to the acoustic environment in the immediate vicinity of the main development site.

7.5.25 In addition to the noise contributors outlined, the noise climate at each of the receptors considered within the defined study area will also have noise sources specific to the location.

Off-site associated development

7.5.26 At this stage, the exact locations of the various off-site associated developments within the search zones have not been confirmed. Once these locations have further

refined to defined locations, baseline monitoring will be undertaken to characterise the current baseline conditions.

7.5.27 Depending on the type of off-site associated development, certain sites may be chosen because of its proximity to major and strategic roads. Such sites (for example, freight management facility, park and ride) would in general be expected to have a higher ambient noise level than a development in a more rural setting because proximity to the transport network is one of the search criteria. Other off-site associated development, such as the project-provided accommodation may be situated in more rural areas, where a lower ambient noise level can be anticipated.

7.5.28 The environments for noise sensitive receptors within the immediate vicinity of the off-site associated developments are likely to be dominated by some or all of the following, depending on location: noise from road traffic movements, noise associated with rural areas, noise from agricultural work, noise from human activity such as car parks or playgrounds, and noise from plant or activities associated with buildings.

Future baseline

7.5.29 The noise and vibration assessment will make reference to the baseline conditions that are likely to exist by the time of the assessment years in the absence of the Project. The existing baseline can be influenced by factors such as, changes in traffic flows and changes in commercial and/or industrial noise contributors.

7.5.30 Changes in road traffic flows may occur as a result of traffic movements associated with developments not related to the Project, but which use the same road corridors. Changes could result in either an increase or a decrease in noise levels.

Planned further surveys and studies

7.5.31 Baseline conditions will be quantified through baseline sound level monitoring in accordance with the BS 7445-2:2003 and BS 4142:2014 + A1:2019 dependent on the noise source. Surveys will be carried out at locations representative of the nearest noise sensitive receptors to the main development site, the off-site associated development sites and the off-site Power Station Facilities. Agreement of the relevant local authorities has been sought for the survey methodology, and the monitoring locations for the survey around the main development site. Monitoring will be targeted at those receptor locations which are determined to be potentially significantly affected by the construction and operation of the Project.

7.5.32 Predicted baseline may be used for road transportation sources.

7.5.33 For the main development site, it is anticipated that the baseline monitoring programme will consist of unattended monitoring at approximately nine locations for a representative time period. Data logging meteorological stations will be co-located at representative monitoring locations.

7.5.34 The Survey and Monitoring Plan (SMP) (which was drafted prior to the preparation of this Scoping Report) is appended at **Appendix 7A** The SMP proposes zones within which a noise monitoring location will be sought. At this stage, the locations identified are close to human receptors and ecological receptors around the main development site, and roads in the immediate vicinity only. The zones respond to feedback obtained from the stakeholder responses from the Scoping workshop held on 16 June 2020.

7.5.35 A workshop was held between Natural England, Royal Society for the Protection of Birds, Essex Wildlife Trust and the applicant on 01 September. It was agreed that an additional ecological baseline noise monitoring position (which has not been incorporated in the SMP (see **Appendix 7A**) to date) will be included for the baseline surveys. Representative baseline sound levels will be determined based on analysis of the data acquired, excluding any data recorded during periods when wind speeds exceed $5ms^{-1}$ or during significant periods of precipitation.

7.5.36 Manned observations will be made of the noise at locations with the potential to be affected by operational noise from the main development site. Observations are needed to enable the context of the site and the existing soundscape to be determined.

7.5.37 It is also proposed to undertake attended noise measurements, where appropriate, or when unattended measurements are not possible. Measurements will be undertaken during a period deemed 'representative'.

7.5.38 Noise monitoring will also be undertaken for the off-site associated developments and off-site Power Station Facilities to help inform the assessment of potential effects. Details of the type and duration of measurements will be specified in more detail once the off-site associated development sites, and their locations, have been defined.

7.5.39 Vibration measurement has not been defined at this stage for properties very close to roads used for construction traffic. Buildings that could potentially be at risk will be identified and be subject to appropriate analysis, which may include measurement, tailored to the specific situation and considered on a case by case basis.

7.5.40 **Table 7.10** provides a summary of the nature of the baseline surveys to be undertaken.

Table 7.10: Planned further surveys and studies

Further Surveys and Studies for Noise and Vibration	Proposed Date
Baseline environmental noise surveys (Background and Ambient).	A time period sufficient to capture representative results (predominantly one week's measurement per receptor grouping around the main development site and up to four days for receptors near off-site associated development). It is anticipated that the survey campaign will occur during Q4 2020, subject to conditions relating to COVID-19 restrictions.
Baseline traffic noise measurements (for construction traffic assessment and for on-route operational traffic).	Single 3-hour measurements per road link affecting receptor group.

7.6 Proposed Approach to the Assessment

Prediction methodology

7.6.1 **Table 7.11** sets out the methods and guidance that will be used to carry out the prediction of noise and vibration.

Table 7.11: Methods and guidance used in prediction of noise and vibration

Guidance Reference	Implications
BS 5228–1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Part 1: Noise (Ref. 7.2).	Annex F sets out the methods of estimating noise from construction sites which consider distance, ground effects, reflections from surfaces and screening from obstacles.
BS 5228–2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Part 2: Vibration (Ref. 7.3).	Annex E sets out empirical equations that can be used to estimate peak particle velocity from a variety of mechanised construction works.
Calculation of Road Traffic Noise (CRTN) (1988) (Ref 7.18).	Defines the method that will be adopted for calculating noise from road traffic.
ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation	Describes the method that will be adopted for calculating the attenuation of sound during propagation outdoors in order to predict levels

Guidance Reference	Implications
outdoors: Part 2 General Method of Calculation (Ref 7.22).	of environmental noise at a distance from a variety of sources.

Assessment methodology and criteria

7.6.2 The assessment methodologies for determining potential significant effects of the Project are based on specific noise and vibration assessment criteria outlined in the relevant policy statements, British Standards (BS) and other industry-standard guidance documents. The relevant assessment criteria will assist the EIA process by defining the magnitude of change (where applicable), the lowest and significant observed adverse effect levels (LOAEL and SOAEL) for noise and vibration. Different criteria and assessment methodologies are appropriate for different sources of noise or vibration. The criteria will be applicable to assessment of the construction and operation phases of the Project and to the removal and reinstatement of the off-site associated development, such that the sensitivity of residential receptors can be addressed.

7.6.3 The assessment of potential significant effects on ecological receptors will be undertaken as part of the Biodiversity assessment (see **Chapter 23 - Biodiversity: Terrestrial and Freshwater Ecology and Ornithology**).

Construction noise (fixed and mobile plant) – direct effects

7.6.4 The BS 5228-1:2009+A1:2014 provides guidance on determining potential significance based principally on noise change from the introduction of construction. The criteria for construction noise effects will be based on the 'ABC' method presented in Annex E of BS 5228-1:2009+A1:2014.

7.6.5 The 'ABC' method considers the existing ambient noise levels at noise sensitive dwellings and requires comparison of such levels against the predicted construction noise level at the receptor location. A potential significant effect is identified when the predicted construction noise level exceeds the appropriate category value. The relevant category values for each time period are detailed in **Table 7.12**.

Table 7.12: Impact categories for construction noise

Assessment Category and Threshold Value Period	Threshold Value in Decibels (dB) $L_{Aeq,T}$		
	Category A (A)	Category B (B)	Category C (C)
Night-time (23:00 – 07:00).	45	50	55
Evening and weekends (D).	55	60	65
Daytime (07:00 – 19:00) and Saturday (07:00 – 13:00).	65	70	75
A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values. *B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.* *C) Category C threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.* *D) 19:00-23:00 weekdays, 13:00-23:00 Saturdays and 07:00-23:00 Sundays.*			

7.6.6 The 'ABC' method indicates that in areas where the existing ambient noise levels are below 65dB for daytime, 55dB for evening or 45dB for night-time (when rounded to the nearest 5dB) the lowest (i.e. Category A) threshold values should be considered for the respective time periods.

7.6.7 The likelihood of a significant effect upon occupants of an individual residential dwelling from construction noise will depend on the noise level, and the duration of the exposure to noise from the activities. For individual residential properties which are predicted to be subject to construction noise arising from the Project for a period exceeding one month, the levels presented in **Table 7.12** will be adopted as the threshold of significant effect. The levels apply only where noise from construction exceeds ambient noise levels.

Construction vibration

Human response

7.6.8 The assessment of human response due to vibration from construction works will be assessed in accordance with BS 5228-2:2009+A1:2014 BS 5228-2:2009+A1:2014 states that:

> *"Whilst the assessment of the response to vibration in BS 6472 is based on the VDV (vibration dose value) and weighted acceleration, for construction, it is considered more appropriate to provide guidance in terms of the peak*

particle velocity (PPV), since the parameter is likely to be more routinely measured based upon more usual concern over potential building damage."

7.6.9 BS 5228-2:2009+A1:2014 provides guidance on the effect of vibration levels in terms of PPV in Table B.1, which has been replicated here in **Table 7.13** and sets out typical effects at certain levels of vibration.

7.6.10 The effect levels that will be used as part of the assessment will also be applied to define trigger levels that can be included in the Code of Construction Practice (CoCP) and will be used for compliance monitoring during construction.

Table 7.13: Criteria for construction vibration – human receptors

Vibration Level	Effect
0.14 mm/s.	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mm/s.	Vibration might be just perceptible in residential environments.
1.0 mm/s.	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s.	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

Cosmetic damage to buildings

7.6.11 BS 7385-2:1993 (Ref 7.17) sets out transient vibration values for cosmetic damage to buildings and these values are presented in **Table 7.14.**

Table 7.14: Criteria for construction vibration – cosmetic damage

Ref.	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4Hz to 15Hz	15Hz and above
1	Reinforced or framed structures. Industrial and heavy commercial buildings.	50 millimetres per second $(\mathrm{mm/s})$ at 4Hz and above.	
2[2]	Unreinforced or light framed structures. Residential or light commercial type buildings.	$15\,\mathrm{mm/s}$ at 4Hz increasing to $20\ \mathrm{mm/s}$ at 15Hz.	$20\mathrm{mm/s}$ at 15Hz increasing to $50\mathrm{mm/s}$ at 40Hz and above.
Note 1 Values referred to are at the base of the building. *Note 2 At frequencies below 4Hz, a maximum displacement of 0.6mm (zero to peak) should not be exceeded.*			

Construction traffic on highways

7.6.12 The determination of significant effects arising from an increase in road traffic movements on highways due to the construction of the Project will be assessed in accordance with the methodology presented in DMRB Volume 11, LA 111 Noise and Vibration. (hereafter referred to as 'LA111'). The guidance provides magnitudes of impacts based on an increase in Basic Noise Level (BNL) and are detailed in **Table 7.15**.

7.6.13 Construction noise assessment for new or altered roads will use the magnitude of impact in **Table 7.15** but the noise levels used for the comparison will be predicted or measured levels instead of a BNL.

Table 7.15: Magnitude of impacts for assessment of construction traffic

Magnitude of Impact	Increase in BNL of Closest Public Road Used for Construction Traffic (dB)
Major	Greater than or equal to 5.0.
Moderate	3.0 to 4.9.
Minor	1.0 to 2.9.
Negligible	Less than 1.0.

Operational road traffic

7.6.14 LA111 includes guidance on the interpretation of changes in road traffic noise ($L_{A10,18hr}$) and description of magnitude of change. The guidance provides different criteria for short-term and long-term effects. The magnitude of impact for a given change in noise level is higher using the short-term criteria. For the purpose of the assessment, it is proposed to undertake an operational assessment for long-term effects only. The criteria for long-term effects, as outlined in LA111, are detailed in **Table 7.16**. It is considered unnecessary to undertake an assessment of the short-term effects during the operation of Bradwell B power station, because the worst-case (short-term) assessment will be undertaken for construction related traffic when traffic flows resulting from the Project will be highest.

Table 7.16: Semantic criteria for road traffic noise, long-term change

Long Term Magnitude	Long Term Noise Change (dB) sound level exceeded for 10% of the time ($L_{A10, 18hr}$) or sound level during the night (L_{night})
High	Greater than or equal to 10.0.
Medium	5.0 to 9.9.
Low	3.0 to 4.9.
Negligible	Less than 3.0.

Operational noise from the Bradwell B power station and other stationary sources

7.6.15 BS 4142:2014 +A1: 2019 provides a methodology and criteria for assessing new or existing sound sources by comparing the operational sound (rating level) with the background sound level that is currently experienced without the development. The rating level is defined as the specific sound level, with addition of character corrections to consider certain acoustic features that could potentially increase significance of impact. A penalty will be applied to the specific sound level if a tone, impulsive or other characteristic occurs or is expected to be present for new or modified sound sources.

7.6.16 The assessment methodology outlined in BS 4142:2014 + A1:2019 indicates that the greater the difference of the rating level in comparison with the background sound level (L_{A90}) the greater the significance of the impact, thus:

- a difference of + 10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- a difference of around + 5dB is likely to be an indication of an adverse impact, depending on the context; and
- the lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant impact. A low impact is defined when the rating level does not exceed the measured background sound level.

7.6.17 BS 4142:2014 +A1:2019 emphasises the requirement to fully understand the context in which the sound occurs and therefore context will be considered in the assessment process before determining the potential significant effect resulting from the impacts identified. For this reason, defining a semantic scale for magnitude of change, or values for the purposes of identifying LOAEL and SOAEL are not considered possible at the EIA scoping stage and will be considered in the appropriate detail once baseline surveys have been completed.

7.6.18 Desk study indicates low background noise conditions at the site, that will be confirmed by noise surveys as part of the EIA. Where background noise is particularly low the appropriateness of undertaking an industrial noise assessment in accordance with BS 4142:2014 +A1:2019 is questionable. The background levels seen to date are sufficiently low such that it is anticipated, subject to further monitoring, that an assessment of absolute noise levels may be more appropriate than the differential noise level approach described by BS 4142:2014 + A1:2019.

7.6.19 Reference will also be made to the absolute level of sound in the assessment of noise from the operation of the Bradwell B power station and other stationary sources.

Assessment of effects and determining significance

7.6.20 The general approach to the assessment of effects and determining significance that will be used for the EIA is provided in **Chapter 5: The EIA Process and Methods**. However, this section sets out where the approach has been directly applied to noise and vibration and where it has been adapted to deal with the specific requirements of noise and vibration criteria.

7.6.21 The evaluation of noise and vibration impacts, and the likelihood of those impacts giving rise to significant effects depends on the type and sensitivity of the receptor, and on the nature of the intruding noise or vibration. There is no single overall metric or rating system that enables identification of all such impacts and effects.

7.6.22 Significant noise effects may occur as a result of the magnitude of a noise change, a high degree of change in the characteristic of a noise, or as a result of the absolute overall noise level. The criterion for identification of significant effects is therefore different, depending on the source of the noise and the sensitivity of the receptor.

7.6.23 Significant vibration effects are most likely to result from the absolute level of vibration (building damage), or the absolute level in combination with the duration (vibration dose value, affecting people). The characteristics of the vibration (continuous, intermittent etc.) also have an influence. Change in vibration level is of secondary importance and is only considered where there is a noticeable source of vibration already affecting a receptor.

7.6.24 Where there are appreciable existing levels of vibration, an increase in VDV of 40% or more would be considered the threshold of potential effect (see **Table 7.17**).

Determination of significance

Residential receptors

7.6.25 Residential receptors are defined as residencies (both existing and proposed) which would include residential nursing homes. The magnitude of impact and the overall noise or vibration level, combined with the receptor sensitivity will be used to determine the potential for effects. The values used for determining the magnitude of impact will be classified based on the type and duration of the assessment activity and for noise are dependent on the existing acoustic environment.

7.6.26 The methods for determining the magnitude of impact for construction and operational road traffic are outlined in paragraphs 7.6.12 and 7.6.14**.**

7.6.27 For construction noise from the main development site and off-site associated development, determining criteria for the relevance of magnitude of change is not appropriate at this EIA scoping stage. This is because there is insufficient detail on the construction programme, existing noise levels and the noise climate to provide context prior to the baseline surveys being carried out.

7.6.28 The assessment will also consider the LOAEL and SOAEL in accordance with the NPSE. The LOAELs and SOAELs have been defined where practical in relation to government noise policy and EIA requirements (set out in **Table 7.17**).

7.6.29 **Table 7.17** summarises the key noise exposure levels (LOAEL and SOAEL) identified for the different Project phases, and nature of source in the assessment for residential receptors.

7.6.30 SOAEL for night-time for all sources is based on the WHO Night Noise Guidelines (Ref 7.25) for Europe Interim Target of 55dB $L_{Aeq,8hr}$ (measured outdoors), on the basis that residential receptors exposed above this level are subject to a significant effect. It should be noted that the assessment will recognise that the WHO Environmental Noise Guidelines for the European Region do not provide values which supersede the above night-time SOAEL.

7.6.31 Construction daytime SOAEL derives from the BS 5228-1:2009 + A1:2014 thresholds presented in **Table 7.12**, with the evening threshold taken between the night-time and daytime SOAEL levels, stepped as per BS 5228-1:2009 + A1:2014.

7.6.32 The daytime SOAEL for road traffic noise is based on the threshold level (converted from a façade level of $L_{A10,\ 18hr}$) at which the Noise Insulation Regulations 1988 requires the provision of noise insulation.

7.6.33 For road traffic noise, the night-time LOAEL is based on the WHO 2018 advice, which indicates that above 45dB$L_{Aeq,8hr}$ (outdoors) road traffic noise could be identified as associated with adverse effects on sleep. Daytime LOAEL is based on the onset of the lowest observed community noise effects during the day (annoyance) following from WHO Guidelines for Community Noise.

7.6.34 For operational sources, the LOAEL and SOAEL will be set considering the advice of BS 41412:2014 + A1:2019 (including contextual considerations once established), in conjunction with reference to absolute levels. The absolute noise levels that will be considered in setting the LOAEL and SOAEL are based on WHO Community Noise Guidelines for daytime and WHO Night Noise Guidelines for Europe for night-time.

Table 7.17: Criteria for identifying LOAELs and SOAELs

Noise Source	Assessment Period, Metric	LOAEL and SOAEL Criteria (outside for noise and inside for vibration)
		Period Noise or Vibration Level (location)
Construction phase noise (fixed and mobile plant).	Weekday Daytime (07:00-19:00) $L_{Aeq, 12hr.}$ Saturday morning (07:00 – 13:00) $L_{Aeq, 8hr.}$	LOAEL 65dB SOAEL(1) 75dB (1m from building façade).
	Weekday evenings (19:00-23:00) $L_{Aeq, 1hr.}$ Saturday (13:00-23:00) $L_{Aeq, 1hr.}$ Sunday (07:00-23:00) $L_{Aeq, 1hr.}$	LOAEL 55dB SOAEL(1) 65dB (1m from building façade).
	Night-time (23:00-07:00) $L_{Aeq, 1hr.}$	LOAEL 45dB SOAEL(1) 55dB (1m from building façade).
Operational phase road traffic noise.	Daytime (07:00-23:00) $L_{Aeq, 16hr.}$	LOAEL 50dB SOAEL 63dB (free field).
	Night-time (23:00-07:00) $L_{Aeq, 8hr.}$	LOAEL 45dB SOAEL 55dB (free field).
Operational phase noise emissions.	Daytime (07:00-19:00) Absolute: WHO $L_{Aeq, 16hr.}$	LOAEL and SOAEL will be determined following site survey, as context is key in determination of significant effects, using the methodology outlined in BS 4142:2014. Consideration of role of absolute levels (from WHO): for LOAEL 50dB. (free field).
	Night-time (23:00-07:00) Absolute: WHO $L_{Aeq\ 8hr}$	As daytime, with consideration of role of absolute levels (from WHO): for LOAEL 40dB. for SOAEL 55dB. (free field).

Noise Source	Assessment Period, Metric	LOAEL and SOAEL Criteria (outside for noise and inside for vibration)
		Period Noise or Vibration Level (location)
Construction: the levels apply only where noise from construction exceeds ambient noise levels. *Construction noise contribution to total noise level to be at least 3dB.* *(1) Level as shown or above the existing ambient over the assessment period (for example, 12 hours for weekday daytime) if ambient is higher.*		
For the purpose of the vibration criteria presented, there is an appreciable existing level of vibration where daytime or night-time vibration dose values exceed 0.2 $ms^{-1.75}$ and 0.1 $ms^{-1.75}$ respectively.		
Identification of likely significant effects for construction noise and vibration will depend on the duration and frequency of occurrence of the noise or vibration, as well as it's exceedance of SOAEL criteria.		

Non-residential receptors

7.6.35 A different approach will be utilised for determining potential effects on non-residential receptors. Significant effects for non-residential receptors are highly dependent on the use of the facility. It is therefore not possible to provide total clarity regarding the significance criteria that will be appropriate for each facility at scoping stage. Broad assumptions regarding usage have been made to enable the screening criteria set out in **Table 7.18** to be identified. The screening criteria will be used to identify where there is the potential for significant effects to occur for a given type of facility.

7.6.36 Note that the screening criteria do not identify that there will be a likely significant effect. The screening criteria in **Table 7.18** are used to determine which non-residential receptors and land-uses will be scoped into the assessment as noise sensitive and therefore requiring further investigation in the EIA. Screening is therefore undertaken on a precautionary basis and where receptors are 'screened in' they will be subject to a receptor specific assessment.

Table 7.18: Significance screening criteria for non-residential receptors

Setting	Noise Levels (outdoors, free-field)	
	Day (07:00-23:00)	Night (23:00 – 07:00)
Places of meeting for religious worship.	50dB $L_{Aeq, 16hr}$.	N/A
Hospitals and hotels.	50dB $L_{Aeq, 16hr}$.	40dB $L_{Aeq, 8hr.}$
Schools, colleges and libraries.	50dB $L_{Aeq, 16hr.}$	N/A
Offices	55dB $L_{Aeq, 16hr.}$	N/A
External amenity spaces.	55dB $L_{Aeq, 16hr.}$	N/A

7.7 Scope of the Assessment

Potential receptors

7.7.1 There are three principal groups of receptors potentially affected by noise or vibration during the construction or operational phases of the Project. These include:

- Existing noise and vibration sensitive human receptors – occupiers of residential properties within a 1km distance from the main development site. In addition, existing noise sensitive residential receptors on populated road traffic routes which may be used to access the Project during the construction and operational phases. Other non-residential receptors that may be included in the assessment comprise existing commercial (office), health and educational uses, quiet areas, parks and other recreation areas. The following chapters provide details of how other aspects will address potential noise impacts on human receptors:
  - **Chapter 11: Human Health**; and
  - **Chapter 21: Recreation.**
- Proposed noise and vibration sensitive human receptors – including all proposed future residential areas, occupants of sensitive non-residential receptors, users of quiet areas, and amenity areas.
- Ecological receptors – sensitive ecological sites such as designated habitats and species, within the study area of the Project, defined in **Chapter 23:**

Biodiversity - Terrestrial and Freshwater Ecology and Ornithology and **Figure 23.4**.

7.7.2 An initial desk-based review has been undertaken to identify receptors that could be subject to effects due to construction and operation of the Project.

7.7.3 The principal noise and vibration receptors that have been identified as being potentially subject to likely significant effects from the main development site are summarised in **Table 7.19**.

7.7.4 Receptors potentially affected by off-site associated development and the off-site Power Station Facilities cannot be identified by name or other specific locational identifiers at this stage as the site locations and boundaries have not been determined. However, it is likely that residential receptors and potentially non-residential noise sensitive receptors close to the periphery, or to the access to, off-site associated development could be subject to likely significant effects.

Table 7.19: Receptors subject to potential effects

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Main development site.	Construction and Operational Phases.	Bradwell Waterside (residential and non-residential noise sensitive receptors). Noise Sensitive Group 1 (NSG1).	Falls within the defined study area for both operational and construction noise.
Main development site.	Construction and Operational Phases.	Bradwell-on-Sea (residential and non-residential noise sensitive receptors) NSG2.	Falls within the defined study area for both operational and construction noise.
Main development site.	Construction and Operational Phases.	East End including The Pavilion Tea Rooms (residential and non-residential noise sensitive receptors) NSG3.	Falls within the defined study area for both operational and construction noise.
Main development site.	Construction and Operational Phases.	Eastland Meadows Country Park and residential properties on	Falls within the defined study area for both operational

Element of the Project	Phase	Potential Receptor	Reason for Consideration
		East End Road (residential and non-residential noise sensitive receptors). NSG4.	and construction noise.
Main development site.	Construction and Operational Phases.	The Othona Community and visitors to the Chapel of St Peter-on-the-Wall (non-residential noise sensitive receptors). NSG5.	Falls within the defined study area for both operational and construction noise.
Main development site.	Construction and Operational Phases.	Eastlands and East Hall Farm (residential and non-residential noise sensitive receptors). NSG6.	Falls within the defined study area for both operational and construction noise.
Main development site.	Construction and Operational Phases.	Properties on Waterside Road (residential and non-residential noise sensitive receptors). NSG7.	Falls within the defined study area for both operational and construction noise.
Main development site.	Construction and Operational Phases.	Properties approximately 80m to the west of the site boundary of the power station undergoing decommissioning (residential noise sensitive receptors). NSG8.	Falls within the defined study area for both operational and construction noise.
Main development site and zone for marine infrastructure.	Construction and Operational Phases.	Ecological receptors within the intertidal, near shore, shoreline terrestrial areas and on Pewet Island. NSG9.	Falls within defined study area for both operational and construction phases.

7.7.5 NSG 1 – 8 can be seen on **Figure 7.4**. The NSG9 receptors are located in discrete shoreline habitats that are described in **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**, but not shown on this figure.

Sensitivity of receptors

7.7.6 Defining sensitivity recognises that receptors have differing sensitivities to noise. National noise policy and BS documents often focus on residential properties as being sensitive to the effects of noise. However, land uses such as offices, hospitals and schools, theatres, recording studios also involve activities that are potentially noise sensitive.

7.7.7 For residential receptors (existing and proposed), a sensitivity rating of Medium will be applied for the assessment.

7.7.8 For non-residential noise sensitive receptors requiring suitable conditions for work requiring concentration (such as offices and schools), a sensitivity rating of Medium will be considered. Patients in hospitals, hospices or other healthcare facilities represent the receptors with the highest sensitivity to noise as they may be less able to cope with stress and disturbance depending on the nature of their medical condition. In-patients occupying such facilities will be assigned a sensitivity rating of High.

7.7.9 Precision engineering sites and instrumentation laboratories (for example, scanning electron microscopy) may be particularly sensitive to vibration and may be of high sensitivity. Sensitivity of such receptors will need to be considered on a case by case basis.

7.7.10 Older houses with minimal foundations are also likely to be of higher sensitivity to vibration. Modern residences are of Medium sensitivity and other commercial development will be Low sensitivity. Important buildings that are difficult to repair, may require special consideration on a case by case basis.

7.7.11 The sensitivity of the ecological receptors will be defined in **Chapter 23: Biodiversity – Terrestrial and Freshwater Ecology and Ornithology.**

Magnitude of impact

7.7.12 The methodology for determining magnitude of impact of noise and vibration depends on the nature of the source, the duration of exposure and the type of receptor.

Likely significant effects

7.7.13 The effects of noise and vibration which have the potential to be significant and that will be taken forward for assessment in the ES are summarised in **Table 7.20** and **Table 7.21**, which consider the sources of noise scoped into the assessment and provide details of noise sources.

7.7.14 Off-site associated developments also have the potential to give rise to likely significant effects from noise during construction and operation, and from vibration during construction. Activities with the potential to give rise to significant effects during construction of the off-site associated developments are as set out in the 'Activity' column of **Table 7.20**, with effects as set out in the Effect column. Activities with the potential to give rise to likely significant effects from operation are as per those set out in **Table 7.21,** with the addition of noise associated with movement of construction materials (freight management facilities)and sports activities (project-provided accommodation).

Table 7.20: Likely significant noise and vibration effects from construction activities

Element of the Project	Activity	Effect	Receptor Group
Main development site.	Earthworks, piling, compaction, concrete works and construction of building superstructure, construction activities including temporary access arrangements and laydown areas, and shoreline construction activity.	Increase in ambient noise levels due to the operation of fixed and mobile plant during the construction phase of the Project, have the potential to cause disturbance of general activities, annoyance or sleep disturbance to humans and disturbance to ecological receptors.	NSG1, NSG2, NSG3, NSG4, NSG5, NSG6, NSG7, NSG8, NSG9.
Main development site.	Earthworks, piling, compaction activities including temporary access arrangements and laydown areas, and shoreline construction activity.	Potential for significant levels of vibration generated during the construction phase of the Project, potential to cause disturbance of general activities, annoyance or sleep disturbance to humans and disturbance to ecological receptors.	NSG1, NSG2, NSG3, NSG4, NSG5 NSG6, NSG7, NSG8, NSG9.
Project-wide.	Additional road traffic on those parts of the road network that are to	Increases in road traffic noise levels during the construction phase of the Project	TBC

Element of the Project	Activity	Effect	Receptor Group
	be used for access during the construction of the Project.	with potential to cause disturbance of activities, annoyance or sleep disturbance to humans and disturbance to ecological receptors.	
Off-site associated development and off-site Power Station Facilities.	Earthworks and excavation, piling, compaction, concrete works and construction of building superstructure, construction activities including temporary access arrangements and laydown areas.	Increase in ambient noise levels due to the operation of fixed and mobile plant during the construction phase of the Project, have the potential to cause disturbance of general activities, annoyance or sleep disturbance to humans and disturbance to ecological receptors.	TBC

Table 7.21: Likely significant noise effects from operation of the Bradwell B power station

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site.	Operation of internal and external plant and any on-site vehicle movements.	Increase in noise levels during the operation of the Project with the potential to cause disturbance of general activities, annoyance or sleep disturbance to humans and disturbance to ecological receptors.	NSG1, NSG2, NSG3, NSG4, NSG5, NSG6, NSG7, NSG8, NSG9.

Effects scoped out of further assessment

7.7.15 **Table 7.22** sets out the effects that it is proposed to scope out of the assessment as they are considered unlikely to give rise to significant effects. the justification for scoping out the element is also provided.

7.7.16 **Table 7.23** provides details receptors, scoped out of the assessment.

Table 7.22: Effects scoped out of the assessment

Potential Effect	Justification for Scoping Out
Effects due to groundborne vibration from traffic on the local road network for the operational phases of the Project.	DMRB (LA111) states that: *"Operational vibration is scoped out of the assessment methodology as a maintained road surface will be free of irregularities as part of project design and under general maintenance, so operational vibration will not have the potential to lead to significant adverse effects.".*
Effects due to vibration from operation of rotating machinery at the main development site.	Plant can give rise to vibration, with rotating equipment (turbines, fans, pumps etc.) being the main source with potential to result in vibration which might be perceived at distance from the source. For the safe and efficient operation of such equipment, vibration must be kept to a minimum through design, commissioning, and continuously during operation through condition monitoring and maintenance. Due to the need for low levels of vibration in operation to prevent malfunction, to ensure long life and efficient running, and the distance between rotating machinery and sensitive receptors, vibration is scoped out.
Effects due to vibration from operation of the substation at the main development site.	Electrical substations have the potential to give rise to feelable vibration in very close proximity (tens of metres) of the plant. Assessment of vibration in the EIA will only be carried out in the unlikely event that the substation is proposed to be less than 100m from the nearest noise sensitive property.

Table 7.23: Receptors scoped out of the assessment

Receptor	Justification for Scoping Out
Residential receptors at West Mersea	Impacts at West Mersea are expected to be less than at residential receptors located to the west of the main development site (notably Bradwell Waterside) i.e. where significant adverse impacts are not identified at these nearest receptors, this will also be the case at West Mersea. The study areas defined above for both the operation and the construction of the proposed power station do not include any residential areas close to West Mersea.

7.8 Potential Mitigation

7.8.1 Power stations feature a considerable complement of power process and services equipment. Most equipment is located internally within buildings and therefore, consideration will be given to use of materials with effective acoustic qualities to reduce the breakout of noise, as required. Ventilation paths and pipes may be fitted with silencing devices to reduce sound emissions at source.

7.8.2 External plant at the main development site with the potential to cause noise impacts will be examined, with noise modelling carried out to determine potential noise levels and the need for mitigation. Although the method of cooling and associated plant has not been selected, there is the potential that cooling towers will incorporate significant numbers of fans and compressors and this has the potential to be the most significant noise source. Therefore, noise control will need to be considered in the selection of specific cooling equipment.

7.8.3 Combustion plant will be located within the permanent plot for the Bradwell B power station within the main development site. Design and operation of such plant will be addressed under the requirements of the Environment Permitting Regulations. Noise will need to be considered in the relevant Combustion Activity permit application particularly with respect to Best Available Techniques which will consider noise emissions

7.8.4 Where practicable during the construction phase, acoustic screening will be provided to mitigate noise. Other potential noise mitigation measures will be considered to achieve Best Practicable Means in accordance with Control of Pollution Act 1974, which include:

- Orientation of noise sources: for example, pointing any particular directional machinery away from noise-sensitive receptors;

- Phasing of works: for example, creating noise bunds or erecting acoustic fencing or other structure or buildings on the outer edge of the works boundary first to ensure future phases of work are screened;
- During earthworks operations, working in the direction of the receptor maximises the potential for a working face to act as a noise barrier for excavated material;
- Consideration of working methods: employing low noise processes, where possible;
- Selection of equipment: use low noise or specifically attenuated plant where feasible. Equipment should be compliant with Outdoor Noise Directive 2000/14/EC on noise emissions;
- Use of non-tonal reversing alarms where appropriate; and
- Avoid working during particularly sensitive time periods, where applicable.

7.9 Assumptions and Limitations

7.9.1 Assessment of potential groundborne vibration impacts due to road traffic during the operation of the Bradwell B power station have been scoped out. This is based on factors regarding road surfaces and on likely traffic composition. It is assumed that new and existing roads will be subject to normal maintenance to avoid irregularities in road surfaces, in accordance with the guidance contained in DMRB. Road traffic during the operation of the Bradwell B power station is assumed to be mostly light vehicles with only occasional heavy vehicles which are considered not to result in a likely significant effect.

7.9.2 The assumptions used for the construction noise and vibration assessment will be based on the best available information at the time. Confirmation of exact details will not be available until a contractor has been appointed to the project. For this reason, the construction noise and vibration assessment will take a foreseeable worst-case approach to ensure all potential effects are identified.

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8. AIR QUALITY

8.1 Introduction

8.1.1 This chapter sets out the approach which has been applied for determining the scope, and the content of the air quality assessment. **Chapter 5: The EIA Process and Methods** introduces the overall Environmental Impact Assessment (EIA) process including the methodology for assessing affects and determining significance. The topic specific methodology for determining receptor value, sensitivity and impact magnitude for air quality are provided in **Section 8.6**.

8.1.2 The chapter contains:

- a summary of work undertaken to date;
- an explanation of the scope of assessment, including:
  - legislation, policy and guidance that inform the assessment;
  - a description of consultation and engagement so far that is relevant to air quality;
  - study area for the assessment;
  - sources of data used in scoping;
  - baseline conditions, including current desk studies and surveys;
  - planned further surveys and studies;
- the receptors that are proposed to be assessed and the effects which have the potential to be significant;
- the effects that are proposed can be scoped out of the assessment; and
- potential mitigation.

8.1.3 The chapter should be read in conjunction with the project description provided in **Chapter 3: The Project**. A Greenhouse Gases (GHG) assessment will be undertaken as part of the scope for the climate change assessment (see **Chapter 12: Climate Change**).

Work undertaken to date

Desk study

8.1.4 A desk study has been undertaken to inform **Section 8.5**, which describes the current air quality baseline. Baseline concentrations of nitrogen oxides (NOx), nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$) have been derived

from the Department for Environment, Food and Rural Affairs (Defra) UK Air Information Resource (AIR) and extrapolated to provide a gradient in pollutant concentrations in the locality of the main development site off-site associated development and to cover the early year routes and preferred Heavy Goods Vehicle (HGV) routes during peak construction (Ref. 8.1).

8.1.5 Air quality monitoring undertaken by Maldon District Council (MDC), Chelmsford City Council (CCC) and Braintree District Council (BDC) has also been reviewed with respect to baseline characterisation (Ref. 8.2 and Ref. 8.3). The data presented in **Section 8.5** was collected by the councils between 2015 and 2019.

Baseline monitoring

8.1.6 A monitoring programme has been devised to allow the collection of data for the characterisation of the baseline environment which will inform the air quality assessment. Details of the proposed baseline air quality monitoring are provided in the Survey and Monitoring Plan (SMP) which is provided at **Appendix 8A**.

8.1.7 The description of the Project, including indicative site boundaries, presented in the SMP reflects the Project status at the point that the SMP was issued to consultees to inform workshops held in June 2020, with subsequent updates to take into account workshop feedback and responses from consultees. As the Project progresses, further iterations of the SMP will be required as proposals are refined, in particular, with respect to off-site associated development. The technical scope contained in the SMP remains applicable irrespective of any future boundary changes (should this be required), subject to a review of receptors and spatial scope.

8.2 Legislation, Policy and Technical Guidance

8.2.1 This section identifies the relevant legislation, national and local policy and guidance which has informed the scope of the assessment relevant to air quality. Further information on policies relevant to the EIA and their status is set out in **Chapter 2: Policy and Regulatory Context**, which should be read in conjunction with this chapter.

8.2.2 The legislation and policy relevant to air quality are detailed in **Table 8.1**. **Table 8.2** provides the Air Quality Standards (AQS) and Air Quality Objectives (AQO) relevant to this assessment.

Table 8.1: Legislation and policy

Relevant Legislation and Policy	Relevance to the Assessment
Legislation	
European Union Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe (Ref. 8.4).	The Directive sets limit, or target levels, for selected pollutants that are to be achieved by specific dates and also details procedures that European Union (EU) Member States should take in assessing ambient air quality. Regulated pollutants include sulphur dioxide (SO_2), nitrogen dioxide (NO_2), nitrogen oxides (NOx), particulates PM_{10} and $PM_{2.5}$, lead (Pb), benzene and carbon monoxide (CO).
The Air Quality Regulations 2000, United Kingdom (Ref. 8.5).	Provides UK Air Quality Objectives (AQOs) for a range of different pollutants, unlike Air Quality Standards, there is no statutory obligation to meet AQOs; AQOs are policy targets often expressed as a maximum ambient concentration not to be exceeded, either without exception or with a permitted number of exceedances, over a specified averaging period.
The Air Quality Standards (England) Regulations 2010 (Statutory Instrument (SI) 2010/1001), as amended (Ref. 8.6).	The Air Quality Standards (AQS) Regulations report limit values at differing averaging periods for certain pollutants. There are limits provided for the protection of human health for SO_2, NO_2, Benzene, CO and Pb. Target values have been set for the concentration of $PM_{2.5}$. A limit value for the concentration of $PM_{2.5}$ is also provided. All limit values included in these Regulations should not be exceeded.
The Non-Road Mobile Machinery (Type-Approval and Emission of Gaseous and Particulate Pollutants) Regulations 2018 (SI 2018/764) (Ref. 8.7).	The Non-Road Mobile Machinery (NRMM) Regulations provide the requirements relating to gaseous and particulate pollutant emission limits and type-approval for internal combustion engines for non-road mobile machinery. This regulation transposes the European Directive 97/68/EC (as amended) into UK law.

Relevant Legislation and Policy	Relevance to the Assessment
Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions (integrated pollution prevention and control) (Ref. 8.8). This Directive is referred to later in this chapter as the Industrial Emissions Directive (IED).	Provides a framework for the control of the main industrial activities in order to reduce and as far as possible eliminate pollution arising from them. This follows the 'polluter pays' principle and the principle of pollution prevention. This Directive requires competent authorities in European Union member states to control and reduce the impact of certain industrial emissions on the environment. Operators of activities listed in Annex I of IED are required to apply to the relevant Competent Authority (the 'Regulator') for a permit to operate their installation. Regulators must set conditions in permits so as to achieve a high level of protection for the environment as a whole, based on the use of the best available techniques (BAT). Amongst others, emissions to air from permitted installations must meet the Best Available Technique Associated Emission Levels (BAT-AEL) set in the relevant sectoral BAT Conclusions and ensure no significant pollution is caused.
The Environment Act 1995 (Ref. 8.9).	The Environment Act 1995 relates to a wide range of environmental issues. The Act covers the control of pollution and lays out the responsibility of the governing bodies in the UK responsible for the enforcement of environmental laws. Part VI of the Act that Local Authorities periodically review air quality within their individual areas. This process of Local Air Quality Management (LAQM) is an integral part of delivering the UK Government's AQOs.
The Environmental Permitting (England and Wales) Regulations 2016 (SI 2016/1154) (Ref. 8.10).	The Environment Agency acts as the competent authority in England and Wales and regulates relevant activities under the Environmental Permitting (England and Wales) Regulations. During the operational phase of the Project, the operation of combustion plant (notably the stand-by diesel generators) will fall under the relevant activities which are regulated under these regulations. A Combustion Activity permit application will be made to address the relevant activities for the operational phase of the Project.

Relevant Legislation and Policy	Relevance to the Assessment
National Policy	
National Policy Statement for Energy (EN-1) (Ref. 8.11).	This National Policy Statement (NPS), in combination with the relevant technology specific NPS, influences decisions made by the Planning Inspectorate (PINS) on applications for energy developments. The levels for pollutants in ambient air are set out in the Air Quality Strategy which embodies EU legal requirements. It is stated that: "*Where the project is likely to have adverse effects on air quality the applicant should undertake an assessment of the impacts of the proposed project as part of the Environmental Statement (ES).*". This chapter will outline the details of the air quality assessment which will take place as part of the ES. The air quality assessment will assess impacts of the Project against the limits included in NPS EN-1. This ensures that the Overarching NPS for Energy is satisfied.
National Policy Statement for Nuclear Power Generation (EN-6) (Ref. 8.12).	This NPS, when in combination with NPS EN-1, provides the basis for decisions taken by the IPC on applications it receives for nuclear power stations. Paragraph 3.12.3 states that: "*The operation of a new nuclear power station is unlikely to be associated with significant noise, vibration or air quality impacts (although there may be local impacts from transport and associated activities during construction; and if cooling towers are required, particularly forced draught towers, the potential noise impact may be greater). With appropriate mitigation, the subsequent effect of these potential impacts on human health is unlikely to be significant.*".

Relevant Legislation and Policy	Relevance to the Assessment
	The potential air quality impacts arising from the operation of the Project will be evaluated in this Scoping Report. The impacts will be assessed during the EIA, and mitigation measures will be suggested to enable the conclusion as stated in EN-6, that the potential impact on health is unlikely to be significant.
National Planning Policy Framework (NPPF) (Ref. 8.13).	Paragraph 181 states: "*Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas (AQMAs) and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in AQMAs and Clean Air Zones is consistent with the local air quality action plan.*". There are three Air Quality Management Areas (AQMAs) which have been declared by CCC and MDC. As such, the assessment will carefully consider the potential impact of the Project and establish whether it might constitute an obstacle to the achievement of strategic objectives that are set out within the air quality action plans of both administrative authorities.
The 2007 Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Ref. 8.14).	The Environment Act 1995 required the adoption of an Air Quality Strategy containing standards, objectives and measures for improving ambient air quality. The 2007 Air Quality Strategy is designed to meet that requirement and provides a framework for improving air quality at a national and local level and supersedes the previous strategy published in 2000. It imposes a number of obligations on local authorities to manage air quality. Central to the Air Quality Strategy are health-based criteria for

Relevant Legislation and Policy	Relevance to the Assessment
	certain air pollutants; these criteria are based on medical and scientific reports on how and at what concentration each pollutant affects human health and mirror the AQOs set out in the Air Quality (England) Regulations 2000. The AQOs are policy targets often expressed as a maximum ambient concentration not to be exceeded, either without exception or with a permitted number of exceedances, over a specified averaging period.
Clean Air Strategy 2019 (Ref. 8.15).	Defra's Clean Air Strategy outlines the Government's proposed ambitions relating to reducing air pollution in order to protect health and nature, whilst boosting the economy. The strategy sits alongside three other UK government strategies: The Industrial Strategy, the Clean Growth Strategy and the 25 Year Environment Plan (Ref. 8.16, Ref. 8.17, Ref. 8.18). Amongst others, the Clean Air Strategy proposes to halve the number of people living in locations where concentrations of particulate matter are above the World Health Organization (WHO) guideline limit of 10 µg m^{-3} by 2025 and work in close collaboration with industry to explore further opportunities for industrial emissions reduction by developing a series of sector roadmaps to set standards aimed at making UK industry world leaders in clean technology. The Project should not conflict with Government's aims of reducing exposure to $PM_{2.5}$ below the WHO guideline.
UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations (Ref. 8.19).	This plan, published in 2017, details how the Government plans to reduce NO_2 concentrations in those areas where they exceed the EU limit value, in the shortest time possible. The plan lists specific actions that will be taken to address the immediate health risks presented by poor air quality at particular locations in the country.
EU's Best Available Techniques reference documents (BREFs) (Ref. 8.20).	The BREFs are guidance documents containing information about best available techniques relevant to the industrial processes listed in Annex 1 of the 2010/75/EU Directive. Member states are advised to refer to these documents when making decisions upon available techniques applicable to industrial processes.

Relevant Legislation and Policy	Relevance to the Assessment
	The Air Quality BREF explains that the EU has a long-term objective to ensure that air quality levels do not reach levels which could have unacceptable impacts on, and risks to, human health and the environment. The BREF also describes particulate matter, nitrogen dioxide and ground-level ozone as being generally recognised as the pollutants which most significantly affect human health.
Local Policy	
CCC Local Plan (2020) (Ref. 8.21).	This local plan includes CCC's new planning framework for the period 2013-2036. Policy DM30 – contamination and pollution addresses AQMA's in Part B. Part B of this policy states that: "*For developments in or adjacent to an Air Quality Management Area, or where an air quality impact assessment has been provided, permission will only be granted where the Council is satisfied that after selection of appropriate mitigation the development will not have an unacceptable impact on air quality and the health and wellbeing of people*.". The main development site is not within either of the two AQMA's declared by CCC. The first being the AQMA on the Army and Navy roundabout in Chelmsford and the second is on Maldon Road in Danbury. However, road transportation requirements (including park and ride facilities) for the Project may affect the Danbury AQMA.
MDC Local Development Plan (2017) (Ref. 8.22).	Points 9 and 10 from policy D2 – Climate Change and Environmental Impact of New Development, states that a development must: "*Maintain and enhance local air quality in accordance with national objectives*".

Table 8.2: Relevant Air Quality Standards and Objectives

Pollutant	AQS or AQO	Averaging Period	Value ($\mu g/m^3$)
Nitrogen dioxide, NO_2 (Human Receptor).	AQS or AQO.	Annual mean.	40
	AQS or AQO.	1-hour mean, not to be exceeded more than 18 times a year (equivalent to 99.79 percentile).	200
Oxides of nitrogen, NOx (Ecological Receptor).	AQS	Annual mean.	30
	AQS	Daily mean.	200
	EAL*	Daily mean.	75
Carbon monoxide, CO (Human Receptor).	AQS or AQO.	Rolling 8-hour mean.	10,000
Sulphur dioxide, SO_2 (Human Receptor).	AQS or AQO.	1-hour mean not to be exceeded more than 24 times a year (equivalent to 99.73 percentile).	350
	AQS or AQO.	24-hour mean, not to be exceeded more than 3 times a year (equivalent to 99.18 percentile).	125
	AQO	15-min mean, not to be exceeded more than 35 times a year (equivalent to 99.9 percentile).	266
SO_2 (Ecological Receptor).	AQS	Annual mean.	20
Particulate matter less than 10 µm, PM_{10} (Human Receptor).	AQS or AQO.	Annual mean.	40
	AQS or AQO.	24-hour mean, not to be exceeded more than 35 times a year (equivalent to 90.41 percentile).	50

Pollutant	AQS or AQO	Averaging Period	Value (µg/m^3)
Particulate matter less than 2.5 µm, PM¬$_{2.5}$ (Human Receptor).	AQS	Annual mean.	25
(*) Environmental Assessment Levels - generally considered to be 75 µg/m^3; but this only applies where there are high concentrations of SO_2 and ozone, which is not generally the current situation in the UK.			

Taken from the UK Air Quality Standards Regulations. Please see paragraph 8.7.1 to paragraph 8.7.6 for more detail about the potential receptors to be considered in the air quality assessment.

Technical guidance

8.2.3 Technical guidance that has been used to define the assessment is set out in **Table 8.3**.

Table 8.3: Relevant technical guidance

Guidance Reference	Implications
Local Air Quality Management (LAQM) Technical Guidance LAQM.TG16 (2018) (Ref. 8.23).	Provides guidance for governmental and private sectors to discharge their obligations under the LAQM regime. It contains guidance on numerous areas including, for example, screening tools and methodologies, air quality monitoring, estimating emissions and dispersion modelling.
Land-Use Planning and Development Control: Planning for Air Quality (2017) (Ref. 8.24).	Provides a procedure for screening potential air quality effects of new development and a procedure for assessing the significance of air quality effects in planning applications.
Guidance on the Assessment of Dust from Demolition and Construction (2014) (Ref. 8.25).	Provides a four-step process for evaluating the risk associated with dust emissions from construction and demolition sites on different types of receptor with respect to dust soiling, health effects and ecological effects.
Guidance on Monitoring in the Vicinity of Demolition and	Provides updated guidance on air quality monitoring in the vicinity of demolition and construction sites. To be

Guidance Reference	Implications
Construction Sites (2018) (Ref. 8.26).	applied in conjunction with the guidance on the assessment of dust from demolition and construction.
Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (2019) (Ref. 8.27).	Provides guidance on the air quality impacts of development on designated nature conservation sites but establishes that the assessment of the effects that air quality impacts may have on habitats and species should be the responsibility of a suitability qualified and experienced ecologist.
Approach to Advising Competent Authorities on the Assessment of Road Traffic Emissions under the Habitats Regulations (2018) (Ref. 8.28).	This guidance describes how Natural England advises competent authorities and others on the assessment of plans and projects likely to generate road traffic emissions to air which are capable of affecting European Sites. European Sites apply to the following protected sites occurring in England: Special Areas of Conservation (SACs), Candidate SACs, Special Protection Areas (SPAs), Sites of Community Importance (SCIs), potential SPAs (pSPAs), possible SACs (pSACs), listed or proposed Ramsar sites and sites identified, or required, as compensatory measures for adverse effects on these European sites.
Air Quality Guidelines for Europe (Ref. 8.29) and Air Quality Guidelines Global Update (2005) (Ref. 8.30).	These documents provide health-based air quality guidelines for a number of pollutants and critical levels for ecological receptors.
Environmental Permitting: Air dispersion modelling reports guidance (2014) (Ref.8.31).	Although this guidance has been drafted specifically for air quality assessments supporting environmental permit applications, it does provide best practice methods and approaches for modelling the dispersion of emissions from industrial stacks.
Air Emissions Risk Assessment for Your Environmental Permit (2016) (Ref. 8.32).	Although this guidance is specifically drafted for environmental permit applications and is not directly applicable to planning applications, it does provide guidance in a number of areas which is considered to represent best practice, including, amongst others: • screening criteria for protected conservation areas; • guidelines, known as Environmental Assessment Levels (EALs), for certain pollutants that do not have a specified AQS or AQO; and

Guidance Reference	Implications
	• maximum deposition rates (MDRs) for certain metals.
Design Manual for Roads and Bridges (DMRB) LA 105 (Ref. 8.33).	Provides a procedure for screening potential air quality effects of new and existing roads and a procedure for assessing the significance of air quality effects associated with traffic emissions.

8.3 Consultation and Engagement

8.3.1 This chapter has been informed by engagement and discussion with various stakeholders. **Table 8.4** details technical engagement to date which has occurred outside of formal statutory consultation. **Table 8.5** provides a summary of consultee comments arising from Stage One Consultation, along with a response to identify how the matter is dealt within this chapter.

Table 8.4: Technical engagement

Consultee	Points of Discussion
Natural England.	Discussions with Natural England took place on 16 October 2019 at the Masterplanning Workshop 1, where the following question on GHGs was raised: Have the evaluation criteria captured the most important issues? Natural England requested further detail on: "*the inclusion of Air Pollution and Climate Change as further criteria to take into account construction traffic and associated emissions*".
Natural England.	Discussion with Natural England took place during the Emissions Workshop held on 16 June 2020. Regarding air dispersion modelling, Natural England advised that this should reflect a worst-case scenario and take the most precautionary climate change predictions into account. Natural England recommended that the potential maximum hours of operation of the stand-by generators and worst-case scenario for meteorological data should be used. The applicant confirmed that modelling will account for the duration of the Project, and therefore predict air quality scenarios for the construction, operation and maintenance phases. This will ensure that exceedances are calculated based on maximum ground level concentrations for the main development site and considering all phases of the Project. Air quality modelling and assessment work

Consultee	Points of Discussion
	will include details of construction and operation phase traffic uplift and make use of NEA001: Advising Competent Authorities on the Assessment of Road Traffic Emissions under the Habitats Regulations.
MDC CCC	During the Emission Workshop held on 16 June 2020, CCC environmental and health officer suggested that air quality baseline data should be collected employing the same type of diffusion tubes currently used by local authorities within Essex. This is to ensure consistencies between NO_2 concentrations recorded by local authorities within Essex and data that will be collected by the applicant as part of the baseline studies. The applicant subsequently contacted the competent officers to verify which type of monitoring equipment is currently used by local authorities within Essex, including CCC and MDC. The Senior Scientific Officer Public Health and Protection Services CCC confirmed that the specification of diffusion tubes used in Essex comprises of 50% Triethanolamine (TEA). The applicant confirmed that, although the equipment will be supplied by a different laboratory, the same type of tubes will be used to ensure consistency between the Project baseline survey and monitoring programme undertaken by local authorities within Essex.

Table 8.5: Stage One Consultation comments

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
Baseline monitoring.	Natural England requested clarification on the scope of the monitoring programme to be proposed as part of this Scoping Report. It was questioned whether the programme of the air quality survey would include monitoring during and after the construction and operational phase of the Project. Natural England commented that the SMP documents lack detail on the monitoring programme that will be required during and after construction and the operations phase.	The purpose of the air quality monitoring programme described in the SMP is to inform the baseline environment for air quality impact assessment which will be undertaken as part of the Environmental Statement (ES). **Sections 8.5** and **Appendix 8A** provide full details of the scope of this baseline monitoring that will be undertaken to inform the air quality assessment. A monitoring programme for the construction and operational phase will be defined on the outcome of the air quality assessment and iteration of the Project design (and in compliance with the required permits).
Assessment methodology.	Consultees commented on the assessment scope of the air quality impacts on local Sites of Special Scientific Interest (SSSI) and Ramsar sites: • Detail required for assessment of nitrogen deposition, particulate matter or dust impacts from traffic on local SSSI and/or Ramsar sites.	Full details of the assessment methodology that will be adopted can be found in **Section 8.6**, The air quality and biodiversity specialists are working in close collaboration to identify ecological sites that contain features that are sensitive to air pollution, including all types of emissions that will arise from the Project (NOx, SO_2, etc.). The methodology for assessing the air quality impacts from road traffic emissions specifically is presented in **Section**

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
	Consultees (Natural England and CCC) requested that both short-term and long-term average critical levels are also used to assess the NOx emissions for the combustion plant. • Request for detail of coordination between the air quality specialists and ecology specialists to be included in this scoping report (MDC). Natural England have commented on the assessment methodology. Natural England requested that a worst-case scenario is used, and that the most precautionary climate change predictions are considered. Natural England expect the modelling scenarios to cover the construction, operational and maintenance phases of the Project.	**8.6** and includes detail concerning the air quality modelling that will be undertaken. A precautionary approach will be adopted in order to assess all the potential impacts under worst-case conditions (for example, assume the realistic maximum hours of operation of the backup diesel generators for the Bradwell B power station and model emissions over 5 years to capture worst case scenario for meteorological conditions).
Assessment scope.	Natural England requested the following: • That the impacts of pollutants in surface water on the marine environment are considered; and	The potential impact of pollutants in surface water on the marine environment are have been considered a review of those impacts is presented in **Appendix 8C**. As stated in **Section 8.7**, the effect of potential impacts on the marine and intertidal environment from run-off will be compensated

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
	• That pollutants such as SO_2, heavy metals, halogens, Volatile Organic Compounds (VOCs) and persistent organic pollutants are considered. Colchester Borough Council commented that the potential air quality impacts from the Site discussed during the consultation does not take into consideration West Mersea and no proposals have been put in place to monitor baseline or assess impacts upon receptors in this locality.	by the reduction in agricultural activities and therefore it is proposed that these impacts are scoped out of the assessment. **Section 8.6** provides a detailed discussion of all relevant pollutants, including SO_2, heavy metals, halogens, VOCs and persistent organic pollutants. The air quality impacts in the West Mersea area have been considered. A preliminary assessment has been conducted and details are provided in **Appendix 8D** and **Section 8.7** The preliminary assessment indicates that impacts at West Mersea are expected to be insignificant and that collecting baseline data is not deemed necessary.
Cumulative impacts.	Natural England requested clarification on which developments are to be included in the cumulative impact assessment. It is expected that both existing and proposed developments will be included in the assessment.	The list of planned developments that will be considered is currently being defined. This information will feed into the transport model which is being develop for the Project. Traffic generated by cumulative developments will be represented in the transport model.

8.4 Data Gathering Methodology

Study area

8.4.1 This section presents the study areas for air quality. As the design and consultation processes progress and the Project is refined, the exact geographical scope of study areas may continue to evolve to accommodate any changes. If the study areas change, data collection will also be reviewed and updated.

8.4.2 **Figure 8.1** shows all elements of the Project which will be used to inform the spatial area of the air quality assessment.

8.4.3 The study area for air quality is dependent upon the type of receptor (i.e. human or ecological), location of the emission source(s), the magnitude of the emissions, the extent to which they are dispersed and diluted in the atmosphere, and the relative location of the human and ecological receptors. This means that there will be different study areas for air quality, specific to the type of air quality emissions associated with the Project. These air quality emissions include:

- construction emissions;
- operational emissions;
- road and marine traffic emissions; and
- NRMM emissions.

8.4.4 The methodological approach to deciding upon the spatial extent of the study area for air quality has been informed by the Institute of Air Quality Management (IAQM) (2014 and 2017) guidance documents and the Environmental Agency's guidance document. The guidance documents will be used to screen for the requirement to undertake a detailed air quality assessment. Details of the methodological approach to determining the different air quality spatial areas is provided below where construction emissions, operational emissions, traffic emissions and NRMM emissions are discussed separately.

8.4.5 The study area for SPAs, SACs and Ramsar, will extend up to 10km from the point source emissions, and up to 2km for SSSIs and all other biodiversity sites. Ecological sites located within 500m of the transportation routes will be also considered. The relevant ecological sites for this air quality assessment are shown in **Figure 8.1**.

8.4.6 In collaboration with the biodiversity team the following ecological sites have been identified in relation to the main development site, based on the presence of habitats and species that are sensitive to changes in nitrogen:

- Essex Estuaries SAC;
- Dengie Ramsar, SPA and SSSI;

- Black Water Estuary Ramsar, SPA and SSSI; and
- Sandbeach SSSI.

8.4.7 The temporal scope of the assessment of air quality will consider the peak year of construction activity (which might differ for dust assessment and NRMM emissions) and the first year of operation of the Project (Bradwell B power station). This is a conservative approach that will enable capture of the worst-case impacts on air quality.

Construction dust and fine particulate emissions

8.4.8 Construction activities associated with the Project will include the construction of the main development site, the Off-site Power Station Facilities and the off-site associated development. Other activities related to the construction phase of the Project will include demolition works, earthworks and trackout (i.e. the transport of dust and dirt from construction sites onto the public road network) activities. These are described further in **Section 8.6**. The site boundaries of each of these sites will be considered when deciding upon the spatial requirements for the assessment of construction activities.

8.4.9 The following spatial area will be used where a detailed air quality assessment is required of dust emissions produced from construction activities:

- A human receptor within:
  - 350m of the boundary of the site considered; or
  - 50m of site access points (in relation to trackout); and
  - Vehicles on the public highway, up to 500m from the site entrance(s).
- An ecological receptor within:
  - 50m of the boundary of the site considered; or
  - 50m of the route(s) used by construction vehicles; and
  - On the public highway, up to 500m from the site entrance(s).

Non-Road mobile machinery emissions

8.4.10 NRMM and plant emissions associated with the construction phase of the Project will be considered for the main development site, Off-Site Power Station Facilities and the off-site associated development sites. The assessment of impacts associated with NRMM emissions will also include combustion emissions from mobile power sources (notably diesel generators).

8.4.11 For NRMM emissions arising within the main development site, effects upon air quality at human receptor locations are considered unlikely to be discernible

beyond a distance of 5km from the main development site boundary and no significant effects are expected beyond 2km. The same approach is proposed for the off-site Power Station Facilities and the off-site associated development sites, although the scale of the related construction activities will be smaller and consequently the area of influence is also expected to be smaller.

8.4.12 The specific method used to assess NRMM emissions will consist in a quantitative predictive modelling approach, which is described further in **Section 8.6**.

Operational emissions - combustion plant

8.4.13 For operational activities within the confines of the main development site boundary, on the basis of experienced professional judgement, the study area will initially consider receptors within 10km of any point sources and the exact study area will be confirmed when emission parameters are known and dispersion modelling is undertaken. The distance considered will follow the guidance provided by the Environment Agency, where the aggregated thermal input of the combustion plant will be considered alongside the fact that the plant will require an environmental permit. More details about the methodological approach to assessing the air quality impacts of the operation of the combustion plant can be found in **Section 8.6**.

Marine traffic emissions

8.4.14 Emissions from marine traffic using the marine off-loading facility during the import of construction materials, components and equipment, will be also considered on the basis of the potential to affect human health and designated sensitive ecological sites. The extent of the study area will be confirmed when details of the barges and off-loading facility, as well as emission parameters, are known. On the basis of experienced professional judgement, the study area will consider receptors within 5km.

Road traffic emissions

8.4.15 A screening exercise will be undertaken to determine if a detailed air quality assessment of traffic emissions is required. This will take place once detailed traffic data are available so that road route sections and related receptors to be considered can be defined. Based on preliminary discussion with the transport specialists for the Project, it is highly likely that a detailed road traffic assessment will be required.

8.4.16 **Table 8.6** reports the indicative screening criteria that will be used. Based on available preliminary information and professional judgement, the study area could include the road network (existing and proposed) extending from the main development site and linking to conurbations (such as the towns of Maldon and South Woodham Ferrers) and the wider strategic highways.

Table 8.6: Screening criteria for detailed air quality assessment of road traffic emissions

Nature of Impact	Screening Criteria for a Detailed Air Quality Assessment
Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors (LDV = cars and small vans <3.5t gross vehicle weight).	A change of LDV flows of: • more than 100 Annual Average Daily Traffic (AADT) within or adjacent to an AQMA; or • more than 500 AADT elsewhere.
Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors (HDV = goods vehicles + buses >3.5t gross vehicle weight).	A change of HDV flows of: • more than 25 AADT within or adjacent to an AQMA; or • more than 100 AADT elsewhere.
Realign roads, i.e. changing the proximity of receptors to traffic lanes.	Where the change is 5m or more and the road is within an AQMA.
Introduce a new junction or remove an existing junction near to relevant receptors.	The introduction of a new junction or removal of a junction will lead to a detailed air quality assessment when this addition or removal causes traffic to significantly change vehicle acceleration or deceleration, for example, traffic lights, or roundabouts.
Introduce or change a bus station.	Where bus flows will change by: • more than 25 AADT within or adjacent to an AQMA; or • more than 100 AADT elsewhere.

Taken from IAQM guidance Land-Use Planning and Development Control: Planning for Air Quality.

8.4.17 If a detailed air quality assessment of road traffic emissions is required, a spatial area of up to 200m from any road section experiencing the effects described in **Table 8.6** will be included in the assessment. However, based on preliminary assessment it is considered unlikely that effects will be significant beyond 50m of the relevant road section.

Sources of data used in scoping

Desk based

8.4.18 The principal desk-based data sources used to inform this chapter comprise of the following in **Table 8.7**.

Table 8.7: Principal desk-based data sources

Source	Data
UK-AIR (Air Information Resource).	Mapped estimates of background concentrations.
Air Quality Annual Status reports produced by CCC, MDC and BDC.	NO_2 concentrations from undertaking automatic monitoring and passive monitoring of air in the local area.
Bradwell Site, Issue 3 Strategic Environmental Assessment, Site Specific Baseline (2014) (Ref. 8.34).	Informed existing baseline conditions.
Natural England Open Data Geoportal (Ref. 8.35).	An ecological designated sites shapefile was obtained from this source. This data aided the production of **Figure 8.1** where the ecological designated sites are identified.

8.5 Baseline Information

Current baseline

8.5.1 The study area of the air quality assessment of the Project, as described in **Section 8.4**, covers the jurisdictional areas of MDC, CCC and BDC. There are three AQMAs declared within these areas. One AQMA is declared by MDC, this is located on Market Hill Road and Fullbridge in Maldon, 15 km from the main development site. BDC has not declared any AQMAs.

8.5.2 Two AQMAs have been declared by CCC. The first is centred on the Army and Navy roundabout in Chelmsford, which is 29km from the main development site. This AQMA is not expected to be impacted by the Project, since none of the transportation routes will interest the Army and Navy roundabout in Chelmsford.

8.5.3 The second is located on the A414 Maldon Road in Danbury and was declared in September 2018 after CCC recorded exceedances of the annual mean AQO for NO_2. The AQMA declared in Danbury is 22km from the main development site.

The distances of each AQMA from the main development site reported in this section were obtained by taking the closest distance to the red line boundary of the main development site.

8.5.4 There are no existing monitoring locations in proximity of the main development site. However, the Defra background data presented in **Figure 8.2** suggest that the NO_2 annual average is below 20 µg/m^3 and overall, air quality within 10km of main development site is good, with NO_2 levels well below the related AQO.

8.5.5 **Figure 8.2** also shows that there is concentration gradient from west to east, with higher concentrations in urban areas within MDC and CCC and lower concentrations moving east, away from the A130, and towards main development site.

8.5.6 Due to the extent of the study area for the different type of emissions, the baseline conditions will vary significantly at the different Project locations. The study area related to road traffic emissions will focus upon areas where NO_2 concentrations are high when compared against the annual average AQO for NO_2.

Background

8.5.7 The UK-AIR website provides data for background concentrations of NOx, NO_2 and PM_{10}. These background concentrations represent 1km^2 grid squares within the area of each administrative authority. **Figures 8.2** to **8.5** show the background concentrations for the study area, where the concentrations from UK-AIR have been used and extrapolated to provide concentrations of pollutants at locations in-between the 1km^2 grid squares.

8.5.8 The Air Pollution Information System (APIS) (Ref. 8.36) will be used to obtain background nitrogen and SO_2 deposition rates at the ecological sites shown in **Figure 8.1**. The effects of the change in nitrogen and acid deposition rates will be assessed further in **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**.

Continuous monitoring

8.5.9 Automatic monitoring of NO_2 was undertaken by CCC between 2015 and 2019. The locations of these monitoring sites are reported in **Appendix 8B**, **Table 8B.1**. Monitoring site CM4 is the closest to the main development site. This monitoring site is situated 3km away from the A12. The distance of 3km is based on a measurement from the closest outer edge of the A12 to the CM4 monitoring site. **Figure 8.6** shows the location of all automatic monitoring sites employed by CCC.

8.5.10 The concentrations reported during this period for NO_2 and PM_{10} are provided in **Appendix 8B, Table 8B.2** and **Table 8B.3** respectively. From 2015 to 2019, there are no exceedances of the Annual NO_2 AQO of 40µg/m^3. Annual concentrations at monitoring site CM4, which is the closest to the main development site, ranged from 25.8 µg/m^3 (2015) to 29.6 µg/m^3 (2016). Similarly, PM_{10} concentrations were below the Annual PM10 AQO of 40 µg/m^3 at all monitoring locations, with

concentrations at CM3 ranging from 17.7 µg/m^3 (2017) to 21 µg/m^3 (2015) in the CCC administrative area.

Passive monitoring

8.5.11 Passive diffusion tube monitoring of NO_2 concentrations was undertaken by MDC, CCC from 2015 to 2019, these passive monitoring locations are shown in **Appendix 8B, Table 8B.4**. MDC undertook passive monitoring at 29 locations and CCC undertook passive monitoring at 51 locations. **Appendix 8B** also reports the passive monitoring undertaken by BDC but for the period 2015 to 2018. During this period BDC undertook passive monitoring at 12 locations. Concentrations recorded at each of these monitoring sites from 2015 – 2019 is presented in **Appendix 8B, Table 8B.5**. **Figure 8.7** shows the location of these passive monitoring sites closest to the main development site.

8.5.12 Passive monitoring undertaken in the MDC for the period 2015 to 2019, shows that the annual NO_2 concentrations are below the annual mean AQO of 40 µg/m^3 for the majority of the monitoring period from 2015 to 2019, except with three exceedances in 2017, five in 2018, and 7 in 2019. Similarly, the monitoring undertaken in the CCC, shows that annual NO_2 concentrations are below the AQO of 40 µg/m^3 for the majority of the monitoring period, except with two exceedances in 2017, one exceedance in 2018, and 5 in 2019.

8.5.13 BDC reported only one exceedance of the annual mean AQO of 40 µg/m^3 in 2018 in Halstead. BDC are in the process of considering the declaration of an AQMA in Halstead, however this location is not within the study area as outlined in **Section 8.4**.

8.5.14 High roadside concentrations have been recorded for monitoring locations BR3 and BR9 along the A12, north-east of Witham town centre. However, these locations are not representative of actual receptor exposure. Adjustment of the recorded concentrations to account for the decay in concentration with distance from the monitoring locations to the closest receptors indicates no exceedances of the AQO at the receptors. These adjustments have been carried out by BDC following Defra's guidance.

Ecological designated sites

8.5.15 The European ecological sites of the Dengie peninsula are found in a large and remote area of tidal mudflat and saltmarsh at the eastern end of the peninsula, between the Blackwater and Crouch Estuaries.

8.5.16 Air pollution can affect European sites if it has an adverse effect on its features of qualifying interest. The main mechanisms through which air pollution can have an adverse effect is through eutrophication (nitrogen), acidification (nitrogen and sulphur) and direct toxicity (ozone, ammonia and nitrogen oxides). Deposition of air pollutants can alter the soil and plant composition and species which depend upon these.

8.5.17 Considering the characteristics of the area, with agriculture activity being the primary source of emissions, the most relevant critical loads are those related to nitrogen deposition. **Table 8.8** below provides an overview of all the features sensitive to nitrogen and the respective critical loads, based on data available from the APIS database. The pollution concentration and deposition data in the APIS database have been recently updated to use the 3-year mean for 2016-18.

8.5.18 According to the APIS, the main contributors to nitrogen deposition in the Dengie Peninsula are long-range international emissions from Europe and agricultural activities (livestock and fertilizers application), with the latter accounting for ~20% of total nitrogen deposition.

8.5.19 **Table 8.8** shows that current maximum estimated nitrogen deposition levels are below the relevant critical loads for all the features, with the only possible exception being the Blackwater Estuary SPA where a more stringent critical load could be applied to the little tern (*Sternula albifrons*).

Table 8.8: Species sensitive to nitrogen and critical loads

Designated Site	Features Sensitive to Nitrogen	Critical Load Range (kg N/ha/yr)	Maximum Nitrogen Deposition (kg N/ha/yr)
Essex Estuaries SAC.	Estuaries	20-30*	16.9
	Salicornia and other annuals colonizing mud and sand.	20-30*	16.9
	Spartina swards.	20-30*	16.9
	Atlantic salt meadows.	20-30*	16.9
	Mediterranean and thermo-Atlantic halophilous scrubs.	20-30*	16.9
	Mudflats and sandflats not covered by seawater at low tide.	No comparable habitat with established critical load estimate available.	16.9
Dengie SPA.	*Branta bernicla.*	20-30*	11.1
Dengie SSSI.	Littoral sediment.	20-30*	11.1

Designated Site	Features Sensitive to Nitrogen	Critical Load Range (kg N/ha/yr)	Maximum Nitrogen Deposition (kg N/ha/yr)
	Supralittoral sediment.	Not assessed.	n/a
	Vascular plant assemblage.	No comparable habitat with established critical load estimate available.	7.4
Blackwater Estuary SPA.	*Sterna albifrons.*	8-20**	14.7
	Limosa limosa islandica.	20-30*	14.7
	Branta bernicla bernicla.	20-30*	14.7
	Aythya farina.	No comparable habitat with established critical load estimate available.	9.8
Blackwater Estuary SSSI.	*Branta bernicla bernicla.*	20-30*	11.1
	Littoral sediment.	20-30*	11.1
	Supralittoral sediment.	Not assessed.	n/a
Sandbeach Meadows SSSI.	*Branta bernicla bernicla*.	20-30*	11.1

(*) The lower level of 20 kgN/ha/yr should be applied to the more densely vegetated upper marsh and to areas of marsh subjected to direct run-off from adjacent catchments.

(**) For acid dunes use 8-10 kgN/ha/yr range; for calcareous dunes a 10-15 kgN/ha/yr range is recommended.

Future baseline

8.5.20 In the absence of the Project, it is expected there would be a gradual decline in current baseline pollutant concentrations as a result of expected improvements in air quality, such as the implementation of the Government's Clean Air Strategy objectives. Improvements in real world emissions performance of road vehicles and more stringent emission limits for industrial sources as environmental permits for operators covering the various industrial sectors are updated in a phased manner, to bring them in line with the requirements of the Industrial Emissions Directive. However, as a conservative approach, it is proposed that such anticipated reductions are not reflected in the future background used for the assessment. For the future nitrogen and acid deposition baseline, the air quality assessment will use the current baseline as described in **Section 8.5**.

8.5.21 The decommissioning of the existing Bradwell nuclear power station began in 2002. The Office for Nuclear Regulation (ONR) has explained that all work needing to be completed to allow decommissioning to enter the Care and Maintenance phase will have been completed by March 2019 (Ref. 8.37). It was also reported that all construction activities of the waste facilities are complete including the construction of the waste storages and that a significant proportion of the reactor systems have been removed. It is not anticipated that significant decommissioning works will be undertaken during the construction and operational phases of the Project and therefore the current baseline concentrations of Particulate Matter (PM_{10} and $PM_{2.5}$) will be assumed for the future baseline for the locality of the main development site.

8.5.22 For ecological sites, the assessment will also consider the nitrogen and acid deposition associated with agricultural activities, which are currently the predominant source in the area. Since the permanent Project will occupy a large portion of the current agricultural land within the main development site (more than 200ha), the future baseline is expected to show a decrease in nitrogen levels resulting from direct nitrogen loss (mainly from fertiliser and manure application) and from reduction of ammonia (mainly arising from livestock and fertilizers).

8.5.23 With regard to the potential effects of climate change on the future air quality baseline, the 2007 report produced by the Air Quality Expert Group (AQEG) indicated that the winter season may become windier with fewer less stable weather conditions by the end of the century, whilst summer seasons are anticipated to become hotter and sunnier, with an increase in unstable weather conditions by the 2040s (Ref. 8.38). The net effect of these anticipated changes on the baseline air quality is difficult to establish but is unlikely to significantly alter the baseline air quality to an extent that it would affect the outcome of any assessment. Other factors such as changes in technology and the move away from combusting fossil fuels, driven by climate change mitigation, would potentially lead to decreases in emissions of the key pollutants considered in this assessment and a corresponding decrease in background concentrations of air pollutants into the future.

Planned further surveys and studies

8.5.24 Baseline monitoring will be carried out for NO_2, PM_{10}, $PM_{2.5}$ and dust deposition. **Figure 8.8** shows the proposed monitoring locations for these pollutants. Although CCC, BDC and MDC have an extensive monitoring network, the closest monitoring site to the main development site is diffusion tube 'MD21' belonging to MDC. This is 8.5km from the main development site boundary and is therefore not an appropriate location from which conclusions about the baseline environment of the main development site can be drawn.

8.5.25 The scope of work for the baseline monitoring programme is detailed in **Appendix 8A**. This work will result in the gathering of data for the baseline air quality environment. The SMP (**Appendix 8A**) does not cover any air quality monitoring which may be required for construction and operation phase emissions. Those requirements will be set out based on the results of the air quality assessment.

8.5.26 Baseline monitoring for the Project commenced in August 2020 in the locality of the main development site, and along the early year routes and preferred HGV routes during peak construction. Although the exact locations of the off-site associated developments have not been established yet, the air quality monitoring locations have been selected taking into account the areas where the off-site associated developments are likely to be located. Since the main concern is in relation to emissions from construction traffic and off-site associated developments will be along construction routes, the 25 selected monitoring locations are likely to cover off-site associated developments as well.

8.5.27 In addition, during commissioning and operation of the Bradwell B power station located at the main development site, monitoring will be performed to demonstrate compliance with the environmental permit conditions for combustion plant.

Sampling strategy

8.5.28 NO_2 monitoring is required in order to inform the assessment of potential effects on receptors caused by changes in air quality resulting from exhaust emissions from plant and site vehicles, site clearance and preparation, civil construction and operation activities, together with the effects of emissions from road traffic movements on the road network.

8.5.29 Passive sampling methods (diffusion tubes) will be used for monitoring ambient NO_2 in order to provide an indicative comparison with the AQOs based on the annual mean. The diffusion tubes will be installed and removed on a monthly basis for a full calendar year at the preliminary monitoring stations in accordance with Defra guidance.

8.5.30 The LAQM (TG) 16 guidance recommends monitoring is undertaken over a minimum consecutive six-month period, including three months winter and three months summer, and, preferably, over a calendar year.

8.5.31 The accuracy of tube measurements will be quantified. An appropriate bias adjustment factor specifically for the calendar year of monitoring will be applied to the annual mean.

8.5.32 $PM_{2.5}$ and PM_{10} baseline monitoring is required in order to inform the assessment of potential effects on human and ecological receptors caused by changes in air quality resulting from site clearance, construction and operation activities.

8.5.33 An Osiris solar-powered instrument system will be used to monitor PM_{10} and $PM_{2.5}$. This instrument will measure PM_{10} and $PM_{2.5}$ on a continuous basis in order to facilitate comparison of results with the short-term (24-hour average) and long-term (annual average) AQOs.

8.5.34 The baseline monitoring of dust is required in order to inform the assessment of potential effects on human and ecological receptors caused by changes in air quality resulting from, in particular site preparation and clearance and civil construction activities.

8.5.35 Dust deposition "Frisbee" gauges will be used to measure deposited dust deposited from the atmosphere. Airborne dust will be captured in a collection funnel and bottle over a one-month period and samples will then be quantified in the laboratory. A calculation will then be performed to determine the total dust deposition, in terms of milligrams of dust deposited per square metre per day ($mg/m^2/d$), averaged over the one-month collection period. Measurements will be made over a 12-month period.

Table 8.9: Planned further surveys and studies

Further Surveys and Studies for Air Quality	Proposed Date
NO_2 monitoring with passive samplers (diffusion tubes).	August 2020 – July 2021.
PM_{10} and $PM_{2.5}$ continuous monitoring.	July 2020 – June. 2021 August 2020 – July 2021.
Dust monitoring using gravimetric dust discs.	August 2020 – July 2021.

8.6 Proposed Approach to the Assessment

Assessment methodology

8.6.1 The assessment methodology broadly follows the methodological approach outlined in **Section 5.3** of **Chapter 5: The EIA Process and Methods**, however different definitions of the magnitude of impacts and receptor sensitivity will be

used. The definitions of the magnitude of impacts and receptor sensitivity will follow the Institute of IAQM guidance and is discussed further in the following section.

Construction phase - dust emissions

8.6.2 A desktop assessment will be undertaken to assess the effects of dust emissions to air. The IAQM guidance on the assessment of dust from demolition and construction.

8.6.3 The dust emitting activities that may take place during the construction phase of Project can be divided into four different types:

- Demolition – an activity involved with the removal of an existing structure or structures;
- Earthworks – the processes of soil-stripping, ground-levelling, excavation and landscaping;
- Construction – an activity involved in the provision of a new structure, including road works; and
- Activities that cause Trackout – the transport of dust and dirt from the site onto the public road network. This arises when lorries leave site with dusty materials or transfer dust and dirt onto the road having travelled over muddy ground on-site.

8.6.4 The IAQM guidance assessment methodology considers three separate dust impacts:

- Annoyance due to dust soiling;
- The risk of health impacts due to an increase in exposure to PM_{10} and $PM_{2.5}$; and
- Harm to ecological receptors.

8.6.5 Detailed air quality assessment involves a three-stage process:

- Stage 1 - construction sites are classified according to the risk of dust impacts (based upon the scale and nature of the works, plus the proximity of sensitive receptors);
- Stage 2 - appropriate site-specific mitigation measures are identified; and
- Stage 3 - the significance of effects is then determined.

8.6.6 The methodology for the classification of construction sites according to the risk of effects is described below.

Construction phase - road traffic

8.6.7 Emissions from road traffic associated with the construction of Project, including park and ride, and freight management facilities, will be quantified using dispersion modelling. An assessment of the corresponding potential effects will be undertaken using the latest release code of ADMS-Roads (Ref. 8.39).

8.6.8 Dispersion modelling will be used in the assessment because it enables the prediction of future air pollutant concentrations and the change in air quality as a result of the Project. Local monitoring provides details of pollutant concentrations at specific locations and dispersion modelling can be used to determine air quality at all other relevant locations.

8.6.9 Uncertainties with the background concentrations of pollutants and the systematic errors associated with the modelling components will be considered through undertaking a model verification. Model verification is a process by which modelled concentrations of air pollutants from road traffic emissions are adjusted based on actual measurement data. It enables an estimation of uncertainty and systematic errors associated with the dispersion modelling components of the air quality assessment to be considered. Model verification involves the comparison of modelled concentrations and local monitoring data.

8.6.10 The latest version of Defra's EFT will be used. Road-NO_X concentrations will be adjusted using the above factor. Defra's NO_X to NO_2 calculator would then be used to convert predicted concentrations of road-NO_X to road-NO_2 concentrations for use in calculating nitrogen deposition.

8.6.11 Annual average concentrations of NO_X, PM_{10} and $PM_{2.5}$ will be determined using a suite of the ADMS-Roads model. Annual average NO_2 concentrations can then be calculated using the concentrations of NO_X and appropriate conversion factors.

Modelling scenarios

8.6.12 Modelling will be undertaken using the following scenarios:

- Scenario A: Current baseline, which is likely to be 2019, due to the availability of monitoring data from the local authorities. This should represent a full year of air quality monitoring and traffic data. The baseline year will be used for model verification;
- Scenario B: Do minimum. This scenario will include committed developments within the area, however, exclude the Project; and
- Scenario C: Do something. A future scenario including the Project and committed developments to determine a cumulative impact.

Construction phase - non-road mobile machinery (NRMM) emissions

8.6.13 A fully quantitative numerical assessment of potential effects associated with NRMM emissions will be conducted.

8.6.14 The assessment includes compiling an inventory of emissions to atmosphere from the NRMM (including power generation plant) and assigning these spatially over the Project construction areas including the marine offloading facility.

8.6.15 The atmospheric dispersion model ADMS (version 5.2), combined with local meteorological data, will be used to calculate the predicted concentrations of air pollutants at human and ecological receptor locations.

Construction phase - marine traffic

8.6.16 Emissions from marine traffic associated with the construction of the marine offloading facility will be quantified for dispersion modelling. Similar to NRMM, the assessment will be undertaken using ADMS (version 5.2).

8.6.17 The calculation of the emissions from marine traffic will consider both emissions from vessels employed during the construction of the offloading facility (for example jack-up barges and back-hoe dredgers) and emissions from vessels used to transport the construction materials for the power plant and associated inland infrastructures (for example, reactors, sand and gravel, etc.).

8.6.18 Vessels which are primarily used during the construction of the offloading facility will be included in the NRMM and other construction plant data described above and would not feature as a marine point source. Emissions from these vessels are modelled using the NRMM approach with their emissions distributed equally over the relevant area sources. These vessels will be assumed to meet International Maritime Organization Tier III marine emissions standards, and emissions will be calculated using emission factors based on the Tier III limits.

8.6.19 Vessels within the marine point source, which represents emissions during operation of the marine offloading facility may include bulk carriers, vessels for abnormal loads, and unpowered barges with tugs. Power ratings for the engines for each vessel type will be determined from information received by the applicant or public information, where available. The shipping movements at various power ratings will be assumed for manoeuvring and docking and, loading or unloading activities. Emission factors will be derived from Defra's UK Ship Emissions Inventory report.

8.6.20 In addition, movement numbers and the turnaround time will be assumed to determine the number of vessels that will be around in the marine offloading facility at any given time. With this information marine vessel emissions during operations will be modelled as a single continuous point source located in the marine offloading facility, with typical values for the stack height, diameter, temperature and velocity parameters. The emission rates for the point source will be derived from the total annual emissions calculated for each of the various types of vessel and numbers of associated movements at the marine offloading facility for the first year of operations.

Operational phase - road traffic emissions

8.6.21 Emissions from road traffic associated with the operation of Project will be quantified using ADMS-Roads.

8.6.22 The approach to assess the impacts associated with operation road traffic emissions is the same as described for the Construction Phase - Road Traffic.

Modelling scenarios

8.6.23 Modelling will be undertaken using the following scenarios:

- Scenario A: Current baseline, which is likely to be 2019 (reflecting the baseline year of the transport model). This should represent a full year of air quality monitoring and traffic data. The baseline year will be used for model verification;
- Scenario B: Do minimum. This scenario will include committed developments within the area, however, exclude the Project; and
- Scenario C: Do something. A future scenario including the Project and committed developments to determine a cumulative impact.

Operational phase – marine traffic emissions

8.6.24 Marine traffic during the operational phase will be limited to infrequent vessel movements to deliver large loads which cannot be delivered by other transport modes. The emissions associated with this type of activities are likely to result in negligible changes in pollutant concentrations and have been therefore scoped out.

Operational phase - emissions from combustion plant

8.6.25 Point source emissions associated with the operational phase of the Project will arise from combustion of fossil fuels (primarily diesel) in standby generators, auxiliary boilers and other smaller on-site combustion plant required to support operation.

8.6.26 Combustion plant will emit a number of pollutants, including NO_x (consisting of nitrogen monoxide (NO) and nitrogen dioxide (NO_2)), PM_{10}, $PM_{2.5}$), sulphur dioxide (SO_2) and carbon monoxide (CO). The effect of these pollutants on human health is the focus of this assessment. NO_x and SO_2, in turn, contribute to nitrogen and acid deposition. The assessment aims to quantify the additional contribution of these pollutants to background deposition levels.

8.6.27 The standby generators are required to provide emergency power so that the reactor can be shut down safely with adequate cooling provided in the event of, for example, a loss of off-site power (LOOP) or a loss of coolant accident (LOCA). Auxiliary boilers provide supplementary utilities (heating and process steam) for on-site purposes. The standby generators will be subject to a regular testing programme and will not be operated on a continuous basis.

8.6.28 Emissions from the combustion plant will be assessed using dispersion modelling. There are two primary dispersion models which have been used extensively throughout the UK for assessing the air quality impacts arising from developments of this nature and accepted as appropriate air quality modelling tools by Regulators and local planning authorities alike:

- The ADMS model, developed in the UK by Cambridge Environmental Research Consultants (CERC) in collaboration with the Meteorological Office, National Power and the University of Surrey; and
- The AERMOD model, developed in the United States by the American Meteorological Society (AMS) and United States Environmental Protection Agency (USEPA) Regulatory Model Improvement Committee (AERMIC).

8.6.29 Numerous model inter-comparison studies have demonstrated little difference between the output of ADMS and AERMOD, except in certain complex terrain scenarios (Ref. 8.40). For the purposes of this particular study, ADMS (Version 5.2) has been selected as the most appropriate model to use.

8.6.30 ADMS is capable of calculating sub-hourly averaged concentrations based on site-specific meteorological and surface conditions, whereas AERMOD can only produce output down to hourly-averaged values. Therefore, to enable an assessment of impact against the 15-minute mean SO_2 AQO, a standard conversion factor (1.34) must be applied to the hourly output from AERMOD to estimate 15-minute mean concentrations. This factor is taken from Turner (Ref. 8.44) who published estimated ratios of calculated peak and mean concentrations at 3 minutes, 15 minutes, 1 hour, 3 hours and 24 hours from published data on lateral and vertical diffusion coefficients in steady winds as reported by Nonhebel (Ref. 8.41). What is important to note here is that these estimates were based upon calculated dispersion coefficients, rather than monitoring results. Furthermore, Turner (1994) cautions that:

> "*...ratios of peak to mean data depend also on the stability of the atmosphere and the type of terrain that the plume is passing over.*".

8.6.31 Therefore, application of a standard, non-site-specific conversion factor that does not have its basis in monitored data would significantly increase the uncertainty in modelled 15-minute mean values obtained from AERMOD. This limitation is not present in ADMS, which uses site-specific meteorological and surface conditions to directly calculate sub-hourly averaged concentrations.

8.6.32 The dispersion model will use 5 years of hourly sequential meteorological data obtained for the specific location of the main development site from the Met Office's Numerical Weather Prediction (NWP). NWP models, such as the Unified Model (UM), are now used operationally by the Met Office for weather forecasting and to model climate change. These models are run on large supercomputers and input observations from ground stations, buoys at sea, radiosondes, aircraft, and satellites. The models integrate the governing equations forward in time to move from a current view of the weather to some future state (the "Forecast"). The

starting point of NWP forecasts is a set of data (the "Analysis") that combines the currently available observations measured all over the globe with an initial state taken from the previous NWP model run.

8.6.33 Versions of the UM include the global and mesoscale models. These cover various domains and grid resolutions. The mesoscale model covers a limited area focused on the UK. In 2006, the North-Atlantic and European (NAE) model replaced the mesoscale model. It covers a larger area but has the same resolution as the immediately preceding version of the mesoscale model.

8.6.34 When generating data suitable for the ADMS model, the NWP Analysis data for the chosen year from the UM mesoscale model is retrieved from storage and then processed using multi-linear interpolation in all 4 dimensions to resolve the effective values of each variable at the station position (latitude and longitude). The raw NWP data are, strictly speaking, analysis data at each assimilation step in the mesoscale model run, mixed with forecast data for the intervening hours. Data before 2004 is interpolated from older versions of the UM mesoscale model with a 60km resolution, whilst data from 2004 to 2006 is interpolated from a finer 12km resolution version of the UM NAE model. From 2007 to 2012, model resolution increased to a 4km level whilst, from 2013 onwards, model resolution is at 1.5km.

8.6.35 The assessment of point source emissions will consider a range of different operational scenarios. These scenarios will be determined as part of the iterative design process but are likely to include, as a minimum:

- Commissioning scenario – individual and in-combination testing of the standby generators over several days or weeks as part of performance tests during the commissioning phase;
- Routine testing scenario – individual testing of each generator for a few hours per month; and
- LOOP or LOCA scenario – assessment of impacts during the simultaneous operation of all standby combustion plant during a LOOP or LOCA scenario.

8.6.36 The scenarios listed above are not to be considered as the final set of scenarios which will be used in the assessment. In line with Natural England recommendations, a conservative approach will be followed. For example, where uncertainties exist in terms of hours of operation of the stand-by generators, the upper range will be used. Scenarios will be finalised once a full description of the combustion plant to be incorporated within the Project is confirmed.

8.6.37 Except for any auxiliary boilers, the combustion sources will only, under normal conditions, operate for short periods of time. To ensure that the worst-case meteorological conditions (i.e. those that produce the highest concentrations at a relevant receptor) are captured by the model, the dispersion model runs will be carried out on the assumption that the sources emit continuously for the whole year. The outputs from the dispersion model are, therefore, over-estimates and the degree of over-estimation needs to be addressed.

8.6.38 When assessing against long-term assessment levels (i.e. annual means), a temporal adjustment to the concentrations can be applied to obtain a more realistic estimate. When assessing against short-term assessment levels (for example, 1 hour mean), an adjustment to the concentrations is not possible, but the probability of exceedance can be calculated.

8.6.39 The approach for representing the intermittent nature of operation of the standby combustion plant will follow the Environment Agency's Guidance on how to do detailed air quality modelling for specified generators. Although generators on nuclear islands are excluded from the definition of specified generator under the Environmental Permitting (England and Wales) Regulations 2016, as amended, this guidance nonetheless provides best practice methodologies for assessing emissions from the specific type and mode of operation of generators to be deployed as part of the Project.

8.6.40 In addition to the combustion plant referred to above, there may be other smaller combustion appliances at the main development site. As per the approach that was agreed with the Regulators for the Hinkley Point C and Wylfa Newydd DCO applications, any smaller combustion plant that aggregates to a thermal input less than 3MW net rated thermal input will be excluded from the study. Emissions from a plant of this scale are unlikely to have significant impacts on receptors and will be insignificant compared to emissions from the main boilers and standby generators operating at the main development site.

8.6.41 Additional model treatments for considering effects such as terrain, building downwash and coastal effects will be included within the model as required. Sensitivity analysis will be undertaken to investigate how these treatments and other assumptions incorporated into the modelling approach affect the predictions of the model.

8.6.42 Model predictions will be made on a 2-dimensional Cartesian receptor grid to allow concentration isopleths to be produced which depict the emission plume footprint. Predictions will also be made at discrete receptor locations which represent specific locations of relevant human exposure (for example, homes, schools, GP surgery's etc).

Project-wide impact

8.6.43 All future scenarios will model the first year of operation of the Bradwell B power station. To undertake the future modelling scenarios, an inventory will be developed to include emissions from the operational Project and road emissions associated with the Project. The data will be combined with local meteorological data to calculate the resultant concentrations of air pollutants at human and ecological receptor locations.

8.6.44 Predictions from the point source dispersion model will be combined with predictions from the road traffic dispersion model used for assessing air quality impacts such that the total contribution from the Project can be enumerated.

8.6.45 In order to estimate the combined impact of point source and road traffic emissions, the long-term baseline concentration used in the assessment of point source emissions will take a value of the total modelled NO_x, NO_2, PM_{10} and $PM_{2.5}$ concentration from the roads model, i.e. local roads contribution plus background after verification, before the long-term process contribution from the point source emissions is added. Analogous to Environment Agency's *Air emissions risk assessment for your environmental permit* guidance, the short-term baseline concentration used in the assessment of point source emissions will take a value of twice the total modelled annual mean concentration of NO_x, NO_2, PM_{10} and $PM_{2.5}$ from the roads model before the relevant short-term process contribution from the point source emissions is added.

8.6.46 Due to the non-linearity in the NO_x:NO_2 relationship, the cumulative modelled NO_x road source and point source contribution for each hour will be determined, before calculating the combined long-term and short-term NO_2 impacts using Defra's NO_x to NO_2 calculator. The proposed method is considered appropriate in this instance due to the following factors:

- The fraction of primary NO_2 in point source and road traffic emissions is likely to be different, which increases the uncertainty in the fraction of primary NO_2 estimate in methods such as Defra's NO_x to NO_2 calculator.
- Accurate predictions of the road contribution for each hour would require a diurnal profile of traffic flows which are not always readily available.
- Maximum short-term impacts from point source and road traffic emissions rarely occur under the same meteorological conditions (the maximum impact from road emissions generally occurring during stable conditions, whereas these conditions generally result in the lowest impact for an elevated point source).
- Experience suggests use of the NO_x:NO_2 conversion factors from the Environment Agency's Guidance on how to do detailed air quality modelling for specified generators generally results in a more conservative prediction of impact for point sources and therefore provides a precautionary approach.

8.6.47 It is proposed to develop a detailed modelling methodology statement for agreement with key stakeholders prior to the commencement of modelling work.

Operational phase - emissions from cooling towers

8.6.48 Emissions from cooling towers will be also considered and the potential impacts will be assessed. Depending on the final cooling tower design that is selected, emissions of particulate matter in the form of drift, salt deposition and bio-aerosol will be considered.

8.6.49 Regarding bioaerosol formation, the primary concern is with *Legionella pneumophila*. According to the Environment Agency (Ref. 8.42), to date no link has been established between an infection and power station cooling towers and there

have been no cases of legionellosis amongst power station workers related to exposure to drift or to blowout.

8.6.50 Emissions emerging from the top of the cooling towers should be almost pure condensate and as such carry virtually no salt if the eliminators are of good design, are all in place and the air and water loadings are correct. According to the Environment Agency, although salt drift was raised as an issue at the planning stage for Deeside, Connah's Quay and for both of the Killingholme combined cycle gas turbines, there has been no evidence of adverse off-site effects attributable to salt drift. Deposition models were used in the past to calculate possible incremental increases in the salinity of soil, irrigation water and natural fresh waters from natural and mechanical draught saltwater cooling towers. The incremental effects of salt deposition from cooling towers upon the surrounding soil and water generally were minimal. Some extreme cases may develop under severe weather conditions, but these will be infrequent and will represent a small fraction of the total operating time. Studies around five seawater cooling towers near Galveston found levels as high as 1,200kg ha^{-1} per year within 100m, decreasing logarithmically with distance to under 300kg ha^{-1} per year at 434m (Ref. 8.43). Only 16% was attributable to the cooling towers; the balance was natural sea spray that averaged about 250kg ha^{-1} per year in the study area. There were only slight observable effects in the soils closest to the towers that may eventually lead to salinization and solonization (clay deflocculation due to high sodium levels).

Ecological designated sites

8.6.51 There are two categories of pollutants which are important to the air quality assessment for ecological sites. These are pollutants which have an effect on vegetation or habitats in a gaseous form and those which have an impact through deposition. **Table 8.10** reports a summary of the relevant air quality standards, objectives, environmental assessment levels, targets, critical loads and levels relevant to the assessment of air quality impacts on ecological receptors. The assessment will be undertaken in consultation with the biodiversity team to ensure consistency between the two aspects.

Table 8.10: Summary of relevant assessment criteria

Pollutant	Air Quality Standards (AQS) or Environmental Assessment Level (EAL) or Target	Objective (UK)	Averaging Period
NO_x	AQS	30 μgm^{-3}	Annual mean.
	AQS	200 μgm^{-3}	Daily mean.
	EAL*	75 μgm^{-3}	Daily mean.
NH_3	Target	1 μgm^{-3} where lichens or bryophytes (including mosses, landworts and hornworts) are present, where not present 3 μgm^{-3}.	Annual mean.
Nutrient Nitrogen deposition.	Target	Feature-specific ranges are obtained from the APIS database.	Annual mean.
Acidity deposition.	Target	Feature-specific ranges are obtained from the APIS database.	Annual mean.

(*) Environmental Assessment Levels - generally considered to be 75 µg/m^3; but this only applies where there are high concentrations of SO_2 and ozone, which is not generally the current situation in the UK.

8.6.52 In addition to the parameters listed in **Table 8.10**, consideration will be given to pollutants such as heavy metals, halogens, VOCs and persistent organic pollutants. Based on the actual design of the stand-by generators for the Bradwell B power station, some of the aforementioned pollutants might be scoped out. Modern diesel generators are not likely to generate significant emissions of heavy metals, halogens and VOCs. The air quality assessment performed for the Hinkley Point C nuclear power plant did not consider any of these pollutants. These assumptions will be confirmed when the actual design of the stand-by generators will be available.

8.6.53 In light of the Wealden judgement (Ref. 8.44), the air quality effects associated with the construction phase of the Project will be considered alone and in-combination with other relevant projects or plans. This is because a series of individually modest impacts may, in-combination produce a significant effect on a habitat or species.

8.6.54 This means that it is no longer appropriate to scope out the need for a detailed assessment of an individual project or plan using, for example, the 1,000 AADT increase in the DMRB (Ref. 8.45) or the 1% of the critical level or load used by Defra and the Environment Agency without first considering the in-combination impact with other projects and plans.

8.6.55 Concentrations of NO_x will be determined by undertaking the dispersion modelling assessment. Modelling results will be used to calculate nitrogen deposition rates at ecological receptors. SO_2 and acid deposition rates will also be considered depending on the content of sulphur in the diesel fuel. For SPAs, SACs and Ramsars, this will include assessment of relevant sites within 10km of the point source emissions, and up to 2km for SSSIs and all other biodiversity sites. The relevant ecological sites for this air quality assessment are shown in **Figure 8.1**.

8.6.56 The maximum project contribution within, or on, the boundary of the designated site will be used to provide a robust assessment (where that coincides with the presence of a habitat or species of concern).

8.6.57 The surface roughness in the wider area will affect the modelled ground level concentration of a pollutant. A suitable value will be selected, in line with model guidance.

8.6.58 For road transport sources, individual receptors along a transect, or along a series of transects at suitable intervals, perpendicular to the road up to 200m will be used.

8.6.59 To determine the concentrations or deposition rates, the process contribution (PC) is added to the baseline concentrations or deposition rates. These may be taken from measurement data or other appropriate sources such as Defra or APIS background maps. The concentration or deposition rate is known as the predicted environmental concentration (PEC).

8.6.60 All deposition rates will be quantified and compared to critical loads using data from the APIS and Air Quality Technical Advisory Group (AQTAG06) guidance (Ref. 8.46).

8.6.61 APIS provides background deposition data and critical loads and levels for deposition assessments. Unlike for the AQS and EAL values, critical loads differ depending on species sensitivity. Critical loads and background concentrations will be obtained from APIS under consultation with the technical leads for **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**.

8.6.62 Due to uncertainty regarding future trends, it is assumed that future baseline concentrations or deposition rates will not change.

8.6.63 In addition to NO_X concentrations and nitrogen deposition, ammonia (NH_3) will be calculated. This is not included in the DMRB assessment methodology for road-traffic emissions requiring assessment, but, due to recent developments in the Wealden judgement and research that has shown relatively low concentrations of ammonia are harmful to vegetation, it will be modelled for completeness. Modelled

concentrations of ammonia will be assessed against 1μgm^{-3} as lichens or bryophytes, including mosses, landworts and hornworts, are present.

8.6.64 To calculate nitrogen deposition the AQTAG methodology will be used as an alternative to the DMRB methodology, as it allows for calculation of nitrogen deposition from ammonia.

Assessment of effects and determining significance

8.6.65 The general approach to assessing the effects and determining significance that will be used for the EIA is provided in **Section 5.4** of **Chapter 5: The EIA Process and Methods**. However, this section sets out where the approach has been directly applied to air quality and where it has been adapted to deal with the specific requirements of air quality criteria.

Sensitivity of receptors

Construction dust

8.6.66 The sensitivity of the area, i.e. land potentially affected by the construction activities, is determined for three main dust effects: dust soiling, health effects and ecological effects. This is determined for each of the four dust emitting activities, allowing a conclusion to be made about the sensitivity of the area for each dust emitting activity to dust soiling, health effects and ecological effects.

8.6.67 The sensitivity of people and property to dust soiling effects, of people to the health effects of PM_{10} and $PM_{2.5}$, and of biodiversity receptors to ecological effects will be determined using professional judgement and the guiding principles as stated in the IAQM guidance. The receptors will be classified into high, medium and low sensitivity categories.

8.6.68 The overall sensitivity of the area where receptors are found will be determined by using a matrix provided in the IAQM guidance for each of the three dust effects and each dust emitting activity. These matrices incorporate the total number of receptors affected, the distance of these receptors from the source and the sensitivity of these receptors previously determined. Similarly, the receptors will be classified into high, medium and low sensitivity categories.

Human receptors

8.6.69 In line with the Local Air Quality Management Technical Guidance (TG16), sensitive receptors will represent locations where people are likely to be exposed for the appropriate averaging time dependent on the air quality objective being assessed against, as presented in **Table 8.11**.

Table 8.11: Human sensitive receptors

Averaging Period	Sensitive Receptors (Where Air Quality Objectives Should Apply)	Not Considered Sensitive Receptors (Where Objectives Should Generally Not Apply)
Annual mean.	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short- term.
24-hour mean and 8-hour mean.	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties*.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
1-hour mean.	All locations where the annual mean and: i. 24 and 8-hour mean objectives apply. ii. Kerbside sites (for example, pavements of busy shopping streets). iii. Those parts of car parks and bus stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. iv. Any outdoor locations where members of the public might reasonably expect to spend one hour or longer.	

Averaging Period	Sensitive Receptors (Where Air Quality Objectives Should Apply)	Not Considered Sensitive Receptors (Where Objectives Should Generally Not Apply)
15-min mean.	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer.	

(*) Such locations should represent parts of the garden where relevant public exposure to pollutants is likely, for example where there is seating or play areas. It is unlikely that relevant public exposure to pollutants would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied.

Ecological receptors

8.6.70 Sensitive receptors will represent ecological designated sites where species sensitive to the categories of pollutants presented in **Table 8.10** exist. Ecological receptors will be classified into high, medium and low sensitivity receptors. The sensitivity of the ecological receptors will be determined based on the spatial extent of the ecological receptor, type of designation i.e. SAC or SSSI etc., and the type of ecological species.

Magnitude of change

Construction dust

8.6.71 Firstly, the magnitude of each of the dust emitting activities will be considered in isolation. The magnitude is based on the scale of the proposed construction activities and will be categorised according to the small, medium or large categorisation provided in the IAQM guidance.

8.6.72 The magnitude of the dust emitting activities concluded at the beginning of the assessment and the overall sensitivity of the area surrounding the construction activities, will be used as part of a matrix to determine the risk of dust impacts for the four dust activities. The risk of impacts will be defined as either high, medium, low or negligible risk and based professional judgment and the guiding principles as stated in the IAQM guidance.

8.6.73 Based on the overall risk assessment for the four activities, site specific mitigation measures may need to be adopted depending on the risk of the impact identified. Should the levels be rated as high, medium or low risk, mitigation measures will need to be developed as part of a dust management plan and implemented. The approach to determine the most applicable or effective mitigation measures, for the risk level determined, is based on professional judgement and the guiding principles as stated in the IAQM guidance (**Table 8.12**). However, should the risk level be negligible, no additional mitigation measures may be required other than those required by legislation.

8.6.74 The assessment of the significance of dust effects will be undertaken after applying the site-specific mitigation. This would take account of the risk of dust impacts, and other factors that might affect the risk of dust effects arising, even after any site-specific mitigation has been implemented. The overall significance of the effects arising from the entire construction phase of the development is based on professional judgement, taking into account the risk of the effects of each of the four activities (demolition, earthworks, construction and trackout).

Table 8.12: Matrices for determining risk of impacts from construction dust (Source: IAQM, 2014)

Category Type	Sensitivity of Area	Dust Emission Magnitude		
		Large	Medium	Small
Demolition	High	High Risk.	Medium Risk.	Medium Risk.
	Medium	High Risk.	Medium Risk.	Low Risk.
	Low	Medium Risk.	Low Risk.	Negligible
Earthworks	High	High Risk.	Medium Risk.	Low Risk.
	Medium	Medium Risk.	Medium Risk.	Low Risk.
	Low	Low Risk.	Low Risk.	Negligible
Construction	High	High Risk.	Medium Risk.	Low Risk.
	Medium	Medium Risk.	Medium Risk.	Low Risk.
	Low	Low Risk.	Low Risk.	Negligible
Trackout	High	High Risk.	Medium Risk.	Low Risk.
	Medium	Medium Risk.	Low Risk.	Negligible
	Low	Low Risk.	Low Risk.	Negligible

Human receptors

8.6.75 Following the IAQM Land-use Planning and Development Control: Planning For Air Quality guidance, the magnitude of change due to an increase in the annual mean concentration of NO_2 and PM_{10} and other pollutants due to the Project is described using the criteria presented in **Table 8.10**.

8.6.76 These criteria are based on the change in concentration of a pollutant at an existing receptor location due to a new development, as a percentage of the Air Quality Assessment Level (AQAL) (i.e. the AQO). When describing the effect at a specific receptor, the percentage change in concentration relative to AQAL is considered in combination with the long-term average concentration at a receptor in the assessment year, using the approach detailed in Table 8.13. The table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. As an example, changes of 0% i.e. less than 0.5% will be described as 'negligible' as detailed in **Table 8.13**.

8.6.77 As recommended by the IAQM guidance, the judgement on significance relates to the consequences of the impacts and whether they are expected to have an effect on human health that could be considered significant.

8.6.78 The population exposure will be evaluated by describing the impacts at individual receptors. These will be chosen to represent groups of receptors (notably groups of residential properties), to consider the approximate number of people exposed to impacts in the various different categories of severity, in order to reach a conclusion on the significance of effect.

8.6.79 For example, an individual property exposed to a moderately adverse impact might not be considered a significant effect, but many hundreds of properties exposed to a slight adverse impact could be. Such judgements will be made taking into account multiple factors since the guidance avoids the use of prescriptive approaches.

8.6.80 The principle underlying this approach is that the assessment should provide enough evidence that will lead to a sound conclusion on the presence, or otherwise, of a significant effect on local air quality.

Table 8.13: Impact descriptors for increases in annual mean pollutant concentration when compared to AQAL

Absolute Concentration with Project, Relative to Assessment Level	% Change in Concentration Relative to Assessment Level				
	0%	1%	2–5%	6-10%	>10%
75% or less.	Negligible	Negligible	Negligible	Slight	Moderate
76–94%.	Negligible	Negligible	Slight	Moderate	Moderate
95–102%.	Negligible	Slight	Moderate	Moderate	Substantial

Absolute Concentration with Project, Relative to Assessment Level	% Change in Concentration Relative to Assessment Level				
	0%	1%	2–5%	6-10%	>10%
103–109%.	Negligible	Moderate	Moderate	Substantial	Substantial
110% or more.	Negligible	Moderate	Substantial	Substantial	Substantial

Ecological receptors

8.6.81 The magnitude of impact will be screened against the relevant long-term critical level or critical load. An increment of 1% (or less) will be considered inconsequential and the effect classified as insignificant.

8.6.82 According to the IAQM guidance, the 1% screening criterion is not a threshold of harm and exceeding this threshold does not, of itself, imply damage to a habitat.

8.6.83 In those cases where effects (alone and in-combination) cannot be definitively described as insignificant on the basis of the air quality assessment alone (i.e. the predicted change is greater than 1%), the ecologist will review the outcome of the air quality assessment and consider the likely significance of the effects.

8.7 Scope of the Assessment

Potential receptors

8.7.1 Receptors potentially affected by the Project comprise residents living near to the main development site, the off-site Power Station Facilities, the off-site associated development locations, in the locality of a potential borrow pit and also along road sections that may be affected by traffic related to the Project. In addition, there are also statutory and non-statutory ecological sites in the locality which may be susceptible to direct exposure to air pollutants emitted from both the construction and operational phase of the Project and through indirect effects associated with nitrogen and acid deposition. These ecological sites are shown in **Figure 8.1**.

8.7.2 Guidance from Defra in LAQM.TG16 establishes that exceedances of the human health-based objectives should only be assessed at outdoor locations where members of the general public are regularly present over the averaging time of the objective. **Table 8.14** provides an indication of those locations that may be relevant for different averaging periods, as extracted from LAQM.TG16.

Table 8.14: Examples of locations where air quality objectives apply

Averaging Period	Objectives Should Apply	Objectives Should Not Apply
Annual mean.	All locations where members of the public might be regularly exposed. Building facades of residential properties, schools, hospitals, care homes etc.	Building facades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
24-hour mean, and 8-hour mean.	All locations where the annual mean objectives would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
1-hour mean.	All locations where the annual mean and 24 and 8-hour mean objectives would apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks and bus stations etc. which are not fully enclosed, where the public might reasonably be expected to spend one hour or more. Any outdoor locations at which the public may be expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.

Averaging Period	Objectives Should Apply	Objectives Should Not Apply
15-min mean.	All locations where members of the public might reasonably be expected to spend a period of 15 minutes or longer.	n/a

Source taken directly from LAQM.TG16

8.7.3 The human receptors proposed to be included in the assessment for the purposes of assessing air quality levels have been chosen based on the guidance provided in **Table 8.10**. The human receptors are selected by identifying places where people may be located and the likely duration of their exposure to pollutants, and proximity to the sites associated with the Project.

8.7.4 **Figure 8.9** shows the human receptors within 350m of the main development site potentially affected by dust emission generated during the construction phase of the Project. A buffer of 350m has been applied based upon the IAQM guidance (2014).

8.7.5 **Figure 8.10** shows the human receptors within 5km and 10km of the main development site potentially affected by combustion sources during construction and operation. The combustion sources include NRMM, marine vessel emissions employed during construction and stand-by diesel generators used during operation.

8.7.6 The principal air quality receptors that have been identified as being potentially subject to effects are summarised in **Table 8.15**.

Table 8.15: Receptors subject to potential effects

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Project-wide.	Construction and operation.	Human and ecological receptors.	Combustion product emissions arising from construction and operational related traffic will add to pollutants included in **Table 8.2**. These will need to be assessed against the AQOs detailed in **Table 8.2** to discover if there are any exceedances to be expected as a result of the Project.
Main development site, off-site Power Station Facilities and off-site associated development.	Construction	Human and ecological	NO_x, NO_2, PM_{10} and $PM_{2.5}$ emissions will result from NRMM associated with the construction phase of the Project. This includes construction vehicles and mobile diesel generators.
Project-wide.	Construction	Human and ecological receptors.	Construction activities are expected to result in fugitive dust emissions which includes PM_{10} and $PM_{2.5}$ emissions. Concentrations of PM_{10} and $PM_{2.5}$ will need to be assessed against the relevant AQOs detailed in **Table 8.2**. An assessment of fugitive dust emissions using the IAQM's 2014 guidance may be required to define the site-specific mitigation.
Main development site, off-site Power Station Facilities and off-site associated development.	Operation	Human and ecological receptors.	NO_x, PM_{10}, $PM_{2.5}$, SO_2 and CO emissions arising from the use of stand-by generators and any auxiliary boilers which are part of the combustion plant will need to be modelled using ADMS.

Likely significant effects

8.7.7 The effects on air quality which have the potential to be significant and that will be taken forward for assessment in the ES are summarised in **Table 8.16** and **Table 8.17**.

Table 8.16: Likely significant air quality construction effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Project-wide.	Construction, demolition, earthworks and trackout activities.	Fugitive dust emissions will result from on-site construction activities and this may have an adverse impact on human health and the integrity of ecological sites.	Human and ecological receptors.
Project-wide.	On-road HGVs and LDV movements.	Vehicle combustion emissions from construction traffic include NO_x, NO_2, PM_{10} and $PM_{2.5}$ may have an adverse impact on human health and the integrity of ecological sites.	Human and ecological receptors.
Project-wide.	Non-road mobile machinery (NRMM) emissions.	NRMM includes construction vehicles and mobile diesel generators used at the main development site, Off-site Power Station Facilities and off-site associated development. Emissions from NRMM include NO_x, NO_2, PM_{10} and $PM_{2.5}$ which may have an adverse impact on human health and the integrity of ecological sites.	Human and ecological receptors.
Project-wide.	Marine traffic.	Vessels combustion emissions during the construction phase include NO_x, NO_2, SO_2, PM_{10} and $PM_{2.5}$ which may have an adverse impact on human health and the integrity of ecological sites.	Human and ecological receptors.

Table 8.17: Likely significant air quality operational effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site and off-site Power Station Facilities.	Operation of stand-by generators and back up infrastructure.	The stand-by generators are expected to use diesel fuel, emitting particulate matter, NO_x, CO and SO_2 which may impact human health. NO_x and SO_2 emissions may also have potential significant effects on concentrations and deposition rates at the ecological sites affecting the integrity of these sites. The assessment of significance of changes in concentrations and deposition rates at these receptors will be made in **Chapter 23: Biodiversity – Terrestrial and Freshwater Ecology and Ornithology**.	Human and ecological receptors.

Effects scoped out of further assessment

8.7.8 The effects scoped out from further assessment in the ES are:

- Potential impacts of the Project on the marine and intertidal ecological receptors in terms of eutrophication and ocean acidification:
  - Although the Project will contribute to nitrogen deposition and acid deposition (mainly through NO_x emissions during the construction phase), the reduction in agricultural activities due to the extent of the construction area within the main development site is expected to lead to a decrease in nitrogen loss and NH_3 emissions in the same area. In fact, the construction site will take more than 200ha of agricultural land, with such land being the predominant source of nitrogen in the area. Overall, nitrogen is expected to decrease, and no associated impacts to air quality are expected. Further details are provided in **Appendix 8C**.
- Potential impacts on human receptors at West Mersea and Tollesbury have been scoped out on the basis of both a preliminary screening assessment (see **Appendix 8D**) and the following considerations:

- The closest residential receptors in West Mersea and Tollesbury are located more than 3km to the north-west and to the north of the main development site boundary respectively.
- Although the initial study area for NRMM and construction plant emissions during construction is set to 5km, no significant effects are expected beyond 2km from the main development site boundary.
- The initial study area for operational emissions at the main development site is set to 10km. However, the standby generators will be subject to the combustion permitting regime and no significant effects are expected at residential receptors across the River Blackwater.

- Emissions from small combustion plant that aggregates to a thermal input less than 3MW net rated thermal input at any one time:
  - In addition to the combustion plant described in **Table 8.17**, there may be other smaller combustion appliances at the main development, off-site Power Station Facilities and off-site associated development sites. As per the approach that was agreed with the Regulators for the Hinkley Point C and Wylfa Newydd applications, any smaller combustion plant that aggregates to a thermal input less than 3MW net rated thermal input will be excluded from the study. Emissions from a plant of this scale are unlikely to have significant impacts on receptors and will be insignificant compared to emissions from the main boilers and standby generators operating at the main development site.
- Marine traffic emissions during the operational phase:
  - During the operational phase, there will be only infrequent and limited marine vessel traffic. The emissions associated with this type of activity are likely to result in negligible changes in pollutant concentrations and therefore have been scoped out from the assessment.
- Emissions to air of radionuclides are covered in **Chapter 9: Radiological**.
- The effects of Climate Change are covered in **Chapter 12: Climate Change**. Furthermore, whilst the net effect of these changes on the baseline air quality is difficult to establish, it is unlikely to significantly alter the baseline air quality to an extent that it would affect the outcome of any assessment. Other factors such as changes in technology and the move away from combusting fossil fuels, driven by climate change mitigation, would potentially lead to decreases in emissions of the key pollutants considered in this assessment and a corresponding decrease in background concentrations of air pollutants into the future.

8.8 Potential Mitigation

8.8.1 Potential mitigation measures would comprise, but not necessarily be limited to, the following:

- Relative to road traffic emissions during the construction phase, where appropriate road realignment and new by-pass sections will be considered to alter the distance between the source of emissions (construction traffic) and receptors (residential properties). These measures would be embedded in the Project design and therefore comprise primary mitigation.

- Relative to the construction phase of the main development site, off-site Power Station Facilities and off-site associated development (including demolition, site clearance, earthworks), a commitment will be made to Stage IV and Stage V equipment compliance under the NRMM Regulations. This would be an embedded design measure and comprises primary mitigation.

- Taking into account nuclear safety requirements, design the locations, layout and stack heights of the standby and support combustion plant (diesel generators and steam-raising boilers) to achieve an optimum balance between the heights of the discharge stacks and the effects upon air quality at nearby sensitive human and ecological receptors. This would be an embedded design measure and comprises primary mitigation.

- Details of the dust assessment which will be undertaken is included in **Section 8.6**. Best practices will be applied to reduce the generation of dust and suppression measures will be implemented where dust generation cannot be avoided. These measures will be included in a Code of Construction Practice. The application of best practice would comprise tertiary mitigation.

- Point source emissions associated with the operation of the Bradwell B power station will need to be designed and operated to comply with emission limits set out in the relevant environmental permit granted by the Environment Agency. Design which addresses emissions control would be an embedded Project design measure and would comprise primary mitigation.

8.9 Assumptions and Limitations

8.9.1 Key limitations of this air quality scoping chapter include:

- It is proposed that atmospheric dispersion modelling will be used to identify the potential air quality effects associated with the Project. Dispersion models have been widely used in the UK for both regulatory compliance and planning purposes for several decades and modelling is an accepted approach for this type of assessment. The ADMS model proposed to be used has also undergone extensive validation by the model developers, CERC. However, the use of any dispersion model is associated with an inherent element of uncertainty, the magnitude of which will vary on a case-by-case basis.

- The additional traffic data which will be used for the detailed road traffic (ADMS-Roads) assessment will be derived from the further survey work as detailed in **Chapter 6: Transport**.

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9. RADIOLOGICAL

9.1 Introduction

9.1.1 This chapter sets out the proposed scope of assessment of the potential radiological effects of the Project. **Chapter 5: The EIA Process and Methods** introduces the overall Environmental Impact Assessment (EIA) process including the methodology for assessing affects and determining significance. The topic specific methodology for determining receptor value, sensitivity and impact magnitude for the radiological assessment is provided in **Section 9.6**.

9.1.2 The radiological assessment will draw upon baseline data and assessments provided for other technical aspects most notably; **Chapter 14: Soils, Geology and Land Use**, **Chapter 13: Major Accidents and Disasters**, **Chapter 15: Water Environment** and **Chapter 18: Marine Water Quality and Sediments**.

9.1.3 This chapter contains:

- a summary of work undertaken to date;
- an explanation of the scope of assessment, including:
  - legislation, policy and guidance that inform the assessment;
  - a description of consultation and engagement so far relevant to Radiological issues;
  - study area for the assessment;
  - sources of data used in scoping;
  - baseline conditions, including current desk studies and surveys; and
  - planned further surveys and studies.
- the receptors that are proposed to be assessed and effects which have the potential to be significant;
- the effects that are proposed can be scoped out of the assessment; and
- potential mitigation.

9.1.4 The chapter should be read in conjunction with the project description provided in **Chapter 3: The Project**.

Work undertaken to date

Scope of assessment

9.1.5 General Nuclear System Limited (GNS) is the Requesting Party (RP) undertaking the Generic Design Assessment (GDA) process for the UK version of the Hualong Pressurised Reactor (UK HPR1000) which is the reactor technology that will be used for the Project.

9.1.6 The GDA process is jointly undertaken by the Office for Nuclear Regulation (ONR) and the Environment Agency to assess the safety, security and environmental performance of new nuclear power stations. GNS began the GDA process for the UK HPR1000 in January 2017 and commenced Step 4 (detailed assessment and consultation) of the GDA process in February 2020 (Ref. 9.1). The Step 4 GDA documents which include the Pre-Construction Environmental Report (PCER) (Ref. 9.2) have been published for public comment.

9.1.7 The PCER presents, for one reactor unit, a bounding case radioactive gaseous and liquid discharges during normal power station operating conditions and proposes annual discharge limits for specific radionuclides or groups of related radionuclides.

9.1.8 A radiological impact assessment (RIA) has been undertaken to support the GDA Step 4 process and this is presented in Chapter 6 of the PCER. The assessment has considered radiological exposure and dose to both human and non-human species. The assessment has been based upon generic UK site characteristics and reasonable worst-case bounding assumptions with respect to exposure to radiation. The assumed generic site characteristics are as follows:

- The site is an estuarine and marine environmental site and the topography of the site is flat;
- There is no water extraction from aquifers and no standing water on the site;
- There are no freshwater bodies on or close to the site;
- The nearest human receptors are assumed to be a fisherman family for liquid discharges and local resident family for gaseous discharges;
- Discharge routes are assumed to be gaseous aerial discharges and liquid discharges to the coastal/estuarine environment; and
- There is no on-site incineration of waste.

9.1.9 The GDA for the UK HPR1000 adopts a single reactor unit as the design basis and the generic site assessment assumes that there are no historical discharges or other sites of radiological releases nearby. The radiological assessment results are thus compared to a single source (i.e. a single power station) dose constraint of 0.3 millisievert per year (mSv/y) as defined in The Ionising Radiation Regulations 2017 (Ref. 9.3) and a threshold for optimisation of 20μSv/y (Ref. 9.4). A sievert is one of

the International System of Units used for the measurement of dose equivalent. If exposures are calculated to be below the optimisation threshold, then the regulators are advised that they should not seek to secure further reductions in discharge limits, provided there is satisfactory evidence that the operator is using the best practicable means to limit discharges.

9.1.10 The radiological assessment has identified that the total dose to the representative person is 24.5μSv/y, which is just over the threshold for optimisation of 20μSv/y, but significantly below the single source dose constraint of 0.3mSv/y. The most important radionuclides in terms of contribution to dose were found to be tritium (H 3) and Carbon-14 (C-14).

9.1.11 With respect to non-human species (flora and fauna) the PCER presents the results of a radiological dose assessment for gaseous and liquid discharges which was primarily undertaken using the ERICA software tool (Ref. 9.5) with the impact due to noble gases assessed using Argon-Krypton-Xenon (Ar-Kr-Xe) Calculation Tool (Ref. 9.6).

9.1.12 The ERICA software tool includes physical characteristics (and for faunal species additional behavioural and dietary characteristics) for 13 reference organisms that are taken to be representative of a range of terrestrial and aquatic species of plants and animals including birds. ERICA adopts a default screening level of 10 microGrays per hour (μGy/h) for all ecosystems and organisms. A Gray is a derived unit of ionising radiation in the International System of Units. It is defined as the absorption of one joule of radiation energy per kilogramme of matter. The ERICA screening level is conservative when compared to screening levels derived from the International Atomic Energy Agency (IAEA) and the United Nations Scientific Committee on the Effects of Atomic Radiation reports (Ref. 9.7 and Ref. 9.8) of 40μGy/h for terrestrial animals and 400μGy/h for terrestrial plants. For aquatic species, a value of 40μGy/h is applied to mammals, reptiles, amphibians and birds and 400μGy/h for all other species. These are benchmarks below which organisms are unlikely to be significantly harmed based on reviews of the scientific literature.

9.1.13 All the predicted doses to non-human species were below the ERICA screening level of 10μGy/h and the PCER therefore concluded that there is no significant risk of harm to non-human species from radioactive discharges under normal operating conditions for the generic design basis adopted for the GDA.

9.1.14 Successful completion of GDA will result in the issuance of a Statement of Design Acceptability (SoDA) (or interim SoDA) from the Environment Agency. Prior to the completion of the GDA process, site-specific design will be progressed for the UK HPR1000 to be located at Bradwell. Site-specific development will require the submission of applications for a range of consents to build and operate the power station, some of which will need to be supported by RIAs for human and environmental receptors (flora and fauna) in the vicinity of the main development site.

9.1.15 The key submissions for which site-specific RIAs are required include:

- Site Justification Report. This report will be submitted to the ONR in support of the Nuclear Site Licence;
- Radioactive Substances Regulations Environmental Permit (EP-RSR) under the Environmental Permitting (England and Wales) Regulations 2016;
- Article 37 of the Euratom Treaty, 2010/635/Euratom, or similar process when the Euratom requirements no longer apply (Ref. 9.9);
- Development Consent Order (DCO) under The Planning Act 2008 (Ref. 9.10). This is considered to incorporate the RIA requirements associated with:
  - Conservation (Natural Habitats) Regulations 1994 (Ref. 9.11); and
  - Marine Licence Application under the Marine and Coastal Access Act 2009 (Ref. 9.12).

9.1.16 The relevant consents and supporting RIA requirements are considered further in **Section 9.6**. The scope of the RIA required for each of these applications will be agreed in collaboration with relevant stakeholders.

Baseline data collection

9.1.17 The radiological assessment will consider the effects of the Project against the relevant baseline conditions and, in particular, the existing levels of radioactivity in the environment. Baseline characterisation studies are described in **Section 9.5**.

9.2 Legislation, Policy and Technical Guidance

9.2.1 This section identifies the relevant legislation, national and local policy and guidance which has informed the scope of the assessment relevant to radiological impacts. Further information on policies relevant to the EIA and their status is set out in **Chapter 2: Policy and Regulatory Context**, which should be read in conjunction with this chapter. It should be noted that a full inventory of legislation and policy related to human health is presented **Chapter 11: Human Health** whilst legislation and policy related to major accidents and disasters is presented in **Chapter 13: Major Accidents and Disasters** and therefore details (for example those related to local policy and development plans and the carriage of dangerous goods including radioactive materials) are not repeated here.

9.2.2 The legislation and policy relevant to radiological issues are detailed in **Table 9.1**.

Table 9.1: Legislation and policy

Relevant Legislation and Policy	Relevance to the Assessment
Legislation	
Directive 2014/52/EU amending Directive 2011/92/EU (Ref. 9.13).	Requires the consideration of the effects of certain public and private projects on the environment ('EIA Directive'), including effects on Human Health. This Directive has been transposed into UK legislation in the EIA Regulations.
Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (Ref 9.14) and Marine Works (Environmental Impact Assessment) Regulations 2007 (Ref. 9.15).	Requires the Project to provide an assessment of the direct and indirect effects of the Project on human health.
National Policy	
National Policy Statement for Energy (EN-1) (Ref. 9.16).	Sets out requirements for applicants' assessment of human health effects of energy projects that fall within the scope of National Policy Statement EN-1. Paragraph 4.13.2 sets out that proposed energy projects that would have effects on human beings are required to "*assess these effects for each element of the project, identifying any adverse health impacts, and identifying measures to avoid, reduce or compensate for the impacts as appropriate.*" Cumulative health impacts will also be considered in determining an application.
National Policy Statement for Nuclear Power Generation (EN-6) (Ref. 9.17).	Paragraph 3.12.1 sets out requirements for applicants' assessment of human health effects. Paragraphs 3.12.8-3.12.10 require that applications should be determined on the basis that the regulatory regime and ONR requirements with respect to safety of radiation will be applied and enforced to protect human health.
National Planning Policy Framework (NPPF) (2019) (Ref. 9.18).	The NPPF sets out the Government's planning policies for England and is a material consideration in determining

Relevant Legislation and Policy	Relevance to the Assessment
	planning applications. Policies of relevance to RIA for the Project include: Paragraph 45. "*Local planning authorities should consult the appropriate bodies when considering applications for the siting of, or changes to, major hazard sites, installations or pipelines, or for development around them.*"

Technical guidance

9.2.3 Technical guidance that has been used to define the assessment is set out in **Table 9.2**.

Table 9.2: Relevant technical guidance

Guidance Reference	Implications
Environmental Permitting Guidance Radioactive Substances Regulation – For the Environmental Permitting (England and Wales) Regulations 2010 (2011) (Ref. 9.19).	This guidance highlights the importance of the use of Best Available Technique (BAT) in the optimisation of doses and the setting of discharge limits.
Radioactive Substances Regulation – Environmental Principles Regulatory Guidance Series, No RSR 1 v2 (2010) (Ref. 9.20).	Provides guidance to the regulators for the regulation of radioactive substances activities including principles relating to dose assessment and the protection of human and environmental health.
Radioactive Substances Regulation – The regulation of radioactive substances activities on nuclear licensed sites. Regulatory Guidance Series, No RSR 2 v2 (2012) (Ref. 9.21).	Provides guidance on how operators should aim to protect people and the environment by minimising the generation of radioactive waste, minimising the amount of radioactive waste that has to be discharged into the environment, discharging that waste in ways that minimise the resulting radiological impact on the public and protect the wider environment, and using the optimal routes for disposal of solid waste.
Principles for the Assessment of Prospective Public Doses	Sets out principles and guidance for the prior assessment of doses to the public arising from exposure

Guidance Reference	Implications
arising from Authorised Discharges of Radioactive Waste (2012) (Ref. 9.22).	to ionising radiation which may arise from planned discharges to the atmosphere and to the aquatic environment. The results of assessments undertaken in accordance with these principles and guidance will be used as an input into the process of determining whether discharges of radioactive waste to the environment should be authorised.
Impact Assessment of Ionising Radiation on Wildlife (R&D Publication 128) (2001) (Ref. 9.23) as modified by 'Terrestrial ecosystems SCK-CEN release version 2.xls'.	Provides information on the impacts of ionising radiation on wildlife, upon which a robust assessment of the doses to non-human receptors can be made. The document also outlines the reference organisms for consideration as potential receptors. The updated version (Ref. 9.6) allows for dose assessments for all the Ar, Kr and Xe isotopes relevant to nuclear industry discharges not covered by the original R&D 128 methodology; it also comprises all of the International Commission on Radiological Protection (ICRP) reference animals and plants considered in the ERICA tool.
Initial radiological assessment (IRA) methodology – part 2 methods and input data Science Report: SC030162/SR2 (2006) (Ref. 9.24).	This document describes a recommended staged approach to the assessment of critical group doses for authorisation purposes. The first stage consists of a simple and cautious assessment of the critical group dose (initial radiological assessment).
Recommendations of the ICRP. ICRP Publication 26. Ann. ICRP 1 (3) (1997) (Ref. 9.25).	Includes the 'critical group' receptor assessment methodology for human dose assessments.
Environmental Risk from Ionising Contaminants: Assessment and Management Tool (ERICA) (2006).	ERICA provides an integrated approach to scientific, managerial and societal issues concerned with the environmental effects of contaminants emitting ionising radiation, with emphasis on biota and ecosystems.

9.3 Consultation and Engagement

9.3.1 There has been no specific consultation to date with respect to the radiological assessment scope and methodology in the context of the EIA for the DCO. However, technical engagement has occurred with key stakeholders with respect to the scope of the radiological baseline characterisation, as detailed in **Table 9.3**.

9.3.2 No specific consultee comments concerning radiological assessment issues have been identified from Stage One Consultation.

Table 9.3: Technical engagement

Consultee	Points of Discussion
Maldon District Council. Chelmsford City Council. Essex County Council. Environment Agency. Natural England.	A workshop concerning Ground Conditions and Hydrology was held on 18 June 2020 during which the approach to baseline characterisation for the main development site was described for soils, geology and land use and for hydrogeology and surface water. Specific details of planned investigation and monitoring for these technical aspects were presented with documented details provided in Survey and Monitoring Plan (SMP) documents prior to the workshop. The documented and presented details described the proposed approach to soil, groundwater and surface characterisation including proposed sampling regimes and laboratory analysis for radiochemical parameters. Clarity was provided during the workshop with respect to the suite of analytical parameters noting that it had been proposed based upon experience from other nuclear new build projects. Following the workshop, the relevant SMPs were updated in response to consultee feedback. The SMPs are appended to the relevant chapters of this Scoping Report (notably **Chapter 14: Soils, Geology and Land Use** and **Chapter 15: Water Environment**).

9.4 Data Gathering Methodology

Study area

9.4.1 The study area for the radiological assessment has yet to be defined in detail. It will focus upon the terrestrial and marine environment in the locality of the main development site within which the Bradwell B power station will be sited. Data will be gathered to characterise baseline conditions covering the range of habitats in the

locality of the proposed Bradwell B power station (i.e. marine, freshwater, terrestrial, coastal and marshland). The spatial areas that will be characterised include the main development site, land to the west of the existing power station (Bradwell A) and the zone for marine infrastructure.

Sources of data used in scoping

Desk based

9.4.2 The principal desk-based data sources used to inform the radiological baseline are set out in **Table 9.4**.

Table 9.4: Sources of data – radiological baseline

Source	Data
Radioactivity in Food and the Environment (RIFE) Report 24, 2018 and Appendix 1 CD Supplement (Ref. 9.26).	The RIFE report and associated Appendix present data concerning: • Radiation exposures (doses) to people living around UK nuclear licensed sites; • Radioactivity concentrations in samples collected around UK nuclear licensed sites; • External dose rates measured around UK nuclear licensed sites; • UK nuclear licensed site incidents and non-routine surveys; • Habits surveys near UK nuclear licensed sites. These surveys help, for example to determine rates of consumption of local foodstuffs such as shellfish and the time that persons spend in certain environments such as residence on houseboats or on local beaches; • Monitoring of radioactivity at remote locations (overseas incidents, non-nuclear sites and regional monitoring across the UK); and • The environmental radioactivity monitoring programmes.

9.4.3 The RIFE reports are compiled and published annually by the Centre for Environment, Fisheries and Aquaculture Science (Cefas) on behalf of the

Environment Agency, Food Standards Agency (FSA), Food Standards Scotland, Natural Resources Wales (NRW), Northern Ireland Environment Agency (NIEA) and the Scottish Environment Protection Agency (SEPA).

9.5 Baseline Information

Current baseline

9.5.1 Information from RIFE Report 24 (2018) (Ref. 9.26), describes the radiological baseline for the area surrounding the existing nuclear power station (Bradwell A) and this is considered to provide sufficient detail to broadly characterise the baseline for the area around the main development site which is adjacent to Bradwell A and within which the Bradwell B power station would be located.

9.5.2 It should be noted that Bradwell A ceased electricity generation in 2002 and defueling was completed in 2006. The site entered the passive Care and Maintenance phase at the end of 2018. Final site clearance is planned to commence in 2083 with completion by 2092. The environmental permit was revised in 2019 to implement reduced radioactive discharge limits that reflect the Care and Maintenance conditions. As an example of the recent reduced radioactive emissions to the environment, there have been no liquid discharges into the Blackwater Estuary from the site's active effluent drain since September 2017 (Ref. 9.26).

9.5.3 The currently permitted gaseous radioactive discharge limits (expressed as annual equivalents in Becquerels (Bq)) for Bradwell A are presented below (actual discharges for 2018 taken from the RIFE 24 report are shown in brackets). A becquerel is defined as one radioactive transformation per second:

- Beta emitting radioniclides associated with particulate matter 6.00E+08 Bq (2.84E+05 Bq);
- Tritium 6.00E+12 Bq (1.37E+10 Bq); and
- Carbon-14 9.00E+11 Bq (5.55E+08 Bq).

9.5.4 In all cases the actual gaseous discharges were less than 1% of the permitted discharge limits.

9.5.5 The currently permitted liquid radioactive discharge limits (expressed as annual equivalents) for Bradwell A are as follows:

- Tritium 7.00E+12 Bq;
- Caesium-137 7.00E+11 Bq; and
- Other radionuclides 7.00E+11 Bq.

9.5.6 The emissions of the above listed radionuclides were all reported as nil for 2018.

9.5.7 **Table 9.5** presents the total and source specific doses for 2018 for the Bradwell locality.

Table 9.5: Total and source specific doses for 2018 for the Bradwell locality

Dose	Representative person	Exposure, mSv per year					
		Total	Fish and shellfish	Other local food	External radiation from intertidal areas or the shoreline	Gaseous plume related pathways	Direct radiation from site
Total dose – all sources.	Prenatal children of local inhabitants (0.25km).	0.011	-	<0.005	-	<0.005	0.011
Source specific doses.	Seafood consumers.	<0.005	<0.005	-	<0.005	-	-
	Infant inhabitants and consumers of locally grown food.	<0.005	-	<0.005	-	<0.005	-

9.5.8 The total dose from all pathways and sources of radiation was 0.011mSv/y, with the highest contribution to dose being made by direct radiation which is radiation arising directly from the Bradwell A site and facilities as opposed to radiation received indirectly, for example via ingestion or inhalation. Doses from other sources do not make any significant contribution to the total dose including local seafood consumers for which the assumed consumption rates are substantial. For context, the total dose of 0.011mSv/y is less than 1% of the dose for members of the public of 1mSv/yr.

9.5.9 Between 2004 and 2018, the total dose to the representative person from all pathways has ranged between <0.005 and 0.098mSv/y, with the variation being attributed to changes in the estimate of direct radiation. For context, the average radioactive background dose in the UK is 2.7mSv/y. Throughout this period the annual doses have been well within the statutory source dose constraint of 0.3mSv/y as defined in the Ionising Radiations Regulations 2017.

9.5.10 Both the terrestrial and marine environmental sampling data for 2018 with respect to the Bradwell locality are summarised in dedicated tables in Section 4 of the RIFE Report 24 (Ref. 9.26).

Future baseline

9.5.11 It is expected that the radiological discharges from the existing nuclear power station (Bradwell A) will be very low during the ongoing Care and Maintenance phase of decommissioning which will overlap with the construction and operational phases of the Project. The contribution to radiological dose to human and non-human species from Bradwell A is not anticipated to increase during the Care and Maintenance phase.

Planned further surveys and studies

9.5.12 Existing baseline information for the radiological assessment will be updated as soil, surface water and groundwater radiochemical quality data are gathered from the planned intrusive ground investigation and subsequent monitoring programme for the main development site. The ground investigation is due to commence in Q3 2020. During the intrusive works, soil samples will be collected for radiochemical testing and groundwater monitoring boreholes will be installed which will be used to collect groundwater samples for radiochemical analysis on a quarterly basis over a 12-month period. Relevant details concerning sampling and analysis of soils and terrestrial waters for the main development site are provided in **Chapter 14: Soils, Geology and Land Use** and **Chapter 15: Water Environment**.

9.5.13 A marine water quality baseline survey campaign commenced in January 2020, the scope of which includes a wide range of physicochemical parameters as described in **Chapter 18: Marine Water Quality and Sediments**. The survey includes the collection of samples from six locations at quarterly intervals. To date, radiochemical analysis has not been included but this will be undertaken for the final quarterly sampling visit in Q4 2021.

9.5.14 It is also anticipated that a marine investigation programme will be implemented in 2021 to determine physical conditions related to marine infrastructure including the proposed locations of the cooling water intake and outfall structures and the marine transport facilities. During the marine investigation, samples of sediment will be collected and analysed for the radiochemical parameters identified by the IAEA with reference to determining the suitability of materials for disposal at sea under the London Convention (Ref. 9.27). The parameters will be as follows:

- Colbalt – 60;
- Caesium – 137;
- Radium – 226 (via Lead - 214);
- Thorium – 232 (via Actinium – 228);
- Uranium – 238 (via Thorium - 234); and
- Americium - 241.

9.5.15 Requirements with respect to the number of samples and depth of sample recovery will be determined once details of likely sediment disturbance and dredging depths related to the construction of the marine infrastructure elements are known.

9.5.16 At the present time no radiochemical characterisation of soil, surface water and groundwater conditions is considered to be necessary for off-site associated development locations as these are anticipated to be at sufficient distance from the Bradwell A power station to not have been influenced by historical radioactive discharges from this facility.

9.5.17 Planned further surveys of relevance to the radiological assessment are set out in **Table 9.6**.

Table 9.6: Planned further surveys and studies for radiological issues

Study Name or Type	Proposed Date and Scope of Study
Sampling of soils for radiochemical analysis.	2021-2022 for the main development site.
Sampling of surface water for radiochemical analysis.	2021-2022 to include a 12-month period for the main development site.

Study Name or Type	Proposed Date and Scope of Study
Sampling of groundwater for radiochemical analysis.	2021-2022 to include a 12-month period for the main development site.
Sampling of marine waters for radiochemical analysis.	Q4 2020.
Sampling of marine sediment for radiochemical analysis.	2021

9.6 Scope of the Assessment

Assessment of potential construction phase radiological impacts

9.6.1 The RIA for the Bradwell B power station construction phase will utilise published data which describes the background radiological baseline as detailed in **Section 9.5** noting at the time the assessment is undertaken such data would be updated notably in response to the publication of RIFE Report 25 which will present data for 2019. The published data will be augmented by the radiochemical analysis of soil, marine sediment and terrestrial surface water and groundwater samples from the investigation and monitoring works to be undertaken in 2020 and 2021.

9.6.2 Subject to the findings of intrusive investigations and monitoring, potential radiological impacts to workers and members of the public associated with key construction activities (notably earthworks, deep excavations and groundwater dewatering) during the construction phase would be assessed using the screening methodology described in NRPB-W36 (Ref. 9.28).

9.6.3 Potential radiological impacts associated with marine construction works (notably dredging which may result in sediment disturbance and consequent remobilisation of seabed contaminants and the potential need for sediment disposal) within the zone for marine infrastructure will be assessed using the screening methodology described in IAEA TECDOC-1375 (Ref. 9.27) which supports compliance with the requirements of the London Convention (1972).

Assessment of potential operational phase impacts (including the transport of radioactive materials)

9.6.4 The Bradwell B power station and associated radioactive waste management facilities will need to be permitted by the Environment Agency under Schedule 23 of the Environmental Permitting (England and Wales) Regulations, 2016 (as amended). Specifically, a Radioactive Substances Regulation Environmental Permit (EP-RSR) must be granted by the Environment Agency prior to the discharge

of any radioactive emissions that will occur during the commissioning and operation of the power station. The permit will authorise the operator to dispose of radioactive waste under specific limitations and conditions.

9.6.5 The RIA for the operational phase of the Bradwell B power station will be carried out primarily to support the EP-RSR application. The RIA will consider discharges of gaseous and liquid effluents to atmosphere and the marine environment respectively resulting from routine operations. The assessment will take into account historical, present and future discharges and direct radiation to the surrounding environment and will address effects on human and non-human (flora and fauna) receptors. The RIA will consider historical and current permitted discharges from Bradwell A together with historic impacts of atmospheric weapons testing, the Chernobyl accident and naturally occurring radioactivity which all contribute to the background radioactivity levels. The findings of the RIA will be adopted for inclusion as part of the Environmental Statement (ES).

9.6.6 For human receptors, the internationally recognised approach for radiological assessment will be adopted that is based upon the identification of "representative persons" whose location and habits (such as dietary intake, occupation and activities) are such that they are subject to the highest doses.

9.6.7 The habits of the representative persons will be identified mainly from published surveys of the local population. In accordance with Environment Agency guidance (Ref. 9.22), the following three age groups will be considered for each representative person:

- infant;
- 10-year-old child; and
- adult.

9.6.8 If determined to be appropriate, an assessment of dose to the embryo and foetus will be undertaken.

9.6.9 In the event that the RIA shows that the health of these "representative persons" would be protected, protection of the wider public can also be demonstrated.

9.6.10 The assessment will use the maximum estimated discharges from two UK HPR1000 reactors and associated facilities located on the Bradwell B power station site.

9.6.11 Site-specific data will be undertaken to determine the following radiological impacts:

- annual doses to the most exposed members of the public from direct radiation exposure to the proposed radioactive waste stores;
- collective doses to the UK, European and world populations from routine releases of liquid and atmospheric discharges and representative 'per caput'

doses (the latter relates to the average dose to individuals within each of these large populations);

- potential doses to the representative person as a result of short-term operational atmospheric discharges; and
- doses due to potential build-up of radionuclides in the environment as a result of discharges during the period of operation of the Bradwell B power station.

9.6.12 The assessment will follow a very similar approach to the RIA which has been undertaken to support Step 4 of the GDA process. In common with the GDA, the European Commission's PC-CREAM model will be used in the assessment of routine radioactive discharges to the environment and to calculate the doses to members of the public. Site-specific data will be used as inputs to the PC-CREAM model wherever possible but where necessary, data from nationally and internationally recognised sources will be applied.

9.6.13 In addition, assessment of dose from exposure to direct radiation associated with the transport of radioactive materials (including spent fuel and radioactive wastes) to and from the proposed power station during operations will be calculated from the estimated external dose rates of the approved transport packages for the relevant material as described in NRPB-W66 (Ref. 9.29). Appropriate input data will be used such as number of journeys, transportation routes and exposure assumptions obtained from analysis carried out to support the assessment of transport impacts (see **Chapter 6: Transport**).

9.6.14 The outputs from the dose calculations described above will be assessed with respect to the following criteria which are intended to be protective of human health:

- 1.0mSv/y – this is the UK public dose limit as defined in the Ionising Radiations Regulations 1999. It includes all contributions from man-made sources but excludes medical or occupational exposure.
- 0.5mSv/y – this is the site dose constraint to a member of the public from discharges from Bradwell A and the proposed discharges from the Bradwell B power station. The site constraint is implemented through the Environmental Permitting Regulations (England and Wales) 2016 (as amended).
- 0.3mSv/y – this is the source dose constraint for members of the public for a single power station and includes the contribution from discharges and direct radiation. The site constraint is implemented through the Environmental Permitting Regulations (England and Wales) 2016 (as amended).
- 0.02mSv/y – this is the screening value defined by the Environment Agency used in radiological assessments below which further detailed studies are not considered to be warranted.
- 0.01mSv/y – derived from statutory guidance issued to the Environment Agency for England and Wales, below which regulators should not seek further

reductions in discharge limits, provided the operator is using best available techniques to limit discharges.

9.6.15 There is no legal dose limit for collective doses. However, the IAEA has presented a dose criterion of less than 1 man Sievert (mSv) per year of operation, below which doses are considered sufficiently low that doses arising from sources or practices may be exempted from regulatory control. This criterion is included in UK regulatory guidance.

9.6.16 In addition, relevant sensitive habitats in the locality of the main development site and marine infrastructure zone will considered for the assessment of non-human biota (flora and fauna) to demonstrate the protection of the environment.

9.6.17 The calculation of dose to non-human species will be undertaken using the ERICA software tool supplemented with the Ar-Kr-Xe tool for noble gases. ERICA and the associated radiological effects database FREDERICA are assessment tools for predicting the dose and effects on non-human species from radioactivity in the environment. The environmental concentration data modelled using the DORIS and PLUME/FAMRLAND modules within PC CREAM will be used as inputs to the ERICA model.

9.6.18 Site-specific data from the ongoing baseline terrestrial, marine and ornithological biodiversity surveys will be used as the basis for selecting the habitats and species of interest with respect to radiological impacts on non-human receptors. There will be a specific focus upon the key qualifying features of designated sites in the locality of the main development site and marine infrastructure zone to define the habitats and species that will be assessed. Tier 2 of ERICA allows the inclusion of non-default reference organisms and the editing of model parameters to address site-specific circumstances.

9.6.19 In contrast to humans, there are no specific UK regulations for the protection of non-human species from radiation sources. However, the Conservation of Habitats and Species Regulations 2010 require maintenance and restoration actions to be taken to ensure the favourable conservation status of habitats and species of European Union (EU) Community level interest.

9.6.20 Although there are no UK regulatory standards for the protection from harm of nun-human species from ionising radiation, the Environment Agency has concluded that it is unlikely there will be any significant effects upon non-human populations at the chronic dose rates listed below:

- 40µG/h for terrestrial animal populations;
- 400µG/h for terrestrial plant populations;
- 400µG/h for populations of freshwater and coastal organisms; and
- 1,000µG/h for populations of organisms in the deep ocean.

9.6.21 The assessment of the significance of chronic doses to non-human species will adopt a conservative threshold of 40μG/h below which no significant effect (i.e. no measurable harm to such species) will be assumed.

Assessment of transboundary impacts

9.6.22 The Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) (Ref. 9.30) sets out the obligations to assess the environmental impact of certain activities at an early stage of planning. It also lays down the general obligation on states to notify and consult each other on all major projects under consideration that are likely to have a significant adverse environmental impact across territory boundaries, including the potential impacts of severe accidents, however unlikely.

9.6.23 Article 37 of the Euratom Treaty requires EU member states to inform the European Commission of plans dispose of radioactive waste, including releases to air or water, under normal conditions or unplanned scenarios. Given that the UK is no longer an EU member state there is uncertainty as to whether an Article 37 submission is required. However, until the UK government position is confirmed it is assumed that an equivalent Article 37 submission will need to be prepared.

9.6.24 The key requirement of the submission is to determine whether the implementation of a radioactive waste disposal plan is liable to result in the radioactive contamination of water, soil or airspace of another member state. The submission should evaluate the effective dose to adults, children and infants living in the vicinity of the relevant facilities (i.e. the Bradwell B power station) and in relevant areas of the other affected members states taking account all significant exposure pathways. RIAs need to be performed for two reference groups, i.e. a local reference group close to the site and a reference group in the nearest EU member state which in the case of the Bradwell B power station is France. In this context, a separate, specific RIA is unlikely to be required to address the normal operating condition of Bradwell B for the local reference group and the same assessment tools as described above the relevant details are likely to be taken from the RIA to support the EP-RSR application.

9.6.25 For the nearest member state (France), habits data (notably occupancy and intake rates for seafood and terrestrial foodstuff) for the public will have to be determined for the assessment. Exposure pathways determined for the EP-RSR will generally be applicable. Long range dispersion of gaseous radioactive discharges will be modelled using either the PC-CREAM atmospheric dispersion module PLUME or the NRPB-R123 model. Dispersion of aqueous discharges to the marine environment and the transfer to seawater, seafood and sediment can be modelled using the DORIS module of PC-CREAM 08. The dose to members of the public in the nearest member state will be calculated by applying ICRP dose coefficients for internal exposure pathways and FGR12 (or latest) coefficients for external exposure

Potential receptors

9.6.26 The receptors relevant to the radiological assessment for the operational phase are the operational workforce and human and non-human species (flora and fauna) in the locality of the main development site and marine infrastructure zone that lie within the potential zone of influence of radioactive discharges and direct radiation from the Bradwell B power station. Members of the public present in close proximity to radioactive waste transport routes will also be considered.

9.6.27 Human receptors will be selected for the radiological dose assessment in accordance with site-specific habit data (for example representative persons occupying houseboats or members of the commercial fishing community). Non-human receptors (flora and fauna) will be identified based upon the distribution of terrestrial and marine habitats and the known presence and characteristics of key species of flora and fauna which will be used to inform inputs for representative species which are required for the dose assessment modelling. The receptors are summarised in **Table 9.7**.

Table 9.7: Receptors subject to potential effects

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Main development site and marine infrastructure zone.	Construction	Construction workforce, members of the public and non-human species (flora and fauna).	Potential for increased radiological exposure due to potential radiochemical contamination of soil and groundwater.
Main development site and marine infrastructure zone.	Commissioning and Operation.	Operational workforce members of the public and non-human species (flora and fauna).	Potential for increased radiological exposure due to radioactive discharges and direct radiation from power station facilities and radioactive waste transport.

Likely significant effects

9.6.28 The construction and operational phase radiological effects which have the potential to be significant and that will be taken forward for assessment in the ES are presented in **Table 9.8** and **Table 9.9** respectively. It should be noted that effects on soils, surface water and groundwater related to the potential presence of existing radioactive contamination will be addressed within the relevant environmental aspect chapters of the ES.

Table 9.8: Potential construction phase radiological effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site.	Intrusive construction works for the Bradwell B power station.	Exposure to soils and groundwater which may be contaminated with radiochemicals leading to increased radiological dose.	Construction workforce and human and environmental non-human (flora and fauna) receptors in the locality of the main development site.

Table 9.9: Potential operational radiological effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site and zone for marine infrastructure.	Radioactive discharges during power station construction, commissioning and operation.	Increased levels of radioactivity in the environment relative to background leading to increased radiological exposure.	Workforce and human and environmental non-human (flora and fauna) receptors in the locality of the main development site and marine infrastructure zone.
Transport routes.	Transport of radioactive waste.	Increased levels of radioactivity leading to increased radiological exposure.	Human receptors in close proximity to transport routes.

Effects scoped out of the assessment

9.6.29 There are no radiological effects expected as a result of activities that would occur at any of the off-site associated development and off-site Power Station Facilities locations. No radioactive disposals will take place from these locations and there is no likelihood that they will be affected by existing radiological contamination. As a result, no RIA will be undertaken for these elements of the Project.

9.6.30 The ES assessment will only consider normal operating conditions and related discharges. Accident event conditions will be considered under **Chapter 13: Major Accidents and Disasters**.

9.6.31 The management of radioactive waste and spent fuel will not be subject to specific assessment for the DCO EIA. These issues will subject to assessment and regulatory approval by the Environment Agency and the ONR in the context of the environmental permit applications and the Nuclear Site Licence application.

9.6.32 Radiological effects related to the decommissioning of the Bradwell B power station at the end of its operational life (i.e. the cessation of electrical power generation) will not be subject to detailed consideration for the DCO. As is currently the case for the decommissioning of the existing nuclear reactor fleet in the UK, such effects will be subject to separate assessment in the future (prior to the end of the operation phase) as required by the Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999 (as amended) (EIADR) (Ref. 9.31). The scope of EIADR includes decommissioning activities following the final defueling of the reactor and the removal of related infrastructure that prevents further operational activity.

9.7 Potential Mitigation

9.7.1 Potential mitigation measures will comprise:

- Generic design measures for the UK HPR1000 – these are measures related to the minimisation and optimisation of radioactive discharges for the generic design which should be resolved during Step 4 of the ongoing GDA process. Specifically, they relate to the Application of Best Available Techniques (BAT) to minimise the generation and discharge or disposal of radioactive wastes. This would be supplemented by operational practices such that discharges from the operational power station would be As Low as Reasonably Practicable (ALARP). The application of BAT ensures that discharges from new nuclear power stations constructed in the UK will not exceed the discharge levels from comparable nuclear power stations across the world. Such measures would be embedded within the Project design as they will need to be in place to satisfy the requirements of the EP-RSR. The Environment Agency has regulatory responsibility to ensure BAT and ALARP principles will be applied to the generic design and also in the context of the EP-RSR.

- Management of soil and groundwater which may be contaminated with radiochemicals such that the radiological risks to the construction workforce and the local human and environmental receptors in the locality of the main development site are minimised.

9.8 Assumptions and Limitations

9.8.1 The following assumptions apply:

- The radiological impacts of decommissioning are assumed to be bounded by the routine activities related to the operation of the Bradwell B power station.
- Discharges from Bradwell A during decommissioning will not increase above their current permitted limits which apply to the Care and Maintenance phase. Any increases that could arise are likely to be limited in time to address specific activities during the decommissioning programme to reduce the hazard on site to assist in achieving the site's restoration. Any changes to the proposed limits for Bradwell A would be subject to regulatory review and approval.

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10. SOCIO-ECONOMICS

10.1 Introduction

10.1.1 This chapter sets out the proposed scope for the assessment of the potential socio-economic effects of the Project. It considers the construction, operational, and where relevant removal and reinstatement (off-site associated developments only) phases across the main development site, off-site Power Station Facilities, and off-site associated development.

10.1.2 Where relevant the chapter considers assessments made in respect of other technical aspects and assesses whether socio-economic effects would be expected to arise as a result of the outputs of these chapters. Chapters assessing effects with potential socio-economic effects include, most notably: **Chapter 6: Transport** and **Chapter 21: Recreation**.

10.1.3 This chapter contains:

- a summary of work undertaken to date;
- an explanation of the scope of assessment, including:
- legislation, policy and guidance that inform the assessment;
- a description of consultation and engagement so far relevant to socio-economics;
- study area for the assessment;
- sources of data used in scoping;
- baseline conditions, including current desk studies and surveys;
- planned further surveys and studies;
- the receptors that are proposed to be assessed and the effects which have the potential to be significant;
- the effects that are proposed can be scoped out of the assessment; and
- potential mitigation.

10.1.4 The chapter should be read in conjunction with the project description provided in **Chapter 3: The Project** and the over-arching assessment methodology set out in **Chapter 5: The EIA Process and Methods.**

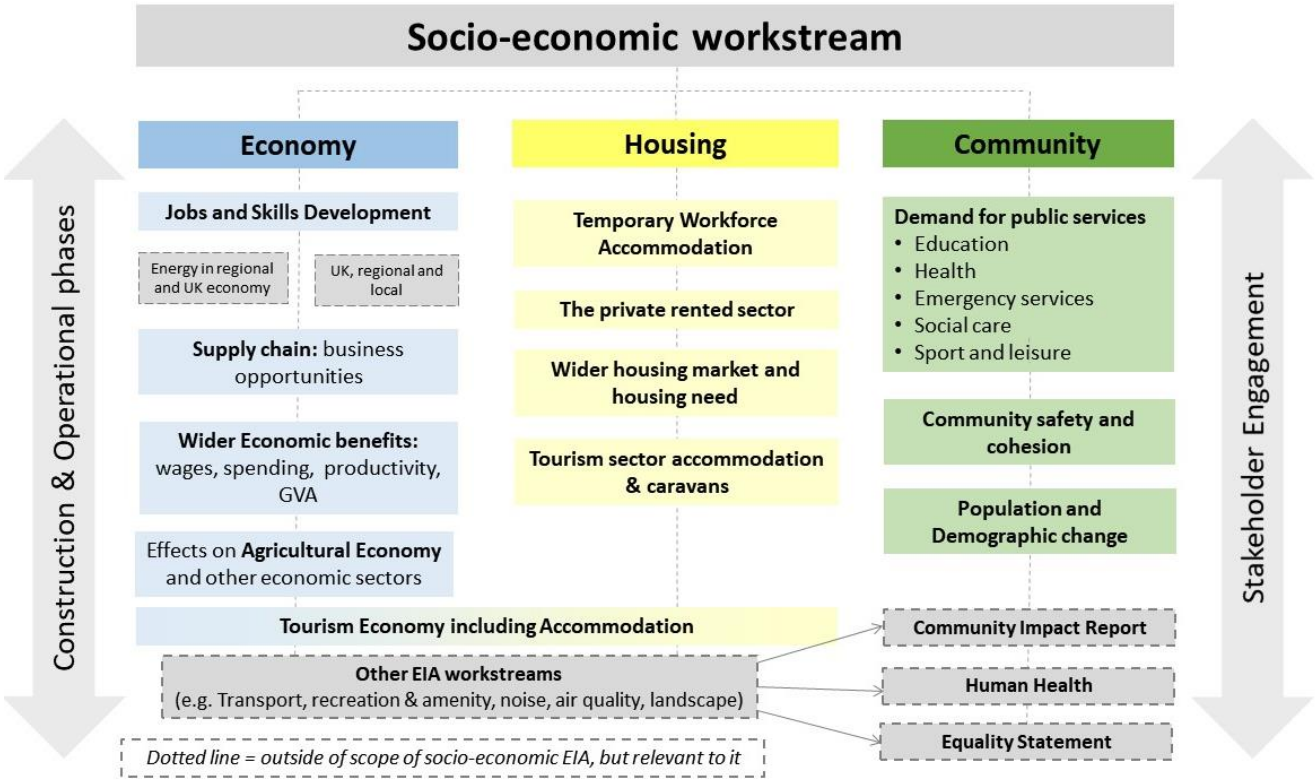
Work undertaken to date

Defining assessment scope

10.1.5 The socio-economic assessment will consider the potential effects of the Project on sensitive receptors including the economy and labour market, housing market and accommodation, communities, facilities and public services during the construction, operational and where relevant removal and reinstatement phases of the Project.

10.1.6 **Plate 10.1** shows an outline scope of the assessment, including an indication of the interdependencies between the socio-economic workstream and other technical aspects. A full list of sensitive receptors and likely significant socio-economic effects are set out in **Section 10.7**.

Plate 10.1: Socio-economic assessment – scope



10.1.7 Socio-economic effects could be either beneficial or adverse:

- Beneficial socio-economic effects cause or contribute to improved economic, housing market or community conditions compared to the existing baseline.
- Adverse socio-economic effects cause or contribute to worsening economic, housing market or community conditions compared to the existing baseline.

10.1.8 The approach to the assessment will set out the socio-economic parameters of the Project and the baseline conditions, and provide an assessment of effects on sensitive receptors, taking into account strategies for mitigation. The approach is shown in **Plate 10.2**.

Plate 10.2: Socio-economic assessment – approach

Developing socio-economic parameters of the Project

10.1.9 Initial work on developing the socio-economic parameters of the Project has been undertaken. This includes work to establish the likely number of workers and anticipated skills profile that will be needed to construct and operate the Project (the workforce profile).

10.1.10 It also includes work to establish the likely distribution of the construction workforce, including the development of an initial Gravity Model which will estimate where workers on the Project will live during the construction phase (further detail is set out in **Table 10.1**). This work is being carried out jointly with the Transport workstream (as set out in **Chapter 6: Transport**).

10.1.11 As further information becomes available on the total cost of the project, including material costs, and the procurement strategy, further analysis will be carried out on the supply chain opportunities generated by the Project, and the likely Gross Value Added (GVA) benefits. This will inform the design of implementation strategies and the assessment of the economic impacts of the Project.

Baseline data collection

10.1.12 Initial work has been undertaken to establish the socio-economic baseline for the Project, including the economic, housing market and community services baseline. This work has informed the scoping of the assessment.

Implementation strategies

10.1.13 High level initial work has taken place to consider potential implementation strategies that would aim to enhance beneficial socio-economic effects and mitigate adverse effects – for example high level work on a Jobs and Skills Strategy that would support the maximisation of beneficial employment effects locally.

Stage One Consultation document

10.1.14 Chapter 5 "*Jobs and People*" of the Stage One Consultation Document for the Project (Ref. 10.1) sets out initial work on workforce profile, the approach to the assessment of socio-economic effects, and a high level strategic approach to mitigation to maximise the socio-economic benefits and minimise adverse effects of the Project. Chapter 5 of the document draws on evidence of actual impacts from Hinkley Point C to quantify the scale of potential economic benefits achieved by other Nuclear New Build projects.

10.1.15 **Table 10.1** sets out a summary of the socio-economic work undertaken to date. All work listed below has been shared with Maldon District Council (MDC) and Essex County Council (ECC) for review.

Table 10.1: Work undertaken to date

Study	Scope of Study
Socio-economic Assessment Scoping.	Scoping work has drawn on a review of assessment scopes for other Nuclear New Build projects, and initial work on spatially specific baseline and Project parameters.
Project parameter development - Draft Construction Workforce Profile, and Operational Workforce Profile.	Initial analysis has been undertaken to estimate likely construction workforce numbers, including peak construction numbers – based upon central and higher workforce number scenarios, and 'home-based' and 'non home-based' worker split.
Project parameter development - Gravity Model.	Initial development of a worker Gravity Model has been carried out to understand likely worker distribution across a 90-minute reasonable maximum daily commute zone (60 minutes for

Study	Scope of Study
	'non home-based' workers). The model will show travel distances and potential locations of the workforce working on the construction phase of the Project.
Baseline Data Collection – Economy.	Baseline data collection and analysis of economic and labour market context for the Project – including policy context, and economic, labour market baseline indicators and tourist economy.
Baseline Data Collection – Housing Market and Accommodation.	Baseline data collection and analysis of existing accommodation and initial assessment of potential availability for workers.
Baseline Data Collection – Community Services.	Baseline data collection and demographic analysis of the existing population and communities, and existing social and community services.
Stage One Consultation Document "Jobs and People".	This document which was produced for the Stage One Consultation presents an initial strategy on the economy, employment and accommodation, and what the Project is likely to mean for local communities.

10.2 Legislation, Policy and Technical Guidance

10.2.1 This section identifies the relevant legislation, national and local policy and guidance which has informed the scope of the assessment relevant to socio-economics. While this includes all relevant details with respect to the scope of the assessment, when undertaking the assessment, a wider range of policies and guidance relevant to individual impacts and their mitigation will be drawn upon as appropriate. The assessment will have regard to all local policy within the spatial areas where potential socio-economic effects of the Project are identified, including policies in adjoining authorities, for instance Colchester, Tendring, Rochford and Braintree, where relevant. Further information on policies relevant to the Environmental Impact Assessment (EIA) and their status is set out in **Chapter 2**: **Policy and Regulatory Context**, which should be read in conjunction with this chapter.

10.2.2 The legislation and policy relevant to socio-economics are detailed in **Table 10.2**.

Table 10.2: Legislation and policy

Relevant Legislation and Policy	Relevance to the Assessment
Legislation	
The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (Ref. 10.2).	Sets out requirement to assess the likely significant effects of Nationally Significant Infrastructure Projects (NSIPs), including any direct and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development on populations.
The Equality Act 2010 (Ref. 10.3).	Sets out nine protected characteristics (age, disability, gender reassignment, marriage and civil partnership, race, religion or belief, sex and sexual orientation) and requires public bodies to exercise decision-making with due regard to the need to reduce the inequalities of outcome.
There is no UK legislation that sets out the requirements for socio-economic assessments or provides standards for significance of effects.	
National Policy	
Overarching National Policy Statement for Energy (EN-1) (Ref. 10.4).	Paragraphs 5.12.2 – 5.12.5 set out requirements for applicants to: consider *"all relevant socio-economic impacts*"; to describe existing baseline conditions and how the socio-economic impacts of NSIPs correlate with local planning policies; and to highlight that socio-economic impacts may be linked to other impacts (for example links between visual impacts and tourism and local businesses). It notes: *"The IPC may conclude that limited weight is to be given to assertions of socio-economic impacts that are not supported by evidence.".*

Relevant Legislation and Policy	Relevance to the Assessment
Overarching National Policy Statement for Nuclear Power Generation (EN-6) (Ref. 10.5).	Sets out requirements for applicants' assessment of socio-economic effects of new nuclear power stations specifically. It notes that generic requirements for energy NSIPs are set out in EN-1. Requirements for socio-economic assessment related to nuclear new build are: to identify at local and regional levels any socio-economic impacts associated with the construction, operation and decommissioning of the proposed nuclear power station – demonstrating the applicant has taken account of potential pressures on local and regional resources, demographic change and economic benefits.
National Planning Policy Framework (NPPF) (Ref. 10.6).	Sets out various policies with respect to the social and economic objectives of the planning system. It states significant weight should be placed on the need to support economic growth and productivity, taking into account both local business needs and wider opportunities for development. It also states that planning should aim to achieve healthy, inclusive and safe places, and provide the social, recreational and cultural facilities and services the community needs.
Local Policy	
South East Local Economic Partnership (LEP), Smarter Faster, Together: Towards a Local Industrial Strategy (2018) (Ref. 10.7).	Sets out strategic priorities to guide the LEP for the medium term. These include supporting ideas and enterprise, developing skills, putting in place infrastructure to support growth, and creating places to which residents and businesses aspire.

Relevant Legislation and Policy	Relevance to the Assessment
South East LEP, Skills Strategy – An employer led partnership approach to skills for a flourishing, inclusive economy (2018) (Ref. 10.8).	Sets out skills challenges and promotes a joined-up approach between business and education providers to identify and solve skills shortages.
Essex County Council (ECC) Economic Plan for Essex (2014) (Ref. 10.9).	Sets out ECC's ambitions for Essex and its partners in South East Local Enterprise Partnership (SELEP). Based on an understanding of the challenges and opportunities faced by Essex County the plan aims to: improve skills, closing the gap between the needs of employers and the choices learners make; invest in infrastructure to support new jobs and homes; and, enhance productivity, with a focus on key growth sectors. This policy is in the process of being updated. The revised policy has similar themes of a dynamic, resilient, inclusive and connected economy.
Maldon District Council (MDC) Local Development Plan (2017) (Ref. 10.10).	*"Policy S1 Sustainable Development"* states the Council will apply key principles in decision making including "ensuring a healthy and competitive local *economy by providing sufficient space, flexibility and training opportunities for both existing and potential businesses"; deliver housing growth that will meet local needs… in the most sustainable locations"; " create sustainable communities by retaining and delivering local services and facilities"; "identify the capacity and constraints of local infrastructure and services and seek to mitigate identified issues"; and minimise the need to travel and where travel is necessary, prioritise sustainable modes of transport*". "*Policy S2 Strategic Growth"* sets out the housing delivery numbers for Maldon, and allocated sites. Sites that come forward outside the allocation will need to demonstrate they will not prejudice or delay the delivery of other development, and there will be sufficient infrastructure to support.

Relevant Legislation and Policy	Relevance to the Assessment
	"Policy E1 Employment" sets out support for employment generating developments and investment to deliver a minimum of 2,000 net additional jobs in the District by 2029. *"Policy E3 Community Services and Facilities*" sets out "*New development proposals in the District will be expected to contribute towards the provision of community facilities where an increased need will arise in the local area as a result of the development".* *"Policy E5 Tourism"* states *"the Council will support developments which contribute positively to the growth of local tourism".* *"Policy E6 Skills, Training and Education"* states *"the Council will work with partners to support the provision and enhancement of training and educational facilities… to meet the needs of the community, local businesses and the local economy".* *"Policy N1 Green Infrastructure Network"* states "*there will be a presumption against any development which may lead to the loss, degradation, fragmentation and or isolation of existing or proposed green infrastructure*". *"Policy N3 Open Space Sport and Leisure"* states "*in principle development must contribute towards improving the provision, quality and/or accessibility of local and strategic open space, sports and associated community and leisure facilities*". *"Policy I1 Infrastructure and Services"* sets out measures to improve infrastructure within the District by protecting existing infrastructure and ensuring new developments provide an appropriate level of infrastructure to meet community needs.
MDC Economic Prosperity Strategy 2013-2029 (no date) (Ref. 10.11).	"*Strategic Intervention 2 – Support Diversification and Enterprise*" sets out the Council's aspiration to support the visitor economy and promote a vibrant business community. *"Strategic Intervention 3 – Improve Skills and Training Provision"* sets out measures to build long-term improvements to skills levels including developing employer-led training, extending employer

Relevant Legislation and Policy	Relevance to the Assessment
	and school engagement projects, promoting apprenticeships and pre-apprenticeship programmes, and enabling adult up-skilling and re-skilling.
Chelmsford City Council (CCC) Local Plan (2020) (Ref. 10.12).	*"Strategic Policy S5"* – Protecting and Enhancing Community Assets sets out the Council's approach to protecting community assets from changes of use or redevelopment. *"Strategic Policy S6"* Housing and Employment Requirements – sets out a minimum housing delivery target of 805 net new homes per annum and a jobs target of 725 net additional jobs per annum. *"Strategic Policy S8"* – Delivering Economic Growth sets out the Council will make provision for flexible and market-responsive allocations of employment land. *"Strategic Policy S9"* – Infrastructure Requirements sets out new development must be supported by the provision of infrastructure, services and facilities that are identified as necessary to serve its needs.

Technical guidance

10.2.3 There is no formal technical guidance or criteria of relevance to the assessment of socio-economic effects. However, established practice from the socio-economic assessment for consented Nuclear New Build and other major infrastructure projects will be considered, including with regard to defining significance of effects, monitoring and governance of mitigation, an iterative approach to assessment, and front-loading engagement (an approach that was used to develop the assessment of effects for other projects including Hinkley Point C and Sizewell C).

10.2.4 Unlike some other technical aspect chapters where absolute levels or changes define significance, for socio-economics changes are assessed in the context of the sensitivity of the existing baseline, a definition of which will be developed through the EIA process.

10.3 Consultation and Engagement

10.3.1 This chapter has been informed by consultation and engagement with stakeholders.

10.3.2 In addition to formal engagement and statutory consultation, engagement has and will continue to take place through the socio-economic working groups which have membership from MDC, ECC and other relevant stakeholders including, but not limited to, other relevant local planning authorities, local economic and skills organisations, public services planning bodies, the National Health Service (NHS), and the emergency services. The applicant will prepare technical notes throughout the EIA process for review and agreement with relevant stakeholders.

10.3.3 The following working groups have been established or are planned: an Over-arching Socio-economic Working Group; Economy Working Group; Jobs, Skills and Supply Chain Working Group; Accommodation and Housing Working Group; Community Working Group; Tourism Working Group; and an Emergency Services and Community Safety Working Group.

10.3.4 It is anticipated that the scope of the assessment, including developing the baseline, identifying sensitive receptors, and assessing likely effects and mitigation will be developed iteratively through ongoing consultation with relevant stakeholders.

10.3.5 **Table 10.3** details technical engagement to date which has occurred outside of formal statutory consultation. **Table 10.4** provides a summary of consultee comments arising from Stage One Consultation, along with responses identifying how considerations will be dealt with through ongoing consultation on scoping, baseline development, impact assessment and mitigation design.

Table 10.3: Technical engagement

Consultee	Points of Discussion
Summary of Technical Engagement to date	
MDC ECC (including ECC Skills Strategy and Growth (SSG) Team). CCC SELEP. Essex Chamber of Commerce. Mid and South Essex NHS Sustainability and Transformation Partnership (STP).	A number of workshops have taken place (as of August 2020) between the applicant and MDC, ECC and other relevant stakeholders on the potential socio-economic impacts of the Project. An ongoing programme of overarching socio-economic and topic-specific technical notes and working groups is planned as part of the iterative and collaborative process of determining the socio-economic baseline and impact assessment. Overarching Socio-economic Working Group Workshops - 04 December 2019 and 29 April 2020 Discussion on scope of socio-economic workstream, EIA methodology, and process and governance of ongoing engagement. Housing and Accommodation Working Group - 22 June 2020 Discussion on scope and Draft Technical Note: Housing and Accommodation Baseline. Socio-economics EIA Scoping briefing: MDC and ECC (joint briefing with Recreation and Human Health) – 24 June 2020 Discussion on methodology and scope of assessment set out in Draft Socio-economic EIA Scoping Chapter. Economy Working Group - 30 June 2020 Discussion on scope and Draft Technical Note: Economic Baseline.

Consultee	Points of Discussion
Responses Relevant to Baseline Assessment	
MDC ECC	Issues raised: MDC and ECC raised that a wider range of policy should be referenced by the socio-economic scoping chapter, some of which is still under development. **Section 10.2** identifies the relevant legislation, national and local policy and guidance which has informed the scope of the socio-economic assessment. While this includes all relevant details with respect to the scope, when undertaking the assessment, a wider range of policies and guidance relevant to individual impacts and their mitigation will be drawn upon as appropriate. The applicant welcomes inputs from stakeholders on the local evidence base, including policy, to inform the assessment and understands that some policy is currently under development. The socio-economic assessment will take account of all available relevant information up to the of finalisation of the ES for the DCO application. MDC and ECC raised preference that local data should be used over national data where it is available and reliable. A specific area of concern was raised around tourist accommodation data availability (and specific concern around the reliability of Visit Britain Tourist Accommodation Stock Audit, 2016).The applicant has set out in a Technical Note, which has been shared with stakeholders, the approach to the baseline assessment, including relevant national data sources which will be supplemented with local data sources where available and reliable. As above, the applicant welcomes inputs from stakeholders on the local evidence base and will draw on all available data to inform the assessment. MDC and ECC raised the potential impact of Covid-19 on data availability and its collection. **Section 10.5** sets out the applicant's approach to developing a baseline that reflects both the most recent data available and is robust to changes including the effects of the Covid-19 virus and Brexit that could cause demand side and supply side shocks to the economy and labour market, and may affect the accuracy and reliability of data over the short to medium term.

Consultee	Points of Discussion
Responses Relevant to Impact Assessment	
MDC ECC	MDC and ECC asked how levels of significance will be determined. The overarching methodology for determining significance is set out in **Chapter 5: The EIA Process and Methods** and methodology specific to the socio-economic assessment is presented at **Section 10.6.** The precise methodology for determining significance is not set out at this scoping stage but will be established through engagement with stakeholders and the Working Group process, in the context of local baseline conditions. MDC and ECC raised ensuring local impacts are properly addressed, particularly at Maldon level and immediately around the site and to take account of service planning boundaries. Study areas for the assessment are set out at **Section 10.4**. Where appropriate and proportionate, the assessment of effects may be carried out at the local ward-based scale to assess potential localised effects. MDC raised potential effects on businesses, including marine agriculture, food producers and others, that rely on the Maldon "brand" that could be impacted by the Project. Socio-economic receptors, including local businesses, are set out in **Section 10.7**. As set out in **Section 10.2** NPS EN-1 requires all potential socio-economic effects of the Project to be assessed and accorded weight where they are evidence based. The applicant will work with stakeholders to understand whether there is an evidence base to demonstrate potential effects on local businesses arising from impacts on the Maldon brand, as a result of the Project. MDC and ECC sought clarity on the temporal scope of assessments, including the impacts of removal and reinstatement. **Section 10.6** sets out the temporal scope of the assessment, which will assess peak effects of the construction, operational and where relevant removal and reinstatement phases.

Table 10.4: Stage One Consultation comments

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
Assessment scope.	Stakeholders including MDC and ECC, Colchester Borough Council (CBC) and SELEP raised potential effects that were not identified or not identified clearly in the Stage One consultation documents, including potential effects on existing local community amenities, the local housing market, and potential tourism effects in specific locations.	**Section 10.7** of this chapter clarifies the socio-economic receptors and likely potential socio-economic effects of the Project. Potential receptors include local businesses, the labour market, local and regional economy, including tourism and agricultural, and other economic sectors, housing and accommodation, and community facilities and public services, including emergency services and public safety.
Stakeholder engagement.	Stakeholders including MDC and ECC, CCC, East Suffolk Council and Suffolk County Council, and the UK Innovation Corridor requested that local authorities, local businesses and other relevant stakeholders are engaged with early on potential socio-economic effects, and that baseline assessment evidence base and Project Implementation Plans are developed by the applicant in further detail and shared with stakeholders.	**Section 10.3** of this chapter details the engagement that has taken place to date and the proposed approach to ongoing engagement with stakeholders throughout the EIA process, including to discuss baseline assessment, potential socio-economic effects and Project Implementation Plans.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
Assessment methodology and scope.	MDC and ECC raised the need for the socio-economic assessment to adequately assess both beneficial and adverse socio-economic effects across the workstream. SELEP raised the need to assess the wider and long-term economic and community effects of the Project.	The assessment will consider both beneficial and adverse socio-economic effects, as indicated in **Section 10.1**. Potential effects and the evidence base to support assessment work will be discussed through ongoing engagement including through planned socio-economic working groups. The assessment will focus on the peak of construction as that is where (most) impacts will be greatest, but it will include assessments of other points (for example, in the early years). The assessment will set out the temporal nature of those impacts (for example. short-term temporary or permanent). The operational effects (which are more long-term or permanent in nature) will also be assessed.
Design	Stakeholders including MDC, ECC and SELEP raised the need to align employment, skills and supply chain strategies and Project Implementation Plans with existing regional strategies. Suffolk County Council raised potential jobs, skills and supply chain synergies between the Project and the Sizewell C development.	Design of implementation strategies on jobs, skills and supply chain will be developed through ongoing engagement with stakeholders through the Jobs, Skills and Supply Chain Working Group. Project provided mitigation for accommodation and/or community facilities effects are likely to be part of the mitigation package that will be

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
	CCC raised potential for legacy benefits of project-provided accommodation and/or community facilities.	designed to meet project requirements and deal with impacts, and designed in collaboration with the working groups, and will include consideration of long-term effects.

10.4 Data Gathering Methodology

Study area

10.4.1 This section presents the study areas for the socio-economic assessment. These are defined with respect to likely significant impacts, which include those that arise from physical development (from the main development site, off-site Power Station Facilities, or off-site associated development) and from the impacts of the workforce. Workforce impacts are likely to include transport and labour markets (for home-based workers), and for non-home based workers there will be a range of effects on, for example, accommodation markets and community infrastructure based on where they live.

10.4.2 The study areas therefore will be based on the likely spatial extent of potential socio-economic effects and will vary by the effect considered. In order to collect relevant baseline data spatial areas will need to be translated into administrative areas that match them as closely as possible. In some cases, bespoke areas will be used (for example, school catchments). Where effects are determined by travel times, these are likely to be affected by transport interventions (which may include, for example, park and ride facilities and off-site highways works) so the definition of these study areas may change as optioneering and Project design evolves. If they do change, the data collected for the baseline will be updated accordingly.

10.4.3 **Figure 10.1** shows the following study areas in relation to the main development site:

- Local wards (Althorne, Burnham-on-Crouch North, Burnham-on-Crouch South, Mayland, Southminster, and Tillingham);
- Local authority areas (main development site, off-site Power Station Facilities and off-site associated development) (Maldon District, Chelmsford District and Essex County); and
- County area (Greater Essex (Essex County, Southend-on-Sea borough and Thurrock borough)).

Administrative areas

10.4.4 Administrative geography is the main scale at which public datasets are available – these scales ranging from smallest to largest scale are as follows:

- Output Areas, Super Output Areas and Wards – small or local area scale geographies will be used to define local areas where effects could occur at a sub-local authority scale – including localised housing or population changes;
- District and county – these areas will be used as the basis of assessment of impacts on the local labour market, housing market and public services;

- Regional – this area will be used to assess impacts of sub-national economic and labour market effects; and
- National – this area (depending on data availability – England, the UK or Great Britain) will be used to benchmark from a wider average or demonstrate the scale of effects where assessed to be national in scale.

Construction workforce spatial distribution areas

10.4.5 The assessment of potential socio-economic effects during the construction (and where relevant removal and reinstatement) phase(s) of the power station permanent development, off-site Power Station Facilities and off-site associated development including impacts of population change, localised housing and accommodation impacts, and impacts on public services, will require analysis of the workforce distribution to assess the spatial impact of effects associated with the construction workforce.

10.4.6 The spatial distribution will be estimated based on the outputs from the Gravity Model. The distribution of workers is defined (broadly) as being within 90 minutes travel time of the main development site (for home-based workers) and within 60 minutes (for non-home-based workers)The approach will be ward-based allowing analysis of effects at a ward level where appropriate.

10.4.7 As set out above, the Gravity Model is being developed jointly with the Transport workstream and a description of the transport elements of the model is set out in **Chapter 6: Transport**. The socio-economic inputs to the Model include some project information (the workforce profile for the main development site and off-site associated development construction) and baseline data on the supply of workers with relevant skills and of affordable and accessible accommodation in each ward.

10.4.8 The model is split into two. One for non-home-based (NHB) workers which extends to approximately 60 minutes from the site. This is the estimated maximum daily commute of workers who move to the area temporarily to work on the Project during the Bradwell B power station construction phase, and is in line with study areas used for other Nuclear New Build projects including Hinkley Point C and Sizewell C. The other is for home-based (HB) workers which extends to approximately 90 minutes from the site (which we call the construction daily commuting zone (CDCZ). This is based on research into the mobility of UK construction workers, and experience of other Nuclear New Build projects, and is considered the likely maximum daily commute time for most workers. An allowance may also be made for a small proportion of workers travelling longer distances. It should be noted from other Nuclear New Build projects that the density of HB and NHB workers tends to increase the closer they are to the main development site, with very few workers living at the furthest edge of the CDCZ.

Economic study areas

10.4.9 Publicly available economic datasets are generally published across all administrative geographies (down to the local level), although more recent data is available at a local authority scale.

10.4.10 The economic impacts of the Project will generally be assessed at local authority or wider scales – in line with the levels at which labour markets operate, and business services, skills provision and education are planned for. It will also be relevant to consider impacts across the South East LEP area as LEP areas are based on functional economic geography.

10.4.11 Potential economic effects will be assessed at a local level where appropriate and proportionate – including where impacts are expected associated with the distribution of the construction workforce across the 60-minute travel area and the 90-minute CDCZ.

10.4.12 The spatial scale for the assessment of impacts of the Project on the tourist economy will be considered based on the nature of the effects, and the location of tourist accommodation.

Housing and accommodation study areas

10.4.13 Publicly available accommodation datasets are generally produced across all administrative geographies (down to the local level), although more recent datasets are available at a local authority scale.

10.4.14 The impact of the Project on housing and accommodation will be assessed at both the district and local levels. Generally, the district is the appropriate level of assessment as this is the level at which housing services including support for households in housing need is provided.

10.4.15 Housing and accommodation impacts are also expected to be influenced by the spatial distribution of the workforce across the 60-minute travel area. Some assessment will therefore be carried out at a ward-based scale, where appropriate and proportionate to assess potential localised effects.

10.4.16 In line with requirements of the National Planning Policy Framework (NPPF) (Ref. 10.6), housing impacts will be assessed at the Strategic Housing Market Area (SHMA) scale. Maldon District is considered to be a single housing market area, as set out in the Local Development Plan.

Community services study areas

10.4.17 The impact of the Project on community services will be assessed in line with the scale at which services are planned. Some services including leisure and sport are planned for at the district scale, others including education are planned at the county scale.

10.4.18 Where relevant and proportionate the impact on community services at a local level will be assessed where significant effects are likely in particular local areas due to the expected spatial distribution of the construction workforce generated by the Gravity Model.

Sources of data used in scoping

10.4.19 As set out above, the likely significant socio-economic effects are scoped based on initial development of both the socio-economic baseline, and socio-economic parameters of the Project.

10.4.20 Data on the local socio-economic baseline is derived mainly from published information from public sources, including the Office of National Statistics (ONS) (for example, Census, Annual Population Survey, sub-national population projections, Business Register and Employment Survey), Department for Communities and Local Government (DCLG) and other public bodies at the national, regional and local scales including MDC and ECC.

10.4.21 Initial work on the socio-economic parameters of the project has included development of initial construction and operational workforce profiles, and initial work on a Gravity Model. Parameters will be updated and refined as the Project develops.

10.4.22 The EIA scoping exercise has been undertaken with reference to **Chapter 3: The Project**, and the likely location and search areas for the main development site, off-site Power Station Facilities, and off-site associated development.

10.4.23 The principal desk-based baseline data sources used are shown in **Table 10.5.** These are principle sources only, the full assessment will draw on data available at the time of the assessment, including local data sources shared by stakeholders through the process of engagement on the socio-economic assessment.

10.4.24 The Covid-19 virus has caused substantial demand side and supply side shocks to the economy and labour market. This may affect the accuracy and reliability of data over the short to medium term. The long-term effects of Covid-19, at both a local and national level, are not known and may still not be clear at the time of the DCO Application. Similarly, the effect of the UK's exit from the European Union (Brexit) is not yet known, and the full extent of any change to the economy and labour market may not be known for some time.

10.4.25 The proposed approach is to develop a baseline that reflects both the most recent data available and is robust to changes in the economic cycle, as a robust and valid basis for the socio-economic assessment.

Table 10.5: Data sources

Source	Data
ONS	2001 Census Data (Ref. 10.13). 2011 Census Data (Ref. 10.14). Mid-year sub-national population estimate data (2018) (Ref. 10.15). Population Projections (2016-based) (Ref. 10.16). Business Register and Employment Survey (2018) (Ref. 10.17). Annual Survey of Hours and Earnings (2019) (Ref. 10.18). Business Counts (2019) (Ref. 10.19). Claimant Count (2019) (Ref. 10.20). Annual Population Survey (2019) (Ref. 10.21). Regional productivity (2019) (Ref. 10.22). Subnational Dwelling Stock Estimates (2019) (Ref. 10.23).
Ministry for Housing, Communities and Local Government (MHCLG).	Indices of Multiple Deprivation (2019) (Ref. 10.24). Live Tables 122, 615 and 215, Vacancies and Dwelling Stock (2019) (Ref. 10.25).
Department for Education (DfE).	Schools Census number on roll data (2019) (Ref. 10.26).
Visit Britain.	Tourist Accommodation Stock Audit, 2016 (Ref. 10.27).
MDC	MDC Economic Prosperity Strategy 2013-2029. MDC Infrastructure Delivery Plan (2013) (Ref. 10.28). MDC Strategic Housing Market Assessment (2014) (Ref. 10.29).
ECC	Economic Plan for Essex, 2014. Essex Skills for Growth Strategy, 2019 (Ref. 10.30). Enterprising Essex: Meeting the Challenge – Final Report of the Essex Economic Commission, 2018 (Ref. 10.31). Schools Admissions Numbers (2020-21) (Ref. 10.32). 10 Year Plan: Meeting the demand for school places in Essex 2019-2028 (Ref. 10.33).

Source	Data
National Health Service (NHS).	NHS Choices GP list sizes (2019) (Ref. 10.34).
Sport England.	Active Places Power (2019) (Ref. 10.35).
South East LEP.	South East LEP wide Economy and Skills Report (Ref. 10.36). Sector and District economy overview reports (Ref. 10.37).
Cambridgeshire Insight.	East of England Forecasting Model (EEFM) (Ref. 10.38).
Construction Industry Training Board (CITB).	Construction Skills Network forecasts 2019-2023 – UK (Ref. 10.39).

10.5 Baseline Information

10.5.1 This section sets out a summary of the key relevant baseline data covering the study areas identified in **Section 10.4**. At district level, data is set out for MDC and CCC as host authorities for the Project. Where ward-level data is available baseline is also set out across the 60-minute (for housing and accommodation; and community services baseline areas) and 90-minute (economic baseline area) travel areas, and the local ward area.

10.5.2 The key project parameters as context to the baseline data set out below were set out at Stage One Consultation. The applicant consulted on a temporary construction workforce of up to 10,600, of which 3,000 would be home-based. Proposals were set out for temporary project-provided accommodation of up to 4,500 workers meaning approximately 3,100 workers would live in accommodation around the 60-minute travel area.

Current baseline

10.5.3 The significance of the socio-economic effects of the Project at different spatial scales will be assessed with regard to existing baseline conditions. A full assessment of baseline conditions will be carried out in consultation with stakeholders through the socio-economic Working Groups. This section summarises the latest baseline data for key receptors including the local population and labour and housing markets and the latest forecasts for the future baseline in terms of economic, population and housing growth.

Employment and labour market

10.5.4 Sub-national population estimates produced by the ONS (2016-based, published in 2018) indicate the working-age population (aged 16-64) of the 90-minute CDCZ is

3,458,000, of these 37,780 live in Maldon district, and 109,300 in Chelmsford district. The working-age population of the local ward area is 14,250.

10.5.5 Over the five years 2013-2018, the working-age population of the 90-minute CDCZ increased by 3.5% (absolute growth of 116,400 people). Over the same time period the working-age population of Maldon district increased by 0.3% (absolute growth of 100 people), Chelmsford district by 1.5% (1,630 people). The local ward area working-age population grew by 3.1% (432 people).

10.5.6 The latest Annual Population Survey (APS) data (for the year up to March 2020) is available at local authority level and above. This shows the employment rate across the local authorities wholly or partly within the 90-minute CDCZ is 75.9%, compared to 82.4% across Maldon district, and 78.9% across Chelmsford district. Approximately 142,100 people (4.1%) of working-age people across the local authorities wholly or partly within the 90-minute CDCZ are unemployed, including to 1,000 (3.0%) across Maldon district and 2,500 (2.9%) in Chelmsford.

Housing and accommodation

10.5.7 Initial analysis into the availability of accommodation within 60-minute travel area from the main development site, is set out in **Table 10.6**. The 60-minute travel area will be refined ahead of submission of the DCO application and the finalisation of the ES to reflect planned transport interventions including park and ride facilities that are expected to affect travel times to the site.

10.5.8 This analysis draws on publicly available datasets, including the ONS and Visit Britain. Visit Britain's tourist accommodation stock audit is the best currently available source of tourist accommodation data. Further work is ongoing to investigate whether more refined local data could become available.

Table 10.6: Accommodation within 60-minute drive time of the main development site (estimated bed spaces)

Accommodation Type	Estimated Accommodation – 60-minute Drive Time Area
Tourist accommodation – hotels, non-serviced holiday dwellings, tourist campsites and other collective accommodation.	14,450 (bedspaces).
Private rented accommodation.	119,610 (bedspaces).
Owner occupied accommodation.	306,850 (homes).

Population and community services

10.5.9 ONS population estimates (2016-based) show approximately 1,046,000 people live in the wards within the 60-minute travel area, including 64,430 people in Maldon district, and 177,100 in Chelmsford district. Approximately 24,120 people live across the local ward area.

Future baseline

Economy

10.5.10 ONS population projections are available at local authority level and above. Across the local authorities wholly or partly within the 90-minute CDCZ, population growth among the working-age population over the 10 years 2018-2028 is expected to be 3.5%, and 4.5% over the 20 years 2018-2038. In Maldon the working-age population is projected to grow more slowly 2018-2028 – by approximately 570 people (1.5% growth), and by approximately 415 people (1.1% growth) over the 20 years 2018-2038. In Chelmsford higher growth is expected – growth of 6,580 working-age people (6.0%) 2018-2028, and 9,530 people (8.7%) 2018-2038.

10.5.11 The EEFM shows the number of jobs based in Maldon District is expected to grow by approximately 900 jobs (3.5%) 2018-2028, and by 1,800 jobs (7.8% growth) 2018-2038. MDC is currently undertaking an Economic Study that may make an update of this estimate available in due course. In Chelmsford higher growth of 4,100 jobs (4.7% growth) is expected 2018-2028 and 8,500 jobs (10.6%) 2018-2038.

10.5.12 Total GVA in Maldon District is expected to increase by £164 million 2018-2028 to £1.3 billion, and by £357 million 2018-2038 to £1.5 billion. In Chelmsford total GVA will increase by £727 million 2018-2028 to £5.7 billion, and by £1.6 billion 2018-2038 to £6.0 billion.

10.5.13 Labour productivity is expected to increase by £9,600 per job to £52,500 in Maldon district over the 20 years up to 2038. In Chelmsford labour productivity is projected to increase by £11,200 per job to £55,300 by 2038.

Housing and accommodation

10.5.14 Housing growth in Maldon District is expected to be delivered in line with the local plan target of 310 homes per annum. The Government's White Paper Planning for the Future consultation document (Ref. 10.40) published in August 2020 includes consultation on the methodology for calculating local authority housing targets. Assumptions on housing growth will be updated accordingly in due course as new methodology and associated target numbers are announced.

Population and community services

10.5.15 ONS population projections show over the 10 years 2018-2028 the population across the local authorities partly or wholly within the 60-minute travel area is

expected to grow by 6.0% to 1,876,000 people, and by 10.6% to 1,957,000 people 2018-2038. Maldon district will grow by 6.6% to 68,670 people up to 2028, and by 11.9% to 72,080 up to 2038. In Chelmsford 7.5% growth is expected up to 2028 (190,300 people) and 12.7% up to 2038 (a total population of 199,600 people by 2038).

10.5.16 The future baseline for the provision of community facilities and social infrastructure over the medium-term is highly uncertain. Due to this uncertainty, for the purposes of this assessment, it is assumed the future baseline for community facilities would be unchanged from the current baseline to the completion of the Project, except where new accommodation and facilities are expected to be delivered in line with general population growth, or as set out in Council plans including MDC's Local Authority Strategic Infrastructure Plans.

Planned further surveys and studies

10.5.17 The approach to surveys and studies for the socio-economic assessment differs from other aspect chapters and reflects the iterative and collaborative nature of the overall assessment process, as set out in **Section 10.3**. Good practice will be followed across all aspects of the assessment, including survey work. Sharing and collaboration with stakeholders will be facilitated through the ongoing programme of working group interactions.

10.5.18 **Table 10.7** sets out planned work that will further define the baseline conditions of socio-economic receptors, the spatial extent of impacts, and the central socio-economic case to be assessed – all of which will input into the socio-economic assessment of the Project.

10.5.19 Work will be ongoing throughout the EIA process to identify potential impacts and develop appropriate implementation, management and enhancement strategies, further detail on which is set out in **Section 10.8**.

10.5.20 Baseline information for the socio-economic assessment will be updated as new datasets are released, and work will be undertaken to account for trend shifts that have occurred where more recent data is not available (for example to update 2011 Census datasets).

Table 10.7: Planned further surveys and studies

Study Name or Type	Proposed Date and Scope of Study
Baseline, Project Parameters, Mitigation Strategy: Accommodation Strategy.	April 2020 – ongoing. Ongoing work to understand accommodation baseline, impacts of project parameters (workforce profile and home-based or non-home-based split), and design of mitigation. Iterative and collaborative approach to be taken with MDC and ECC Housing and Accommodation Working Group. Work will ultimately feed into a Project Accommodation Strategy to be submitted with the application.
Baseline, Project Parameters: Gravity Model development.	April 2020 – ongoing. Gravity Model refinements and updates to be made based on updated Project parameters and baseline data, and transport workstream updates as set out in **Chapter 6: Transport**.
Project Parameters: Workforce Profile development.	Ongoing. Refinements to workforce profile to generate details showing quarterly workforce numbers across the construction phase. Including broad occupational split.
Project Parameters, Baseline, and Mitigation: Sport and Leisure audit and estimated demand.	August – October 2020. Audit of baseline sport and leisure provision across 60-minute drive time area, and assessment of potential impacts of the Project during the construction phase.

Study Name or Type	Proposed Date and Scope of Study
Baseline and mitigation. Tourism Assessment.	July – December 2020. Assessment of tourism economy baseline and sector jobs that could be impacted by the Project. Iterative and collaborative approach to be taken with MDC and ECC Tourism Working Group.
Baseline, project parameters. Local economic effects, including effects on agricultural sector (land and sea agriculture).	July – September 2020. Assessment of local economic baseline, including land and sea agricultural sector baseline (including quantity of agricultural land in Maldon District, and agricultural sector jobs that could be impacted by the Project).
Project Parameters, Impact Assessment and Mitigation. Economic Benefits Statement.	April 2020 – Ongoing. Modelling and defining Economic Benefits of the Project.
Jobs, Skills and Education Strategy.	April 2020 – Ongoing. Collaborative and iterative strategy development on Project approach to jobs, skills and education – to include but not limited to, recruitment, training and apprenticeship strategies, schools outreach and work with hard to reach groups.

Study Name or Type	Proposed Date and Scope of Study
Supply Chain Strategy.	April 2020 – Ongoing. Baseline analysis, collaborative and iterative strategy development on Project approach to supply chain engagement, and support, local supply chain spend and associated opportunities.
Baseline, Mitigation. Community Safety Management Plan.	September 2020 – Ongoing. Survey of baseline emergency services and community safety provision and likely potential impacts of the Project.

10.6 Proposed Approach to the Assessment

10.6.1 **Chapter 5: The EIA Process and Methods** sets out the overall approach to the assessment methodology for the Project. This section sets out where the approach to the socio-economic assessment differs from the general approach.

10.6.2 The assessment of socio-economic effects is determined by the socio-economic parameters of the development, the baseline conditions, and proposed mitigation (as set out in **Section 10.1**).

Spatial scope

10.6.3 The spatial scope for the socio-economic assessment is set out in **Section 10.4**.

10.6.4 As set out in **Section 10.4**, most socio-economic effects will occur either around the physical elements of the development (both the main development site and off-site associated development and off-site Power Station Facilities sites) or within the 60 and 90-minute zones for NHB and HB workers. These effects fall into four broad categories:

- Economic effects – generally experienced at wider spatial scales reflecting the level at which labour markets operate and business services, skills provision and education are planned for. Effects will be considered at the local authority, Local Enterprise Partnership, county and regional scales. The economic effects of the non-home-based construction workforce will be assessed across the 60-miute travel time area, and the employment effects for home-based construction workers will be assessed across the 90-minute daily commuting area. Where relevant and proportionate an assessment will be made of any localised effects at the ward level.

- Housing and accommodation effects – generally experienced at the local authority scale reflecting the level at which housing services are provided. Strategic Housing Market Areas will also be considered where relevant and proportionate. Accommodation effects related to the non-home-based construction workforce will be assessed across the 60-minute travel time area. Where relevant and proportionate an assessment will be made of any localised effects at the ward level.

- Community and population effects – will be assessed at the level of spatial scale relevant to service provision within the 60-minute zone (as these effects are driven by non-home based workers). Local service provision such as GP surgeries will be assessed at a localised catchment scale, whereas services that cover a larger spatial area such as policing and ambulance services will be assessed at the relevant larger scale.

- Tourism effects – will be assessed at scales relevant to the nature of effects (for example, where transport impacts have an effect on tourism), and the location of sensitive receptors such as tourist accommodation and designated sites or

areas (relevant scale to be confirmed, in consultation with stakeholders through Socio-economic Working Groups.

Temporal scope

10.6.5 In line with **Chapter 5: The EIA Process and Methods**, potential socio-economic effects will be categorised in line with whether temporary (short-term (0-2 years), medium-term (2-5 years), long-term (5-10 years)), or permanent.

10.6.6 Potential effects will be assessed at key stages of the construction, operation and (where relevant) removal and reinstatement phases of the Project. These will apply to the main development site, off-site Power Station Facilities, and off-site associated development.

10.6.7 Based on experience from other nuclear new-builds, the construction phase is likely to generate the largest effects, most of which will be temporary (long-term) in nature.

10.6.8 Potential construction phase effects relate mainly to the size of the workforce (home-based and non-home-based elements) and the extent to which both of these peak is likely to be the peak of the workforce and related socio-economic effects.

10.6.9 There may also be different impacts in the early years of the construction of the main development site, before key mitigation is in place (such as transport improvements which may include, for example, park and ride facilities and off-site highways works). Where these are higher than the peak impact, an early years assessment will be undertaken.

10.6.10 There is unlikely to be an equivalent situation later in the construction phase (i.e. after the peak) so a post-peak assessment is not necessary. Any impacts that persist after the peak and are longer-term in nature, will have been assessed in the peak assessment and as long as the necessary mitigation remains in place, they do not need re-assessing post-peak, when the impacts to be mitigated will be lower.

10.6.11 Operational phase effects will be permanent over the operational life of the Bradwell B power station. The effects associated with the temporary construction workforce will not be relevant to the operational phase.

Assessment of effects and determining significance

10.6.12 The general approach to assessment of effects and determining significance that will be used for the EIA is provided in **Chapter 5: The EIA Process and Methods**. However, the remainder of this section sets out how the approach has been applied and where it has been adapted to deal with the specific requirements of socio-economics.

Sensitivity

10.6.13 The sensitive socio-economic receptors fall under topic areas: local businesses, the labour market, local and regional economy (including tourism and agricultural and

other economic sectors); accommodation and housing; and community facilities and public services, including emergency services and public safety. It is not possible to ascribe a relative "value" to these receptors as impacts could be felt at all spatial scales and are as important to individuals and communities in a local area as they are at a regional scale. Each of these is a dynamic receptor, that is, the baseline responds to external changes in ways that can reduce the level of impact. Housing and labour markets in particular are large, liquid and dynamic and do respond to changes in supply and demand. For example, the size of the labour market will often increase as a result of new jobs becoming available.

10.6.14 The sensitivity of each receptor will be assessed therefore on its ability to respond to change (based on recent rates of change and turnover). The baseline assessment will identify the extent of background change, and then as far as possible, the scale of likely impacts will be benchmarked against this change. For example, the impact of the employment change associated with the Project will depend on the dynamism of the existing labour market and ability to change to respond to the Project requirements. This capacity is dependent on wider economic and demographic trends which can very between location and over time. The socio-economic assessment will consider such information as it is produced and in consultation with the local authorities and other stakeholders will define appropriate quantitative sensitivity criteria.

Magnitude of change

10.6.15 For the socio-economic assessment, the magnitude of change will be identified based on the ability of the relevant receptor to respond to change – taking into account the nature of the change in terms of whether they are permanent or temporary impacts, adverse or beneficial, affect a small or large spatial area, the recent baseline rates of change and the capacity for change in the locality.

Determination of significance

10.6.16 The significance of a socio-economic effect will be a product of the sensitivity of the receptor and the magnitude of change, as defined above and using the significance evaluation matrix set out in **Chapter 5: The EIA Process and Methods**.

10.6.17 Following the classification of an effect using this methodology, a clear statement will be made as to whether that effect would be 'significant' or 'not significant', in line with the generic classifications set out in **Chapter 5: The EIA Process and Methods**. As a general rule, major and moderate socio-economic effects are considered to be significant, while minor and negligible effects are considered to be not significant. However, professional judgement will also be applied where necessary.

10.6.18 Some socio-economic impacts cannot be quantitatively assessed; in such cases a qualitative assessment will be used.

10.6.19 The significance of the impact will not necessarily mirror the scale of effect, with other key influences taken into account such as the geographical extent, duration

and reversibility, the capacity of a receptor to absorb change, and recent rates of change.

Mitigation and residual effects

10.6.20 The socio-economic assessment will report on the likely effects of the Project following the implementation of mitigation.

10.6.21 **Section 10.8** sets out a high-level summary of proposed mitigation, which will evolve through the planning and refinement of the Project, in collaboration with relevant stakeholders.

10.6.22 Where relevant, reflecting the dynamic nature of the baseline environment and effects on socio-economic receptors, and the potential for change given the overall long-term nature of the Project construction and operation phases, a flexible and adaptive approach to mitigation will be developed to respond to effects on socio-economic receptors that arise due to this dynamism and inherent uncertainty. This will be managed through a "plan-monitor-manage" approach and will be identified where relevant in the assessment.

10.7 Scope of the Assessment

Potential receptors

10.7.1 The principal socio-economic receptors that have been identified as being subject to potential effects are summarised in **Table 10.8**.

10.7.2 For all receptors, potential socio-economic effects could either be project-wide (i.e. relating to the workforce or wider economy) or related to specific to individual parts of the project - the main development site, off-site Power Station Facilities, or off-site associated development.

Table 10.8: Receptors subject to potential effects

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Project-wide and site specific – main development site, off-site Power Station Facilities, or off-site associated development.	Construction, operation and off-site associated development removal and reinstatement.	Local businesses.	Potential effects on businesses associated with disturbance during construction, operation and where relevant removal and reinstatement phases – including potential transport, marine biology, and soils and agriculture impacts.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Project-wide and site specific – main development site, off-site Power Station Facilities, or off-site associated development.	Construction, operation and off-site associated development removal and reinstatement.	Labour market.	Potential employment effects, and wider effects on the labour market as a result of construction, skills and supply chain opportunities associated with the Project.
Project-wide.	Construction, operation and off-site associated development removal and reinstatement.	Local/regional economy, including tourism and agricultural, and other economic sectors.	Potential economic effects of business and supply chain opportunities, and wages and spending impacts associated with the Project.
Project-wide.	Construction, operation and off-site associated development removal and reinstatement.	Accommodation	Potential effects on accommodation locally associated with the Project.
Project-wide and/or site specific – main development site, off-site Power Station Facilities, or off-site associated development.	Construction, operation and off-site associated development removal and reinstatement.	Community facilities and public services, including emergency services and public safety.	Potential effects on community facilities and public services due to potential disturbance during construction, and/or population and demographic change leading to changes in demand associated with the Project.

Likely significant effects

10.7.3 The effects on socio-economic receptors which have the potential to be significant and that will be taken forward for assessment are summarised in **Table 10.9** and **Table 10.10**.

Table 10.9: Likely significant socio-economic construction effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Project-wide and site specific – main development site, off-site Power Station Facilities, or off-site associated development.	Construction and where relevant off-site associated development removal and reinstatement.	Potential disturbance associated with construction – including potential transport, marine biology, and soils and agriculture impacts.	Local businesses
Project-wide and site specific – main development site, off-site Power Station Facilities, or off-site associated development.	Construction and where relevant off-site associated development removal and reinstatement.	Employment and skills opportunities, direct and in the supply chain.	Labour market.
Project-wide.	Construction and where relevant off-site associated development removal and reinstatement.	Economic effects – worker wages and spending in the supply chain, effects on the tourism and agricultural sectors.	Local or Regional economy, including tourism and agricultural sectors.
Project-wide.	Construction and where relevant off-site associated development removal and reinstatement.	Increase in demand for accommodation.	Accommodation locally – all accommodation sectors.
Project-wide and site specific – main development site, off-site Power Station Facilities, or off-site associated development.	Construction and where relevant off-site associated development removal and reinstatement.	Increase in demand for community services and facilities.	Local community services and facilities.

Table 10.10: Likely significant socio-economic operational effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Project-wide, permanent power station, and off-site associated development.	Operation of the Bradwell B power station.	Employment and skills opportunities, direct and in the supply chain.	Labour market.
Project-wide, permanent power station, and off-site associated development.	Operation of the Bradwell B power station – associated economic effects.	Economic effects – worker wages and spending in the supply chain, effects on the tourism and agricultural sectors.	Local or Regional economy, including tourism and agricultural sectors.
Project-wide, permanent power station, and off-site associated development.	Operation of the Bradwell B power station – potential demand for accommodation.	Effects on demand for accommodation.	Accommodation locally – all accommodation sectors.
Project-wide, permanent power station, and off-site associated development.	Operation of the Bradwell B power station – potential demand for community services.	Potential disturbance associated with operational phase, and potential change in demand for community services and facilities.	Local community services and facilities.

10.8 Potential Mitigation

10.8.1 Central to the socio-economic assessment will be an iterative process of identifying and planning mitigation to enhance beneficial effects and mitigate any significant adverse effects. The Project will do this in parallel with the technical assessment work and working in consultation with the local authorities and other public agencies and stakeholders, including through the socio-economic working groups set out in **Section 10.3**.

10.8.2 Mitigation would comprise, but would not necessarily be limited to, the following mitigation:

- Project design measures (embedded) – such as the proposed project-provided accommodation and caravan park site or sites that would accommodate non-home-based workers close to the main development site, reducing potential transport, accommodation and other community impacts.

- Good practice measures (embedded) – such as a Worker Code of Conduct to ensure workers are required to adhere to best practice requirements in terms of behaviour, and measures to secure local recruitment including outreach and employment and training activities in the local area, and a Community Safety Management Plan setting out strategy to mitigate potential effects with respect to community safety and emergency response.

10.8.3 If significant adverse effects are assessed as likely, once this mitigation is taken into account, additional mitigation will be identified. For indicative purposes, other nuclear new build projects have developed such mitigation which has included mitigation such as:

- a Community Fund;

- a Tourism Fund;

- a Housing Fund; and

- a Public Services Contingency Fund.

10.8.4 This mitigation would likely be managed through establishing monitoring and management measures and developing thresholds after which secondary mitigation would be triggered. This will ensure mitigation is directed to the most effective areas.

Monitoring and management strategies, and implementation plans

10.8.5 It is anticipated additional supporting documents will be produced which will include implementation of strategies related to accommodation, community safety and economic, education, skills and supply chain management. These will provide details of the approach to managing effects on specific sub-topics.

10.8.6 Where likely significant effects are identified but specific strategies not required, the Project will identify additional required mitigation, likely to be controlled through the use of requirements or obligations (pursuant to a legal agreement).

10.9 Assumptions and Limitations

Defining reasonable potential effects

10.9.1 The Project is likely to have complex socio-economic impacts. Assumptions will be produced to support the reasonable maximum potential effects (beneficial and adverse) of the assessment. This will demonstrate the maximum scale of beneficial impacts and ensure mitigation meet the reasonable worst case for adverse impacts. The timing of the worst case of impacts may vary by receptor and/or effect thus in

each case the assessment will define the reasonable maximum potential effects. For the workforce profile, this is expected to be at peak construction for the main development site, however the assessment will also have regard to pre-peak effects.

10.9.2 The peak construction will be based on a set of assumptions including the Project timescale, number of workers needed, the skill profile of workers required, commuting patterns, and accommodation sector and spatial breakdown of the works. These assumptions will be informed by engagement with the local authorities.

Project parameters

10.9.3 Socio-economic parameters of the Project will, in interaction with baseline conditions and proposed mitigation, input into the assessment of effects. Assumptions on parameters will include: the duration and phasing of the Project; the size, profile and characteristics of the construction, operational and where relevant removal and reinstatement workforces; the recruitment of the workforce – including the extent to which workers would be home-based and non-home-based; and the Project cost.

10.9.4 These parameters will be based on technical modelling and professional assessment but would be based on projections and therefore could be subject to change.

Defining “worker”

10.9.5 Construction worker numbers (the workforce profile) will be defined to enable the distinction of workers who may generate the potential of socio-economic effects (for example on housing or public services), from visitors. This is usually based on the “five-day rule” which was adopted for reporting on construction of the 2012 London Games. This counts as workers anyone who works at the site for more than five days in total or four consecutive days in any month.

Baseline dynamism

10.9.6 As with any data, the data used in this assessment represent a single point in time and can change due to wider changes in economic conditions and demographic trends. As far as possible the assessment will aim to reflect the dynamic nature of this environment by using future projections and identifying sensitivities to change.

REFERENCES

Ref. 10.1 Chapter 5 “Jobs and People” of the Stage One Consultation Document for the Project Bradwell B. 2020.

Ref. 10.2 Parliament of the United Kingdom, The Town and Country Planning (Environmental Impact Assessment) Regulations. (London, 2017).

Ref. 10.3 Parliament of the United Kingdom, The Equality Act 2010. (London, 2010).

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11. HUMAN HEALTH

11.1 Introduction

11.1.1 This chapter sets out the approach which has been applied for determining the scope and content of the assessment of the potential human health effects of the Project. **Chapter 5: The EIA Process and Methods** introduces the overall Environmental Impact Assessment (EIA) process including the methodology for assessing affects and determining significance. The topic specific methodology for determining receptor value, sensitivity and impact magnitude for human health are provided in **Section 11.6**.

11.1.2 The underlying objective of the human health assessment is to facilitate more health-conscious planning and decision making, by investigating how the Project may influence health through a range of key determinants.

11.1.3 More specifically, the objective of the human health chapter will be to:

- present the existing health baseline established from desk-based studies, surveys and consultation;
- present the potential environmental effects on health arising from the proposed development, based on the information gathered and the analysis of outputs provided by inter-related technical disciplines; and
- highlight any necessary monitoring and/or mitigation measures that could prevent, minimise, reduce or offset any possible adverse effects on health, identified in the EIA process.

11.1.4 Due to the multi-disciplinary nature of human health, this chapter considers the relevance of assessments made by other technical aspects and determines if the data and outputs of these chapters is sufficient, or whether further assessment of effects on human health is required.

11.1.5 Chapters assessing effects with potential impacts on human health include: **Chapter 6: Transport**; **Chapter 7: Noise and Vibration**; **Chapter 8: Air Quality**; **Chapter 9: Radiological**; **Chapter 10: Socio-economics; Chapter 12: Climate Change; Chapter 13: Major Accidents and Disasters**; **Chapter 14: Soils, Geology and Land Use**; **Chapter 15: Water Environment**; **Chapter 16: Flood Risk and Drainage**; **Chapter 20: Landscape and Visual Assessment**; and **Chapter 21: Recreation.**

11.1.6 This chapter contains:

- a summary of work undertaken to date;
- an explanation of the scope of assessment, including:

- legislation, policy and guidance that inform the assessment;
- a description of consultation and engagement so far of relevance to human health;
- study area for the assessment;
- sources of data used in scoping;
- baseline conditions, including current desk studies and surveys; and
- planned further surveys and studies.

- the receptors that are proposed to be assessed and the effects which have the potential to be significant;
- the effects that are proposed can be scoped out of the assessment; and
- potential mitigation.

11.1.7 This chapter should be read in conjunction with the project description provided in **Chapter 3: The Project**.

Work undertaken to date

Project approach to human health

11.1.8 Reflecting the multi-disciplinary nature of human health, a health-conscious approach to planning will be embedded across the Project. The assessment of effects of the Project on health that will be set out in the Environmental Statement will reflect this cross-project approach whereby mitigation to prevent, minimise, reduce or offset any potential adverse effects on health and support beneficial health effects will be developed iteratively, in consultation with stakeholders, and in line with local health priorities.

Scope of assessment

11.1.9 'Health' is commonly defined as *"a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"* (the definition used by the World Health Organisation (WHO) since 1946) (Ref.11.1).

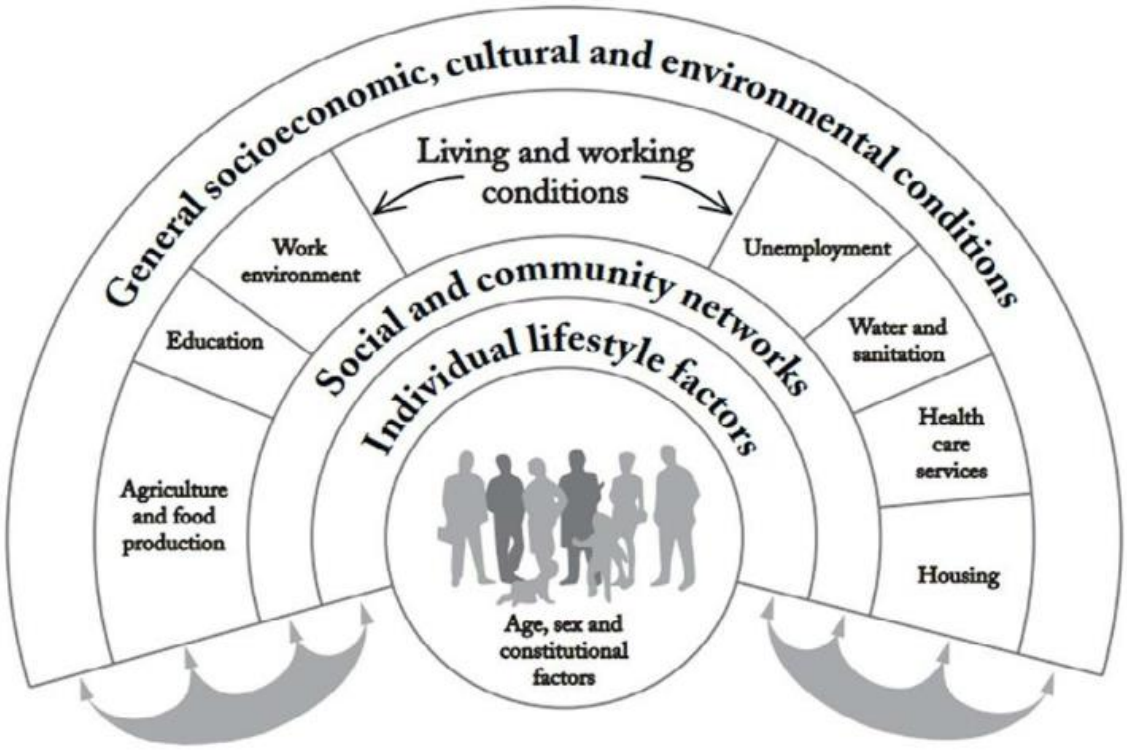
11.1.10 The scope of the human health assessment will be finalised in consultation with relevant stakeholders. It will consider potential impacts on human health arising as a result of the Project using a “source-pathway-receptor” model – a source being an effect of the Project that could impact human health, potential pathways being changes to the main determinants of health, and receptors being health or health services. For an effect to be identified will require identification of a specific source, a pathway or number of pathways, and a receptor or receptor group. An assessment

will then be made against the baseline conditions to determine the significance of the effect.

11.1.11 The basis of this assessment of health impacts is to apply a broad socio-economic model of health that encompasses conventional health impacts such as disease, accidents and risk, along with wider health determinants which are vital to achieving good health and wellbeing such as employment and local amenity. It considers both physical and mental health, and also the social impacts where possible. The assessment is therefore based on both 'social' and 'ecological' (environmental) determinants of health, which are affected through relevant health pathways.

11.1.12 Determinants of human health are root cause factors that influence human health positively or negatively. **Plate 11.1** illustrates the main determinants of human health (Ref.11.2). At the centre of the illustration are factors that are largely fixed – including individual age, sex, constitutional and genetic factors. Outside of this are factors generally described as the wider or broader determinants of health. The model emphasises interactions between determinants. Individual lifestyle choices are embedded in social norms and networks, and in living and working conditions, which in turn are related to the wider socioeconomic and cultural environment.

Plate 11.1 Main Determinants of Health (Source: Dahlgren and Whitehead, 1993)



Source: Dahlgren and Whitehead

11.1.13 When defining potential health pathways for a development project, it is also useful to consider three broad domains of public health practice: health protection (that is, environmental pollution and standards set to protect health); health promotion (that is, healthy lifestyles, socio-economic status and inequalities); and health care (that is, provision, effectiveness and equity of access to healthcare services).

11.1.14 Determinants can be impacted by individual, political or commercial decisions and this can lead to beneficial or adverse effects on health:

- Beneficial effects either contribute to the maintenance of health or eliminate or reduce risk of disease or poor health.
- Adverse health effects cause or contribute to the risk of preventable disease or poor health.

11.1.15 Due to the broad nature of the determinants of health, assessing the health effects of the Project will require a multi-disciplinary approach considering the environmental effects identified by technical aspects that could impact human health.

11.1.16 The following chapters include the assessment of Project effects that could impact human health:

- **Chapter 6: Transport**;
- **Chapter 7: Noise and Vibration**;
- **Chapter 8: Air Quality**;
- **Chapter 9: Radiological**;
- **Chapter 10: Socio-economics;**
- **Chapter 12: Climate Change;**
- **Chapter 13: Major Accidents and Disasters**;
- **Chapter 14: Soils, Geology and Land Use**;
- **Chapter 15: Water Environment**;
- **Chapter 16: Flood Risk and Drainage**;
- **Chapter 20: Landscape and Visual Assessment**; and
- **Chapter 21: Recreation**.

11.1.17 **Section 11.6** details the approach to how these chapters are scoped into or out of the human health assessment.

Baseline data collection

11.1.18 The human health assessment will consider the effects of the Project against the baseline physical and mental health profile. The key components of the baseline data collection include:

- Initial desk-based analysis of baseline physical and mental health has been carried out in preparation for further development through engagement with health stakeholders to establish an existing local health profile, including any local health needs and priorities.
- The baseline for health will be consistent with the population and demographic data that forms part of the socio-economic baseline and will mirror that of the relevant technical aspects (for example air quality and noise) in terms of geographic scope. Work to date on baseline development for these aspects is set out in the relevant chapters listed in **Section 11.1.**

11.2 Legislation, Policy and Technical Guidance

11.2.1 This section identifies the relevant legislation, national and local policy and guidance which has informed the scope of the assessment relevant to human health. While this includes all relevant details with respect to the scope of the assessment, when undertaking the assessment, a wider range of policies and guidance relevant to individual impacts and their mitigation will be drawn on. The assessment will have regard to all relevant local health policy within the spatial areas where potential human health effects of the Project are identified including policies in adjoining authorities, for instance Colchester, Tendring, Rochford and Braintree, where relevant. This will be influenced by the geographic extent of the relevant technical aspects relevant to the potential Human Health effects of the Project, as set out in **Section 11.4**.

11.2.2 There is no site-specific policy with regard to health at the local or regional level. Local health policy is summarised in **Table 11.1**, with most policy being related to infrastructure requirements to support residential development.

11.2.3 Further information on policies relevant to the EIA and their status is set out in **Chapter 2: Policy and Regulatory Context**, which should be read in conjunction with this chapter. The legislation and policy relevant to human health are detailed in **Table 11.1**.

Table 11.1: Legislation and policy

Relevant Legislation and Policy	Relevance to the Assessment
Legislation	
Directive 2014/52/EU amending Directive 2011/92/EU (Ref. 11.3).	Requires the consideration of the effects of certain public and private projects on the environment ('EIA Directive'), including effects on human health. This Directive has been transposed into UK legislation in the EIA Regulations 2017.
Infrastructure Planning (Environmental Impact Assessment) Regulations 2017; and, Marine Works (Environmental Impact Assessment) Regulations 2007 (Ref. 11.4).	Require the Project provides an assessment of the direct and indirect effects of the Project on human health.
National Policy	
National Policy Statement for Energy (EN-1) (Ref. 11.5).	Sets out requirements for the assessment of human health effects of energy projects that fall within the scope of National Policy Statement EN-1. Paragraph 4.13.2 sets out that proposed energy projects that would have effects on human beings are required to "*assess these effects for each element of the project, identifying any adverse health impacts, and identifying measures to avoid, reduce or compensate for the impacts as appropriate."* Cumulative health impacts will also be considered in determining an application.

Relevant Legislation and Policy	Relevance to the Assessment
	Paragraphs 4.13.3-4.13.4 set out that projects could have direct and indirect health effects. Paragraph 4.13.5 acknowledges that "*generally, those aspects of energy infrastructure which are most likely to have significantly detrimental impact on health are subject to separate regulation (for example air pollution) which will constitute effective mitigation of them, so that it is unlikely that health concerns will either constitute a reason to refused consent or require specific mitigation under the Planning Act 2008*".However "*health concerns will be taken into account when setting requirements relating to a range of impacts such as noise*.". Part 5.10 sets out requirements when a project would have direct effects on open space and green infrastructure and states that these uses should be identified, consulted on, and applicants should consider providing new or additional space or facilities to substitute for any losses.
National Policy Statement for Nuclear Power Generation (EN-6) (Ref. 11.6).	Paragraph 3.12.1 sets out requirements for assessment of human health effects of new nuclear development, and policy specific to new nuclear power stations. It notes generic requirements for energy Nationally Significant Infrastructure Project (NSIPs) are set out in National Policy Statement EN-1. Human Health is identified as a potential "*Nuclear Impact*" where additional policy is provided in EN-6. Paragraph 3.12.2 notes that where a project has impact on land that has recreational value, the requirements for human health assessment should be read in conjunction with NPS EN-1 requirements relating to land use including open space, green infrastructure and Green Belt.

Relevant Legislation and Policy	Relevance to the Assessment
	Paragraph 3.12.3 states "*the operation of a new nuclear power station is unlikely to be associated with significant noise, vibration or air quality impacts (although there may be local impacts from transport and associated activities during construction; and if cooling towers are required, particularly forced draught towers, the potential noise impact may be greater). With appropriate mitigation the subsequent effect of these potential impacts on human health is unlikely to be significant*". Paragraphs 3.12.5-3.12.6 state there could be impacts on local health care provision due to increased demand, and there could be positive effects on health and wellbeing resulting from positive socio-economic benefits. Paragraph 3.12.7 sets out that the applicant should work with the local authority and local health stakeholders "*to identify any potentially significant health impacts and appropriate mitigation measures*". Paragraphs 3.12.8-3.12.10 require the positive health effects of employment and other socio-economic effects to be taken into account in determining an application, and that the decision should be made on the basis that the regulatory regime and the Office for Nuclear Regulation (ONR) requirements with respect to safety of radiation will be applied and enforced to protect human health. Paragraphs 3.12.8-3.12.10 require that applications should be determined on the basis that the regulatory regime and ONR requirements with respect to safety of radiation will be applied and enforced to protect human health.

Relevant Legislation and Policy	Relevance to the Assessment
National Planning Policy Framework (NPPF) (Ref. 11.7).	Sets out various policies with respect to the health objectives of the planning system. It states planning should aim to support healthy and safe communities as part of creating sustainable development (Paragraph 8). Paragraphs 96-101 set out the importance of open space and recreation in the health of communities.
Local Policy	
Essex Joint Health and Wellbeing Strategy (JHWS) (2018) (Ref. 11.8).	The Essex JHWS sets out priorities for initiatives that aim to lead across Essex to an "*improvement in health and wellbeing outcomes and a reduction in health inequalities*". It sets out a "*Health in all policies approach, recognising health is linked to a range of social and environmental determinants*".
Maldon District Council (MDC) Local Development Plan (2017) (Ref. 11.9).	"*Policy I2 Health and Wellbeing"* sets out the Council's aim "*to improve the District's health and wellbeing*" including by "*addressing health issues identified in the Maldon Health Needs Assessment (HNA) and other plans and initiatives produced by Essex Public Health, NHS England, the Mid Essex Clinical Commissioning Group, Essex Health & Wellbeing Board or any associated or successor bodies, to deliver modern healthcare which meets the needs of the District*"; "*Maximising accessibility to services, particularly for vulnerable groups*"; and "*Ensuring increased access to the District's green spaces and opportunities for higher levels of physical activities*".

Relevant Legislation and Policy	Relevance to the Assessment
	It also states "*new developments will be required to support the provision of new or improved facilities for health and social care*". Paragraphs 8.15-8.18 set out the existing health context in the District, identifying "*increasing pressure and demand on healthcare*" "*pockets of deprivation in the District where pronounced health inequalities exist*" and that "*the level of GP provision in the District is deemed to be 'insufficient' by the HNA*" (both in terms of physical capacity and patient list sizes). Paragraphs 8.25-8.26 states "*development proposals where there is a potential for significant health impacts will be required to produce a comprehensive Health Impact Assessment*". The scope of the assessment should include "*the impact of a new development on promoting healthy lifestyles*" and on "*the capacity of existing health services and facilities*".
Chelmsford City Council (CCC) Local Plan (2020) (Ref. 11.10).	Paragraphs 2.33 and 2.34 set out the existing health context in Chelmsford district. It states the health of the population is "*an overall positive picture*" but "*some inequalities do exist*". "*Strategic Policy S4 – Conserving and Enhancing the Natural Environment*" highlights the role of the City's natural assets and green infrastructure in meeting the needs of community health and wellbeing. "*Strategic Policy S9 – Infrastructure Requirements*" sets out the requirement for new development to "*be supported by the provision of infrastructure, services and facilities that are identified as necessary to serve its needs*", including transport, community facilities (including health and wellbeing facilities and measures), and green and natural infrastructure.

Technical guidance

11.2.4 The current EIA Regulations reinforce health within the planning and assessment process, but do not provide definitive guidance on the approach, process or methodology to follow.

11.2.5 Taking this into consideration, it is appropriate for the human health assessment to apply recognised Health Impact Assessment (HIA) guidance and other relevant guidance, and combine this with the requirements defined for EIA to investigate, inform, assess and effectively communicate how and where all health issues and opportunities are addressed.

11.2.6 The approach draws on documented guidance and research, as summarised in **Table 11.2**, and best practice set out by other nuclear new build projects including Hinkley Point C, Moorside and Sizewell C which also drew on elements of these documents.

Table 11.2: Relevant guidance and reports

Guidance Reference	Implications
Planning Practice Guidance (PPG) (2019) (Ref.11.11).	Provides guidance for *"how positive planning can contribute to healthier communities".* It states "*Planning and health need to be considered together in two ways: in terms of creating environments that support and encourage healthy lifestyles, and in terms of identifying and securing the facilities needed for primary, secondary and tertiary care, and the wider health and care system (taking into account the changing needs of the population)".* It also sets out guidance on the health organisations that should be involved in considering planning for health, delivering sufficient school places, and planning for safe and secure places.
A Critical Guide to HIA (2007) (Ref.11.12).	Guidance on best practice approach to carrying out health impact assessment.
Health Impact Assessment: A practical guide (2012) (Ref. 11.13).	Guidance on best practice approach to carrying out health impact assessment.

Guidance Reference	Implications
The Marmot Review. Fair Society, Healthy Lives: The Marmot Review. Strategic review of health inequalities in England post-2010 (2010) (Ref. 11.14). The Marmot Review. Health inequality in England: The Marmot Review 10 years on. (2020) (Ref. 11.15).	Guidance on decision-making to reduce health inequality in the context of health inequality in England.
Healthy Lives, Healthy People: Our strategy for public health in England (2010) (Ref. 11.16).	Sets out the Government's response to the 2010 Marmot Review – Government's approach to addressing health inequality.
Reuniting Health with Planning – Healthier Homes, Healthier Communities (2012) (Ref. 11.17).	Sets out the role of planning in health outcomes, relevant policy and guidance sources, and how stakeholders can work collaboratively to ensure health is assessed appropriately in the planning process.
Design Manual for Roads and Bridges (DMRB) (2019) (Ref. 11.18)	Document LA112 sets out requirements for assessing and reporting the environmental effects on population and health from construction, operation and maintenance of highways projects.
Essex Design Guide, Health Impact Assessment (online, accessed August 2020) (Ref 11.19).	Provides advice on environmental impact assessments and health as well as the main contacts across the health and wellbeing system.

11.2.7 In addition to the guidance set out in **Table 11.2**, the technical assessments on which the health chapter draws will each follow their own guidance. The relevant technical aspects scoped into the assessment of human health effects are listed in **Section 11.6**.

11.3 Consultation and Engagement

11.3.1 Consultation and engagement will be key to the health-conscious approach to planning the Project and where relevant aligning with local health priorities. A Human Health Working Group has been established with membership from the applicant, and the Councils. Other relevant stakeholders will be invited and the group will meet regularly and be consulted on the evolving assessment for the

Project. With respect to the human health assessment specifically, the approach will inform the scope of the assessment, the baseline context, and relevant design and mitigation measures.

11.3.2 **Table 11.3** details technical engagement to date which has occurred outside of formal statutory consultation. It includes details of technical engagement that has been carried out in regard to technical aspects which could impact human health and which are included in the scope of the Human Health chapter in **Section 11.6**.

11.3.3 **Table 11.4** provides a summary of consultee comments arising from Stage One Consultation, along with a response to identify how the matter will be dealt with through the EIA process.

Table 11.3: Technical engagement

Consultee	Points of Discussion
MDC Essex County Council (ECC). Mid and South Essex NHS Sustainability and Transformation Partnership (STP).	Human Health Project Briefing: Mid and South Essex NHS STP (membership includes five Clinical Commissioning Groups (CCGs), ECC and CCC) – 17 June 2020. NHS Mid Essex raised whether there would be a standalone Health Impact Assessment (HIA) report (in addition to the EIA). The applicant confirmed the health assessment will be set out in the Human Health chapter, embedding the assessment in the EIA assessment regulatory process. A separate standalone HIA (not subject to the EIA regulatory process) will not be required. This is in line with the approach for other nuclear new build DCO applications including Sizewell C. Human Health EIA Scoping Briefing: MDC and ECC (joint briefing with Socio-economics and Recreation) – 24 June 2020. ECC and MDC raised whether well-being and quality of life effects would be within the scope of assessment. The applicant confirmed that the source-pathway-receptor model will be used to identify any potential Project effects where they could have a demonstrable impact on health, as defined in **Section 11.1**. The identification of potential effects and assessment of impacts will be established through the EIA process including ongoing work through the Human Health Working Group (membership including MDC and ECC).

Consultee	Points of Discussion
	Other technical aspects Where technical engagement has taken place on technical aspects that could impact human health, (as set out in **Section 11.6**) details of points of discussion are set out in the relevant chapters of this scoping report. To the extent impacts on human health arise through these aspects they will be identified through the source-pathway-receptor model to assess potential effects on physical and/or mental health.

Table 11.4: Stage One Consultation comments

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
Assessment scope.	Mid and South Essex NHS STP and Colchester Borough Council – suggested a standalone Health Impact Assessment should be produced in addition to the EIA.	As set out in **Table 11.3**, the health assessment will be set out in the Human Health chapter and subject to the EIA regulatory process. An additional standalone HIA report will not be required. This is in line with the approach for other nuclear new build DCO applications including Sizewell C. Population, health and wellbeing are formally defined within and a requirement of planning legislation and policy. This means greater weight is now given to public health alongside other

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
		environmental and socio-economic considerations. In line with this, we propose a Human Health technical appendix to the EIA.
Mitigation	Mid and South Essex NHS STP, and Public Health England raised a number of design issues with respect to health including transport, recreation, jobs and skills, accommodation, and air quality. South East Local Enterprise Partnership (SELEP) and the UK Innovation Corridor raised potential health impacts on the temporary construction workforce and suggested putting in place initiatives to protect physical and mental health.	Design and mitigation measures relevant to human health will be shared and developed through the EIA process in discussion with the Health Working Group. Transport, recreation, jobs, skills, accommodation and air quality are, amongst others, key issues that are scoped into the assessment and will be investigated, addressed and mitigated accordingly to manage risk and maximise potential opportunities locally, in consultation with the Health Working Group.

11.4 Data Gathering Methodology

Study area and temporal scope

11.4.1 This section presents study areas for human health as currently estimated, but these may need to change as the EIA progresses. The study area and assessment year for the determinants of health will match those of the individual environmental aspects (for example air quality, noise and transport) set out in **Section 11.1**. They may also be different for the construction and operational phases, and across the main development site, off-site Power Station Facilities, and off-site associated development.

11.4.2 At present, a wide definition of the spatial area for consideration for the health assessment applies that includes the main development site, off-site Power Station Facilities, and off-site associated development. It also includes the surrounding areas based on administrative boundaries (to align with how the Government publishes official data) defined by each environmental aspect of relevance to human health. The precise areas used will be influenced by the appropriate scale for each category of the assessment and in some cases also reflect the boundaries of relevant service planning areas (for example for health facilities). The spatial scope of the human health assessment will therefore vary by impact category.

Human health profile baseline study area

11.4.3 The study area for the human health profile baseline is influenced by the availability of relevant publicly available data which is collected at different scales of administrative geography. Generally, the smallest geographic area at which up-to-date publicly available data on human health is published is local authority level, however smaller areas will be considered where data is available and relevant to the assessment. In some cases, the study area will reflect the boundaries of relevant human health service planning areas.

11.4.4 The baseline study areas will include national (England), regional (East), County (Greater Essex (Essex County, Southend and Thurrock unitary authorities)), districts (Maldon district, Chelmsford district and Essex County), and where data is available and relevant, the local wards closest to the main development site (Althorne, Burnham-on-Crouch North, Burnham-on-Crouch South, Mayland, Southminster, and Tillingham) (hereafter, the “local ward area”). The areas are shown in **Figure 11.1.**

11.4.5 The baseline study areas will be set out as part of a Technical Note on the human health baseline, to be shared with the Human Health Working Group.

Administrative areas

11.4.6 Administrative geography is the main scale at which public datasets are available – these scales ranging from smallest to largest scale are as follows:

- Output Areas, Super Output Areas and Wards – small or local area scale geographies will be used to define local areas where effects could occur at a sub-local authority scale;
- District and county;
- Regional; and
- National – this area (depending on data availability – England, the UK or Great Britain) will be used to benchmark from a wider average.

Human health assessment study areas

11.4.7 The study areas for aspects of relevance to the human health assessment will be influenced by the geographic extent of the relevant technical aspects. For example, potential effects on human health related to noise are likely to be experienced close to the source, whereas human health effects related to socio-economic factors such as employment opportunities would be expected to be experienced over a much larger area. The impact of the Project on existing health services will be assessed in line with the scale at which services are planned. The assessment will refer to the spatial areas identified by the relevant technical aspect assessments.

Sources of data used in scoping

Desk based

11.4.8 The principal desk-based data sources used to inform the human health profile baseline are set out in **Table 11.5.** These are principle sources only and the assessment will draw on data available at the time of the assessment, including local data sources shared by stakeholders through the process of engagement on human health through the Human Health Working Group and set out in a Technical Note on the human health baseline that will be shared with the Group for input.

Table 11.5: Principle sources of data – human health profile baseline

Source	Data
Office for National Statistics (ONS).	• Mid-year sub-national population estimate data (2016-based) (2018) (Ref. 11.20). • Population Projections (2016-based) (2018) (Ref. 11.21). • 2011 Census Data (Ref. 11.22). • Life Expectancy at birth data (2015) (Ref. 11.23).
NHS Choices.	• Health services and patient list size data (Ref. 11.24).
Sports England.	• Active People Survey (Ref. 11.25).
Public Health England.	• Deaths by cause, disease prevalence data (Ref. 11.26).
Ministry of Housing, Communities and Local Government (MHCLG).	• Index of Multiple Deprivation – Health and Disability domain (for 2019) (Ref. 11.27).
Essex JHWS (Ref. 11.28).	• Essex health profile and priorities.
Health Needs Assessment (HNA) (Ref. 11.29).	• Maldon health profile and district level health priorities.

11.5 Baseline Information

Current baseline

11.5.1 This section sets out a summary of the key relevant baseline data covering the study areas identified in **Section 11.4**.

11.5.2 The main development site and immediate surrounding are predominantly farmland, with nearby villages including Bradwell-on-Sea and Bradwell Waterside. The nearest larger settlements include Southminster and Burnham-on-Crouch.

Population and demographics

11.5.3 Sub-national population estimates produced by the ONS (2016-based, published in 2018) indicate the wards closest to the main development site have a population of 24,120 people, there are 64,430 people living in Maldon district and 177,100 living in Chelmsford district, 1,833,000 in Essex, Southend-on-Sea and Thurrock combined, 6,201,000 in the East of England and 55,980,000 in England.

11.5.4 Approximately 16.3% of the local ward area population is under 16 years of age, compared to 16.4% in Maldon district, 19.1% in Chelmsford district, 19.3% in Essex, Southend-on-Sea and Thurrock combined, 19.4% across the East of England and 19.2% in England as a whole. Approximately 24.6% of the local ward area residents are aged over 64 – compared to 24.9% in Maldon district, 19.1% in Chelmsford district, 19.8% in Essex, Thurrock and Southend-on-Sea combined, and 19.6% in the East of England, and 18.2% in England as a whole.

Life expectancy

11.5.5 Average life expectancy at birth (2016-2018) in Maldon district is 83.3 for females and 81.0 for males, and in Chelmsford district it is 84.3 for females and 81.4 for males. This compares to 83.3 for females and 79.0 for males in Thurrock, 82.1 for females and 82.5 for males in Southend-on-Sea, 83.3 for females and 80.2 for males in Essex, and 83.7 for females and 80.3 for males across the East of England.

Self-reported health and health deprivation

11.5.6 ONS Census data (2011) records the self-reported health of individuals, based on one of five categories – very good health, good health, fair health, bad health and very bad health. Approximately 81% of residents of the local wards are reported to be in very good or good health, compared to 82% in Maldon district, 85% in Chelmsford district, and 82% across both Essex, Thurrock and Southend-on-Sea combined and the East of England.

11.5.7 ONS Census data (2011) also records the number of residents who report experiencing limitations to their day to day activities due to long-term health problems or disability – this represents 18% of the population of the local wards area, 17% of Maldon district, 14% of Chelmsford district, 17% of residents in Essex, Thurrock and Southend-on-Sea combined, 17% in the East of England and 18% across England as a whole.

11.5.8 The Government's Index of Multiple Deprivation (2019) measures deprivation in England across seven different domains which combine to create an overall index. However, it is also possible to review data under each of the separate domains. The health and disability domain is one of the seven domains, and is most relevant to the human health assessment. It ranks all areas in England based on four health-

related indicators: years of potential life lost (measuring people who die prematurely (before age 75); acute morbidity (emergency admissions to hospital); prevalence of mood and anxiety disorders; and a comparative illness and disability ratio (measuring proportion of residents receiving benefits due to inability to work through ill health). Maldon was ranked 211th out of 317 local authorities with respect to health and disability deprivation in 2019, and no area in Maldon was within the 30% most deprived areas in England. Chelmsford was ranked 272nd.

Future Baseline

11.5.9 ONS population projections are available at local authority level and above. The population of Maldon district is expected to grow by 6.6% over the 10 years 2018-2028 and by 11.9% over the 20 years 2018-2038. Chelmsford district is expected to grow by 7.5% and 12.7% over the same time periods, Essex, Thurrock and Southend-on-Sea combined, by 6.3% and 11.1%, the East of England 5.0% and 8.5% and England as a whole by 5.0% and 8.6% respectively.

11.5.10 Due to the broad range of individual and environmental determinants that can potentially impact physical and mental health outcomes, elements of the future baseline with respect to health are inherently uncertain. Given this uncertainty, for the purposes of this assessment it is assumed the future baseline for health indicators (including with respect for example to indicators on disease and life expectancy) would be in line with the current local baseline conditions.

Planned further surveys and studies

11.5.11 Baseline information for the human health assessment will be updated as new datasets are released and expanded as the baseline conditions of receptors are further defined and the spatial extent of impacts are understood. Work will be ongoing throughout the EIA process to identify potential effects and develop mitigation where appropriate, in discussion with the Human Health Working Group.

11.5.12 A number of studies will be undertaken as part of the assessments for the environmental aspects listed in **Section 11.1**. Those of particular importance include:

- Socio-economics: healthcare service audits and analysis of emergency service provisions; Community Safety Management Plan; Jobs, skills and education strategy; Supply Chain strategy; Economic benefits statement; and Accommodation strategy;
- Transport: Accident Study and related pedestrian fear and intimidation considerations;
- Noise: baseline sound level monitoring will be carried out to establish the noise baseline conditions. This will include background and ambient, and traffic noise measurement;

- Landscape and Visual: viewpoint photography and visual residential amenity assessment;
- Air Quality: Dust monitoring and NO_2, PM_{10} and $PM_{2.5}$ monitoring; and
- Recreation: Consultation with user groups of the River Blackwater field surveys will also be conducted alongside automatic counts and visitor and user surveys for routes affected by the main development site.

11.6 Proposed Approach to the Assessment

11.6.1 **Chapter 5: The EIA Process and Methods** sets out the overall approach to the assessment methodology for the Project. This section highlights elements of the general approach of relevance to the human health assessment.

Assessment of effects and determining significance

Sensitivity

11.6.2 The receptors for the human health assessment are the mental and physical health of the workforce and resident population, including users of the local roads and transport network and local services, housing and accommodation. Individuals within a population vary in their sensitivity to health impacts. It is therefore not possible to provide a uniform classification of sensitivity for each health determinant. To allow for this diversity in sensitivity a precautionary approach will be applied with populations ascribed a high sensitivity.

Magnitude of change

11.6.3 The magnitude of human health effects will be determined based on the supporting assessment relevant to each identified determinant of health, and a qualitative assessment of the likely magnitude of change to human health via an impact to a health pathway.

11.6.4 For some technical aspects, the magnitude of change will reflect guidance on levels of acceptability (for example for air quality and noise), for others it will reflect professional judgement.

11.6.5 The qualitative assessment of the magnitude of change via a health pathway will consider the assessment made by each topic area and the magnitude of the likely health effect of the change taking into account the nature of the change in terms of whether an impact would be permanent or temporary, adverse or beneficial, affect a small or large population, the recent rates of change and the capacity for change in the locality.

Determination of significance

11.6.6 The significance of a human health effect will be a product of the sensitivity of the receptor and the magnitude of change, as defined above and using the significance evaluation matrix set out in **Chapter 5: The EIA Process and Methods**.

11.6.7 Following the classification of an effect using this methodology, a clear statement will be made as to whether that effect would be 'significant' or 'not significant', in line with the generic classifications set out in **Chapter 5: The EIA Process and Methods**.

Mitigation and residual effects

11.6.8 The human health assessment will report on the likely effects of the Project taking into account the implementation of mitigation measures.

11.6.9 This chapter sets out a high level summary of proposed measures (see **Section 11.8**), which will evolve through the implementation planning and refinement of the design of the Project, in collaboration with relevant stakeholders through the Human Health Working Group, and based on the assessment work carried out by related technical aspects.

11.6.10 Reflecting the multi-disciplinary nature of health impacts, the Project will take a health-conscious approach considering health issues and opportunities when planning the design and implementation of the Project. This will be facilitated in part through the development of the health assessment, consultation with stakeholders (including the Health Working Group), and the need for design and mitigation measures to consider effects on human health.

11.6.11 Reflecting the dynamic nature of the health profile baseline, and the potential for change given the long-term nature of the Project, a flexible and adaptive approach to mitigation will be developed to respond to effects on health receptors that arise due to this dynamism and inherent uncertainty. This will be managed through a "plan-monitor-manage" approach and will be identified where relevant in the assessment.

11.7 Scope of the Assessment

11.7.1 The assessment will consider the impacts of the Project that could have effects on human health. Using a source-pathway-receptor approach impacts will be identified where there is potential for beneficial or adverse effect, and an assessment will be made of the likely significance of the effect on human health.

11.7.2 The assessment will consider both beneficial and adverse effects on health, as defined in **Section 11.1**.

Temporal scope

11.7.3 The assessment will cover the construction and operational phases with respect to the main development site, off-site Power Station Facilities, and off-site associated development. The removal and reinstatement of off-site associated development will also be considered where applicable.

11.7.4 Temporally, the assessment will reflect the assessment years set out by the relevant technical aspect assessments. This is likely to vary by technical aspect reflecting the differing points of maximum effects, and the relevant assessment years for the main development site, off-site Power Station Facilities and off-site associated development.

Project-wide approach

11.7.5 Some human health effects will be Project-wide effects (not spatially associated with aspects of the physical development such as impacts on the overall transport network), others will arise due to the main development site, off-site Power Station Facilities and off-site associated development specifically (for example, noise associated with construction works at the main development site or off-site associated development locations).

Qualitative and quantitative assessment

11.7.6 The factors resulting in quantitative health outcomes are complex and difficult to measure. Causes of poor or good health are likely to be multiple and dynamically related. The assessment approach will be quantitative where the evidence base allows, and the relative change is sufficient. With regard to the more subjective and intangible aspects of health, a qualitative approach supported by an appropriate evidence base will be applied. In both cases, the assessment of significance will be consistent with that of the overarching EIA methodology, considering the sensitivity of receptors and magnitude of impact in assigning significance conclusions to each of the health determinants to be assessed.

Potential receptors

11.7.7 The receptors relevant to the human health assessment are the physical and mental health of residents, employees, and visitors. These receptors are summarised in **Table 11.6.**

11.7.8 Where relevant the assessment will consider the effects across the population, including identifying any groups that are affected to a greater extent by identified impacts. The definition of these groups will be developed as the Project evolves and in collaboration with stakeholders.

Table 11.6: Receptors subject to potential effects

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Project-wide (across local economy and local transport network, not spatially associated with the main development site, off-site Power Station Facilities or off-site associated development).	Construction and operation.	The health of local residents, business owners and employees, workers in the local economy, visitors using the local transport network, and the capacity of local health services.	Potential health effects associated with socio-economic and transport effects of the Project.
Main development site.	Construction phase.	The health of local residents, workers and visitors, and the capacity of local health services.	Potential health effects associated with socio-economic, transport, noise and vibration, landscape and visual, air quality, and recreation effects associated with the construction of the Project.
Main development site.	Operational phase.	The health of local residents, workers and visitors, and the capacity of local health services.	Potential beneficial and adverse health effects associated with socio-economic, transport, noise, landscape and visual, air quality and recreation effects when the Bradwell B power station is operational.
Off-site Power Station Facilities and off-site associated development.	Construction and operation, and where applicable removal and reinstatement.	The health of local residents, workers and visitors, and the capacity of local health services.	Potential beneficial and adverse health effects associated with socio-economic, transport, noise and vibration, landscape and visual, air quality and recreation effects associated with the construction, operation and where applicable removal and reinstatement phases.

Likely significant effects

11.7.9 The effects on human health which have the potential to be significant and that will be taken forward for assessment in the ES are summarised in **Table 11.7** and **Table 11.8**. Effects that are scoped out of the ES are in **Table 11.9**.

11.7.10 Potential significant effects on human health will be assessed drawing on the following technical aspects that are expected to report potential significant effects that could in turn impact human health:

- **Chapter 6: Transport**;
- **Chapter 7: Noise and Vibration**;
- **Chapter 8: Air Quality**;
- **Chapter 10: Socio-economics**;
- **Chapter 20: Landscape and Visual Amenity**; and
- **Chapter 21: Recreation**.

Table 11.7: Likely significant human health construction effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Project-wide (across local economy and not spatially associated with the main development site, off-site Power Station Facilities or off-site associated development).	Supply chain spending and wages for employees during the construction of the main development site, off-site Power Station Facilities and off-site associated development (including removal and reinstatement where relevant).	Socio-economic effect. Increased opportunities for businesses to benefit from supply chain opportunities, for workers to increase wages, and for other businesses in the economy to benefit from increased spending and economic multiplier effects.	The health of workers and wider local resident and local working population.
Project-wide (across local labour market and not spatially associated with the main development site, off-site Power Station Facilities or off-site associated development).	Generation of employment opportunities, and up-skilling opportunities, and apprenticeships associated with the construction and where of the main development site, off-site Power Station Facilities and off-site associated development (including removal and reinstatement where relevant).	Socio-economic effect. Increased employment and training opportunities.	The health of the Project workforce.

Element of the Project	Activity	Effect	Receptor or Receptor Group
Project-wide (across local population and housing market and not spatially associated with the main development site, off-site Power Station Facilities or off-site associated development).	Temporary growth in local population and change in demographics associated with the temporary construction workforce during the construction of the main development site, off-site Power Station Facilities and off-site associated development (including removal and reinstatement where relevant).	Socio-economic effects. Increase in population including demographic change, potential increase in demand for accommodation and community services including health services.	Health of local residents living in accommodation or accessing existing health services.
Project-wide (across local transport network and not spatially associated with the main development site, off-site Power Station Facilities or off-site associated development).	Construction-related traffic including movement of workers and freight associated with the construction of the main development site, off-site Power Station Facilities and off-site associated development (including removal and reinstatement where relevant).	Transport effect. Potential increase in volume and changes in type of traffic movements.	Health of users of the local transport network.
Project-wide (across local transport network and not spatially associated with the main development site, off-site Power Station Facilities or off-site associated development).	Improvements to the transport network.	Transport effect. Potential improvements to journey times on some routes.	Health of users of the local transport network.

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site, off-site Power Station Facilities and off-site associated development.	Noise and vibration associated with construction of the main development site, off-site Power Station Facilities or off-site associated development (including removal and reinstatement where relevant).	Noise and vibration effect. Potential changes in exposure to noise and vibration.	Health of local residents, workers and visitors exposed to noise and vibration.
Main development site, off-site Power Station Facilities and off-site associated development.	Air quality effects including dust associated with construction of the main development site, off-site Power Station Facilities and off-site associated development (including removal and reinstatement where relevant).	Air quality effect. Potential changes in air quality.	Health of local residents, workers and visitors exposed to air quality impacts.
Main development site, off-site Power Station Facilities and off-site associated development.	Disturbance to recreational routes and amenity areas associated with the construction of the main development site, off-site Power Station Facilities and off-site associated development (including removal and reinstatement where relevant).	Recreation effect. Potential changes to recreational use of routes and amenity areas.	Health of users of affected recreational routes and amenity areas.

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site, off-site Power Station Facilities and off-site associated development.	Disturbance to views associated with construction of the main development site, off-site Power Station Facilities and off-site associated development (including removal and reinstatement where relevant). .	Landscape and Visual effect. Potential visual impacts could impact on the mental and physical health of people living or working in local communities.	Health of local people living or working in communities close to the main development site, off-site Power Station Facilities and off-site associated development.

Table 11.8: Likely significant human health operational effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Project-wide (across local economy and not spatially associated with the main development site, off-site Power Station Facilities or off-site associated development).	Supply chain spending and wages for employees during the operation of the permanent power station, off-site Power Station Facilities and off-site associated development.	Socio-economic effect. Increased opportunities for businesses to benefit from supply chain opportunities, for workers to increase wages, and for other businesses in the economy to benefit from increased spending and economic multiplier effects.	Health of workers and wider local resident and working population.

Element of the Project	Activity	Effect	Receptor or Receptor Group
Project-wide (across local labour market and not spatially associated with the main development site, off-site Power Station Facilities or off-site associated development.).	Generation of employment opportunities, and up-skilling opportunities, and apprenticeships associated with the operation of the permanent power station, off-site Power Station Facilities and off-site associated development.	Socio-economic effect. Increased employment and training opportunities.	Health of workers.
Project-wide (across local transport network and not spatially associated with the main development site, off-site Power Station Facilities or off-site associated development.).	Permanent legacy improvements to transport network.	Transport effect. Decreased journey times for road users.	Health of users of local transport network.
Main development site, off-site Power Station Facilities and off-site associated development.	Operation of the permanent power station, off-site Power Station Facilities and off-site associated development.	Noise effect. Change in noise exposure – noise generated by the operational activities.	Health of local population and workers exposed to noise generated by the operation of the permanent power station, off-site Power Station Facilities and off-site associated development.

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site, off-site Power Station Facilities and off-site associated development.	Disturbance to recreational routes associated with the operation of the permanent power station, off-site Power Station Facilities and off-site associated development.	Recreation effect. Potential changes to recreational use of routes and amenity areas – diversions or closures.	Health of users of recreation routes and amenity areas.
Main development site, off-site Power Station Facilities and off-site associated development.	Disturbance to views associated with the operation of the permanent power station, off-site Power Station Facilities and off-site associated development.	Landscape and visual effect. Potential visual impacts could impact on the mental and physical health of people living or working in local communities.	Health of local people living or working in communities close to the operation of the permanent power station, off-site Power Station Facilities and off-site associated development.

Effects scoped out of the human health assessment

11.7.11 Due to the broad nature of the determinants of health, a comprehensive assessment of the health effects of the Project will consider the environmental effects identified by other environmental aspects that could impact human health. These aspects are listed in **Section 11.6**.

11.7.12 In addition, the following environmental aspect chapters will assess additional effects of the Project that could impact human health, where measures are expected to be established to manage risk and ensure there are no significant effects on human health. These aspects are scoped out of the human health assessment, as set out in **Table 11.9**. These aspects will be monitored during the preparation of the ES, and where potential health effects are identified, these will be considered in the human health chapter as relevant and appropriate.

Table 11.9: Effects scoped out (human health effects assessed elsewhere – as indicated)

Effect	Justification for Scoping Out of Human Health Chapter
Human Health effects relating to radiological effects.	The potential radiological effects of the Project will be assessed in **Chapter 9: Radiological**, as well as in technical documents for licensing and regulating nuclear power stations. The human health effects of radiological effects will be implicit to this assessment which will set out measures to avoid health impacts. It is proposed no additional assessment of effects on human health will be required and health effects associated with radiological effects are scoped out of the human health chapter. Where significant effects relevant to human health are identified these will be cross-referred to.
Human Health effects relating to Climate change effects.	The potential effects of the Project in terms of its impact on the climate will be assessed in **Chapter 12: Climate Change**. The chapter will set out measures that minimise the risk of climate change effects of the Project and the Project's vulnerability to climate change, which will in turn ensure effects on human health are avoided. It is proposed no additional assessment of effects on human health will be required and health effects associated with climate change effects are scoped out of the human health chapter.
Human health effects relating to major accidents and disasters.	The potential impacts of the Project due to major accidents and disasters are set out in **Chapter 13: Major Accidents and Disasters**. The chapter will set out measures to ensure risks are minimised or controlled via secondary consent, permit or license and legislation, which will in turn ensure effects on human health are avoided.

Effect	Justification for Scoping Out of Human Health Chapter
	It is proposed no additional assessment of effects on human health will be required and health effects associated with major accidents and disasters are scoped out of the human health chapter. Where significant effects relevant to human health are identified these will be cross-referred to.
Human health effects relating to soils, geology and land use.	The effects of the Project on soils, geology and land use, including potential contamination of land are set out in **Chapter 14: Soils, Geology and Land Use**. The chapter will set out measures to manage risk and avoid effects on human receptors, and implicitly human health. It is proposed no additional assessment of effects on human health will be required and health effects associated with soils, geology and land use are scoped out of the human health chapter. Where significant effects relevant to human health are identified these will be cross-referred to.
Human health effects relating to the water environment.	The effects of the Project on the water environment, including potential for changes in quality, pollution or hazardous contamination, are set out in **Chapter 15: Water Environment**. The chapter will set out measures to manage risk and avoid effects on human receptors, and implicitly human health. It is proposed no additional assessment of effects on human health will be required and health effects associated with the water environment are scoped out of the human health chapter. Where significant effects relevant to human health are identified these will be cross-referred to.
Human Health effects relating to Flood risk.	The effects of the Project on flood risk are assessed in the **Chapter 16: Flood Risk and Drainage**.

Effect	Justification for Scoping Out of Human Health Chapter
	This includes an assessment of the potential effects of flooding on human receptors, and implicitly human health. The chapter will set out measures to manage risk of flooding and avoid effects on human health. It is proposed no additional assessment of effects on human health will be required and health effects associated with flood risk are scoped out of the human health chapter. Where significant effects relevant to human health are identified these will be cross-referred to.

11.8 Potential Mitigation

11.8.1 The human health assessment will facilitate more health-conscious planning and development and it will develop iteratively as potential impacts are identified and mitigation measures designed to enhance beneficial effects and mitigate any significant adverse effects on human health. The Project will do this to inform the technical assessment, working in consultation with the local authorities and other public agencies and stakeholders, including through the Human Health Working Group.

11.8.2 Many mitigation measures will be identified through the following specific technical aspects that will avoid significant health effects: **Chapter 6: Transport; Chapter 7: Noise and Vibration; Chapter 8: Air Quality; Chapter 10: Socio-economics; Chapter 20: Landscape and Visual Assessment**; and **Chapter 21: Recreation**. Potential mitigation measures which have been identified to date include:

- Design measures (embedded) – help to avoid impacts such as provision of an on-site medical centre to meet demand for primary healthcare for workers during the construction phase; insulation, screening and other measures to reduce noise impacts, and the temporary diversion of amenity routes where these may be disturbed during the construction phase.

- Good practice measures (embedded) – including a Code of Construction Practice to include measures to reduce dust, odours and noise during the construction phase (which could have impacts on human health), and outreach and employment measures to support local people into work on the Project which could support beneficial mental and physical health effects.

- Additional mitigation – to mitigate any significant adverse effects, once project design and best practice measures are taken into account. In alignment with local health initiatives and in consultation with stakeholders, this could include funding allocated for community initiatives which could lead to beneficial health effects. At other nuclear new build sites secondary mitigation has included: a community fund; housing fund; and public services contingency fund.

11.9 Assumptions and Limitations

11.9.1 The assessment of effects on human health will draw on the assessment of effects set out by other environmental aspects set out in **Section 11.6** and is subject to the same assumptions and limitations affecting those assessments.

11.9.2 As with any data, the baseline data used in this assessment represents a single point in time and can change due to wider changes in the determinants of health.

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12. CLIMATE CHANGE

12.1 Introduction

12.1.1 This chapter sets out the approach for determining the scope of assessment, the methodology and determination of significance for both the Greenhouse Gases and Vulnerability to Climate Change elements of the assessment.

12.1.2 In accordance with Schedule 4, paragraph 5(f) of the Environmental Impact Assessment (EIA) Regulations (Ref. 12.1), this chapter considers climate change in two ways:

- The impact of the Project on climate (for example the nature and magnitude of greenhouse gas emissions) – 'Greenhouse Gases'.
- The vulnerability of the Project to climate change (including the impact on built assets and environmental mitigations put in place, as well as the exacerbating impacts of climate change on environmental receptors affected by the Project) – 'Vulnerability to Climate Change'.

12.1.3 Therefore, this section addresses each of these two climate aspect assessments separately.

12.1.4 The aim of the Greenhouse Gases assessment is to identify the extent to which the Project has a material effect on the UK Government's targets for decarbonisation, with focus on the power sector.

12.1.5 The aim of the Vulnerability to Climate Change assessment is to assess the extent to which projections for climate change would affect the Project assets, the environmental mitigations put in place, and the receptors affected by the Project. It assesses how hazards such as sea level rise, drought and extreme temperatures are projected to be exacerbated in the future, and identify changes to the design, environmental mitigation or operational processes that would reduce the risk they pose to acceptable levels. This assessment includes 'In-combination climate change impacts' as defined in the Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation (Ref. 12.2).

12.1.6 This chapter contains:

- a summary of work undertaken to date;
- an explanation of the scope of assessment, including:
  - legislation, policy and guidance that inform the assessment;
  - a description of consultation and engagement so far relevant to climate change;

- study area for the assessment;
- sources of data used in scoping;
- baseline conditions, including current desk studies and surveys;
- planned further surveys and studies;
- the approach for the assessment;

- the receptors that are proposed to be assessed and the effects which have the potential to be significant;
- the effects that are proposed can be scoped out of the assessment; and
- potential mitigation.

12.1.7 The chapter should be read in conjunction with the project description provided in **Chapter 3: The Project**.

Work undertaken to date

12.1.8 Consideration of climate change impacts on the UK HPR1000 design has been ongoing through the Generic Design Assessment (GDA) of the technology by the Office for Nuclear Regulation (ONR). The GDA is currently at Step 4 of the four-step process. The ONR Summary report - Step 3 Assessment of the UK HPR1000 Reactor (Ref. 12.3) identifies the need to further analyse the effect of climate change on relevant external hazards and to further justify the generic site envelope.

12.2 Legislation, Policy and Technical Guidance

12.2.1 This section identifies the relevant legislation, national and local policy and guidance which has informed the scope of the assessment relevant to climate change. Further information on policies relevant to the EIA and their status is set out in **Chapter 2**: **Policy and Regulatory Context**, which should be read in conjunction with this chapter.

12.2.2 The legislation and policy relevant to the greenhouse gases assessment and the climate change assessment are detailed in **Table 12.1** and **Table 12.2** respectively.

Table 12.1: Legislation and policy relevant to greenhouse gases assessment

Relevant Legislation and Policy	Relevance to the Assessment
Legislation	
UK Climate Change Act 2008 (Ref. 12.4) (as amended).	This commits the UK to reduce its net greenhouse gas (GHG) emissions by at least 100% below 1990 levels by 2050 and requires the Government to establish 5-year Carbon Budgets. In 2011, the UK Government issued its Carbon Plan, which sets out how the UK will achieve decarbonisation within the framework of UK energy policy and make the transition to a low carbon economy. The most recent Carbon Budget, the fifth, was released in 2016 and describes the budget for the period 2028-2032. Total GHG emissions reductions for the UK as a whole have met the requirements of the Second Carbon Budget and are projected to meet the third carbon budget (Ref 12.5). Most of the reduction to date has come in the power, industry and waste sectors, with transport increasing since 2007 largely as a result of rising demand for travel and a slowing of progress in improving the efficiency of vehicles (Ref 12.6). Carbon Budgets for a range of sectors have been produced under the Fifth Carbon Budget. The Sixth Carbon Budget will be published in Autumn 2020, which will set out advice on the volume of GHG emissions the UK can emit during the period 2033-2037. Whilst this is not available at this time, it will be taken into account when producing the Environmental Statement (ES) for contextualisation of emissions.
Carbon Budgets Order 2009 (Ref. 12.7).	This legislation implements the carbon budgets set out in the Climate Change Act 2008. The budgets require the UK to continually reduce emissions in line with the carbon reduction commitments established under the Climate Change Act 2008. Progress is monitored by the Committee on Climate Change. The carbon budgets used to contextualise emissions are:

Relevant Legislation and Policy	Relevance to the Assessment
	• first carbon budget, 2009 to 2012, 3,018 Mega tonnes Carbon Dioxide Equivalent ($MtCO_2e$) representing 25% reduction below 1990 levels; • second carbon budget, 2013 to 2017, 2,782 $MtCO_2e$ representing 31% reduction below 1990 levels; • third carbon budget, 2018 to 2022, 2,544 $MtCO_2e$ representing 37% reduction below 1990 levels by 2020; • fourth carbon budget, 2023 to 2027, 1,950 $MtCO_2e$ representing 51% reduction below 1990 levels by 2025; and • fifth carbon budget, 2028 to 2032, 1,725 $MtCO_2e$ representing 57% reduction below 1990 levels by 2030.
International Policy	
The United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement (Ref. 12.8).	The United Nations Framework Convention on Climate Change (UNFCCC) is the major international body responsible for managing climate change and carbon emissions. In 2015, it adopted the Paris Agreement, the aims of which are stated as: *"This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by: a) Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and*

Relevant Legislation and Policy	Relevance to the Assessment
	impacts of climate change; and (b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production.". The agreement sets targets for countries' GHG emissions, but these are not legally binding or enforceable.
National Policy	
National Policy Statement for Energy (EN-1) (Ref 12.9).	EN-1 sets out the national policy for energy infrastructure and aims to speed up the transition to a low carbon economy to help realise the UK climate change commitments. Paragraph 3.3.5 states that "*Government would like industry to bring forward many new low carbon developments (renewables, nuclear and fossil fuel generation with CCS) within the next 10 to 15 years to meet the twin challenge of energy security and climate change as we move towards 2050."*.
National Policy Statement for Nuclear Power Generation (EN-6) (Ref 12.10).	EN-6 along with EN-1 provides the primary basis for decisions taken by the Infrastructure Planning Commission (IPC) on applications it receives for nuclear power stations. Note that the IPC was a non-departmental public body responsible for the examining and in certain circumstances the decision-making body for proposed nationally significant infrastructure projects. The Commission was abolished in 2012 with responsibility being passed to the Planning Inspectorate. Paragraph A.3.1 sets out the Governments support for new a nuclear generation plan: *"For the UK to meet its energy and climate change objectives, the Government believes that there is an urgent need for new generation plant including new nuclear power. Nuclear power generation is a low carbon, proven technology, which is anticipated to*

Relevant Legislation and Policy	Relevance to the Assessment
	play an increasingly important role as we move to diversify and decarbonise our sources of electricity.".
Appraisal of Sustainability (AoS): Site Report for Bradwell EN-6 Revised Draft National Policy Statement for Nuclear Power Generation (Ref. 12.11).	The AoS Site Report for Bradwell states that *"establishment of a new nuclear power station will contribute positively to climate change objectives at a local and national level*". The report highlights that a lack of sustainable transport could result in emissions from surface access, however these could be mitigated with green travel plans and public transport. This would be taken into account when developing measures to mitigate the effects of the Project.
National Planning Policy Framework (NPPF) (Ref. 12.12).	The NPPF sets out the Government's planning policies for England. The planning process aims to achieve sustainable development following three overarching objectives: economic, social and environmental. Within the framework it is recognised that the planning process should *"shape places in ways that contribute to radical reductions in greenhouse gas emissions".* Further, new developments should be planned to reduce GHG emissions recognising that *"even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions".*
Environment Bill 2020 (Ref. 12.13).	The emerging Environment Bill 2020 sets out how the environment will be put at the centre of policy making. The Bill aims to help the Government achieve the net zero carbon emissions target. It will establish a new public body, the Office for Environmental Protection which will act as an independent, domestic watchdog. All climate change legislation (including carbon budgets) will be within the enforcement remit of the body, ensuring that there is no governance gap in relation to climate change legislation.

Relevant Legislation and Policy	Relevance to the Assessment
Marine Management Organisation (MMO) South East Inshore Marine Plan Draft for Consultation (2020) (Ref 12.14).	This Plan sets out a strategic approach to planning within the inshore waters between Felixstowe, in Suffolk and near Dover, in Kent. The objectives of the Plan recognise the importance of the marine environment in mitigating climate change. Policy SE-CC-1 states that proposals which have significant adverse impacts on *"carbon sequestration ecosystem services must demonstrate that they will, in order of preference:* *a) avoid* *b) minimise* *c) mitigate significant adverse impacts, or as a last resort* *d) compensate and deliver environmental net gains in line with and where required in current legislation.".*
Local Policy	
Maldon District Council (MDC) Local Development Plan (2017) (Ref. 12.15).	The Local Development Plan (LDP) sets out the planning strategy for future growth over the next 15 years. The Plan states that *"the council will strongly support the principle of the development of a new nuclear power station at Bradwell-on-Sea".* Policy S1 states that the Council will take a positive approach to applications which *"enable and adapt to the effects of climate change by limiting greenhouse gas emissions through the efficient use of energy and use of renewable alternatives, coastal management, and mitigating against flooding.".*
Chelmsford City Council (CCC) Local Plan (2020) (Ref. 12.16).	In May 2020, CCC adopted a new Local Plan. Policy S2 sets out that the Council will encourage new developments that reduce GHG

Relevant Legislation and Policy	Relevance to the Assessment
	emissions and encourage design and construction techniques which contribute to climate change mitigation and adaptation.
CCC Climate and Ecological Emergency Action Plan (2020) (Ref. 12.17).	In 2019, CCC and Southend Borough Council declared or recognised a 'climate emergency'. In 2020 CCC produced a Climate and Ecological Emergency Action Plan which commits the Council to achieve net-zero by 2030 and sets out proposed measures to achieve this including establishing a Task Group to co-ordinate the response to the Climate and Ecological Emergency. Focus areas for work include establishing a carbon baseline position and implementing measures to reduce energy consumption.
Essex County Council (ECC) Minerals Local Plan (2014) (Ref. 12.18).	The Plan supports *"economic growth in the County through the delivery of land, buildings and infrastructure to meet our future needs".* The Plan identifies the Project as a potential user of aggregates from the region and this issue would be taken into account when developing measures to mitigate the effects of the Project.
Essex and Southend-on-Sea Waste Local Plan (2017) (Ref. 12.19).	The Waste Local Plan sets out how Essex and Southend will deal with all types of waste arising now and in the future. Paragraph 9.15 of the Waste Local Plan states that climate change and transportation of waste should be addressed in any planning application.

Table 12.2: Legislation and policy relevant to the vulnerability to climate change assessment

Relevant Legislation and Policy	Relevance to the Assessment
Legislation	
UK Climate Change Act 2008 (as amended).	The Climate Change Act 2008 requires the Government, on a regular basis, to assess the risks to the UK from the impact of climate change and report the findings back to Parliament. The Act contains the Adaptation Reporting Power, which allows Government to ask certain organisations to produce reports on both their climate change risks and their adaptation plans. The Act also requires the Government to lay before Parliament five-yearly climate change risk assessments (CCRA) detailing current and predicted impacts of climate change. The last was developed in 2017 and lists six priority areas: • from flooding and coastal change; • to health and well-being from high temperatures; • due to water shortages; • to natural capital; • to food production and trade; and • from pests and diseases and invasive non-native species.

Relevant Legislation and Policy	Relevance to the Assessment
International Policy	
The United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement.	The UNFCCC is the major international body responsible for managing climate change and carbon emissions. In 2015, it adopted the Paris Agreement, the aims of which are stated as: *"This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:* *…(b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production.".*
National Policy	
National Planning Policy Framework (NPPF).	The NPPF sets out the Government's planning policies for England. The planning process aims to achieve sustainable development following three overarching objectives: economic, social and environmental including adapting to climate change. Within the framework it is recognised that plans should take a proactive approach to adapting to climate change. *"New Development should be planned for in ways that: avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure.".*
National Policy Statement for Energy (EN-1).	EN-1 sets out the national policy for energy infrastructure and aims to speed up the transition to a low carbon economy to help realise the UK climate change commitments.

Relevant Legislation and Policy	Relevance to the Assessment
	Section 4.8 sets out the requirement for the ES to include: *"how the proposal will take account of the projected impacts of climate change".* Paragraph 4.8.6 states that *"the IPC should be satisfied that applicants for new energy infrastructure have taken into account the potential impacts of climate change using the latest UK Climate Projects available.".* For the Vulnerability to Climate Change Hazard Assessment (**section 12.7**), applicants are required to present results from the 10%, 50% and 90% probabilities as a minimum. Where energy infrastructure has safety critical elements, which is the case for the Project, the applicant should apply the high emissions scenario.
National Policy Statement for Nuclear Power Generation (EN-6).	EN-6, along with EN-1, provides the primary basis for decisions taken by the Infrastructure Planning Commission (IPC) on applications it receives for nuclear power stations. Section 2.10 sets out the requirements for applicants relating to climate change adaptation. Applicants are required to provide *"information as to how the development incorporates adaptation measures to take account of the effects of climate change, including:* • *Coastal erosion and increased likelihood of storm surge and rising sea levels;* • *Effects of higher temperatures; and* • *Increased risk of drought, which could lead to a lack of available process water".*
Appraisal of Sustainability (AoS): Site Report for Bradwell EN-6 Revised Draft National	The AoS Site Report for Bradwell focuses on assessing the environment and sustainability impacts of a new nuclear power station at the nominated site at Bradwell. The site was put forward by the Nuclear Decommissioning Authority and includes the land alongside

Relevant Legislation and Policy	Relevance to the Assessment
Policy Statement for Nuclear Power Generation.	the existing nuclear power station at Bradwell. The report indicated that the nominated site is at risk with respect to a number of climate hazards including storm surges, coastal erosion, sea level rise and flooding and suggests appropriate mitigations. As set out in **Section 12.7**, these hazards would be considered in the Vulnerability to Climate Change Assessment for the main development site.
National Adaptation Programme (NAP) (Ref. 12.20).	The NAP sets out the Government's response to the second Climate Change Risk Assessment (CCRA). It sets out the actions the Government will take to address the risk and opportunities posed by a changing climate. This is part of the five-yearly cycle as set out in the Climate Change Act 2008 to drive an adaptive approach to building resilience to climate change. The NAP states new nuclear installations: *"must reflect internal and external hazards including the reasonably foreseeable effects of climate change over the lifetime of the facility as well as other factors such as coastal erosion, extreme weather and flooding.".*
Regional Policy	
South East Inshore Marine Plan Draft for Consultation (2020).	The Marine Management Organisation (MMO) Plan sets out a strategic approach to planning within the inshore waters between Felixstowe, in Suffolk and near Dover, in Kent. Policy SE-CC-2 states that Proposals *"should demonstrate for the lifetime of the project that they are resilient to the impacts of climate change and coastal change.".* Policy SE-CC-3 states that *"proposals that may have significant adverse impacts on climate change adaptation measures outside of the proposed project area must demonstrate that they will, in order of preference:* *a) avoid* *b) minimise*

Relevant Legislation and Policy	Relevance to the Assessment
	c) mitigate the significant adverse impacts upon these climate change adaptation measures.".
Local Policy	
MDC Local Development Plan (2017).	The LDP sets out the planning strategy for future growth over the next 15 years. Policy D1 states that *"all developments must demonstrate that they have regard to the design principles set out in the Maldon District Design Guide",* which in turn has requirements for future proofing to mitigate the effects of climate change under Policy C21.
CCC Local Plan (2020).	In May 2020, CCC adopted a new Local Plan. Strategic Policy S2 sets out requirements for developments to address climate change and flood risk. The plan states that *"the Council will require that all development is safe, taking into account the expected life span of the development, from all types of flooding and appropriate mitigation measures are identified, secured and implemented. New development should not worsen flood risk elsewhere.".* Strategic Policy S2 also sets out that the council will encourage new developments that: • reduce GHGs; • promote efficient use of natural resources; • reduce the need to travel and provides sustainable transport modes; • provides opportunities for renewable and low carbon energy technologies and schemes; • encourages design and construction techniques which contribute to climate change mitigation and adaptation; and

Relevant Legislation and Policy	Relevance to the Assessment
	• provide opportunities for green infrastructure. Strategic Policy S4 sets out that climate change adaptation will be considered in the conservation and enhancement of the natural environment. Policy DM19 – Renewable and Low Carbon Energy sets out that planning permission will be granted for renewable or low carbon energy developments provided that they do not cause demonstrable harm to residential living environment, they avoid or minimise impacts on historic environment, demonstrate no adverse effect on the natural environment, do not have an unacceptable visual impact and will not have a detrimental impact on highways safety. The reasoned justification for this includes mitigation of climate change. Policy DM24 – Design and place shaping principles in major developments sets out that all new major developments should incorporate site design and individual building design that minimises energy consumption and provides resilience to a changing climate. Policy DM25 – Sustainable Buildings sets expectations for residential and non-residential buildings to incorporate sustainable design features to reduce carbon dioxide emissions. This includes convenient access to electric vehicle charging infrastructure and all non-residential buildings with a flood area in excess of 500sqm achieving a minimum BREEAM rating of 'Very Good'.
ECC Minerals Local Plan (2014).	The Plan supports economic growth in the County through the delivery of land, buildings and infrastructure to meet our future needs. The Plan identifies the Project as a potential user of aggregates from the region. The plan states that: *"Ensuring all minerals development is located, operated and managed whilst having regard to climate change mitigation and adaptation, so the County plays its part in reducing greenhouse gas emissions and is resilient to potentially more extreme future weather conditions.".*

Relevant Legislation and Policy	Relevance to the Assessment
	The Plan sets out considerations relating to climate change that are required for mineral application sites.
Essex and Southend-on-Sea Waste Local Plan (2017).	The Waste Local Plan sets out how Essex and Southend will deal with all types of waste arising now and in the future. Paragraph 9.15 of the Waste Local Plan states that climate change and transportation of waste should be addressed in any planning application.

Technical guidance

12.2.3 Technical guidance that has been used to define the assessment is set out in **Table 12.3** and **Table 12.4**.

Table 12.3: Technical guidance relevant to the greenhouse gases assessment

Guidance Reference	Implications
Assessing Greenhouse Gas Emissions and Evaluating their Significance (2017) (Ref 12.21).	Provides guidance on assessment and mitigation of GHG emissions within an EIA context. Includes a focus on proportionate and robust assessment. IEMA Guidance is based on the five IEMA Principles on Climate Change Mitigation and EIA: 1. The GHG emissions from all projects will contribute to climate change; the largest interrelated cumulative environmental effect. 2. The consequences of a changing climate have the potential to lead to significant environmental effects on all topics in the EIA Directive, for example, population, fauna, soil etc. 3. The UK has legally binding GHG reduction targets – EIA must therefore give due consideration to how a project will contribute to the achievement of these targets.

Guidance Reference	Implications
	4. GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reductions from a project might be considered to be significant. 5. The EIA process should, at an early stage, influence the location and design of projects to optimise GHG performance and limit likely contribution to GHG emissions.
Publicly Available Standard (PAS) 2080: 2016 – Carbon Management in Infrastructure (Ref. 12.22).	PAS 2080 provides an approach to reducing GHG emissions from infrastructure projects including working with stakeholders throughout the project lifecycle. The Greenhouse Gases assessment would be carried out in-line with PAS 2080.
The Greenhouse Gas Protocol Corporate Accounting and Reporting Standard (GHG Protocol) (2001) (Ref. 12.23).	GHG Protocol provides standards and guidance for preparing a GHG emissions inventory. The Greenhouse Gases assessment would be carried out in-line with the GHG Protocol.
BS EN 15978 (2011) (Ref. 12.24).	BS EN 15978 focuses on the calculation method to assess the environmental performance of a building, based on life cycle assessment (LCA) for both new and existing buildings. The standard presents a description of the object of assessment, system boundaries applicable at the building level, procedures used for inventory analysis, a list of indicators and procedures for calculation, and reporting and data requirements. The Greenhouse Gases assessment would be carried out in-line with BS EN 15978.
Net Zero – The UK's contribution to stopping global warming (2019) (Ref. 12.25).	This report prepared by the Committee on Climate Change to the Governments of the UK, Wales and Scotland reassesses the UK's long-term emission target. In the UK the report recommends a net-zero date of 2050 achieved through known technologies, improvements in

Guidance Reference	Implications
	people's lives and policy updates. As a result of this report, emission targets in the UK were updated in the Climate Change Act 2008.
Committee on Climate Change Reducing UK emissions 2019 Progress Report to Parliament (2019) (Ref. 12.26).	This report sets out the UK's progress for 2019 against emissions reduction targets to 2050. It states that *"Alongside new renewables, technologies which can offer firm and flexible power, such as nuclear and CCS, will be required for a power system in 2050 contributing fully to achieving overall net zero emissions."*. The report sets out a gap of around 15TWh of low carbon generation, not delivered through offshore wind, that will need to be in place by 2030. If this gap is not filled through other low carbon generation sources for example, nuclear, it is likely that an increase in gas-fired power generation would be needed to meet electricity demand. The Progress Report is updated annually.
BS EN ISO 14064-1: 2019 (Ref 12.27).	ISO 14064-1 sets out guidance for quantification and reporting of greenhouse gas emissions and removals. The methodology for quantification of greenhouse gases in **Section 12.6** follows this guidance and the stated guidance on reporting will be taken into account as part of this assessment.

Table 12.4: Technical guidance relevant to the vulnerability to climate change assessment

Guidance Reference	Implications
UKCP18 projections (Ref. 12.28).	UKCP18 has been produced by the Met Office and provides the latest set of climate change projections for the UK. It includes projections of how temperatures, rainfall, cloud cover and humidity could change in the coming decades, as well as forecasts for how far sea levels around the UK could rise. UKCP18 projections would be used in the hazard assessment (**Section 12.7**). Should a new version of UK Climate Projections be produced during the assessment period, they would be used instead of UKCP18. Where UKCP18 information is not available for certain parameters such as sea surface temperature, projections and datasets from UKCP09 and/or academic literature would be used in place of UKCP18.
UKCP18 technical notes including: 1. Science Overview report (2018) (Ref. 12.29). 2. UKCP18 Land projections: Science report (2018) (Ref. 12.30). 3. UKCP18 Factsheets (Ref. 12.31).	The UKCP18 technical notes provide information on both projections for future time periods. These technical notes would be used in the hazard assessment (**Section 12.7**) when relevant projections are not available.
Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation (2020) (Ref. 12.32).	This IEMA guidance provides a framework for the effective consideration of climate change resilience and adaptation in the EIA process. The methodology for the Vulnerability to Climate Change assessment detailed in **Section 12.7** would be in line with this guidance.

Guidance Reference	Implications
UK Climate Change Risk Assessment 2017 (2017) (Ref. 12.33).	The Climate Change Risk Assessment (CCRA) 2017 fulfils the requirement under the Climate Change Act 2008 for the Government to produce a five-yearly assessment of the risks for the UK of the current and predicted impacts of climate change. The report addresses six priority areas: • flooding and coastal change risks; • health, well-being and productivity from high temperatures; • shortages in the public water supply and for agriculture, energy generation; • natural capital including terrestrial, coastal, marine and freshwater; • domestic and international food production and trade; and • new and emerging pests and diseases and invasive non-native species affecting people. The assessment methodology presented in **Section 12.7** is considerate of the CCRA 2017 and the evolving approach to the upcoming CCRA 2022.
Principles for Flood and Coastal Erosion Risk Management Advice Note (2017) (Ref. 12.34).	These principles provide advice on how flood and coastal erosion risk issues should be taken into account when considering proposals for developments. Appendix C of this report sets out the required approach to considering climate change for flood risk and coastal erosion including the most up to date climate projections for the UK. It would be considered in the Vulnerability to Climate Change assessment.
New Reactor Division – Generic Design Assessment (GDA).	The GDA Step 3 assessment of the UK HPR1000 Reactor sets out the regulators' (ONR and Environment Agency) most up-to-date findings regarding the safety of the reactor technology

Guidance Reference	Implications
Summary of the Step 3 Assessment of the UK HPR1000 Reactor.	to be used for the Project. The GDA is the process which allows the regulators to assess the reactor design separately from applications to build at specific sites. The Step 3 report identified that analysis of the effects of climate change on relevant external hazards and justification of the generic site envelope has been identified as requiring assessment during Step 4. The Step 3 review identified extreme high temperature differences from the reference plan, however no design changes were implemented. Therefore, further scrutiny is required during Step 4. Step 4 is expected to be completed in Q4 2021. The assessment methodology presented in **Section 12.7** is considerate of the GDA, and the Vulnerability to Climate Change assessment would be carried out in an integrated manner with the ongoing GDA.
Maldon District Design Guide (Ref. 12.35).	The Maldon District Design Guide is intended to assist landowners, developers, applicants, agents, designers and planners in the process of developing and assessing design quality. Policy C21 Future Proofing states that: *"It is important to mitigate the effects of climate change in hotter and colder weather patterns, and to reduce energy consumption. Materials from sustainable sources and recycled materials should be considered. Mitigating development impacts through landscape design, tree planting and biodiversity measures to maintain and encourage wildlife should also be considered.".*
Climate Change Adaptation Manual (NE751) (Ref. 12.36).	The Climate Change Adaptation Manual (NE751) has been updated in 2020. It is designed to support practical and pragmatic decision-making on considering climate change adaptation for impacts on habitats, green infrastructure, geology and geomorphology, and access and recreation. The assessment methodology presented in **Section 12.7** considers the Climate Change Adaptation Manual in the assessment of impacts on affected ecosystems.

12.3 Consultation and Engagement

12.3.1 This chapter has been informed by engagement and discussion with various stakeholders. **Table 12.5** details technical engagement to date which has occurred outside of formal statutory consultation. **Table 12.6** provides a summary of consultee comments arising from Stage One Consultation, along with a response to identify how the matter is dealt with in this report.

Table 12.5: Technical engagement

Consultee	Points of Discussion
Responses relevant to the Greenhouse Gases assessment	
Natural England.	Discussions with Natural England took place on 16 October 2019 at the Masterplanning Workshop 1, where the following question on GHGs was raised: Have the evaluation criteria captured the most important issues? Natural England requested further detail on "*the inclusion of Air Pollution and Climate Change as further criteria to take into account construction traffic and associated emissions".* GHG emissions would be covered within the scope of the GHG assessment in the Climate Change chapter. Further details can be found in **Section 12.6**. Additional details with respect to how air pollution will be addressed for the ES are provided in **Chapter 8: Air Quality**.
Responses relevant to the Vulnerability to Climate Change assessment	
Essex County Council (ECC).	At the Masterplanning Workshop 1 meeting held on 16 October 2019, ECC raised a question with regard to sea level rise. It was highlighted that 'sea wall' type flood defences would lend themselves to meeting the requirement of the NPS EN6: "*must also be able to demonstrate that they could achieve further measures for flood management at the site in the future if future climate change predictions show they are necessary'. (para. 3.6.7)."* Climate change allowances would be included in the Flood Risk Assessment (FRA) carried out for the Project as described in **Chapter 16: Flood Risk and Drainage.** An indicative optimal level of the platform would be approximately 7.5m Above Ordnance Datum (mAOD). This corresponds to a 1 in 10,000-year event with consideration for climate change impacts on sea level rise.

Consultee	Points of Discussion
Environment Agency.	At the Masterplanning Workshop 1 meeting held on 16 October 2019, the Environment Agency suggested that the applicant adopts the enhance-avoid-mitigate-compensate hierarchy. It was flagged that: *"New energy infrastructure will need to remain operational over many decades in the face of a changing climate (4.8.5 EN-1). The Company must consider the effects of climate change when planning the location, design, build, operation and decommissioning of new energy infrastructure.* *We advise that when considering the environmental effects of the development that in each case it is considered in combination with the effects of climate change and if measures taken to avoid or mitigate effects will be effective with the additional effect of climate change.".* The effects of climate change on the Project would be considered in the Vulnerability to Climate Change assessment. This process, as detailed in **Section 12.7**, would include the development of design measures to increase the resilience of the Project to climate change impacts. Further detail on the approach to decommissioning is provided in **Chapter 3: The Project.** At the Transport Shortlist Workshop meeting, held on 28 November 2019, the Environment Agency suggested that when culverting watercourses, the applicant should take into account the predicted impacts of climate change (using an allowance for climate change). The impacts of climate change on the design of any culvert will be included in the FRA carried out for the Project as described in **Chapter 16: Flood Risk and Drainage.**
Natural England. Marine Management Organisation (MMO).	The kick-off meeting for the MMO and Natural England held on 6 November 2019 raised the following consideration regarding ecology and climate change: *"We stress that an appropriate impact range for each receptor must be calculated and based on the most precautionary of ecological inputs, be defined as the maximal limit of impact and include the more recent and precautionary climate change predictions.".* The Vulnerability to Climate Change assessment considers the exacerbating impact of climate change on receptors impacted by the Project, including ecological receptors.

Consultee	Points of Discussion
	The use of the RCP8.5 emissions scenario in this assessment ensures that the most recent and precautionary climate change predictions are made, as RCP8.5 is the highest emissions scenario within the core UKCP18 information. Its use is in-line with the requirements of EN-1.
MMO	The Transport Longlist Workshop meeting held on 7 November 2019 with the Environment Agency raised the following question regarding sea level rise. Due to the expected design life of the project (~80 years), the MMO advised that the potential impacts for the project life and project design are considered –for example climate change and sea level rise. The potential climate change impacts for the project life or design would be considered within the Vulnerability to Climate Change assessment. A full climate hazard assessment would be undertaken which includes sea level rise. The assessment methodology as set out in **Section 12.7** inherently considers the design life of the Project. Four different 20-year time periods would be used. Together the time periods span the operational life of the Project. These 20-year periods include: the '2030s' (2020 to 2039), the '2050s' (2040 to 2059), the '2070s' (2060 to 2079) and the '2090s' (2080 to 2099). The '2090s' is the latest time period for which climate projections are available within UKCP18 for the majority of parameters.
Environment Agency.	At the FRA meeting held on 22 February 2020, the Environment Agency suggested the use of the UK Meteorological Office UK Climate Projections 2018 for Climate Change projections to determine appropriate climate allowances for the Project. Further detail on this issue is provided within this chapter.

Table 12.6: Stage One Consultation comments

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
Greenhouse Gases.	The Environment Agency highlight the importance of adopting low carbon solutions. ECC and MDC state their support for the development mitigating and adapting to climate change as per the requirements in the NPS. The Councils request further details on the carbon footprint of the development and the measures proposed that would support the transition of the wider area to become a zero-carbon economy. Furthermore, South Woodham Ferrers Town Council note that the carbon footprint for the construction of the power station must be considered in addition to any perceived benefits. There appears to be a lack of a strategy to reduce carbon emissions during the construction of the power station and the resultant huge carbon footprint is highly likely to significantly outweigh the benefits of the small footprint of the energy produced once the power station is operational. Appropriate monitoring and reporting must be put in place.	The approach to producing a carbon footprint of the development is described in **Section 12.6** with the quantification of GHGs from the Project and how this would be used in the assessment of significance. Specific measures to reduce GHGs from the Project would be developed and reported in the PEI for Stage Two Consultation and the ES.
Vulnerability to Climate Change.	The Environment Agency requests that the development takes into account flooding, drought, heatwaves, intense rainfall events and rising sea levels using the most recent UK Climate Projections and suggests adaptation approaches for doing so. It also suggests there is an opportunity to enhance the climate resilience of important plant, invertebrate and bird species, intertidal habitats and natural coastal	This Scoping Report sets out the assessment approaches for the vulnerability of the proposed Project to climate change, and its impacts on climate change. The assessments inherently consider mitigations that are developed to reduce the impact where practicable.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
	processes. Finally, it suggests Natural England and RSPB's Climate Change Adaptation Manual (2019) is used in the assessment. Natural England and Essex Wildlife Trust also note that there is no mention of climate related impacts of the Project in the Stage 1 DCO Consultation documentation, and that these impacts should be incorporated into all relevant assessments. Natural England and Essex Wildlife Trust requests that the Project needs to draw on the most precautionary and up-to-date climate change predictions across the whole project lifecycle. The MMO stated that climate change policies should be considered in the development of a Marine Plan Policy assessment.	The Vulnerability to Climate Change assessment methodology set out in **Section 12.7** considers the most up-to-date climate projections for the UK (UKCP18), the most precautionary emissions scenario (RCP8.5) and the longest available timescales. The 2020 update to the RSPB Climate Change Adaptation Manual would be considered in the Vulnerability to Climate Change assessment and is included in the technical guidance in **Table 12.4**.

12.4 Data Gathering Methodology

Greenhouse gases

Study area

12.4.1 GHG emissions from all activities associated with the Project would be considered in the Greenhouse Gases Assessment. This includes the power station permanent development, temporary construction facilities, off-site Power Station Facilities and off-site associated development as detailed in **Chapter 3: The Project.** The construction, commissioning, site restoration and removal and reinstatement (where relevant) and operation of the Project would be considered. This includes indirect emissions embedded within the construction materials (arising from the energy used in their production), emissions associated with transportation of materials, waste and construction workers.

12.4.2 Decommissioning of the Bradwell B power station is scoped out of the Greenhouse Gases assessment. Decommissioning of the power station at the end of operation would be covered by a separate consenting regime and EIA as detailed in **Chapter 3: The Project**.

12.4.3 The spatial impact of GHG emissions is global. However, national and regional-scale contextualisation of the emissions produced by the Project is used to determine the significance of effects (see **Section 12.6**).

Temporal scope

12.4.4 The temporal scope of the assessment of GHG emissions is consistent with the timescales for which the UK Carbon Budgets are set, as well as the overall lifetime of the project. The assessment therefore considers the cumulative GHG emissions over the period from the beginning of construction to 2050, and the cumulative GHG emissions from the beginning of construction to the end of operation.

Vulnerability to climate change

Study area

12.4.5 The study area for the Vulnerability to Climate Change assessment is the extent of the assets making up the Project as described in **Chapter 3: The Project** and the receptors that the Project affects, as detailed in the specific aspect chapters of this Scoping Report. As the design and consultation processes progress and the Project is refined, the exact geographical scope of study areas may continue to evolve to accommodate any changes.

12.4.6 Relevant environmental topics would consider the exacerbating impacts of climate change within their assessments and mitigations. Therefore, the study area comprises the study area boundaries defined by each of the environmental topics. These are reported within the relevant chapters, including but not limited to:

- **Chapter 13: Major Accidents and Disasters**;
- **Chapter 14: Soils, Geology and Land-use**;
- **Chapter 15: Water Environment**;
- **Chapter 16: Flood Risk and Drainage**;
- **Chapter 17: Coastal Geomorphology and Hydrodynamics**;
- **Chapter 18: Marine Water Quality and Sediments**;
- **Chapter 20: Landscape and Visual Amenity**;
- **Chapter 21: Recreation**;
- **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**; and
- **Chapter 24: Marine Ecology and Fisheries**.

Temporal scope

12.4.7 The temporal scope of the Vulnerability to Climate Change assessment is consistent with the Project timescales. UKCP18 projections for future periods that are in-line with project timescales for the construction, commissioning, site restoration and removal and reinstatement (where applicable), and operation of the Project would be used.

12.4.8 The potential impacts of climate change increase over time, so the potential impacts experienced by any one receptor or asset would be greatest at the end of its design life. Therefore, UKCP18 projections that are representative of the end of the design life would be used to assess effects.

12.4.9 For receptors affected by the Project such as ecosystems and settlements, the end of the operational design life of the Project is used to assess effects.

Sources of data used in scoping

Desk based

12.4.10 The principal desk-based data sources used to inform this chapter are presented in **Table 12.7**.

Table 12.7: Data used for scoping

Source	Data
Greenhouse Gases	
BEIS Updated energy and emissions projections 2018 (Ref. 12.37).	Historic and projected GHG emissions and energy demand for the UK from this Department for Business, Energy and Industrial Strategy (BEIS) report and annexes have been used to inform the baseline for the Greenhouse Gases assessment.
Vulnerability to Climate Change	
Met Office Eastern England: Climate. 2016 (Ref. 12.38).	Regional climate summary for eastern England spanning the most recent 30-year averaging period of 1981-2010 has been used to inform the baseline.
UKCP18	Probabilistic climate change projections for the UK at 25km spatial resolution. In line with EN-1, data for the 10%, 50% and 90% probability levels for the high emissions scenarios was obtained.

12.5 Baseline Information

Greenhouse gases

Current baseline

12.5.1 The GHG current baseline is the existing situation in which there is no power provided to the UK grid from the Bradwell B power station and is therefore considered to have no impact on the GHG emissions produced by the UK energy sector.

12.5.2 The Committee on Climate Change Reducing UK emissions 2019 Progress Report to Parliament states that:

> "*Nuclear energy's generation increased by 2.4% in 2018 [globally above 2017 levels], but its share of electricity generation remained largely unchanged (10%) due to growing global electricity demand*."

12.5.3 In 2017, emissions from the energy sector were 108 $MtCO_2e$ as stated in the BEIS Updated energy and emissions projections 2018.

12.5.4 This report also states that:

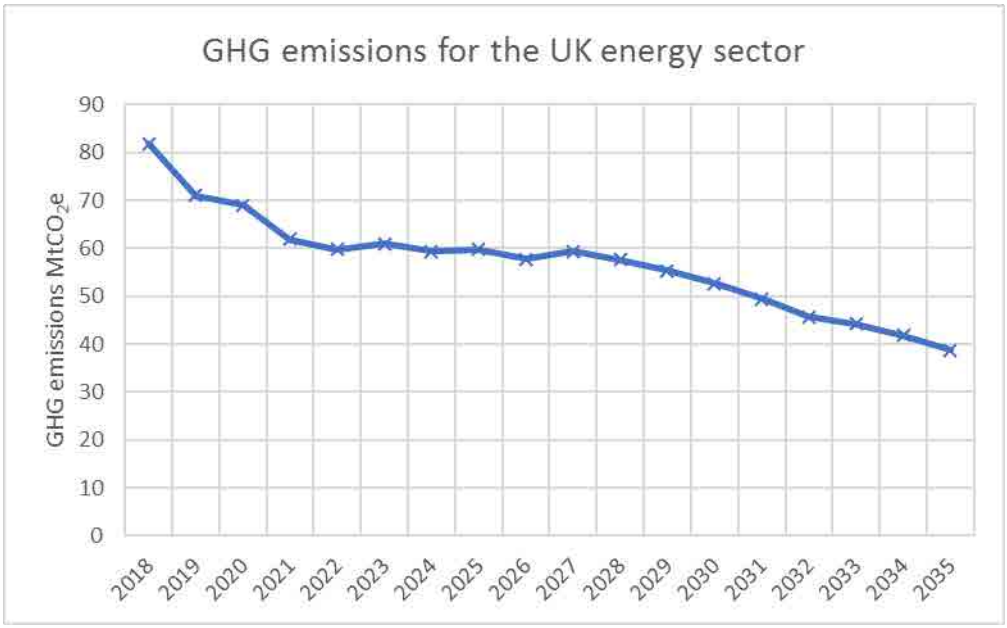
> "*CO_2 emissions from power stations have reduced by 60% since 1990, including a 48% fall between 2010 and 2016.*"

Future baseline

12.5.5 The GHG future baseline is the scenario in which the Project is not developed and therefore no power is provided to the UK grid from the Bradwell B power station at the planned start of the operational phase. GHG emissions to the power sector from the Bradwell B power station and the Project are therefore zero.

12.5.6 The BEIS Updated Energy and Emissions Projections 2018 extend to 2035. They state that the energy sector will account for 39 $MtCO_2e$ in 2035 in the reference case. This case is based on central assumptions for the key drivers of energy and emissions "*such as fossil fuel prices Gross Domestic Product (GDP) and population"*. **Plate 12.1** shows the projected reduction in GHG emissions for the energy sector to 2035 (produced using the BEIS Updated Energy and Emissions Projections 2018).

Plate 12.1: BEIS energy projections – reference case



12.5.7 The BEIS emissions projections reference case indicates that at the end of the current BEIS emissions projections in 2035, the nuclear industry is projected to contribute 104TWh of power, contributing to a total UK generating capacity of 332TWh. Nuclear power is therefore a major contributor to the reduction in GHG emissions shown in **Plate 12.1.**

12.5.8 The reference case indicates that new build nuclear facilities will produce 12GW of power by 2035, contributing to a total UK generating capacity of 141GW.

12.5.9 It should be noted that the BEIS emissions projections report also states that:

> "*Beyond the early 2020s, the scenario presented here is illustrative and includes assumptions that may go beyond current Government policy.*".

12.5.10 These projections precede the net zero by 2050 legislation target passed in 2019. As part of its recommendation for net zero, the Committee on Climate Change stated that *"Alongside new renewables, technologies which can offer firm and flexible power, such as nuclear and CCS, will be required for a power system in 2050 contributing fully to achieving overall net zero emissions.".*

12.5.11 The Committee on Climate Change net zero recommendation report also sets out a gap of around 15TWh of low carbon generation, which is not expected to be delivered through offshore wind, that will need to be in place by 2030. If this gap is not filled through other low carbon generation sources (such as nuclear), it is likely that an increase in gas-fired power generation would be needed to meet electricity demand.

12.5.12 It is against this Future Baseline scenario that the impact of the Project on the UK's ability to meet its net zero legislation is currently assumed to be assessed, although

any further policy changes or energy mix projections produced prior to the completion of the ES will be considered.

Vulnerability to climate change

Current baseline

12.5.13 The current baseline for the Vulnerability to Climate Change assessment is the current climatic conditions at the site. They would be used to contextualise the climate change impacts throughout the construction and operation of the Project.

12.5.14 In general, the east of the UK tends to be drier, warmer, sunnier and less windy than western and northern regions. The general locality of the Project has a temperate marine climate with mild damp winters and warm, drier, sunnier summers, similar to much of the southern British Isles. Given its location close to continental Europe, it can be exposed to continental weather influences that bring cold spells in winter and hot, humid weather in summer (Ref. 12.39).

12.5.15 Current climate conditions are described in the Met Office Eastern England: Climate. 2016 which provides a regional climate summary for eastern England:

- The mean annual temperature over the eastern England region varies from 9.5°C to just over 10.5°C.
- Mean daily maximum temperatures range from just over 6°C to 8°C during the winter months. January and February are the coldest months with mean daily minimum temperatures close to 1°C.
- Mean daily maximum temperatures range from 20°C to 23°C in the summer.
- Sea temperatures off the coast of eastern England vary from 5-6°C in February and March to 15-16°C in August. The temperature is influenced by the influx of warm waters associated with the Gulf Stream.
- The average number of days a year with air frost (when temperatures at 1.25m above the ground fall below 0°C) is less than 30 at coastal regions. Although frost is more prevalent in the winter, the warming effect of the sea can delay the start of the frost season at coastal sites.
- Much of eastern England receives less than 700mm per year of precipitation and includes some of the driest areas in the UK. In eastern England there is a more even distribution of rainfall throughout the year than in most other parts of the UK. Across the region, there are on average about 30 rain days (rainfall greater than 1mm) in winter and less than 25 days in summer.
- The average number of days of thunderstorms per year is about 15, although there is considerable variability from year to year.
- There are 6-8 days each year with hail over much of East Anglia.

- The average number of days with snow falling is under 20. The average number of days with snow lying (when the ground is more than 50% covered at 09:00 am) is less, varying from about 6 to 15.
- Eastern England is one of the more sheltered parts of the UK. Winds are usually stronger by day than by night. Wind directions from the south and north-west account for the majority winds and nearly all cases of strongest winds.
- Coastal sea breezes starting at the coast and progressing inland are important in late spring and summer. These are associated with a drop in inland temperatures.
- Eastern England has no more than 2 days of gale each year (a day on which the wind speed attains a mean value of 34 knots or more over any period of 10 minutes), although this can be higher at about 5 gales each year for exposed coastal areas.

12.5.16 Further detail on baseline information for surface, pluvial and other sources of flood risk is described in **Chapter 16: Flood Risk and Drainage.**

Future baseline

12.5.17 The future baseline is used to set out the general climatic conditions that would be experienced in the Project location in the future. A full description of the climatic hazards, including an exploration of their uncertainty, would be included as part of the Vulnerability to Climate Change assessment process as described in **Section 12.7**. The following text summarises the future baseline for climate variables based on UKCP18 information using the relevant 25km^2 grid square for the main development site and the RCP8.5 emissions scenario. RCP8.5 is the highest emissions scenario within the core UKCP18 information. The use of this scenario is in accordance with the requirements of EN-1, although the lower RCP6.0 would also be used to characterise the design basis.

Temperature

12.5.18 The main predicted changes in temperature over the coming century are summarised in **Table 12.8.** It is projected that an increase in both average and extreme temperatures would occur. Winter and summer mean temperatures are projected to increase as are winter minimum and summer maximum temperatures.

Precipitation

12.5.19 There is greater uncertainty regarding projected changes to precipitation than for temperature. The main changes are summarised in **Table 12.8**.

12.5.20 Mean winter precipitation is projected to increase slightly by the end of the century. Summer precipitation is projected to decrease.

12.5.21 Climate change is projected to have an impact on precipitation variability (changes in seasonal precipitation and year to year variation), which in turn would impact intensity and duration of droughts, floods and in-soil moisture deficit.

12.5.22 Climate change allowances would be included in the FRA carried out for the Project as described in **Chapter 16: Flood Risk and Drainage.** Generally, as a result of climate change, it is projected that there would be an increase in peak rainfall intensities and resulting flood flows over time. The Environment Agency guidance (Ref. 12.40) on climate change allowances to be applied in England was last updated in 2019 and provides guidance on the potential enhanced rainfall intensity and seasonality with wetter winters and drier summers and potential increases in sea level. The guidance provides a single set of recommendations for extreme rainfall allowances for all of England, along with regional sea level rise allowances for central and upper end estimates.

Humidity

12.5.23 Specific humidity is projected to increase over the coming century (both summer and winter means) as summarised in **Table 12.8**.

Table 12.8: Projected changes to mean climate variables under a RCP8.5 (high) climate scenario

Climate Variable Anomaly Relative to an Appropriate Baseline	Time Period											
	2030s (2020-2039)			2050s (2040-2059)			2070s (2060-2079)			2090s (2080-2099)		
	10%	50%	90%	10%	50%	90%	10%	50%	90%	10%	50%	90%
Temperature												
Mean annual air temperature anomaly at 1.5m (°C).	0.4	1.0	1.7	0.9	1.8	2.8	1.4	2.9	4.4	2.2	4.1	6.2
Mean summer air temperature anomaly at 1.5m (°C).	0.4	1.3	2.2	0.9	23	3.8	1.3	3.5	5.9	2.5	5.1	8.1
Mean winter air temperature anomaly ay 1.5m (°C).	0.0	1.0	1.9	0.5	1.7	3.0	0.8	2.5	4.3	1.5	3.6	5.9
Maximum summer air temperature anomaly at 1.5m (°C).	0.3	1.4	2.6	0.8	2.6	4.4	1.2	3.9	6.8	2.4	5.7	9.5
Minimum winter air temperature	0.0	0.9	2.0	0.4	1.7	3.2	0.8	2.6	4.6	1.3	3.7	6.5

Climate Variable Anomaly Relative to an Appropriate Baseline	Time Period											
	2030s (2020-2039)			2050s (2040-2059)			2070s (2060-2079)			2090s (2080-2099)		
	10%	50%	90%	10%	50%	90%	10%	50%	90%	10%	50%	90%
anomaly at 1.5m (°C).												
Precipitation												
Annual precipitation rate anomaly (%).	-4.9	0.6	6.7	-8.0	-1.7	5.4	-8.0	-1.7	5.0	-9.1	-1.7	6.2
Summer precipitation rate anomaly (%).	0.1	0.5	0.9	-5.3	11.2	29.0	-2.0	18.5	41.5	1.0	24.4	53.0
Winter precipitation rate anomaly (%).	-33.7	-10.6	13.9	-46.8	-20.7	7.3	-60.0	-28.0	4.6	-69.3	-38.3	-0.9
Humidity												
Summer specific humidity anomaly at 1.5m (%).	-2.4	5.9	14.6	-1.1	10.2	22.2	1.2	15.9	31.6	3.6	22.9	42.6
Winter specific humidity anomaly at 1.5m (%).	0.1	0.5	0.9	1.0	10.7	21.5	3.9	17.2	32.0	8.5	26.0	45.5

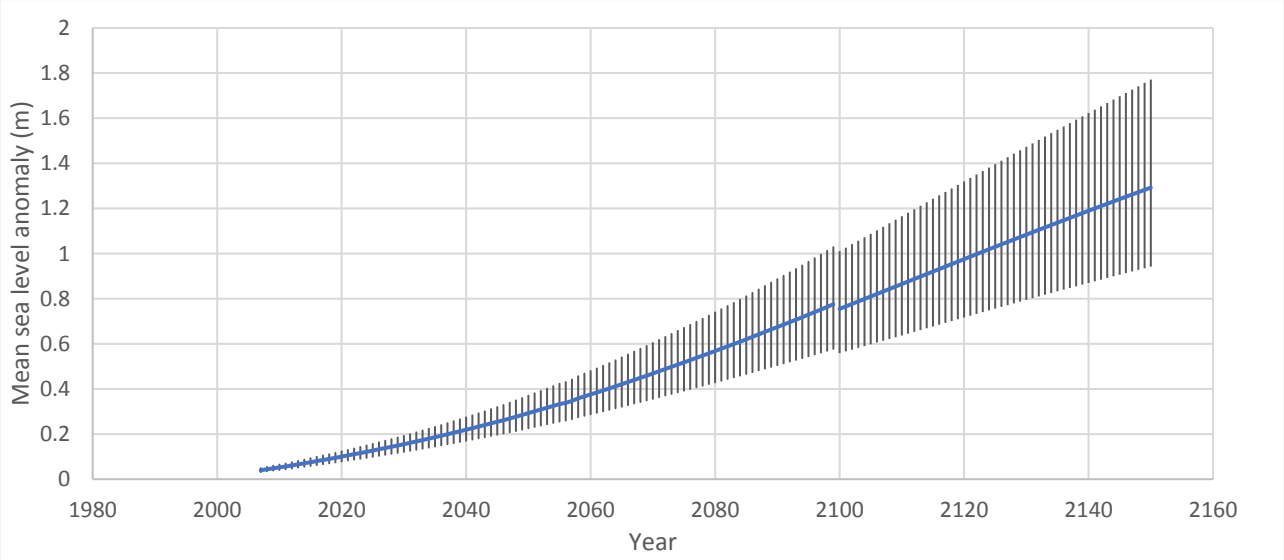
Sea level

12.5.24 Marine projections available from UKCP18 show the mean sea level anomaly for around the coastal regions of the UK over the 21st century and exploratory data provides projections until 2300.

12.5.25 UKCP18 probabilistic projections for mean sea level have been analysed for the 25km coastal grid square adjacent to where the Project is located under an RCP8.5 climate scenario. RCP8.5 is the highest emissions scenario within the core UKCP18 information. Its use is in-line with the requirements of EN-1.

12.5.26 Sea level around the main development site is projected to rise over the 21st century, even with large reductions in greenhouse gas emissions. Projections indicate that by 2100 mean sea levels in the relevant UKCP18 grid square could be 0.78m higher (ranging from 0.58m to 1.03m for the 10% to 90% probability levels respectively) compared to baseline 1981-2000 values (see **Plate 12.2**).

Plate 12.2: Projected changes to mean sea level under a RCP8.5 climate scenario relative to an appropriate baseline



Planned further surveys and studies

Greenhouse gases

12.5.27 The future baseline would continue to develop as new forecasts for the UK energy sector are produced and UK net zero policy and guidance is released (for example, the delayed National Infrastructure Strategy).

12.5.28 The Greenhouse Gases Assessment current baseline is for contextual purposes only and would therefore not be updated.

Vulnerability to climate change

12.5.29 The Vulnerability to Climate Change Assessment current and future baselines are for contextual purposes only and would therefore not be updated further.

12.5.30 A full climate hazard assessment for the Project would be carried out as part of the assessment methodology detailed in **Section 12.7**. This does not form part of the current or future baselines but is part of the risk assessment process.

12.6 Proposed Approach to the Greenhouse Gases Assessment

Assessment methodology

12.6.1 The approach taken is to identify the factors associated with the Project that affect GHG emissions and the associated sensitivity of those factors. The total emissions from the Project scenario would be compared to the future baseline scenario in order to understand the net effect of the Project on GHG emissions.

12.6.2 The approach taken is based on the relevant guidance stated in **Table 12.3**.

12.6.3 The assessment would consider all approaches to reduce GHG emissions within the construction, design and operation of the Project.

12.6.4 GHG emissions are measured in CO_2 equivalent (CO_2e) where possible. Relevant GHGs are defined in the Kyoto Protocol (Ref. 12.41):

- carbon dioxide (CO_2);
- methane (CH_4);
- nitrous oxide (N_2O);
- sulphur hexafluoride (SF_6);
- hydrofluorocarbons (HFCs);
- perfluorocarbons (PFCs); and
- nitrogen trifluoride (NF_3).

12.6.5 The assessment considers the following emissions sources for the Project:

- construction: embodied carbon (the GHG emitted during the manufacture, transport and construction of building materials required for all stages of the Project), surface access (i.e. road use) for construction staff and equipment, component transportation for waste and materials and on-site energy use during the construction period;
- commissioning energy use: GHG emissions required to commission the facility;

- site removal and reinstatement: GHG emissions required to restore temporary off-site associated development;
- operational surface access and transport: transport of materials used in operation to the site, transport of waste from the Project off-site for processing, surface access for operational staff;
- operational energy use: GHG emissions required to operate facilities, and;
- fuel supply chain.

12.6.6 The PAS 2050 (Ref. 12.42) specification excludes emissions sources which contribute <1% of emissions inventories and these emissions inventories are considered complete for verification purposes. This approach would be applied to the Greenhouse Gases Assessment.

12.6.7 GHG emissions associated with land use change resulting from the Project are expected to be minimal. Whilst changes to land use may be a potential carbon sink, they are not of a scale that would be of relevance to the assessment of significance and it is therefore not proportionate to the scale of the Project to include them in the climate assessment.

12.6.8 GHG emissions associated with the decommissioning of the Bradwell B power station are scoped out of this assessment. Any future decommissioning activities would require a separate permission as detailed in **Chapter 3: The Project**.

Quantification of construction GHG emissions

12.6.9 For construction emissions, the cumulative emissions of all construction phases for the main development site, project-provided accommodation and off-site associated development up to the point at which they are handed over for operations. This therefore includes both commissioning and site restoration and removal and reinstatement (where relevant).

12.6.10 The largest emissions from the construction are likely to be the embedded GHG emissions within construction materials associated with the Project. This represents the sum of GHG emissions covering extraction of raw and primary materials and their manufacture and refinement into products and construction materials, as well as the transport and supply logistics to the factory gate. A suitable methodology such as that developed by Royal Institute of Chartered Surveyors (RICS) would be used to calculate embodied carbon along with the Inventory of Carbon and Energy (ICE) database (Ref. 12.43). The approach would be in-line with BS EN15978:2011: Sustainability of Construction Works – Assessment of environmental performance of buildings – Calculation method.

12.6.11 GHG emissions from surface access and marine transport associated with construction activities would be estimated based on trip length and using BEIS emissions factors for GHG reporting (Ref. 12.44). Details on the number of construction vehicles including Heavy Goods Vehicle movement and their

respective trip lengths would be obtained from transport modelling (see **Chapter 6: Transport**). Construction staff commuting distances would also be estimated (Ref. 12.45).

12.6.12 On-site energy use resulting from the construction, commissioning and site restoration and removal and reinstatement (where relevant) processes would be estimated based on available guidance and best practice (for example, research on typical on-site GHG emissions).

12.6.13 GHG emissions associated with the disposal and transportation of construction waste would be estimated based on available guidance and best practice.

Quantification of operational GHG emissions

12.6.14 Direct emissions from nuclear power generation are minimal, but emissions arise from the rest of the nuclear lifecycle. Therefore, operational energy use relates to any processes or building energy use required that is not related to construction. These include:

- Operations on site and surface access (for example, electricity supply to site, energy used to supply potable water and treat wastewater, diesel supply use, backup generation, waste treatment and employee access); and
- Fuel supply chain (for example, mining, milling, enrichment of uranium and transportation of fuels and materials).

12.6.15 Annual and cumulative GHG emissions from operation of the Project would be estimated based on available guidance and best practice (for example, research and relevant data on GHG emissions from particular processes) and project-specific data such as fuel processing methods, uranium ore grade estimates, decarbonisation of electricity used in the supply chain, mining location etc.

Assessment of effects and determining significance

12.6.16 The general approach to assessment of effects and determining significance that would be used for the EIA is provided in **Chapter 5: The EIA Process and Methods**. However, this section sets out how the approach has been applied to the Greenhouse Gases assessment and where it has been adapted to deal with the specific requirements of the Greenhouse Gases assessment.

12.6.17 The significance of a Greenhouse Gases effect resulting from the Project is assessed by reference to the sensitivity (or value) of a receptor and the magnitude of the impact.

Sensitivity

12.6.18 The only receptor for the Greenhouse Gases assessment is the global climate. Any increase or decrease to GHG emissions against the future baseline can be

considered to be significant based on their effect on the global climate, which is a very high sensitivity receptor.

Magnitude

12.6.19 The approach set out enables quantification of the GHG emissions across the construction and operation of the Project, provides a mechanism for identifying areas where mitigation measures may be required, and for identifying the most appropriate measures to reduce the magnitude of GHG emissions.

12.6.20 In order to identify the effects of a single project against the universal receptor (i.e. the global climate), an approach for contextualisation must be used. For this assessment, the UK carbon budgets and sector-based climate change targets and strategies would be used.

12.6.21 The climate change impact or benefit of the Project as a whole would be derived by comparing the emissions required to construct and operate it against the expected grid mix without the Project, which is characterised in the Future Baseline set out in **Section 12.5**. The emissions per kWh of electricity generated by the Project would be compared against the projected grid electricity sources for the UK as a whole.

12.6.22 The fifth carbon budget for the 2028–2032 budgetary period is 1,725,000,000tCO_2e. To meet the fifth carbon budget, the Committee on Climate Change advises that the carbon intensity of power generation needs to decrease from 450gCO_2/kWh in 2014 to below 100gCO_2/kWh in 2030. The Committee on Climate Change 2019 progress report updates this to imply a required level of low carbon generation consistent with reducing emissions to 50gCO_2/kWh by 2030.

12.6.23 The sixth carbon budget will be published in late 2020. It will set out advice on the volume of GHG emissions the UK can emit during the period 2033-2037 and will provide analysis of how sectors should meet that challenge (i.e. how a certain level of carbon intensity can be achieved). Whilst this is not available at this time, it would be taken into account when producing the ES.

12.6.24 The assessment of the magnitude of the impact would consider the scale of GHG emissions from the construction and operation of the Project compared to the Future Baseline (contextualised as the overall impact on the UK carbon targets). The extent to which the Project materially affects the ability of the UK to meet its carbon budgets and the 2050 net zero target would be analysed to determine magnitude. The magnitude criteria are provided in **Table 12.9**.

Table 12.9: Magnitude criteria for GHG impact assessment

Magnitude	Magnitude criteria
High	Carbon intensity (CO_2e/kWh) of the Project is not in-line with forecasts and strategies for how the energy sector is to meet net zero by 2050 (for example, CCC Sixth Carbon Budget analysis), including requirements for baseload power in the UK energy mix.
Low	Carbon intensity (CO_2e/kWh) of the Project is in-line with forecasts and strategies for how the energy sector is to meet net zero by 2050 (for example, CCC Sixth Carbon Budget analysis), including requirements for baseload power in the UK energy mix

12.6.25 The most up-to-date forecasts and strategies available at the time of the finalisation of the ES would be used. The extent to which satisfactory mitigations are in place to reduce GHG emissions through design, construction and operation wherever practicable, and the appropriateness of GHG emission monitoring arrangements following approval, would also be taken into consideration. The carbon intensity of energy generation from the Project would be compared to other grid electricity options in the Future Baseline.

12.6.26 The magnitude of GHG emissions would be considered low or high based on the extent to which the scheme materially affects the ability of the UK Government to meet its carbon budgets and 2050 net zero target, using expert judgement.

Significance of effect

12.6.27 Given that all emissions may be considered significant as the sensitivity of the receptor is always high, the effect would be assessed as described in **Table 12.10**.

Table 12.10: Classification of effects

Magnitude	Significance
Low	Minor adverse.
High	Major adverse.

12.7 Proposed Approach to the Vulnerability to Climate Change Assessment

Assessment methodology

12.7.1 The approach for the Vulnerability to Climate Change assessment would be to conduct a hazard assessment of climate variables and to conduct a risk assessment to evaluate the extent to which the assets and infrastructure required for the Project, the environmental and social mitigations put in place, and the environmental and

human receptors impacted by the Project are affected by climate change within the anticipated lifetime of its operation.

12.7.2 Hypothetical examples of how increased temperature could impact each of these aspects of the Project are included in **Table 12.11**.

Table 12.11: Aspects of the Project considered and example climate change impacts

Aspect of the Project	Example of how increased temperature could have an impact
Built assets and infrastructure required for the Project.	Increased high temperatures impact thermal efficiency and cooling of the plant as-built.
Environmental and social mitigations put in place.	Increased high temperatures impact and the success of new tree planting which are provided as mitigation to account for landscape impact.
The exacerbating impacts of climate change on environmental and human receptors affected by the Project, including ecosystems and settlements.	Increased high temperatures impact the sea surface temperatures into which cooling water discharges, thus exacerbating the risk to ecological receptors.

12.7.3 The approach taken considers the IEMA guidance on climate change resilience and best practice from other Development Consent Order (DCO) applications.

12.7.4 The Vulnerability to Climate Change assessment is a risk-based approach undertaken by climate change topic specialists in collaboration with relevant design teams (for example designers responsible for flood risk, earthworks, built environment, safety and risk, landscaping, biodiversity and surface access etc.).

12.7.5 A requirement of the Office for Nuclear Regulation's Safety Assessment Principles for Nuclear Facilities (Ref. 12.46) is a need to demonstrate that the site can be developed and operated safely, accounting for external hazards, for example with respect to the risk of flooding due to increases in sea level resulting from climate change. This would be taken into account throughout the assessment process.

12.7.6 A separate FRA would be conducted and is described in **Chapter 16: Flood Risk and Drainage**. This would include an assessment of climate change effects on flood risk, taking into account current Environment Agency climate change allowances for increases in peak river flow, rainfall intensity and sea level. The results of the FRA would be considered by the climate change assessment team, the relevant Project engineering and design teams, and the water environment aspect team, and brought into the Vulnerability to Climate Change assessment.

12.7.7 The following key terms and definitions relating to the Vulnerability to Climate Change assessment would be used. These are in-line with those used in the UK Climate Change Risk Assessment 2017 and the developing methodology for the Climate Change Risk Assessment 2022 but would be adapted to suit the EIA context.

- A **climate hazard** is a weather or climate related event, which has the potential to do harm to the infrastructure, assets and/or receptors associated with the Project. An example of a climate hazard is a high precipitation event.
- **Exposure** is the presence of infrastructure, assets, people and/or environmental receptors in places and settings that could be adversely affected.
- **Vulnerability** is the propensity or predisposition of infrastructure, assets, people and/or environmental receptors to be negatively affected by a hazard.
- A **climate impact** can be any type of damage or interference to the infrastructure, assets and/or receptors as a result of a climate hazard. An impact can be either direct, for example flooding of the infrastructure or assets, or indirect, for example heat exhaustion of workers.
- A **consequence** is any negative or positive effect on the Project itself and/or the environmental and human receptors the Project influences.
- **Risk** is the potential for adverse consequences where something of value is at stake and where the occurrence and degree of an outcome is uncertain. For this assessment, risk is used to refer to potential for adverse consequences on the Project itself as well as the environment and human receptors the Project influences. Risk results from the interaction of vulnerability, exposure over time, the climate hazards and the likelihood of an impact occurring.

12.7.8 The following sections set out the process for determining the significance of climate change risks to all aspects of the Project.

Compile inventory of assets and receptors

12.7.9 The assets included within the Project and the environmental and human receptors potentially affected by the Project would be collated based on **Chapter 3: The Project**. Both construction and operational phases of the Project would be considered.

Climate hazard assessment

12.7.10 The climate hazard assessment would provide an understanding of the climate hazards that have the potential to affect the Project, the environmental and social receptors it affects or the environmental mitigations put in place (as defined in **Table 12.11**).

12.7.11 Where data is available, climate variables would be downloaded directly from UKCP18 to inform the Vulnerability to Climate Change assessment. Where information on specific variables is not available, hazards would be derived using either a combination of variables, or sources of data and information outside of UKCP18, or from technical guidance provided alongside UKCP18.

12.7.12 UKCP18 provides probabilistic climate change projections for pre-defined 20-year periods for annual, seasonal and monthly changes to mean climatic conditions. These are expressed as anomalies compared to a baseline period.

12.7.13 The 20-year baseline period of 1981 – 2000 has been selected for this assessment in line with guidance on standard baseline for calculations from the Met Office (Ref. 12.47). This ensures consistency across UKCP18 projections.

12.7.14 Given the long lifetime of the operational phase of the Bradwell B power station, average climate projections are provided for four different 20-year time periods which together span the 60-year operational life. The changes in climate variables would be assessed for the following future 20-year periods: the '2030s' (2020 to 2039), the '2050s' (2040 to 2059), the '2070s' (2060 to 2079) and the '2090s' (2080 to 2099) which is the latest time period for which climate projections are available within UKCP18 for the majority of parameters. Use of 20-year periods allows the effects of climate variability on annual to decadal time scales to be accounted for.

12.7.15 EN-1 states that the 10%, 50% and 90% probability levels should be considered in the Vulnerability to Climate Change assessment as a minimum. Where energy infrastructure has safety critical elements, the high emissions scenario should be applied. The high emission scenario would be used, in line with the requirements of the EN-1, alongside the lower RCP6.0 emission scenario which represents the design basis.

12.7.16 UKCP18 probabilistic projections for temperature, precipitation and humidity would be analysed for the 25km grid square where the Project is located under the RCP6.0 and RCP8.5 climate scenarios, which represent the 'design basis' and the 'credible maximum' future climates. These figures are expressed as anomalies in relation to the 1981-2000 baseline (see **Table 12.4**). Further products within UKCP18, including 12km and 2.2km resolution projections, would be used in the Vulnerability to Climate Change assessment as appropriate.

12.7.17 The likelihood of a hazard occurring would be estimated based on the probability of a specific climate variable being exceeded under future climate change conditions (see **Table 12.12**). In some cases, the likelihood of a hazard occurring would be determined using expert judgement. The categories are in line with the definitions of likelihood in the IPCC Fifth Assessment Report (Ref. 12.48). It does not give an indication of the magnitude of change.

Table 12.12: Likelihood of hazards

Level of likelihood of hazard occurring	Very unlikely	Unlikely	Possible	Likely	Very likely
Likelihood of occurrence	<10% probability	<33% probability	33-66% probability	>66% probability	>90% probability

12.7.18 The AoS identifies storm surges, coastal erosion, sea level rise and flooding as potential hazards for the Project. In addition, EN-6 identified drought and high temperature as hazards which require consideration. The following climate hazards would be assessed, as a minimum:

- rates of coastal erosion;
- sea level rise, storm surges, alteration of wave climate and sediment regime;
- sea surface temperatures;
- extreme temperatures and heatwaves;
- increased risk of drought;
- changes to extreme precipitation events;
- changes to seasonal rainfall patterns;
- humidity variations;
- strong winds (including storms); and
- lightning.

12.7.19 Very unlikely or unlikely hazards would not be considered further.

Determine exposure of assets and receptors

12.7.20 An understanding of how exposed the defined assets and receptors are to climate change hazards would be developed. This would be used to inform the impact assessment. Those assets and receptors that are considered to have very limited exposure to environmental hazards would not be considered further.

List of potential climate impacts

12.7.21 A list of direct and indirect potential climate impacts across the Project and its receptors would be compiled.

12.7.22 Examples of potential effects are described in the following list. This is an indicative list and is not exhaustive:

- exacerbation of drought conditions, leading to a lack of available process water;
- coastal erosion and increased likelihood of storm surge and rising sea level;
- high temperatures creating operational stresses and failures;
- heat stress for staff;
- flood risk from all sources to the main development site, off-site associated development, local populations and power supply and access;
- storm damage to structures and other assets;
- extreme weather impacts on power supply and access;
- disruption to construction programme due to extreme climatic events;
- exacerbation of climate change impacts on affected terrestrial and marine ecosystems (for example, thermal impacts on aquatic ecology);
- biological fouling of the water intakes;
- changes to atmospheric dispersion;
- increased sea spray causing corrosive attack;
- wildfires or external fires;
- drought affecting water availability for operations;
- extreme weather influencing power supply and access;
- low temperature phenomena such as frost, hard rime, frazil ice etc.; and
- alterations to ground conditions affecting site, marine infrastructure and environmental receptors.

12.7.23 The work carried out to inform the GDA would be considered in the development of this list.

12.7.24 The assessment of impact on the Project will consider the exposure and vulnerability of relevant infrastructure, assets and operations, taking into account design requirements and specifications and any existing mitigations already committed to or embedded within the design, including those mitigation measures proposed by other environmental topics. As such, the climate change assessment team would work in an integrated fashion with the design development for relevant aspects of the Project.

Likelihood of climate change impact.

12.7.25 The likelihood of each identified impact on the Project and its receptors will be estimated based on the definitions in **Table 12.12**. This would consider the hazard assessment, the exposure and vulnerability of assets and receptors.

12.7.26 The potential likelihood of an impact would be scored using a semiquantitative five-point scale which is summarised in **Table 12.13**.

Table 12.13: Proposed criteria to assess likelihood of an impact in the vulnerability to climate change assessment

Level of Likelihood	Definition of Likelihood
Very likely (5).	Given existing mitigation measures impact is highly probable to occur during the 60-year operational lifetime of the Project infrastructure and 12-year construction phase.
Likely (4).	Given existing mitigation measures impact is expected to occur during the 60-year operational lifetime of the Project infrastructure and 12-year construction phase.
As likely as not (3).	Given existing mitigation measures impact may occur during the 60-year operational lifetime of the Project infrastructure and 12-year construction phase.
Unlikely (2).	Given existing mitigation measures impact is not expected to occur during the 60-year operational lifetime of the Project infrastructure and 12-year construction phase.
Very unlikely (1).	Given existing mitigation measures impact is highly improbable to occur during the 60-year operational lifetime of the Project infrastructure and 12-year construction phase.

Consequence of climate change impact

12.7.27 Qualitative statements of consequence will be developed for each potential climate change impact. These would consider the hazard assessment, exposure and vulnerability of assets and receptors.

12.7.28 The criteria described in **Table 12.14** would be used to define levels of consequence using a scale of 1-5 from Very Low to Very High. This scale is combined with the likelihood value to determine risk (see **Table 12.15**).

Table 12.14 Proposed criteria to assess consequence to the Project resulting from a potential impact

Level of Consequence	Safety	Cost	Structures or Assets	Environment
Very high (5).	Serious health effects, possible loss of life.	Extreme financial impact.	Permanent damage to structures or assets. Complete loss of operation or service. Complete or partial renewal of infrastructure.	Exceptional environmental damage.
High (4).	Major health impacts.	Major financial loss.	Extensive infrastructure damage and complete loss of service. Some infrastructure renewal.	Considerable environmental impacts.
Medium (3).	Adverse effects on health.	Moderate financial impacts.	Partial infrastructure damage and some loss of service.	Adverse effects on environment.
Low (2).	Slight adverse health or environmental effects.	Small financial losses.	Localised infrastructure disruption and minor loss of service. No permanent damage, minor restoration work required.	Slight adverse environmental effects.
Very low (1).	No impacts on health.	No adverse financial impact.	No damage to infrastructure.	No impacts the environment.

Assign risk

12.7.29 The risk to the Project and its receptors from all impacts would be determined based on the matrix shown in **Table 12.15.** The assignment of risk is based on the scales of 1-5 for likelihood and consequence as defined previously.

Table 12.15: Matrix to assess risk levels for the vulnerability to climate change assessment

Consequence	Likelihood of the Impact Occurring (a Climate Hazard Having an Impact)				
	Very Likely (5)	Likely (4)	As Likely as Not (3)	Unlikely (2)	Very Unlikely (1)
Very high (5).	Very high.	Very high.	High	Medium	Low
High (4).	Very high.	High	High	Low	Low
Medium (3).	High	High	Medium	Low	Low
Low (2).	Medium	Medium	Medium	Very low.	Very low.
Very low (1).	Low	Low	Low	Very low.	Very low.

Assign significance

12.7.30 Risks assessed to be 'medium', 'high' or 'very high' in **Table 12.15** would be considered to result in significant effects.

Mitigation

12.7.31 Additional mitigation would be developed for any significant effects to mitigate risk. Where mitigations are put in place, the assessment process would be repeated to ascertain significance with the additional measures in place.

12.7.32 Mitigation measures would then be developed for all significant risks associated with the Vulnerability to Climate Change Assessment. This would occur early in the design process to ensure that mitigations can be built into the design of the Project, where possible as it is assessed at DCO submission. The risk assessment would be updated to consider all mitigations as they are developed so the final assessment of significance would only show residual effects.

12.8 Scope of the Assessment

Greenhouse gases

12.8.1 In-line with IEMA Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance 2017 guidance, all GHG emissions are considered significant. The guidance states that *"in the absence of any significance criteria or a defined threshold, it might be considered that all GHG emissions are significant and an EIA should ensure the project addresses their*

occurrence by taking mitigating action". Therefore, the effect of emissions should be considered in further assessment.

12.8.2 The global climate is the only receptor for the Greenhouse Gases assessment.

12.8.3 The only likely significant Greenhouse Gases effect is the effect of all activities associated with the Project on the global climate. Decommissioning of the nuclear power station at the end of operation is scoped out of the assessment, as per **Chapter 3: The Project.**

12.8.4 **Table 12.16** sets out the activities associated with the Project which contribute to the effect. The assessment methodology and details on determination of significance are provided in **Section 12.6.**

Table 12.16: Likely significant greenhouse gases effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Project-wide.	Operations on-site and surface access (for example, electricity supply to site, energy used to supply potable water and treat wastewater, diesel supply use, backup generation, waste treatment and employee access). Fuel supply chain (for example, mining, milling, enrichment of uranium and transportation of fuels and materials).	The cumulative GHG emissions over the design life of the Project would be contextualised against the UK's contribution to global GHG emissions, as described in **Section 12.6**. Emissions to the global climate receptor are considered direct, negative and permanent in all cases.	Global climate.

Vulnerability to climate change

12.8.5 A climate change risk assessment is scoped into the EIA due to the timescales associated with the Project as described in **Section 12.4**. The approach would be to conduct a hazard assessment of climate variables and use that to conduct a risk assessment to evaluate whether the Project as defined in **Table 12.11** is affected by climate change within its anticipated lifetime operational lifetime. The approach is detailed in **Section 12.7**.

12.8.6 As the full hazard assessment has not been carried out at this stage, all potential climate hazards and their impacts on the Project and the receptors associated with it remain under consideration. **Section 12.7** sets out examples of likely impacts.

12.8.7 Decommissioning of the Bradwell B power station at the end of operation is scoped out of the assessment as per **Chapter 3: The Project**.

12.9 Potential Mitigation

12.9.1 Mitigation would be developed throughout the design process to ensure that GHG emissions are minimised wherever practicable and that the design is resilient to future climate.

Greenhouse gases

12.9.2 There are various good practice guides and procedures for low-carbon design of buildings and infrastructure that could be used in the development of the design and the mitigations put in place. These include BREEAM (Ref. 12.49) and the Royal Institute of British Architects (RIBA) Sustainable Outcomes Guide (Ref. 12.50). These would be used as appropriate throughout the Greenhouse Gases assessment.

12.9.3 The Stage 2 GDA report (Ref. 12.51) commits the applicant to monitor and report GHG emissions annually to the regulator, the Environment Agency.

Vulnerability to climate change

12.9.4 Measures to reduce the vulnerability of the Project to climate change would be developed through the ongoing design process which would be informed by early assessment outputs as detailed in **Section 12.7**.

12.9.5 The Stage 3 GDA summary report states that *"analysis of the effects of climate change on relevant external hazards and justification of the generic site envelope*" requires follow up during Step 4.

12.9.6 For example, flood defences would be raised around the platform to protect the power station from extreme flood events. The indicative optimal platform level would be around 7.4m AOD, which protects against 1 in 10,000-year extreme coastal flooding event including climate change impacts on sea level.

12.10 Assumptions and Limitations

Greenhouse gas assessment

12.10.1 There is significant uncertainty regarding emissions factors used for vehicles, building energy use and the carbon intensity of electricity supply for later in the 21st century. Best practice information would be used in the assessment and is detailed in **Section 12.6**.

12.10.2 The Greenhouse Gases assessment would be based on information concerning energy use, types and quantities of materials used, and waste generated that would be available during the ongoing design process. Where information is not available, assumptions based on professional judgement would be made. These assumptions would be consistent with those made for other environmental assessments.

Vulnerability to climate change assessment

12.10.3 Climate change is associated with a range of assumptions and limitations with respect to uncertainty. For example, there is uncertainty regarding how global climatic trends would be reflected at the regional scale. To overcome these issues, a range of projections would be used from UKCP18.

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13. MAJOR ACCIDENTS AND DISASTERS

13.1 Introduction

13.1.1 This chapter sets out the approach for determining the scope and content of the major accidents and disasters assessment. **Chapter 5: The EIA Process and Methods** introduces the overall Environmental Impact Assessment (EIA) process including the methodology for assessing affects and determining significance.

13.1.2 The chapter contains:

- legislation, policy and guidance that inform the assessment;
- a description of consultation and engagement so far relevant to major accidents and disasters;
- study area for the assessment;
- sources of data used in scoping;
- baseline conditions, including current desk studies and surveys;
- planned further surveys and studies;
- proposed approach to the assessment, including the assessment methodology;
- the receptors that are proposed to be assessed and the effects which have the potential to be significant;
- the effects that are proposed can be scoped out of the assessment; and
- potential mitigation.

13.1.3 This chapter should be read in conjunction with the Project description provided in **Chapter 3: The Project.**

13.1.4 In the context of this environmental assessment of major accidents and disasters:

- a major accident is defined as an unintended event caused by a man-made activity or asset that leads to serious damage to receptors, either immediate or delayed;
- a disaster is defined as a natural occurrence that leads to serious damage to receptors, either immediate or delayed;
- serious damage to human populations includes harm which would be considered substantial i.e. death(s), multiple serious injuries or a substantial number requiring medical attention; and

- serious damage to the environment is – loss or significant detriment to populations of species or organisms, valued sites (including designated sites), valued cultural heritage sites, with lower thresholds for high-value or protected species or sites, contamination of drinking water supplies, ground or groundwater, or harm to environmental receptors.

13.1.5 For the purposes of EIA, the 'effect' of a major accident or disaster is the risk of such an event arising, thus:

> "*A risk is the likelihood that a hazard will actually cause its adverse effects, together with a measure of the effect. It is a two-part concept and you have to have both parts to make sense of it*." (Ref. 13.1).

13.2 Legislation, Policy and Technical Guidance

13.2.1 This section identifies the relevant legislation, national and local policy and guidance which has informed the scope of the assessment relevant to major accidents and disasters. Further information on policies relevant to the EIA and their status is set out in **Chapter 2**: **Policy and Regulatory Context**, which should be read in conjunction with this chapter.

13.2.2 The legislation and policy relevant to major accidents and disasters are detailed in **Table 13.1**.

Table 13.1: Legislation and policy

Relevant Legislation and Policy	Relevance to the Assessment
Legislation	
The Nuclear Installations Act 1965 (Ref. 13.2).	This legislation governs construction, operation and decommissioning of nuclear installations in the UK through a nuclear site licensing regime, which is regulated by the Office for Nuclear Regulation (ONR). The licensing regime is in place to assure the safety of nuclear installations in the UK. The ONR Licence Condition Handbook (Ref. 13.3) details a set of 36 standard conditions that must be complied with over the lifetime of the installation. A number of the conditions require that the licensee provides the ONR with documentation to demonstrate compliance, and this includes a Nuclear Safety Case. The ONR has issued a number of supporting documents outlining its requirements for compliance with the conditions (refer to **Table 13.2**). The assessment of major accidents and disasters considers the processes and equipment in place to comply with the licensing conditions and related guidance and standards as 'good practice environmental measures'.
The Health and Safety at Work etc. Act 1974 (HSAW) (Ref. 13.4). The following Regulations have been made under this Act and are relevant to the assessment: 1. The Management of Health and Safety at Work Regulations 1999 (MHSAW) (Ref. 13.5);	The HSAW covers health and safety in the workplace and establishes various legal duties to ensure, so far as is reasonably practicable, that persons are not exposed to risks to their health and safety. The Health and Safety Executive (HSE) along with the local authorities, are responsible for enforcement. The Act and associated regulations are relevant to the identification of major accidents and good practice environmental measures. MHSAW require an assessment of the risk of accidents arising from all causes. 'Suitable and sufficient' measures must be put in place to ensure that the residual risk is As Low As

Relevant Legislation and Policy	Relevance to the Assessment
2. The Control of Major Accident Hazards Regulations 2015, (COMAH) (Ref. 13.6); 3. The Dangerous Substances and Explosive Atmospheres Regulations 2002, (DSEAR) (Ref. 13.7); 4. The Control of Substances Hazardous to Health Regulations 2002 (COSHH) (Ref. 13.8); 5. The Ionising Radiation Regulations 2017 (IRR) (Ref. 13.9); 6. The Radiation (Emergency Preparedness and Public Information) Regulations 2019 (REPPIR19) (Ref. 13.10); 7. The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (CDG) (Ref. 13.11); 8. The Construction (Design and Management) Regulations 2015 (CDM) (Ref. 13.12);	Reasonably Practicable (ALARP), competent people appointed and information and training about risks in the workplace provided. The COMAH Regulations apply to establishments which have dangerous substance(s) specified in an aggregate quantity at or above a qualifying threshold, with some limited industry exceptions. For those sites to which the COMAH Regulations applies, specific obligations exist to support the management of major accidents and disasters (environmental and safety risk). A level of demonstration is required which is proportionate to the level of risk posed by the establishment, and the quantity of dangerous substances involved. Standards and guidance, that underpin COMAH have been used to develop the assessment methodology, including for identifying and defining the scale of potential major accidents and disasters and setting the thresholds and criteria for assessing the significance of effects. DSEAR sets out requirements to identify explosion risks including from dangerous substances in the workplace, and to implement appropriate protection, controls, and procedures to prevent or reduce their effects. The COSHH Regulations place requirements on employers to identify, assess and manage the health risks from hazardous substances (including biological substances but excluding radiation) to eliminate where practicable and where this is not practicable to maintain and monitor control measures and plan for emergencies. IRR require radiation exposure of workers and the general public to be restricted so far as is reasonably practicable by employer, with certain responsibilities also placed on employees. REPPIR sets out the framework for arrangements to respond to a radiation emergency. The scope includes human life, health and safety, property and the environment to significant unplanned doses of ionising radiation or releases of radioactivity. These apply to premises where quantities exceed listed thresholds. Under REPPIR the local authority

Relevant Legislation and Policy	Relevance to the Assessment
9. Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) (Ref. 13.13); 10. Provision and Use of Work Equipment Regulations 1998 (PUWER) (Ref. 13.14); and 11. The Workplace (Health, Safety and Welfare) Regulations 1992. (Ref. 13.15).	sets emergency planning zones (EPZ) which are used to determine the area within which the ONR seeks to be consulted on developments. The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations implement requirements and restrictions on the carriage of dangerous goods by road and rail. It defines the requirements for the safe transportation of hazardous materials including radioactive waste. CDG specifically requires that there is an adequate emergency plan for radiation emergencies, (identified under IRR17) that could occur during transport. CDM places specific duties on clients, designers and contractors, to manage the risks to people during construction, maintenance and demolition work. This includes designing out foreseeable risks so far as reasonably practicable and the appointment of a Principal Designer and Principal Contractor to co-ordinate health and safety aspects during construction. CDM sets out numerous other requirements relating to site security, construction hazards, emergency arrangements and welfare on construction sites. Duties under LOLER require that all lifting equipment is used in a safe manner and maintained. It requires that the location, operation, and deconstruction of cranes will be risk assessed and the design verified by competent persons. PUWER ensures that people using, working and having access to equipment and machinery in a workplace, do so in a safe environment. It ensures suitability of equipment and maintenance for safety purposes and competency of workers. The Workplace (Health, Safety and Welfare) Regulations sets out the minimum health, safety and welfare requirements for the workplace. except workplaces involving construction work on construction sites, those in or on a ship, or those below ground at a mine.

Relevant Legislation and Policy	Relevance to the Assessment
Environmental Protection Act 1990 (EPA) (Ref. 13.16).	This act sets out controls on the transport and disposal of non-radioactive wastes, as enforced by the Environment Agency. It is relevant to the identification of potential major accidents and disasters and good practice measures.
Civil Contingencies Act 2004 (CCA). (Ref. 13.17).	CCA sets out what needs to be done to prepare for and respond to emergencies at the local level. Local authorities and primary responders (for example, emergency services) are required to make arrangements to respond to foreseeable emergencies. Primary responders have a duty to assess the risk of an emergency occurring and co-operate with each other, in a local resilience forum, to maintain a "Community Risk Register" of their assessments. Relevant information about civil contingencies must be published. CCA is relevant to the identification of potential major accidents and disasters and good practice measures.
The Regulatory Reform (Fire Safety) Order 2005 (RRFSO) (Ref. 13.18).	This legislation requires for all premises that the risk of fire is assessed and that measures are implemented and maintained including for fire avoidance and prevention; detection, alarm, evacuation and fire protection. It is relevant to the identification of potential major accidents and disasters and good practice environmental measures in respect of fires.
The Building Regulations 2010 (Ref. 13.19).	Set out standards for aspects of building design and construction. Of relevance to major accidents and disasters are requirements relating to structural safety, fire safety, measures to manage contaminated land (for example, radon and methane) access and electrical safety. These are relevant to the good practice measures.
The Energy Act 2013 (Ref. 13.20).	This act establishes the ONR as the regulator in regard to nuclear safety, nuclear site health and safety, nuclear security and nuclear safeguards and transport. These regulatory processes are relevant to the good practice measures.

Relevant Legislation and Policy	Relevance to the Assessment
International Maritime Organization (IMO) Conventions. These are transposed into UK law under the Merchant Shipping Regulations. (listed but not limited to): 1. Convention on the International Regulations for Preventing Collisions at Sea (1972) (COLREGs) (Ref. 13.21); 2. International Convention for the Safety of Life at Sea (SOLAS) (1974) (as amended) (Ref. 13.22); and 3. IMO - International Convention for the Prevention of Pollution from Ships (1973) (as amended) (MARPOL) (Ref. 13.23).	A specialised agency of the United Nations, the IMO is the global authority for setting standards for safety, security and environmental performance relating to international shipping. The UK is a signatory of IMO conventions. The conventions are relevant to good practice environmental measures. COLREGs includes rules to prevent collisions at sea, including for steering and sailing, and lighting of ships. SOLAS specifies minimum requirements relating to construction and operation, and continued sea worthiness of vessels; fire protection, detection and firefighting; navigation safety; radiocommunications and life-saving arrangements for shipping. MARPOL – includes requirements to prevent and minimise pollution from accidental releases and routine operations from ships. For how the conventions affect Marine Navigation, see **Chapter 19: Navigation**.
Nuclear Industries Security Regulations 2003 (Ref. 13.24).	This sets out the requirements for the regulation of the civil nuclear industry for security purposes. This includes security provisions of nuclear premises; the transport of nuclear material; and of sensitive nuclear information. It also requires each nuclear premise to have an approved security plan, with a delegated person to oversee compliance to the approved security plan. It is relevant to the identification of potential major accidents and disasters and good practice environmental measures with respect to the management of security on-site.

Relevant Legislation and Policy	Relevance to the Assessment
Planning (Hazardous Substances) Regulations 2015 (Ref. 13.25).	These regulations set out land-use planning requirements under the Seveso III Directive (2012/18/EU) (Ref. 13.26) on the control of major accident hazards. This requires sites where hazardous substances are held at or above a controlled quantity (or quantities) specified to obtain hazardous substances consent to operate. The HSE are statutory consultees for developments within the 'Consultation Distance' around sites holding Hazardous Consent. The basis of the advice that they provide to the Planning Authority constrains development around major hazard sites and provides segregation between sources of accident and receptors.
Environmental Permitting (England and Wales) Regulations 2016 (EPR) (Ref. 13.27).	The EPR require the regulator (either the Environment Agency or the local authority depending on the nature of the process or permit) to control certain activities which could harm the environment and human health. This is done through the issue of an environmental permit to the operator which provides conditions and limitations that must be complied with. The scope of the permitting regulations includes facilities where radioactive and ionising radiation substances, fuels and chemicals are present (used or stored). These include requirements of some permits (for example, combustion activity, water discharge activity permits) for an environmental incident control plan to be in place for the purposes of environmental protection.
The Air Navigation (Restriction of Flying) (Nuclear Installations) Regulations 2016 (Ref. 13.28).	Nuclear power stations in the UK are afforded some protection from aviation activity by the establishment of a Restricted Area at each station. Aviation activity within any Restricted Area is limited to that specifically permitted by the Regulations. Typically, such Restricted Areas have a radius of two nautical miles and extend vertically to 2,000 feet above the surface. The Regulations will be revised as necessary to take account of any new nuclear power stations.

Relevant Legislation and Policy	Relevance to the Assessment
National Policy	
National Policy Statement for Energy (EN-1) (Ref. 13.29).	Note that this National Policy Statement (NPS) was published in 2011 and pre-dates the current EIA Regulations 2017 which set out the requirement to consider major accidents and disasters in EIA for DCO applications. Therefore, the NPS makes no specific provision for the environmental impact assessment of major accidents and disasters. Nevertheless, a number of NPS requirements are considered relevant to the major accident and disasters assessment and these are outlined here. This Policy outlines the government's strategy for energy infrastructure. Part 4.11 – Safety: "*HSE is responsible for enforcing a range of occupational health and safety legislation some of which is relevant to the construction, operation and decommissioning of energy infrastructure. Applicants should consult with the Health and Safety Executive (HSE) on matters relating to safety.*". "*Applicants seeking to develop infrastructure subject to the COMAH regulations should make early contact with the Competent Authority. If a safety report is required it is important to discuss with the Competent Authority the type of information that should be provided at the design and development stage, and what form this should take. This will enable the Competent Authority to review as much information as possible before construction begins, in order to assess whether the inherent features of the design are sufficient to prevent, control and mitigate major accidents. The IPC should be satisfied that an assessment has been done where required and that the Competent Authority has assessed that it meets the safety objectives described above.".*

Relevant Legislation and Policy	Relevance to the Assessment
	Part 4.12 – Hazardous Substances: "*All establishments wishing to hold stocks of certain hazardous substances above a threshold need Hazardous Substances consent. Applicants should consult the HSE at pre-application stage if the project is likely to need hazardous substances consent*.". "*HSE sets a consultation distance around every site with hazardous substances consent and notifies the relevant local planning authorities. The applicant should therefore consult the local planning authority at preapplication stage to identify whether its proposed site is within the consultation distance of any site with hazardous substances consent and, if so, should consult the HSE for its advice on locating the particular development on that site*.". Part 4.15 – Security Considerations: "*National security considerations apply across all national infrastructure sectors. Overall responsibility for security of the energy sector lies with DECC. It works closely with Government security agencies including the Centre for the Protection of National Infrastructure (CPNI) to reduce the vulnerability of the most 'critical' infrastructure assets in the sector to terrorism and other national security threats. The Office for Civil Nuclear Security (OCNS) is the security regulator for the UK's civil nuclear industry*.".
National Policy Statement for Nuclear Power Generation (EN-6) (Ref. 13.30).	Note that this NPS was published in 2011 and pre-dates the current EIA Regulations 2017 which set out the requirement to consider major accidents and disasters in EIA for DCO applications. Therefore, the NPS makes no specific provisions for the environmental impact assessment of major accidents and disasters. Nevertheless, a number of NPS requirements are considered relevant to the major accident and disasters assessment and these are outlined here. This Policy outlines the government's strategy for deployment of new nuclear power stations.

Relevant Legislation and Policy	Relevance to the Assessment
	1.7 The Appraisal of Sustainability: A summary of the main findings of the Nuclear Appraisal of Sustainability (AoS) is set out below. 4. "*Significant trans-boundary effects arising from the construction of new nuclear power stations are not considered likely. Due to the robustness of the regulatory regime there is a very low probability of an unintended release of radiation, and routine radioactive discharges will be within legally authorised limits.*". Part 2.7 – Relationship between the regulatory framework for nuclear power stations and the planning regime: "*As with other major energy infrastructure, the regulators play an important role in ensuring the safety, security and protection of people and the environment in relation to the design, construction, operation and decommissioning of nuclear power stations and the transport of nuclear material. The regulators for the nuclear industry are the Environment Agency, the Office for Nuclear Regulation (ONR) and the Department for Transport (DfT) (collectively referred to in this NPS as the Nuclear Regulators).*". "*The licensing and permitting of nuclear power stations by the nuclear regulators is a separate regulatory process which nuclear power stations have to undergo. To avoid unnecessary duplication and/or delay and to ensure that planning and regulatory expertise are focussed on the most appropriate areas, when considering a development consent application the IPC should act on the basis that:* 5. *the relevant licensing and permitting regimes will be properly applied and enforced;* 6. *it should not duplicate the consideration of matters that are within the remit of the Nuclear Regulators (see paragraph 2.7.4 below); and*

Relevant Legislation and Policy	Relevance to the Assessment
	7. *it should not delay a decision as to whether to grant consent until completion of the licensing or permitting process (see paragraphs 2.7.5 and 2.7.6 below).".* "*Certain matters are for consideration of the Nuclear Regulators and the IPC should not duplicate the consideration of these matters itself. Such matters include the Generic Design Assessment (GDA) and the site licensing and environmental permitting processes (including in respect of the management and disposal of radioactive waste, the permitting of cooling water discharges, etc). The Nuclear Regulators are also responsible for those matters listed in paragraph 3.5.3 of this NPS.*". 2.8 Consideration of good design: "*Section 4.5 of EN-1 sets out the principles of good design that should be applied to all energy NSIPs. In applying these principles to applications for the development of nuclear power stations, the need to ensure the safety and security of the power station, and the need to control the impacts of its operations, must be given substantial weight given the importance of these factors to the operation of a nuclear power station.*". "*For some structures where the functional requirements may change over the lifetime of the structure, such as sea defences, they should be capable of being adapted if the need were to arise in future without major re-design or significant physical disruption (see Section 2.10 of this NPS).* "*The GDA, site licensing and environmental permitting processes will consider certain aspects of design, which the IPC should not replicate (see Section 2.7 above).".* Part 3.4 – Nuclear Impacts: "*Certain "Nuclear Impacts" are set out in this Part to provide policy that is additional to the generic impacts set out in EN-1 for when the IPC is considering an application for a new nuclear power station. In certain cases, the text in this Part amends the application of policy in EN-1 for this NPS, for example see Section 3.6 (flood risk).".*

Relevant Legislation and Policy	Relevance to the Assessment
	Applicants Assessment: "*Where possible, safety and operational critical installations should be sited in the areas of the site at least risk of flooding.".* Nuclear Impact human health and wellbeing: "*Radiation from nuclear power stations requires careful management during and beyond the operational life of the power station. However, safety systems in place in the designs of new nuclear power stations and compliance with the UK's robust legislative and regulatory regime mean that the risk of radiological health detriment posed by nuclear power stations (both during normal operation and as a result* of an unplanned release) is very small.". 3.13 Flag for Local Consideration: proximity to civil aircraft movements: "T*he IPC should consider this Flag for Local Consideration in accordance with the policy set out in Section 5.4 of EN-1. Given the specific security arrangements in relation to air movements around nuclear sites, and the potential impact that new nuclear power stations may have on existing aerodromes and aviation activities, the application should assess the proximity of aircraft movements to the proposed site. Where necessary the IPC should seek the advice of the ONR to ensure that the proposed arrangements sufficiently safeguard the safety of the site.".*
National Planning Policy Framework (NPPF) (Ref. 13.31).	This framework sets out the government's planning policies for England. It outlines the following which are relevant to major accidents and disasters: Pre-application engagement and front-loading: "*45. Local planning authorities should consult the appropriate bodies when considering applications for the siting of, or changes to, major hazard sites, installations or pipelines, or for development around them.".* Ground conditions and pollution:

Relevant Legislation and Policy	Relevance to the Assessment
	"*178. Planning policies and decisions should ensure that:* *a) a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation).".* Promoting healthy and safe communities: *"95. Planning policies and decisions should promote public safety and take into account wider security and defence requirements by:* *a) anticipating and addressing possible malicious threats and natural hazards, especially in locations where large numbers of people are expected to congregate. Policies for relevant areas (such as town centre and regeneration frameworks), and the layout and design of developments, should be informed by the most up-to-date information available from the police and other agencies about the nature of potential threats and their implications. This includes appropriate and proportionate steps that can be taken to reduce vulnerability, increase resilience and ensure public safety and security.".*
UK Marine Policy Statement (MPS) (Ref. 13.32)	Provides a framework for preparing marine plans and taking decisions affecting the marine environment. The UK MPS states that any decisions made should minimise any adverse effects on shipping activity, freedom of navigation and navigational safety while meeting obligations for marine safety and environmental protection. Paragraph 2.6.1 indicates that the potential for spills needs to be considered in the evaluation of development proposals.

Relevant Legislation and Policy	Relevance to the Assessment
Local Policy	
Maldon District Council (MDC) Local Development Plan (2017) (Ref. 13.33).	Policy D2: "*11) Where appropriate, development will include measures to remediate land affected by contamination and locate development safely away from any hazardous source;*".
Chelmsford City Council Local Plan (2020) (Ref. 13.34).	Policy DM30 – Contamination and Pollution: *"For developments on, or near to, hazardous substance sites or land which is contaminated or has a history of a potentially contaminating use, permission will only be granted where the Council is satisfied that:* *i) there will be no threat to the health or safety of future users or occupiers of the site or neighbouring land; and* ii) *there will be no adverse impact on the quality of local groundwater or surface water.".*
Essex and Southend-on-Sea Waste Local Plan (2017) (Ref. 13.35).	This plan sets out the how the types of waste arising in Essex and Southend is dealt with. Flooding, Water Resources and Water Quality: "*9.42 The risk of flooding should be minimised for people, property and the natural environment. Development can increase surface water run-off to streams and rivers, through increasing built development in the local environment. To prevent or minimise this risk, proposals should incorporate effective surface water management, such as sustainable drainage systems, where necessary to ensure flood risk is not increased.*".

Relevant Legislation and Policy	Relevance to the Assessment
East Inshore and East Offshore Marine Plans (Ref. 13.36).	The East Inshore and East Offshore Marine plans state how development in the marine environment is to be managed and cover the area to the east of the South East Inshore plan, where the main development site is located. There are no explicit requirements for major accidents and disasters.
Draft South East Inshore Marine Plan 2020 (Ref. 13.37).	The South East Inshore Marine Plan states how development in the marine environment from Felixstowe, Suffolk to Dover, Kent is to be managed. There are no explicit requirements for major accidents and disasters.

Technical Guidance

13.2.3 Technical guidance that has been used to define the assessment is set out in **Table 13.2**.

Table 13.2: Relevant technical guidance

Guidance Reference	Implications
A Guide to the Control of Major Accident Hazards Regulations (COMAH) (L111) (2015) (Ref. 13.38).	A guide to the COMAH 2015 regulations, providing advice to duty holders on the scope of the regulations and its requirements. The guidance informs the assessment method for major accidents and disasters.
A Guide to the Regulatory Process (2013) (Ref. 13.39).	Issued jointly by the ONR and Environmental Agency, this guide describes the process by which parties such as reactor vendors and developers, may request a Generic Design Assessment (GDA) of the safety, security and environmental implications of new nuclear

Guidance Reference	Implications
	power station designs, before applications are made for the permissions required to build that design at a particular site. The GDA of the type of reactor proposed for the Project began in 2017 and Step 4 of the four-step process commenced in 2020. The GDA process is relevant to the identification of design and good practice environmental measures.
All Measures Necessary – Environmental Aspects Guidance to the Competent Authority Inspectors and Officers. COMAH Competent Authority (2016) (Ref. 13.40).	This guidance has specifically been used to inform the assessment methodology for the prevention and major accidents environmental measures and the concepts of proportionality and risk tolerability.
Chemicals and Downstream Oil Industry Forum (CDOIF) – Environmental Risk Tolerability for COMAH establishments V2 (2016) (Ref. 13.41).	This guidance on the assessment of harm and tolerability of major accidents to the environment has been established in relation to COMAH sites. The guidelines have provided the basis for the assessment methodology to identify and qualitatively assess potential major accidents and disasters (considering both the duration and severity of harm for environmental receptors).
Environmental Impact Assessment of Projects, Guidance on the Preparation of the Environmental Impact Assessment Report (2017) (Ref. 13.42).	Guidance on how to develop a good quality environmental impact report to ensure appropriate information is available for decision making purposes. Section 1.3.3 relates to the impacts of major accidents and disasters and outlines key considerations including the use of risk-based significance criteria. The guidelines have been used to inform the approach to the assessment of major accidents and disasters.
European Commission's Overview of Natural and Man-made Disaster Risks the European Union may face (2017) (Ref. 13.43).	This guidance provides information about the potential natural and man-made disasters which could occur in European Union. It is relevant to the identification of major accidents and disasters.

Guidance Reference	Implications
Guidelines for Environmental Risk Assessment and Management Green Leaves III (2011) (Ref. 13.44).	The guidance has been used to inform the development of the assessment methodology. In particular, the source-pathway-receptor model has been adopted.
Guidance Emergency Preparedness: Guidance on part 1 of the Civil Contingencies Act 2004 (CCA), its associated regulations and non-statutory arrangements (2006) (Ref. 13.45).	This guidance sets out requirements for risk assessment of emergencies (which include major accidents and disasters) by Local Resilience Forums (LRFs). It has been used to inform the harm criteria for human receptors.
Guidance on the Interpretation of Major Accidents to the Environment for the purposes of COMAH Regulations (1999) (Ref. 13.46).	This guidance informs the thresholds of a major accident for environmental receptors.
Guide to Predicting Environmental Recovery Durations for Major Accidents (2017) (Ref. 13.47).	Establishes guidance on recovery time for ecosystems and habitats following a major accident in relation to the environmental fate of released chemicals. This guidance is relevant to the consideration of recovery duration where scenarios can impact the natural environment.
HSE Major Hazard Regulatory Model: Safety Management in Major Hazard Sectors (2013) (Ref. 13.48).	This guidance describes the HSE's role in regulation of major hazards.

Guidance Reference	Implications
International Atomic Energy Authority (IAEA) Safety Standards: (listed but not limited to): 1. Fundamental Safety Principles (2006) (Ref. 13.49); 2. Leadership and Management for Safety (2016) (Ref. 13.50); 3. Radiation Protection and Safety of Radiation Sources: International Basic Safety Standard (2014) (Ref. 13.51); 4. Safety Assessment for Facilities and Activities (2014) (Ref. 13.52); 5. Predisposal Management of Radioactive Waste (2016) (Ref. 13.53); 6. Decommissioning of Facilities (2009) (Ref. 13.54); 7. Preparedness and Response for a Nuclear or Radiological Emergency (2014) (Ref. 13.55); 8. Site Evaluation for Nuclear Installations (2019) (Ref. 13.56); 9. Safety of Nuclear Power Plants: Design (2016) (Ref. 13.57); and	The IAEA is the world's central intergovernmental forum for scientific and technical co-operation in the nuclear field and has established these safety standards to protect health and minimize danger to life and property. The ONR has taken account of these standards when developing its Safety Assessment Principles and Technical Assessment Guides. These standards are relevant to the identification of potential major accidents and disasters; good practice environmental measures and the assessment of significance of effects arising from major accidents and disasters.

Guidance Reference	Implications
10. Safety of Nuclear Power Plants: Commissioning and Operation (2016) (Ref. 13.58).	
Land Use Planning and the Siting of Nuclear Installations, ONR Guide, NS-LUP-GD-001 Revision 0 (2018) (Ref. 13.59).	This guidance provides the baseline standards for safety which will be in place at Nuclear Licensed Sites ensured by the ONR regulatory process.
Licence Condition Handbook. (Ref. 13.60).	This document details 36 standard conditions that must be complied with over the lifetime of a nuclear installation. This includes conditions to ensure that the licensee is a capable organisation; that the installation is designed to be safe, is operated safely by competent persons; is maintained in a safe state; that safety mechanisms, devices and circuits be provided for, and for suitable emergency arrangements to be in place. A number of the conditions require that the licensee provides the ONR with documentation to demonstrate compliance, and this includes a Nuclear Safety Case. It is relevant to the identification of potential major accidents and disasters and good practice environmental measures.
ONR Technical Assessment guides. These include:	NS-TAST-GD-013 explains how the ONR assesses the consideration of external hazards provided in licensees safety case submissions. It is relevant to the identification of potential major accidents and disasters and good practice environmental measures.

Guidance Reference	Implications
1. External Hazards, Nuclear Safety Technical Assessment Guide NS-TAST-GD-013 Revision 7 (2018) (Ref. 13.61); 2. Internal Hazards, Nuclear Safety Technical Assessment Guide NS-TAST-GD-014 Revision 5 (2019) (Ref. 13.62); and 3. Guidance on the Demonstration of ALARP (As Low As Reasonably Practicable), Nuclear Safety Technical Assessment Guide NS-TAST-GD-005 Revision 10 (2019) (Ref. 13.63).	NS-TAST-GD-014 outlines the approach of the ONR in assessing safety submissions in relation to internal hazards which could affect nuclear safety detrimentally. It is relevant to the identification of potential major accidents and disasters and good practice environmental measures. NS-TAST-GD-005 describes how the ONR makes decisions on whether the risk of major accident or disaster is as low as reasonably practicable. It has been used to inform the criteria for assessing the significance of major accident and disaster.
ONR Technical inspection guides (2020) (Ref. 13.64).	These guides assist licensees by describing the ONR's Licence condition compliance expectations. They are relevant to the development of good practice environmental measures.
Planning Inspectorate Advice Note 11 Annex G – The Health and Safety Executive (no date) (Ref. 13.65).	This guidance describes the role of the HSE in Land Use Planning and Nationally Significant Infrastructure Projects in relation to major accident and disasters. Specifically, the Advice Note refers to requirements of the Land Use Planning process and Control of Major Accident Hazards (COMAH).
Reducing Risks Protecting People (R2P2) (2017). (Ref. 13.66).	This guidance describes the basis and criteria on which the HSE's decision making process is based. The tolerability criteria for risk to people set out in R2P2, including the aversion

Guidance Reference	Implications
	for large numbers of casualties resulting from single incidents, have been used to derive the qualitative criteria for assessing the significance of effects on people, arising from major accidents and disasters.
Security Assessment Principles for the Civil Nuclear Industry (2017) (Ref. 13.67).	This guidance describes the regulatory judgements and recommendations of security submissions and the ONR's role in approval. It is relevant to the identification of potential major accidents and disasters and good practice environmental measures.
Safety Assessment Principles for Nuclear Facilities (2014) (Ref. 13.68).	This guidance outlines the principles that the ONR applies when assessing nuclear site licensees' safety submissions. It is relevant to the identification of potential major accidents and disasters; good practice environmental measures and the assessment of significance of effects arising from major accidents and disasters.
The International Standards Organization's ISO 31000:2018 Risk Management – Guidelines (2018) (Ref. 13.69).	This guidance describes a framework for developing an approach to managing risks including cyber-crime, political risk and terrorism.
Tolerability of Risk from Nuclear Power Stations (1992) (Ref. 13.70).	This guidance informs the criteria for tolerability (significance) of risk for major accidents affecting human receptors, especially those related to nuclear power stations.

13.3 Consultation and Engagement

13.3.1 This chapter has been informed by engagement and discussion with various stakeholders to date. **Table 13.3** details technical engagement to date which has occurred outside of formal statutory consultation and is relevant to the major accidents and disasters aspect. No specific Stage One Consultation responses have been received for major accidents and disasters.

Table 13.3: Technical engagement

Consultee	Points of Discussion
Responses relevant to flood risk	
ONR Environment Agency. Natural England. ECC MDC	An initial meeting to discuss the Flood Risk Assessment (FRA) was held on 22 January 2020. Topics discussed: 1. flood risk and drainage matters of importance to the stakeholders; 2. how flood risk has influenced the Project design to date; and 3. the proposed approach to FRA. Initial data (tidal flood modelling reports, and flood defence condition) have been supplied by the Environment Agency. This has informed an ongoing program of work to assess risks (to people, property and infrastructure) associated with the failure or exceedance of the defences during the construction and operation phases with specific reference to the main development site and the Bradwell B power station.
Responses relevant to safety and major accidents	
ONR	Following the FRA meeting on 22 January 2020, the ONR provided comments outlining where the jurisdictional boundary lies between ONR and HSE with respect to various safety regulations.
Environment Agency.	The Environment Agency meeting on 04 December 2019 on the Habitats Regulations Assessment and Marine Conservation Zone noted that the effects of unexploded ordnance (UXO) must be considered. A UXO desk study which relates to the main development site has been completed and the key findings will be considered during the development of the Project proposals and for further planned

Consultee	Points of Discussion
	investigations within the main development site and the zone for marine infrastructure.
Responses relevant to consideration of climate change.	
Environment Agency.	The Environment Agency suggested the use of the UK Meteorological Office UK Climate Projections 2018 (Ref. 13.71) for Climate Change projections to determine appropriate climate allowances for the Project. Further detail is provided in **Chapter 12: Climate Change**.

13.4 Data Gathering Methodology

Study area

13.4.1 This section presents the study areas for the major accidents and disasters assessment. As the design and consultation processes progress and the Project is refined, the exact geographical scope of study areas may continue to evolve to accommodate any changes. If the study areas change, data collection will also be reviewed and updated.

13.4.2 The Zone of Influence (ZoI) of a major accident or disaster varies depending on the size and nature of such events, how the effects transmit to the receptors (that is, the pathways) and the sensitivity of the receptors. For this reason, multiple study areas are identified, reflecting the range of hazards required to be assessed and their ZoIs. The study areas reflect an area sufficient to bound the distance from a source of major accident or disaster at which a receptor could experience serious damage in the event of the major accident or disaster occurring. In line with the project description provided in **Chapter 3: The Project**, the study areas have been applied to three categories: main development site, off-site Power Station Facilities and off-site associated development.

13.4.3 The specific approach to wider transboundary effects will be as described in **Chapter 5: The EIA Process and Methods,** specifically **Section 5.5.**

Main development site

13.4.4 The study areas considered for the scoping of effects arising from non-radiological major accidents and disasters associated with the main development site comprises the main development site plus buffers that are summarised in **Table 13.4** and shown in **Figure 13.1** and **Figure 13.2**.

13.4.5 It is proposed that the assessment of major accidents and disaster effects will not duplicate work that is being carried out as part of the assessments to be undertaken for the GDA, NSL and REPPIR processes. The study area for radiological major accidents and disasters will therefore be consistent with the agreement under

REPPIR. For scoping, a conservative distance extending 30 kilometres (km) from the main development site has initially been applied for radiological effects. This is consistent with the generic initial and precautionary outline (emergency) planning zone (OPZ) for operating nuclear power plants defined in Schedule 5 of REPPIR19. The OPZ is to assist local authorities plan for extremely unlikely but more severe events. This distance will be under review as the Project develops and is expected to reduce significantly, and the study area will be reduced accordingly. A Detailed Emergency Planning Zone (DEPZ) will also be defined in due course. The DEPZ is generally much smaller than the OPZ and is *"a defined zone around a site where it is proportionate to pre-define protective actions which would be implemented without delay (e.g. within a few hours) to mitigate the most likely consequences of a radiation emergency"* (Ref. 13.72). By way of example, the inner DEPZ for Sizewell B is 2-3km (depending on post code boundaries), and for Heysham it is 1km. All DEPZs for nuclear facilities in the UK are less than 10km.

Table 13.4: Size of study area (non-radiological effects) for each receptor type

Receptor Type	Receptors in This Group	Study Area	Justification
Marine receptors.	Marine environment including designated sites.	20km	Professional judgement drawn from consequence modelling of potential accidental releases to the marine environment at other similar sites in similar environments.
Land based receptors.	Human populations Ecological receptors including designated sites, habitats and species.	10km	Aligned to COMAH competent authority expectations of an initial study area as set out in the COMAH Safety Report Assessment Manual (SRAM) Section 13 (Ref. 13.73).
Surface water receptors.	Surface water bodies, associated habitats and species, where not considered under the marine receptor group, including drinking water sources.	10km	Aligned to COMAH competent authority expectations of an initial study area as set out in the COMAH SRAM Section 13.
Cultural heritage receptors.	Designated heritage assets including conservation areas, scheduled monuments	10km	Aligned to the COMAH SRAM Section 13.

Receptor Type	Receptors in This Group	Study Area	Justification
	and listed buildings (Grade I and II*).		
Groundwater receptors.	Groundwater bodies.	10km	Initial conservative study area, aligned to the COMAH SRAM Section 13.

13.4.6 Scoping has considered the following sources of major accidents that are external to the Project. These distances are from the main development site boundary:

- aerodrome runways: within 20km, in line with the guidance for Nuclear Safety Cases (Ref. 13.74);
- external sites holding hazardous materials (sites with hazards substances consent (including COMAH sites), licensed explosives sites and Major Accident Control Regulations (MACR) sites): within 1km, the SRAM suggests 10km but this is primarily applicable to receptors on downstream surface water pathways, and 1km is considered sufficient to bound the ZoI when the nature of major accidents that could realistically affect receptors within the Project or lead to domino effects are taken into account;
- major accident hazard pipelines (MAHPs): within 1km, consistent with the maximum hazard distance identified for hazardous pipelines in CRR82/1994 (Ref. 13.75);
- existing and historical mining and landfill sites: within 1km, bounding the hazard range of accidents caused by instability or gas ingress; and
- waste sites: within 1km, bounding the hazard range of accidents that could arise from these facilities, such as fires and cylinder explosions.

Off-site associated development and off-site Power Station Facilities

13.4.7 The study areas selected for the identification of receptors in proximity of the off-site associated development or the off-site Power Station Facilities are described in **Table 13.5**. A number of location options are currently being shortlisted for these elements of the Project, so the exact composition of receptors has yet to be confirmed. The study areas for these facilities have therefore been developed based on the nature of the proposed facilities and the potential major accidents that are associated with them. Receptors within these study areas will be identified once the final sites are known to allow the assessment of potential effects.

13.4.8 As the off-site associated development and off-site Power Station Facilities have fewer potential major accident and disaster scenarios associated with them, and

those that are present are of a lower magnitude, smaller study areas than for the main development site are justified. Professional judgement has been used to allocate appropriate study areas.

13.4.9 The study area for sources of major accidents and disasters that are external to the Project, described for the main development site in **Section 13.4** will be applied to the off-site associated development and the off-site Power Station Facilities with the exception of aerodrome runways.

13.4.10 For the off-site associated development and off-site Power Station Facilities, the study area for aerodrome runways is 10km from the development boundary. This is consistent with HSE guidance that the risk of air crash associated with a specific aerodrome is negligible in comparison to the background crash rate at this distance. The hazard of domino effects is significantly lower at the off-site associated development and off-site Power Station Facilities compared to the main development site, and therefore a smaller study area is appropriate.

Table 13.5: Off-site associated development and off-site Power Station Facilities study areas for receptors

Site	Study Area	Potential Major Accidents
Off-site highways works and park and ride facilities.	500 metres (m).	Potential major accidents include structural collapse or vehicle collisions including fires. It is anticipated that effects from the worst-case major accident would extend no further than 500m.
Project-provided accommodation.	500m	Potential major accidents include structural collapse or building and, or caravan fires. It is anticipated that effects from the worst-case major accident would extend no further than 500m.
Freight management facilities.	500m	Potential major accidents include HGV accidents or spillages. It is anticipated that effects from the realistic worst-case major accident would extend no further than 500m.
Off-site Power Station Facilities.	500m	Potential major accidents include structural collapse, building fires, or small spillages with limited off-site impact. It is anticipated that effects from the realistic worst-case major accident would extend no further than 500m.

Note: Some of the off-site associated development and off-site Power Station Facilities are likely to be located in close proximity to the main development site so that the study area for some of these elements may be entirely within the main development site study area.

Sources of data used in scoping

Desk based

13.4.11 The principal desk-based data sources used to inform the identification of potential effects comprise of the following in **Table 13.6.**

Table 13.6: Sources of data for the desk-based assessment

Source	Data
Multi Agency Geographic Information for the Countryside (MAGIC) website (Ref. 13.76).	Details and locations of statutory designated and non-designated sites and habitats for both land and marine based receptors.
Natural England website (Ref. 13.77).	Details and locations of statutory designated sites which have special status as protected areas because of their natural importance.
Historic England website (Ref. 13.78).	Details and locations of historical listed buildings.
HSE Planning Advice Web App (Ref. 13.79).	Locations of sites which have hazardous substance consent, major accident hazard pipelines, and licensed explosives sites.
HSE COMAH 2015 Public Information Search (Ref. 13.80).	Locations of COMAH sites.
MDC website (Ref. 13.81).	Details and locations of conservation areas.
Colchester Borough Council website (Ref. 13.82).	Details and locations of conservation areas.
European Commission Major Accident Reporting System (eMARS) (Ref. 13.83).	Details of accident reports submitted to the EC.
Environmental Agency website (Ref. 13.84).	Details and location of historic landfill sites, licensed waste operations and location of groundwater bodies.
ONR Site Reports - Quarterly Statements (Ref. 13.85).	Details of nuclear incidents at nuclear installations.

Source	Data
The Coal Authority Interactive Map (Ref. 13.86).	Locations of historic and abandoned mines.
Essex Wildlife Trust Biological Records Centre Data (Ref. 13.87).	Locations and details of Local Wildlife Sites.

13.5 Baseline Information

13.5.1 **Chapter 3: The Project** provides an overview of the location of the Project and existing surrounding land usage. Information relevant to the baseline for major accidents and disasters is set out on a project-wide basis. Major accidents and disasters encompass a wide range of hazards and receptors, which is reflected in the following description of the baseline. Baseline information has been generated using information obtained from the data sources listed in **Table 13.6**, supplemented by relevant baseline information provided in other environmental aspect chapters.

Current baseline

Population

13.5.2 The main development site lies within the jurisdiction of MDC and is surrounded by agricultural land, with the villages of Bradwell-on-Sea approximately 1km to the south and Bradwell Waterside approximately 1km to the west. There are a few residential and agricultural properties situated within main development site boundary. A full list of population areas within 10km of the main development site is provided in **Appendix 13A**.

Heritage assets

13.5.3 There are no scheduled monuments, world heritage sites, registered park and gardens, Grade I or II* listed buildings, registered battlefields, protected wreck sites or protected military sites within the main development site.

13.5.4 There are 23 Scheduled monuments, nine Grade I and 23 Grade II* buildings within 10km of the main development site. The closest of these are:

- the Chapel of St Peter-on-the-Wall (Grade I) and Saxon Shore Fort and Anglo-Saxon monastery (Scheduled Monument) at Bradwell-on-Sea lying approximately 1km south-east of the main development site;
- Saxon coastal fish weir at Sales Point (Scheduled monument) located to the east; and

- the Church of St Thomas (Grade II*) and Bradwell Lodge (Grade II*) approximately 1km south-west of the main development site, within the Bradwell-on-Sea Conservation Area.

13.5.5 Seven conservation areas, including Bradwell-on-Sea, were identified within 10km of the main development site, designated either by MDC or Colchester Borough Council.

13.5.6 A full list of heritage receptors (of the types presented in **Table 13.13**) within 10km of the main development site is provided in **Appendix 13A.** A full description of all heritage assets within 1km of the main development site can be found in **Chapter 22: Historic Environment - Terrestrial and Marine**.

Ecological receptors: designated sites, habitats and species

13.5.7 There are six Ramsar sites, seven Special Protection Areas, one Special Area of Conservation, seven Sites of Special Scientific Interest and three National Nature Reserves, within 10km of the main development site, with many of the designation types overlapping with each other. In addition to these internationally or nationally designated sites there are several locally designated sites within the study area.

13.5.8 A list of designated sites within 10km of the main development site is provided in **Appendix 13A.** Further descriptions of the designated ecological sites can be found in **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**, which also includes information about protected species within its study area.

Marine receptors

13.5.9 One Marine Conservation Zone, the Blackwater, Crouch, Roach and Colne Estuaries Conservation Zone, has been identified within the 20km study area. Further information is provided in **Chapter 24: Marine Ecology and Fisheries**.

Surface water bodies

13.5.10 The principal watercourse at the main development site is the Weymarks River, which flows from the south of the disused airfield, to the north-east, connecting into the network of land drains and the Borrow Dyke. To the south of the main development site, there are a number of marshes, with some being fed by the Bradwell Brook and draining into the North Sea. A list of surface water receptors within 10km of the main development site is provided in **Appendix 13A** and further descriptions of the surface water and receptors can be found in **Chapter 15: Water Environment**.

Groundwater receptors

13.5.11 Some areas of the main development site are directly underlain by River Terrace Deposits, which are designated as a Secondary (undifferentiated) aquifer. They have the potential to contain some groundwater within thicker, more permeable

sequences found beneath the higher topography, and constitute the WFD Essex Gravels groundwater body. The alluvium is considered unproductive. The underlying or occasionally outcropping London Clay can also be regarded as a non-aquifer. The Chalk at depth is a Principal Aquifer and WFD groundwater body, but the considerable thickness (25 – 62m) of the London Clay and associated Harwich Formation (together forming the Thames Group) aquitard means that the Chalk aquifer is protected from contamination resulting from spillages or fire water run-off seeping through the ground. Further information on groundwater bodies is presented in **Chapter 15: Water Environment**.

Topography, geology and water features

13.5.12 A full description of the topography and geology around the main development site is provided in **Chapter 14: Soils, Geology and Land Use**.

13.5.13 A description of the surface water drainage system and the flow pathways is given in **Chapter 16: Flood Risk and Drainage**.

External Factors – man-made

13.5.14 There are no COMAH or MACR sites, or MAHPs identified within 1km of the main development site.

13.5.15 A site with Hazardous Substance Consent (HSC) has been identified within 1km of the main development site to the south. However, on recent satellite imagery viewed through Google Earth, the site appears to be disused and has no apparent storage of hazardous substances. This will be further investigated as part of preparation of the forthcoming EIA process.

13.5.16 The existing Bradwell power station is located to the north of the main development site. It has ceased generation and all fuel has been removed from site. In 2018, the site officially entered 'Care and Maintenance', the second of the three decommissioning phases ahead of final site clearance (Ref. 13.88). Prior to final site clearance, it is anticipated that the only buildings remaining on site will be the Reactor Buildings, purpose built Intermediate Level Waste (ILW) Store, the Ponds and Vaults complex weather envelopes and the site's substation, together with portacabin offices and welfare facilities for security personnel. The ILW Store will receive waste packages from other sites. The existing Bradwell power station continues to be the subject of a Nuclear Site Licence during this period. The ONR has confirmed that a radiation emergency as defined by the REPPIR Regulation 2(1) is no longer reasonably foreseeable.

13.5.17 One airport has been identified within 20km of the main development site: Clacton Airport. The airport is located approximately 15km to the north-east of the main development site. Its runway is orientated north-south and it is primarily used for light aircraft (Ref. 13.89). The next closest airport is London Southend, located approximately 21km south-south-west of the main development site.

13.5.18 There are no existing or historical mining or landfill sites within the study area of the main development site. **Chapter 14: Soils, Geology and Land Use** baseline information identifies locations within the main development site, and project-provided accommodation where ground may be potentially contaminated.

13.5.19 There are no licensed waste sites within 1km of the main development site. The nearest, at Curry Farm, is several hundred metres beyond the 1km study area.

External factors – environmental conditions

13.5.20 Information about the baseline climate conditions is provided in **Chapter 12: Climate Change**.

13.5.21 The prevailing wind direction at the main development site comes from either the south, or north-west. Further details on wind conditions are presented in the **Chapter 12: Climate Change**.

13.5.22 A description of the sea conditions is presented in **Chapter 17: Coastal Geomorphology and Hydrodynamics**.

Natural events

13.5.23 Natural events that are relevant to the assessment of major accidents and disasters effects include: extreme storm and extreme weather; drought; wild fires; flooding; electromagnetic interference; space weather; seismic hazards (for example, earthquake) and tsunami; subsidence, landslip from natural causes, outbreak of disease, infestation and importation of invasive species.

13.5.24 Seismic risks in the UK are generally low and management of ground issues will form part of the licensing process. Further information on the ground conditions (including geology and soils) and assessment of ground hazards is presented in **Chapter 14: Soils, Geology and Land Use**.

13.5.25 The baseline relevant to flooding from tidal, fluvial, pluvial, groundwater, sewers and reservoirs is provided in **Chapter 16: Flood Risk and Drainage**.

Future baseline

13.5.26 This section sets out how the current baseline is predicted to change by the time the Project is due to be constructed and then operated.

13.5.27 Factors which may change the baseline conditions over the lifetime of the Project and influence the nature, scale, consequences and likelihood of major accidents and disasters are described in the following paragraphs. These will be considered further in the assessment of likely significant effects in the ES.

13.5.28 Climate change is predicted to lead to a number of changes including: an increase in peak rainfall intensities and resulting flood flows over time, with wetter winters and drier warmer summers; a rise in sea level. Climate change is expected to alter the

prevalence of extreme weather conditions such as extreme droughts which could lead to a disaster.

13.5.29 The magnitude of the changes brought about by climate impact is uncertain, but projections are available until the end of the 21st century. The anticipated impact of climate change on environmental conditions is considered in **Chapter 12: Climate Change**, with further detail and a full hazard assessment to be undertaken during preparation of the ES.

13.5.30 Changing land use may mean that the surrounding environment could become more agricultural, industrial, residential or recreational in use. Changing ecological baselines resulting from land use and climate change factors may also impact the local ecology and associated environmental designations. As the surrounding environment changes, so do the receptors which could be affected. If land adjacent to the main development site was to become designated or receive a higher level of designation, then the sensitivity of receptors could increase.

13.5.31 The MDC Local Development Plan notes that Bradwell-on-Sea (including Bradwell Waterside), Dengie and Asheldham are historic settlements. In the absence of the Project it is not likely that there will be significant changes to the generally rural local setting of several scattered dwellings and hamlets.

13.5.32 The Care and Maintenance phase of decommissioning of the existing Bradwell power station is predicted to last until 2080. After this time, the site will enter Final Site Clearance. Remaining structures will be dismantled, residual radioactivity will be cleared to applicable standards, and the site will be delicensed. Changes to the existing Bradwell power station as a result of future decommissioning will not be considered as the site is expected to remain in Care and Maintenance until 2080.

13.5.33 Substantial development of technology during the lifetime of the Project is anticipated. This could include advances in remote handling, robots or decontamination techniques. These may reduce the risk posed to the environment (human and non-human receptors) during operation and decommissioning even further; however, they may also introduce new hazards that would need to be managed at the appropriate time and through the appropriate process.

Planned further surveys and studies

13.5.34 The full extent of the baseline for major accidents and disasters will be further developed as the EIA progresses, particularly in relation to the off-site associated development and off-site Power Station Facilities.

13.5.35 The list of receptors will be expanded to identify, in a proportionate manner, receptors that are outside of the 10km to 20km study area for non-radiological effects, but within the study area that will be set for radiological effects, should this be larger than 20km. Accidents and disasters that could affect this wider area are extremely unlikely to arise. Therefore, only the most sensitive receptors will be identified: namely centres of population, and internationally designated sites.

13.5.36 The list of receptors and baseline will be developed to identify receptors and potential sources of major accident or disaster within the study area for the off-site associated development and off-site Power Station Facilities, where these have not already been identified within the study area for the main development site.

13.5.37 Further work is required to understand:

- the baseline accidents and disasters that exist within the study area, for example through review of relevant local authority risk registers;
- the baseline incidence and magnitude of natural events; and
- arrangements for civil contingencies that the relevant off-site authorities have in place, including the location of infrastructure such as designated potential rest centres.

13.5.38 Relevant elements of the baseline will be expanded to reflect knowledge obtained from specialist data sources related to other environmental aspects.

13.5.39 The baseline will be updated to reflect findings of surveys and studies being undertaken by other aspects. Relevant aspects and proposed surveys and studies are:

- **Chapter 16: Flood Risk and Drainage**:
  - hydrological monitoring is proposed to gain an understanding of water levels within the surface water drainage system;
  - a detailed hydraulic flood modelling study (tidal coastal and pluvial) for the main development site is proposed alongside surface water quantity modelling to inform the EIA; and
  - topographic surveys of on-site watercourses and hydraulic and flood risk management structures will be undertaken as required to underpin these assessments.
- **Chapter 14: Soils, Geology and Land Use**:
  - phased ground investigation, with subsequent surface water and groundwater monitoring and sampling; and
  - the approach for identifying, clearing and managing UXO hazards.
- Surveys and desktop studies prepared for **Chapter 9: Radiological, Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology; Chapter 24: Marine Ecology and Fisheries** and **Chapter 19: Navigation**.

13.6 Proposed Approach to the Assessment

13.6.1 Major accidents and disasters are by their nature of high consequence (if they occur) and are 'unplanned', with the effects not part of the intended design, construction or operational intent. The assessment of significant effects for major accidents and disasters will focus on the risk significance, namely the combination of the 'magnitude of change' (if they were realised) and likelihood of the major accident or disaster occurring rather than the magnitude of the change and sensitivity of the receptor only.

13.6.2 Risk tolerability for major accidents and disasters in the UK is built on the principle of eliminating intolerable risks, and then ensuring that any residual risks, while small, are further minimised where practicable. This principle has been applied to set the criteria for significance, with 'intolerable risk' interpreted as equivalent to 'significant adverse effects' in EIA terminology thus enabling consistency with other EIA aspects.

13.6.3 Risk tolerability for people is well established in the UK. The primary reference for this is HSE's Reducing Risk Protecting People (R2P2) which in turn is based on the method which the HSE applies to the control of risk at nuclear power stations, originally published in 1988 as 'The Tolerability of Risks from Nuclear Power Stations' (TOR).

13.6.4 Limited options are available upon which to benchmark environmental (non-human) major accident and disaster tolerability and these have mainly been developed in relation to Control of Major Accident Hazards (COMAH) sites. Guidance which is widely referenced in the UK and has been developed to support evaluation of establishments falling under the Control of Major Accident Hazard (COMAH 2015) Regulations 2015 is detailed in Chemicals and Downstream Oil Industry Forum (CDOIF) – Environmental Risk Tolerability for COMAH establishments (CDOIF).

13.6.5 CDOIF is a strategic forum established by the HSE comprising industry and regulatory bodies including the Environment Agency and HSE. The Safety Report Assessment Manual (SRAM) issued by the COMAH Competent Authority recommends CDOIF Guidelines for assessing the risk of major accidents to the environment. The CDOIF Guidelines are also suitable to apply to non-COMAH facilities where environmental risk assessment of major accidents and disasters is required.

13.6.6 The CDOIF and R2P2 criteria have been used in this assessment methodology to provide a consistent basis for the EIA using common established benchmarks for major accidents and disasters applied across the UK.

13.6.7 The fact that the Project is currently in the early design stage means that the estimates will be necessarily qualitative and based on expert judgement informed by comparison against experience in similar industries and for similar developments, where practical.

13.6.8 The scoping exercise has recognised major accident and disasters that are covered by other regulations. In particular radiological hazards are tightly regulated via the nuclear licensing regime.

13.6.9 The nuclear industry is regulated under legislation specific to major accidents and disasters. Of particular relevance, is the ONR licensing conditions and the GDA process of the ONR and the Environment Agency. The EIA Regulations allow that information about the risks of major accidents and disasters obtained pursuant to the Nuclear Safety Directive 2009/71/Euratom and other environmental assessments may be used to inform the assessment of effects, provided that the information meets the requirements of the EIA Directive.

13.6.10 In order to avoid duplication, the assessment will provide a description of the rigorous processes and regulatory frameworks which will be in place to ensure safety and security through design, construction and operation. The methodology will identify those hazards that are covered by the GDA, the Nuclear Site License, and other regulatory regimes, and provide a summary of their reasonably foreseeable worst-case environmental consequence (with due account for the number of nuclear islands), and a summary of the required mitigation, in the form of regulatory requirements, to reduce these risks to as low as reasonably possible. Effects that are not fully covered by other regulation and therefore cannot be referred out will be assessed using the method described in the Assessment Methodology.

13.6.11 This approach is supported by:

- The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (Schedule 4) which state that "*Relevant information available and obtained through risk assessments pursuant to EU legislation such as Directive 2012/18/EU of the European Parliament and of the Council or Council Directive 2009/71/Euratom or UK environmental assessments may be used for this purpose provided that the requirements of this Directive are met*.".

- The National Policy statement (NPS) for Nuclear Power Generation (EN-6) acknowledges that "*The licensing and permitting of nuclear power stations by the nuclear regulators is a separate regulatory process which nuclear power stations have to undergo. To avoid unnecessary duplication and / or delay and to ensure that planning and regulatory expertise are focussed on the most appropriate areas, when considering a development consent application the IPC should act on the basis that: the relevant licensing and permitting regimes will be properly applied and enforced; and it should not duplicate the consideration of matters that are within the remit of the Nuclear Regulators*.".

Assessment methodology

13.6.12 The assessment process for major accidents and disasters will include:

- determining the full range of major accident and disasters that could occur during the Project life cycle, as follows:

- identify potential receptors;
- identify all potential sources of major accidents and disasters arising from, altered by or affecting the Project; and
- assess whether any credible pathways exist (i.e.) the link between an event and a receptor.

- For each credible source–pathway-receptor combination the assessment would qualitatively assess the severity of harm and impact duration where applicable to establish the magnitude of change and:
  - for those that do not meet the threshold of a major accident and disaster, as set out in **Table 13.7**, conclude no significant effects arising from major accidents and disasters;
  - for those that meet or exceed the threshold of a major accident and disaster continue assessment and:
    - identify key mitigation measures;
    - qualitatively assess the likelihood of the major accident or disaster being realised, taking into account embedded mitigation; and
    - assess significance.

13.6.13 Potential receptors that have been identified within the study area are described in **Appendix 13A.**

13.6.14 The full range of potential major accidents and disasters will be determined systematically with reference to:

- project risk registers;
- relevant accident data bases including eMARS; and ONR Site Reports - Quarterly Statements;
- accident and disaster initiators drawn from:
  - ONR Safety Assessment Principles for Nuclear Facilities;
  - COMAH SRAM Section 10 and Section 13;
  - European Commission's Overview of Natural and Man-made Disaster Risks the European Union may face; and
  - national and relevant Community Risk Registers.

13.6.15 All pathways by which one or more receptor could be impacted by a potential accident or disaster will be identified, and credible source-pathway-receptor combinations established.

Assessment of effects

13.6.16 A significant adverse effect from major accidents and disasters is one which would result in serious damage to human populations or the non-human environment, as defined in **Section 13.1**, with a likelihood that the effect is considered intolerable to general society.

13.6.17 A significant effect could include immediate or delayed effects. An immediate effect would be one that is self-evident at the time of the event (for example, fire damage, injury). A delayed effect is one which becomes evident only after time (for example, loss of feeding ground leading to a sustained change in the ecosystem).

13.6.18 The following factors are important in defining the criteria for establishing the significance of effects:

- magnitude of change – which is established from the following dimensions that intrinsically account for receptor sensitivity;
  - severity of harm (a combination of extent and damage potential);
  - duration of harm (the recovery period) for non-human receptors or the numbers of people affected for human receptors; and
- likelihood of the event occurring.

13.6.19 These combine to provide a measure of risk, that is, the combination of the serious damage (magnitude of change) arising from a potential event and its likelihood of occurrence).

Magnitude of change

13.6.20 In order to distinguish between potential major accidents of differing severities, all potential major accidents and disasters are categorised into one of four magnitude of change categories: Low, Medium, High, and Very High. Any scenario which does not meet the threshold criteria of a major accident or disaster set out in **Table 13.10** and **Table 13.11** is simply listed as Not MA&D, that is, not major accident and disaster. Magnitude of change within the context of major accidents and disasters is assessed from both the severity of the harm, and either the duration over which the receptor experiences that harm or the number of people affected.

13.6.21 Receptor sensitivity, which relates to the intrinsic value or sensitivity of receptors, is embedded within the ‘severity of harm’, ‘duration of harm’ and ‘number of people affected’ criteria to establish their threshold levels and scaling factors. For this reason, receptor sensitivity is not explicitly considered in the major accidents and disasters assessment.

Severity of harm for all receptors

13.6.22 The criteria for severity of harm for non-human receptors was extracted directly from the CDOIF guidance and further receptor types for human populations were established to align to HSE's R2P2. The severity of harm criteria is given in **Table 13.7**.

13.6.23 Four categories of harm severity are considered: Not Significant, Severe, Major and Catastrophic.

- Not Significant: corresponds to a level of harm that is below the minimum threshold determined for a major accident or disaster in the CDOIF guidance and in R2P2; and
- Severe, Major, and Catastrophic represent increasing levels of damage or harm to populations or environmental receptors.

13.6.24 In **Table 13.7**, the term 'not significant' is used to refer to a level of harm that might lead to noticeable pollution or a minor impact on people that is below the threshold of a major accident or disaster. In the CDOIF guidance, this column is termed 'significant' (rather than 'not significant'). The CDOIF guidance considers this level of harm to be lower than 'serious damage' i.e. it would not be considered a major accident to the environment. It has been renamed to 'not significant' here to avoid confusion since significant has a different meaning within the EIA context.

Non-human receptors

13.6.25 The environmental (non-human) criteria have been directly extracted from that of the CDOIF guidance which sets a maximum or minimum severity ranking for some receptors. Where this is the case, the severity of harm categories that do not apply to those receptors are noted as non-applicable (N/A) in the table.

13.6.26 In **Table 13.7**, where two threshold parameters are given within a single category, for example, <0.5 ha or 10% of a designated site of national importance, the lesser of the two is taken to be the threshold for a given receptor. This ensures there is no gap between the 'severity of harm' categories.

13.6.27 Cultural heritage receptors are those which the NPPF considers as being assets of the highest significance, where instances of their harm or loss should be treated as 'wholly exceptional'. These heritage assets include: scheduled monuments, protected wreck sites, registered battlefields, Grade I and II* listed buildings, Grade I and II* registered parks and gardens, and World Heritage Sites. Associated conservation areas that contribute to their significance are also included.

13.6.28 In line with the CDOIF and DETR guidance, destruction of Grade II listed buildings, or Grade II Registered Park and Gardens, are not considered to be a Major Accident. However, if the incident which led to their destruction could endanger human life, or a relevant population of particular species, then it would be

considered as a major accident under the appropriate receptor. Damage to Grade II buildings is not considered to be 'wholly exceptional' under the NPPF.

Population and human health

13.6.29 The descriptions for population and human health severity criteria in **Table 13.7** include wider health, social and economic effects as well as direct physical harm. The wider effects are drawn from the Civil Contingencies guidance. The descriptions incorporate relevant aspects of the health, social and economic effects in the guidance, tailored to the severity of harm levels used in **Table 13.7** and major accidents and disasters that are relevant to the Project.

13.6.30 Where the severity of harm is at the 'not significant' and 'severe' level, the severity of harm criteria for workers differs from that for members of the public. This is consistent with HSE's R2P2 which reasons that individual members of the public 'have the risk imposed on them 'in the wider interest of society' whereas workers accept the risk, have more control over it and benefit from the activity. It is also easier to separate the public from the hazard and therefore reduce their risk.

13.6.31 Where the severity of harm is 'large' or 'very large' (i.e.) a substantial number of fatalities and life changing injuries arise from a single event, the severity of harm is the same for the workers as for the public. In setting criteria for societal risk, the HSE does not make the distinction between workers and the public.

13.6.32 Where the severity of harm is 'large' or 'very large' the wider health, social and economic effects that apply differ slightly, reflecting the differences in how the public and workers may be affected. For example, damage to residential properties is an effect upon the public and is not applicable to workers.

Table 13.7: Major accidents and disasters severity of harm criteria

Receptor Type	Severity of Harm			
	Not Significant	Severe	Large	Very Large
Human populations (public).	Small number of minor injuries.	Substantial number of people requiring medical attention. Events of this magnitude may also involve some damage to housing, with low numbers of people being displaced. Potential for localised interruption to utilities and damage to infrastructure.	Multiple life changing injuries or potential loss of life in low numbers. Events of this magnitude are also likely to involve significant community impact such as: • many people requiring medical treatment; • many people suffering long term mental health issues related to the event; • housing and business premises rendered uninhabitable with many people displaced for significant periods;	Potential loss of life in high numbers or substantial number of life changing injuries. Events of this magnitude are also likely to involve significant community impact such as: • very many people requiring medical treatment; • widespread mental health issues related to the event; • large areas of housing and business premises rendered uninhabitable with large numbers of people displaced for extended periods;

Receptor Type	Severity of Harm			
	Not Significant	Severe	Large	Very Large
			• significant adverse medium-term economic effects locally; • significant clean-up and recovery costs; • potential for disruption to regional infrastructure, utilities and services; and • incident requiring emergency response at county or regional scale.	• extensive adverse long-term economic effects regionally and nationally; • extensive clean-up and recovery costs; • potential for disruption to regional infrastructure, utilities and services; and • incident requiring emergency response at national or international scale.
Human populations (workers).	Substantial number of people requiring medical attention.	Multiple life changing injuries.	Multiple life changing injuries, potential loss of life in low numbers. Events of this magnitude are also likely to involve: • many people suffering long term mental health	Potential loss of life in high numbers and substantial number of life changing injuries. Events of this magnitude are also likely to involve:

Receptor Type	Severity of Harm			
	Not Significant	Severe	Large	Very Large
			issues related to the event; • incident requiring emergency response at county or regional scale; • significant adverse medium-term effects to local economy; • significant clean-up and recovery costs to the local community; • potential for disruption to regional infrastructure, utilities and services; and • incident requiring emergency response at county or regional scale.	• widespread mental health issues related to the event; • extensive adverse long-term economic effects regionally and nationally; • extensive clean-up and recovery costs to society; • potential for disruption to regional infrastructure, utilities and services; and • incident requiring emergency response at national or international scale.

Receptor Type	Severity of Harm			
	Not Significant	Severe	Large	Very Large
Designated land or water sites (internationally important).	<0.5 ha or <5% of designated feature (site area, linear feature or population), see table footnote.	>0.5 ha or 5-25% of designated feature (site area, linear feature or population), see table footnote.	25-50% of designated feature (site area, linear feature or population), see table footnote.	>50% of designated feature (site area, linear feature or population), see table footnote.
Designated land or water sites (nationally important).	<0.5 ha or <10% of designated feature (site area, linear feature or population), see table footnote.	>0.5 ha or 10-50% of designated feature (site area, linear feature or population), see table footnote.	>50% of designated feature (site area, linear feature or population), see table footnote.	N/A
Other designated land.	<10 ha or <10%.	10-100 ha or 10-50% of land.	>100 ha or >50% of land.	N/A
Scarce habitat.	<2 ha or <10%.	2-20 ha or 10-50% of habitat.	>20 ha or >50% of habitat.	N/A
Widespread habitat – non-	<10ha	Contamination of 10-100 ha of land, preventing growing	100 – 1,000 ha (applied as per text under 'Severe').	>1,000 ha (applied as per text under 'Severe').

Receptor Type	Severity of Harm			
	Not Significant	Severe	Large	Very Large
designated land.		of crops, grazing of domestic animals or renders the area inaccessible to the public because of possible skin contact with dangerous substances. Alternatively, contamination of 10ha or more of vacant land.		
Widespread habitat – non-designated water.	N/A	Contamination of aquatic habitat which prevents fishing or aquaculture or renders it inaccessible to the public.	N/A	N/A
Particular species (these criteria apply nationally).	Loss of <1% of animal or <5% of plant ground cover in a habitat.	Loss of 1-10% of animal or 5-50% of plant ground cover.	Loss of 10-90% of animal or 50-90% of plant ground cover.	Total loss (>90%) of animal or plant ground cover.

Receptor Type	Severity of Harm			
	Not Significant	Severe	Large	Very Large
Fresh and estuarine water habitats.	Impact below that indicated to be severe.	WFD chemical or ecological status lowered by one class for 2-10km of watercourse or 2-20ha or 10-50% area of estuaries or ponds. Interruption of drinking water supplies, as per Groundwater Source of Drinking Water.	WFD chemical ecological status lowered by one class for 10-200km of watercourse or 20-200ha or 50-90% area of estuaries and ponds. Interruption of drinking water supplies, as per Groundwater Source of Drinking Water.	WFD Chemical or ecological status lowered by one class for >200km of watercourse or >200ha or >90% area of estuaries and ponds. Interruption of drinking water supplies, as per Groundwater Source of Drinking Water.
Marine	<2ha littoral or sub-littoral zone, <100ha of open sea benthic community, <100 dead sea birds (<500 gulls), <5 dead or significantly impaired sea mammals.	2-20ha littoral or sub-littoral zone, 100-1,000ha of open sea benthic community, 100-1,000 dead sea birds (500-5,000 gulls), 5-50 dead or significantly impaired sea mammals.	20-200ha littoral or sub-littoral zone, 100-10,000ha of open sea benthic community, 1000-10,000 dead sea birds (5,000-50,000 gulls), 50-500 dead or significantly impaired sea mammals.	>200ha littoral and sub-littoral zone, >1,000ha of open sea benthic community, >10,000 dead sea birds (>50,000 gulls), >500 dead or significantly impaired sea mammals.
Groundwater source of drinking water.	Interruption of drinking water supply <1000 person-hours	Interruption of drinking water supplied from a ground or surface source	>1 x 10^7 person-hours interruption of drinking water (a town of ~100,000 people	>1 x 10^9 person-hours interruption of drinking (~1 million people losing supply for

Receptor Type	Severity of Harm			
	Not Significant	Severe	Large	Very Large
	or for England and Wales only <1ha SPZ.	(where persons affected x duration in hours [at least 2] >1,000) or for England and Wales only 1-10ha of SPZ where drinking water standards are breached.	losing supply for month) or for England and Wales only 10-100ha SPZ drinking water standards breached.	1 month) or for England and Wales only >100ha SPZ drinking water standards breached.
Groundwater – non-drinking water source.	<1ha	1-100ha of aquifer where water quality standards are breached (or hazardous substance is discernible).	100-10,000ha.	>10,000ha.
Groundwater in unproductive strata.	Groundwater not a pathway to another receptor.			
Soil or sediment (i.e. as receptor rather than purely a pathway).	Contamination not leading to environmental damage (as per ELD), or not significantly, affecting	Contamination of 10-100ha of land etc. as per widespread habitat; contamination sufficient to be deemed environmental damage (Environmental Liability Directive).	Contamination of 100-1,000ha of land, as per widespread habitat; contamination rendering the soil immediately hazardous to humans (for example, skin contact) or the living	Contamination of >1,000ha of land, as per widespread habitat; contamination rendering the soil immediately hazardous to humans (for example, skin contact) or the living environment and

Receptor Type	Severity of Harm			
	Not Significant	Severe	Large	Very Large
	overlying water quality.		environment, but remediation available.	remediation difficult or impossible.
Cultural Heritage.	Damage below a level at which designation of importance would be withdrawn.	Damage sufficient for designation of importance to be withdrawn.	Feature of heritage asset subject to designation of importance entirely destroyed.	N/A

Note: The CDOIF guidance defines 'population' as the known or estimated population at the site, and individual species named in the designation, not the national population. It further states that species which are not named in the designation should be treated as particular species and not designated sites.

Duration (non-human receptors)

13.6.33 In general terms a receptor which is able to recover quickly from an event is considered to have suffered a lesser level of harm than one that does not recover or recovers only after a very long time. This concept is recognised in the duration criteria, which takes account of the ability of the receptor to recover naturally. Duration criteria differ by receptor type, and what is considered short-term for one receptor type is not the same as that of another. For non-human receptor types, four categories of duration are considered: short, medium, long, and very long-term. These are defined in **Table 13.8**.

13.6.34 These criteria are taken directly from the CDOIF guidance. Four categories of duration are considered: short-term, medium-term, long-term and very long-term.

Table 13.8: Major accidents and disasters duration of harm criteria (non-human receptors)

Description	Short-term	Medium-term	Long-term	Very Long-term
Groundwater or surface water drinking water source (public or private).	N/A	N/A	Harm affecting drinking water source or SPZ <6 years.	Harm affecting drinking water source or SPZ >6 years.
Groundwater (except drinking water sources).	WFD hazardous substances <3 months.	WFD hazardous subs >3 months.	WFD hazardous subs >6 years.	WFD hazardous subs >20 years.
	WFD non-hazardous substances <1year.	WFD non-hazardous substances >1 year.	WFD non-hazardous substances >10 years.	WFD non-hazardous substances >20 years.
Surface water (except drinking water sources - see above).	<1 year.	>1 year.	>10 years.	>20 years.
Land	<3 years.	>3 years or >2 growing seasons for agricultural land.	>20 years.	>50 years.

Description	Short-term	Medium-term	Long-term	Very Long-term
Heritage Assets.	Can be repaired in <3 years, such that its designation can be reinstated.	Can be repaired in >3 years, such that its designation can be reinstated.	Feature destroyed, cannot be rebuilt, all features except world heritage site.	Feature destroyed, cannot be rebuilt, world heritage site.

Human Receptors – number of people affected

13.6.35 For human receptors, the number of people affected is accounted for in assigning the magnitude of change, this ensures appropriate alignment to HSE R2P2 concepts. For human receptors the magnitude of change is categorised based on the number of people, affected to provide appropriate positioning against HSE risk tolerability concepts, as set out in **Table 13.9**.

Table 13.9: Number of people affected

	Number of People Affected		
	Low	Medium – High	Very High
Human Populations.	Less than 5.	10s of people.	100s of people.

Magnitude of change

13.6.36 The severity of harm (**Table 13.7**) and harm duration (**Table 13.8**) for non-human receptors are combined in order to determine the magnitude of change as given in **Table 13.10**.

Table 13.10: Magnitude of change – non-human receptors

		Duration of Harm			
		Short	Medium	Long	Very Long
Severity of Harm	Very Large.		High	Very High.	Very High.
	Large		Medium	High	Very High.
	Severe		Low	Medium	High
	Not Significant.	Not MA&D			

13.6.37 The severity of harm (**Table 13.7**) and the number of people affected for human receptors (**Table 13.9**) are combined in order to determine the magnitude of change as given in **Table 13.11.**

Table 13.11: Magnitude of change – human receptors

		Number of People Affected	
		Low to High	Very High
Severity of Harm.	Very Large.	High	Very High.
	Large	Medium	High
	Severe	Low	Medium
	Not Significant.	Not MA&D.	Low

Assessment of significance of effects

13.6.38 Potential major accidents or disasters that have been assigned a magnitude of change equal to or higher than 'low' will be further assessed to determine whether its effects are significant, unless they are eliminated under any of the following cases:

- although a source, pathway and receptor combination is present, it is unrealistic to consider that major accident and disaster consequences could occur, even if theoretically credible;
- the magnitude of damage, when assessed without taking into account mitigation, would not meet the threshold for major accident or disaster, that is, the magnitude of change is 'Not MA&D';
- if the 'source' would not directly cause a major accident but influences the sequence of events leading to a major accident or disaster being realised, the influence of the source is integrated into the event scenario assessment - it would not be assessed as a standalone scenario. Examples include:
  - conditions such as snow and rain that make driving more dangerous, but do not directly cause accidents – these are considered as causal factors; and
  - impairment of an embedded environmental measure such as damage to a secondary containment designed to contain hazardous spillages – this does not cause release, but if a spillage occurs while it is damaged the consequences are more likely to be major accident – these are considered in the assessment of the likelihood of the major accident to the environment being realised.

Determination of significance

13.6.39 **Table 13.12** gives the magnitude of change and a qualitative likelihood scale to determine whether the risk is significant. In the major accidents and disasters assessment, a significant effect would represent a level of risk that would generally be considered intolerable.

13.6.40 The threshold for what may be considered significant (i.e. intolerable) includes much less frequent effects than are addressed in many other aspect chapters. Events of lower magnitude are generally tolerated much more readily by society than those of higher magnitude.

13.6.41 The assessment will apply expert judgement to evaluate the likelihood of each potential major accident and disaster occurring, once the mitigation is considered. The likelihood and magnitude of change reported will be that above the baseline (i.e.) the incremental likelihood and risk. This is the risk that can be attributed to the Project directly or indirectly.

13.6.42 While qualitatively stated, the definition and classifications used for likelihood are designed to be compliant with HSE's R2P2 for societal risk, and CDOIF for environmental tolerability, if considered on a per effect basis rather than in terms of aggregated risk. Expert judgement has been used to establish the appropriate qualitative parameters for likelihood categorisation, with levels used ranging from 'remote chance of occurring' through to 'reasonable chance of occurring'. These then provide an allocation of likelihood against magnitude to determine risk significance, which in turn is an approach that is consistent with major accident tolerability perceptions commonly applied elsewhere in the UK.

Table 13.12: Significance matrix – major accidents and disasters

Magnitude of Change	Likelihood (per Receptor per Effect)				
	Remote Chance of Occurring	Very Small Chance of Occurring	Small Chance of Occurring	Chance of Occurring	Reasonable Chance of Occurring
Very High	Not Significant.	Significant	Significant	Significant	Significant
High	Not Significant.	Not Significant.	Significant	Significant	Significant
Medium	Not Significant.	Not Significant.	Not Significant.	Significant	Significant
Low	Not Significant.	Not Significant.	Not Significant.	Not Significant.	Significant

13.7 Scope of the Assessment

13.7.1 The principal major accidents and disaster receptors that have been identified as being subject to potential effects are summarised in **Table 13.13**. A list of receptors is provided in **Appendix 13A**. Land receptors are listed to 10km and marine to 20km which is the study area for non-radiological effects. The approach to identifying receptors outside of this area but within the study area that will be agreed for radiological effects (should this be larger than 20km) will be proportionate and considered during the EIA and ultimately presented in the ES.

13.7.2 The CDOIF guidance on which the assessment of significance on non-human receptors is based also includes criteria for damage to widespread (non-designated) land and water that would be considered a major accident to the environment. It is foreseeable that in the event of major accidents or disaster non-designated land or water used for agriculture, forestry, fishing or aquaculture, could become contaminated and, if unmitigated, lead to indirect effects on people. Non-designated land and water is less sensitive to harm than the designated receptors listed in **Table 13.13**. It is generally the case that ensuring that the effects of major accidents and disasters are not significant to more sensitive receptors ensures that they are not significant to non-designated habitat.

Table 13.13: Receptors subject to potential effects

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Project	Construction and operational phase.	Population and human health: 1. populations within the Project (main development site, off-site associated development and off-site Power Station Facilities) including workers involved in construction and operation; 2. workers on the project-provided accommodation including occupants of accommodation; and 3. populations outside the Project workforce including people at work and the public, local villages and towns, road users and including vulnerable receptors such as schools, hospitals and care homes.	These receptors fall within the defined study area for land-based receptors.
Project	Construction and operational phase.	Designated sites (internationally important): 4. Special Areas of Conservation (SACs); 5. Special Protection Areas (SPAs); and 6. Ramsar Sites.	These receptors fall within the defined study areas for land and marine based receptors.
Project	Construction and operational phase.	Designated sites (nationally important): 7. Sites of Special Scientific Interest (SSSIs); 8. National Nature Reserves (NNRs);	These receptors fall within the defined study areas for land and marine based receptors.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
		9. Marine Conservation Zones (MCZs); and 10. National Parks.	
Project	Construction and operational phase.	Other designated land: 11. Environmentally Sensitive Areas (ESAs); 12. Areas of Outstanding Natural Beauty (AONBs); 13. Green Belt Land; 14. Local Nature Reserves (LNRs); and 15. Local Wildlife Sites (LWS).	These receptors fall within the defined study area for land-based receptors.
Project	Construction and operational phase.	Scarce habitat: 16. Biodiversity Action Plan (BAP) habitats and geological features such as caves, fossil beds, mineral veins and moraines; and 17. Habitats of Principal Importance (HPI).	These receptors fall within the defined study area for land-based receptors.
Project	Construction and operational phase.	Fresh and estuarine water habitat: 18. Surface water such as streams, ponds, rivers, canals, reservoirs, estuaries and lakes.	These receptors fall within the defined study area for surface water receptors.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Project	Construction and operational phase.	Marine Designations: 19. Non-estuarine marine waters; 20. sub-littoral zones; 21. benthic community adjacent to the coast; and 22. fish spawning grounds.	These receptors fall within the defined study area for marine receptors.
Project	Construction and operational phase.	Groundwater sources - Drinking water sources (Source Protection Zones (SPZs)) in aquifers.	These receptors fall within the defined study area for groundwater receptors.
Project	Construction and operational phase.	Groundwater source (non-drinking water) - such as within aquifers or waterbodies below the surface.	These receptors fall within the defined study area for groundwater receptors.
Project	Construction and operational phase.	Non-designated land and water – land used for agriculture, forestry, fishing or aquaculture.	These receptors fall within the defined scoping area for land-based receptors.
Project	Construction and operational phase.	Cultural heritage (designated buildings or sites). Receptors included within this group: 23. Grade I/II* listed buildings; 24. Grade I/II*registered parks and gardens;	These receptors fall within the defined scoping area for cultural heritage.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
		25. battlefields; 26. wreck sites; 27. conservation areas; 28. world heritage sites; and 29. scheduled monuments.	

Likely significant effects

13.7.3 The effects of major accidents and disasters which have the potential to be significant and that will be taken forward for assessment in the ES are summarised in **Table 13.14**.

Table 13.14: Likely significant major accidents and disasters effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site • nuclear Island; • conventional Island;	All construction activities and facilities including: Enabling Works: • earthworks, excavation. Main Construction	Risk of immediate and delayed effects on people and to the non-human environment arising from: • radiological accidents including those which could result in radiological exposure or release to air, land or water (the footnote below this table clarifies the limited element of the construction phase to which this potential effect applies). This	All receptor groups identified in **Table 13.13**.

Element of the Project	Activity	Effect	Receptor or Receptor Group
• balance of plant (storage and handling of gases and liquids); • cooling water infrastructure; • fuel and waste storage; • office provision, welfare, security and emergency facilities; and • beach landing facility. • Off-site associated development: • project-provided accommodation and supporting	• levelling, preparation; • delivery of materials and plant components; • civil construction; • installation of functional equipment; • erection or dismantling temporary structures; • erection, operation and dismantling of temporary plant for example, concrete batching plant; • installation of utilities; • marine works; • commissioning (Cold functional testing, Hot functional testing);	includes chemotoxic (non-radiological) effects of active chemicals, for example, fire, toxics, explosion, contaminated fire water run-off; • release of non-radioactive hazardous chemical or biological substance used in construction or caused by construction activity, this includes contaminated fire water run-off; • non-radiological fire or explosion caused by accidental release with ignition, adverse chemical reaction, physical explosion; • non-process, non-radiological fire or explosion (for example, building fires); • physical effects that arise during construction (structural collapse, impact, dropped or swung load, high energy pipe or equipment failure, subsidence, collapse of excavation); • transport accidents including marine and accidents on public roads associated with construction activities, for example, work buses and construction vehicles (for example, a diesel tanker). This excludes non-company transport;	

Element of the Project	Activity	Effect	Receptor or Receptor Group
amenities and utilities; • park and ride facilities; • freight management facilities; and • off-site highways works. Off-site Power Station Facilities.	• construction, operation and dismantling of off-site associated development; • construction of the off-site Power Station Facilities; • landscaping and site restoration.	• accidents whose origin is external to the Project where the construction activity associated with the Project has a material effect on the extent and severity of the accident; • historic hazards (for example, UXO, former mines and landfill sites); • natural disasters where construction activity and facilities associated with the Project has a material effect on the extent and severity of the disaster; and • malicious acts (for example, terrorism, cyber-security attacks, vandalism and theft) targeted at construction activities associated with the Project.	

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site: • nuclear island; • conventional island; • balance of plant (storage and handling of gases and liquids); • cooling water infrastructure; • fuel and waste storage; • office provision, welfare, security and emergency facilities; and • beach landing facility.	All routine operations and planned and unplanned maintenance and outages associated with: • reactor operation; • electrical generation and export; • spent fuel removal, pre-cooling, on-site transportation and storage; • intermediate level waste handling and storage; • low level waste handling and storage; • cooling water; • on-site transportation; • marine operations;	Risk of immediate and delayed effects on people and to the non-human environment arising from: • radiological accidents or disasters including nuclear excursion, radiological exposure and release to air, land or water. This includes chemotoxic (non-radiological) effects of active chemicals, for example, fire, toxics, explosion, contaminated fire water run-off; • release of non-radioactive hazardous chemical or biological substance, this includes contaminated fire water run-off; • non-radiological fire or explosion caused by accidental release with ignition, adverse chemical reaction, physical explosion; • non-process, non-radiological fire or explosion (for example, building fires); • physical effects that arise during accidents that occur in operation (structural collapse, impact, dropped or swung load, high energy pipe or equipment failure, subsidence, collapse of excavation);	All receptor groups identified in **Table 13.13**

Element of the Project	Activity	Effect	Receptor or Receptor Group
Off-site associated development: • off-site highways works Off-site Power Station Facilities.	All routine operations, planned and unplanned maintenance, and outages associated with off-site Power Station Facilities. Anticipated operation of the off-site highway infrastructure including maintenance.	• transport accidents that occur in normal operation including marine; • accidents whose origin is external to the Project where the Project has a material effect on the extent and severity of the accident; • historic hazards (for example former mines and landfill sites); • natural disasters where operations and facilities associated with the Project has a material effect on the extent and severity of the disaster; and • malicious acts (for example, terrorism, cyber-security attacks, vandalism and theft).	
Fuel and waste storage.	Transportation of radioactive waste: • Low Level Waste (LLW); and • spent fuel.	Risk of immediate and delayed effects on people and to the non-human environment arising from: • radiological accidents or disasters during transportation of hazardous waste including radiological exposure and release to air land or water, and nuclear excursion;	Workers on-site. Receptors on transport route.

Element of the Project	Activity	Effect	Receptor or Receptor Group
	Transportation of fresh fuel assemblies Transportation of non-radiological hazardous substances.	• accidental release of non-radioactive hazardous chemical or biological substance, this includes contaminated fire water run-off; • non-radiological fire or explosion caused by accidental release with ignition, adverse chemical reaction, physical explosion; • accidents whose origin is external to the transportation where the transportation of radioactive waste associated with the Project has a material effect on the extent and severity of the accident; • natural disasters where the transportation of radioactive waste associated with the Project has a material effect on the extent and severity of the accident; and • malicious acts (for example, terrorism, cyber-security attacks, vandalism and theft) targeted at transportation of radioactive waste associated with the Project.	

Note It is proposed to scope in radiological accidents and disasters during the construction phase. The construction activities at the main development site are scheduled to be completed and the majority of the construction workforce demobilised before nuclear materials are introduced, which will reduce the potential for interaction between construction and the operating power plant. However, there will be a short period of overlap at the end of the construction phase when reactor Unit 1 begins operation while commissioning is being completed on Unit 2 and site restoration is carried out. During this time specific consideration of the interface between construction and operation will be required.

13.7.4 Effects arising from a major accident or disaster may be direct (for example, chemical burns) or indirect (for example, contamination of water or food supply).

13.7.5 The operation and construction activities and facilities may have a material effect on the extent and severity of a natural disaster or an event whose origin is external to the Project if:

- the accident or disaster affects receptors associated with the Project;
- the accident or disaster initiates a 'domino' accident at the Project such as structural failure or loss of containment;
- the Project temporarily or permanently changes the pathway between an external source and an external receptor; or
- the Project impairs effective deployment of measures to mitigate the effects of an accident or disaster on the human and non-human environment.

13.7.6 Natural disasters include, but are not limited to:

- extreme storms and extreme weather (for example, hot or cold temperature, rain, snow, wind (including tornadoes), lightning);
- drought;
- wild fires;
- flooding (for example, high tides, groundwater, pluvial, fluvial, coastal);
- electromagnetic interference;
- space weather, for example geomagnetic storms;
- seismic hazards (for example, earthquake) and tsunami;
- subsidence, landslip from natural causes;
- infectious disease, pandemic, microbial resistance, and epizootic or animal and plant disease; and
- infestation and importation of invasive species.

13.7.7 Potential accidents whose origin is external to the Project include, but are not limited to:

- impact from aircraft, other transport, projectiles;
- effects from an industrial accident in the vicinity (for example, fire, explosion, release of hazardous substance or agent, structural collapse, excavation failure)

including COMAH or MACR establishments, explosives installation, MAHPs and licensed nuclear installations;

- loss of a key utility (for example, power supply, water supply);
- historic hazards (for example, UXO, former mines and landfill sites);
- impact arising from industrial action, protest; and
- Malicious acts (for example, terrorism, civil unrest, cyber-security attacks, vandalism and theft).

13.7.8 Accidents and disasters leading to large releases of radiological materials are expected to be "*very low probability, due to the robustness of the regulatory regime*" (The National Policy statement (NPS) for Nuclear Power Generation (EN-6)). However, if they did occur, they could have the potential to result in transboundary effects. Transboundary effects will be considered as described in **Chapter 5: The EIA Process and Methods,** specifically **Section 5.5.**

Effects scoped out of further assessment

13.7.9 The effects scoped out from further assessment are listed in **Table 13.15**.

Table 13.15: Effects scoped out of the assessment

Potential Effect	Justification for Scoping Out
Effects on workers, during construction and operation, arising from workplace accidents where effects are restricted to only 1-2 workers involved in the immediate task.	Workplace accidents of this severity are not normally considered as major accident and disaster consequences. The effects are not influenced by the environment of the Project. These risks are managed by compliance with the Health and Safety at Work Act and associated regulations. These workers would be exposed to the same effects wherever they were working. Note that accidents involving higher numbers of workers or workers that are not immediately associated with the activity that has given rise to the accident are not scoped out.
Effects on pedestrians and road traffic users associated with road traffic accidents, during construction and operation, where effects are restricted to 1-2 people.	Road traffic accidents resulting from collision and leading to a small number of fatalities are not assessed here. Road traffic management and design is covered separately in **Chapter 6: Transport.**

13.8 Potential Mitigation

13.8.1 Potential mitigation would comprise, but not necessarily be limited to, the following:

- Masterplanning for the Project follows a structured design process, informed by safety, environmental and security considerations.
- At this early stage, the focus is on inherent safety, i.e. designing out major accidents and disasters where practicable, and where this is not practicable minimising the hazard and designing in resilience. Examples of embedded design measures include:
  - the design process has committed to applying the General Principles of Prevention and Eliminate, Reduce, Isolate and Control (ERIC) principles, which is given as Claim 2.4 in the Pre-Construction Safety Report paragraph 25.2.1 (Ref. 13.90).
  - ensuring adequate segregation between potential sources of accidents and receptors;
  - ensuring that the design layout allows sufficient space for construction and maintenance activities to be undertaken safely, including vehicular access, lifting envelopes and construction sequences which is given in the Pre-Construction Safety Report paragraph 25.3.2.3;
  - minimising the quantities of hazardous substances used on-site throughout the lifecycle;
  - locating the nuclear island, chemical storage and generating equipment on the areas of lowest flood risk on-site at the main development site; and
  - designing key components of the Project to be resilient against potential major accidents and disasters, for example resilient against severe weather including consideration of climate change.
- Residual risks are managed through a pallet of physical measures such as safety systems and alarms, and containment measures:
  - The UK HPR1000 is undergoing GDA, as part of this process the ONR reviews the design documentation to ensure that there has been adequate consideration of the risks of a release of radiological material and that the design is robust with sufficient defence in depth to reduce the risks to tolerable. Building on the safety case developed for GDA, a site-specific safety case for the UK HPR1000 at Bradwell will be prepared.
  - As part of the GDA Process, the ONR also reviews conventional safety and fire safety hazards, and the approach to managing these is described in Chapter 25 of the Pre-Construction Safety Report. The GDA process commits the Project to '*reduce, so far as is reasonably practicable, the health and*

safety risks to workers and the public, and the impact on the environment.' This commitment known as 'Claim 4' applies throughout the design, construction, commissioning, operation, maintenance, and decommissioning phases of the Project.

- Implementing emergency arrangements to respond effectively in the event of an accident or disaster, with the masterplan making provision for these. For example:
  - emergency access or egress; firewater provision or spent firewater runoff retention; and
  - on-site emergency control centre supported by a technical support centre and operational support centre, which are located separately from the main control room as described in Chapter 32 of the Pre-Construction Safety Report (PCSR) (Ref. 13.91); and
  - Off-site Alternative Emergency Control Centre and Mobile Emergency Equipment Garage, as described in **Chapter 3: The Project**.
- Provision of measures to manage the risks of pandemic, including preventing onward transmission due to movement of personnel during construction.
- As a minimum, the Project will be designed, constructed and operated in accordance with relevant Health, Safety and Environmental legislation. The nuclear industry is strictly regulated, with specific focus on ensuring that the risk of major accident or disaster is tolerable. Compliance with more general legislation is also relevant, in particular the HSAW Act and associated Regulations. The processes and equipment that will be in place to meet regulatory requirements are considered 'good practice measures'. Key legislation relevant to the mitigation of major accidents and disasters is listed in **Table 13.1**.
- Operators of nuclear licences must have site security plans approved by the ONR, and these must be kept under review.
- To ensure that potential major accidents and disasters are identified, and that the appropriate measures identified and implemented at the appropriate time, a safety, security and environmental management system is being developed and will be maintained for the duration of the Project. In particular, for the construction phase the Code of Construction Practice (CoCP) will include a requirement for specific consideration of major accidents and disasters. This will include methodical identification of the potential for such events. Where practicable, major accident and disasters that could arise during construction will be designed out or minimised through selection of inherently safer construction methods and sequencing or layout. All necessary measures will be put in place to mitigate those hazards that remain. This will include emergency arrangements for construction that specifically address the major accidents and disasters

identified. A system to monitor the effectiveness of mitigation will be implemented.

13.9 Assumptions and Limitations

13.9.1 The scoping exercise for major accidents and disasters is based upon the following key assumptions:

- the main development site will include a licensed nuclear installation and COMAH establishment. The conditions attached to the site licence will include maintaining a suitable nuclear safety case, an approved security plan and will meet the required duties of the site licensing conditions, COMAH regulations and the HSAW Act;
- ILW will remain on-site for at least the operational lifetime of the Bradwell B power station, pending the availability of a UK Geological Disposal Facility;
- An Integrated Management System (IMS) covering (Safety, Security and Environmental aspects will be developed and maintained for the duration of the Project, and its scope shall include for major accidents and disasters. The duration of the Project in this case includes for design, construction, commissioning, operation and maintenance, including management of change, removal and reinstatement; and
- the applicant will ensure, through its contracts, that any contractor appointed has suitable management systems in place to ensure compliance with all regulatory requirements, where relevant the scope will include for major accidents and disasters

13.9.2 The assessment of major accidents and disasters will provide a description of the rigorous processes and regulatory frameworks which will be in place to ensure safety and security through design, construction and operation. The assessment of major accidents and disaster effects will not duplicate work that is being carried out as part of the assessments to be undertaken for GDA, NSL and REPPIR. Rather, the assessment will identify those hazards that are covered by the GDA, NSL and other regulatory regimes, and provide a summary of their reasonably foreseeable worst-case environmental consequence (with due account taken of the presence of two nuclear islands), and a summary of the required mitigation, with a focus on regulatory compliance and requirements, to reduce these risks to ALARP. Radiological and nuclear security aspects will be covered in this way.

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14. SOILS, GEOLOGY AND LAND USE

14.1 Introduction

14.1.1 This chapter sets out the approach for determining the scope, and content of the assessment for soils, geology and land use for the Project. It contains:

- a summary of work undertaken to date;
- a description of the scope of assessment, including:
  - legislation, policy and guidance that inform the assessment;
  - a description of consultation and engagement so far relevant to soils, geology and land use;
  - study area for the assessment;
  - sources of data used in scoping;
  - baseline conditions, taken from existing desk studies and surveys;
  - planned further surveys and studies;
- the receptors that are proposed to be assessed and the effects which have the potential to be significant;
- the effects that are proposed to be scoped out of the assessment; and
- potential mitigation.

14.1.2 Details of planned further surveys and studies are summarised herein, with further details set out in the Soils, Geology and Land Use Survey and Monitoring Plan (SMP) (see **Appendix 14A**). The SMP reflects the Project status at the point that the SMP was issued to stakeholders to inform technical engagement in June 2020. As the Project progresses, further iterations of the SMP will be provided as proposals are refined, in particular, with respect to the off-site associated development.

14.1.3 The chapter should be read in conjunction with the project description provided in **Chapter 3: The Project.**

Work undertaken to date

14.1.4 This chapter has been informed by a high-level review of desk-based baseline information obtained to date for the study areas. Information sources are detailed in **Section 14.4**, with a summary of the current baseline included in **Section 14.5**.

14.2 Legislation, Policy and Technical Guidance

14.2.1 This section identifies the relevant legislation, national and local policy and guidance that has informed the scope of the assessment relevant to soils, geology and land use. Further information on policies relevant to the Environmental Impact Assessment (EIA) and their status is set out in **Chapter 2**: **Policy and Regulatory Context**, which should be read in conjunction with this chapter.

14.2.2 The legislation and policy that is relevant to soils, geology and land use are detailed in **Table 14.1**.

Table 14.1: Legislation and policy

Relevant Legislation and Policy	Relevance to the Assessment
Environment Protection Act 1990, Part IIA (Ref. 14.1) and Environment Act 1995 (Ref. 14.2).	Part IIA of the Environmental Protection Act 1990 (Part IIA), as established by Section 57 of the Environment Act 1995 sets out the legal framework for the identification and remediation of contaminated land in the UK. Part IIA adopts a 'suitable for use' approach, which requires that the risks associated with land contamination are assessed on a site-by-site basis and applies to land where contaminants pose an unacceptable risk to human health or the environment, defined as significant pollutant (or contaminant) linkages. Part IIA considers risks associated with the current use of the site, as risks associated with future development and use are to be dealt with under the planning system.
Radioactive Contaminated Land (Enabling Powers) (England) Regulations 2005, amended by Radioactive Contaminated Land (Enabling Powers and Modification of Enactments) (England) (Amendment) Regulations 2010 (SI 2010/2147) (Ref. 14.3) and Radioactive Contaminated Land (Modification of Enactments) (England) Regulations 2006, amended by Radioactive Contaminated Land Enabling Powers and Modification of Enactments)	Sets out how the powers contained in Part IIA of the Environmental Protection Act 1990 are to be exercised in relation to land contaminated by radioactive substances in, on or under the land. They implement Articles 48 and 53 of Council Directive 96/29/Euratom, which set out basic safety standards for the protection of the health of workers and the general public against the dangers from ionizing radiation.

Relevant Legislation and Policy	Relevance to the Assessment
(England) (Amendment) Regulations 2018 (SI 2018/429) (Ref. 14.4).	
Contaminated Land (England) Regulations 2006, as amended (Ref. 14.5).	The regulations introduce a scheme for remedying contaminated land, identifying 'special sites' enforced by the Environment Agency, setting out the rules for issuing of remediation notices and their contents, and setting out the information to be held on a contaminated land register maintained by local authorities.
Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009 (Ref. 14.6).	Sets out Environment Agency powers to prosecute or take other enforcement action to prevent pollution or require the remediation of land and/or groundwater affected by such contamination.
The EU Water Framework Directive (2000/60/EC) (WFD) (Ref. 14.7).	Provides the framework under which the baseline quality of the water environment within the study area is assessed by the Environment Agency. All new developments that may have an impact on the water environment are required to comply with objectives of the WFD. In relation to land quality, the Project will need to demonstrate that where there is the potential for the development to have an effect on surface water bodies (rivers and lakes), transitional water bodies (estuaries) or groundwater bodies, during construction and operation, that this is avoided through design or mitigated, and that land remediation is completed as needed to achieve this.
The European Union (EU) Groundwater Directive (2006/118/EC) (Ref. 14.8).	'Daughter directive' to the WFD it includes procedures for assessing the chemical status of groundwater and measures to reduce levels of pollutants, and states that where necessary to assess the impact of existing plumes of pollution in bodies of groundwater that may threaten the achievement of the objectives of the WFD, and in particular, those plumes resulting from point sources and contaminated land, Member States shall carry out additional trend assessments for identified pollutants in order to verify that plumes from contaminated

Relevant Legislation and Policy	Relevance to the Assessment
	sites do not expand, and do not cause deterioration of the chemical status of the body or group of bodies of groundwater, and do not present a risk for human health and the environment.
Groundwater (England and Wales) Regulations 2009 (Ref. 14.9).	The Groundwater (England and Wales) Regulations 2009 implement the WFD and Article 6 of the Groundwater Daughter Directive on the protection of groundwater against pollution and deterioration.
The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref. 14.10).	Transpose the WFD for England and Wales and aspects of the Groundwater Daughter Directive for the protection of groundwater against pollution and deterioration. The Project will need to demonstrate that it will not result in the deterioration of groundwater quality.
EU Environmental Quality Standards Directive (2008/105/EC) (Ref. 14.11). and Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 (Ref. 14.12).	The Environmental Quality Standards Directive (2008/105/EC) established limits on concentrations of priority substances in surface waters and groundwaters. The Project will need to demonstrate compliance with these limits, as written into UK legislation in the Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.
Land Drainage Act 1991 (Ref. 14.13) and 1994 (Ref. 14.14).	The Acts give Local Authorities powers to serve a notice on landowners to ensure works are carried out to maintain flow of watercourses. In the context of this assessment, the Act regulates activities that interfere with ordinary watercourses, requiring consent of local authorities for such activities and requiring riparian landowners to ensure that no obstructions to flow are introduced. Groundworks including remediation works have the potential to affect drainage and therefore any such works will need to be designed to comply with the Act.
The Environmental Impact Assessment (Land Drainage Improvement Works)	The regulations require that the characteristics of drainage improvement works must be considered with regard to items including the use of natural resources, in particular land, soil,

Relevant Legislation and Policy	Relevance to the Assessment
(Amendment) Regulations 2017 (Ref. 14.15).	water and biodiversity; the production of waste; pollution and nuisances; and risks to human health (for example due to water contamination).
Pollution Prevention and Control Act 1999 (Ref. 14.16).	Introduced the PPC regulatory regime for certain activities and industries and was enacted to prevent and control pollution.
Environmental Permitting (England and Wales) Regulations 2010 (Ref. 14.17) and The Environmental Permitting (England and Wales) (Amendment) Regulations 2013 (Ref. 14.18) and The Environmental Permitting (England and Wales) Regulations 2016 (Ref. 14.19).	Provides the regulatory framework for regulators to control certain activities which could harm the environment or human health. The 2016 regulations consolidate 2010 Regulations and set out the current environmental permitting and compliance regime that applies to various activities and industries. The 2016 regulations also transposes Directive 2010/75/EU (known as the Industrial Emissions Directive, or IED) in England and Wales and requires that for the purposes of implementing the Water Framework Directive and the Groundwater Directive, the regulator must, in exercising its relevant functions, take all necessary measures to prevent the input of any hazardous substance to groundwater, and to limit the input of non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater.
The EU Priority Substances Directive (2013/39/EU) (Ref. 14.20) and The EU revision of the Priority Substances Directive (2013/39/EU) (Ref. 14.21).	Sets out the 'priority list' of substances posing a threat to or via the aquatic environment with the aim of reducing (or eliminating) pollution of surface water (rivers, lakes, estuaries and coastal waters) by the pollutants on the list. EU Directive (2013/39/EU) lists a number of environmental quality standards (EQSs) for some current substances and added additional substances to the original list. EQS are used as assessment criteria for assessing risks to the water environment from contaminants in soil and groundwater.

Relevant Legislation and Policy	Relevance to the Assessment
Environmental Liability Directive (2004/35/EEC) (Ref. 14.22); and Environmental Damage (Prevention and Remediation) Regulations 2009 (Ref. 14.23) SI153.	The Directive is based on the "polluter pays" principle and requires EU member states to impose obligations and liabilities on operators whose activities cause or threaten environmental damage. Environmental damage includes land contamination where there is a significant risk of adverse effects to human health. The Directive requires an operator to take preventative, as well as remedial, measures and applies both to damage that has occurred and where there is an imminent risk of it occurring but does not apply to damage that occurred prior to 30 April 2007. In England the Directive is implemented by the Environmental Damage (Prevention and Remediation) Regulations 2009. The Regulations only apply to damage that takes place after the Regulations come into force on 1 March 2009. The Environmental Damage Regulations aim to prevent 'environmental damage', including preventing new land contamination that will damage water or health. Where damage does occur, they require comprehensive clean-up.
Control of Pollution Act 1974 (as amended) (Ref. 14.24).	Under the Act it an offence to deposit controlled waste, or knowingly cause or knowingly permit controlled waste to be deposited in or on any land unless under an environmental permit. The Act also prohibits persons from submitting controlled waste, or knowingly causing or knowingly permitting controlled waste to be submitted, to any listed operation (other than an operation within subsection (1)(a)) that— (i) is carried out in or on any land, or by means of any mobile plant, and (ii) is not carried out under and in accordance with an environmental permit. The Act also makes it an offence to treat, keep or dispose of controlled waste in a manner likely to cause pollution of the environment or harm to human health.
Control of Pollution (Oil Storage) (England and Wales) Regulations 2001 (Ref. 14.25).	Applies to industrial and commercial businesses and institutional sites who store oil above ground in containers holding over 200 litres (with some exceptions). The regulations set out legal requirements including design standards for tanks and containers (including mobile

Relevant Legislation and Policy	Relevance to the Assessment
	bowsers), where to locate and how to protect them, and capacity of bunds and drip trays, to lower the risk of pollution of land or water due to spills or leaks. The regulations are applicable to the construction and operational phase of the Project.
Water Quality (Water Supply) Regulations 2000 (as amended) (Ref. 14.26).	The Water Quality (Water Supply) Regulations 2000 apply to the public water supply and set out a list of microbiological and chemical parameter requirements for drinking water quality at consumers' taps. These drinking water standards (DWS) can be applied when assessing risks to human health associated with contamination in groundwater.
Private Water Supplies (England) Regulations 2016 (as amended) Ref. 14.27).	The Private Water Supplies (England) Regulations 2016 give Local Authorities powers to carry out an investigation to establish the cause if it suspects that a private water supply is unwholesome or that an indicator parameter does not comply with the concentrations or values prescribed in the associated schedules, which include chemical, microbiological and radioactivity parameters. A local authority can serve a notice under that regulation, or within 28 days of becoming aware of the failure and if appropriate remedial action has not been taken, serve a notice in accordance with section 80 of the Act (remedial powers of local authorities in relation to private supplies).
The Construction Design and Management Regulations 2015 (Ref. 14.28).	The Construction Design and Management Regulations 2015 (CDM 2015) apply to all building and construction work, including ground investigation and remediation. CDM 2015 sets out the legal duties for the management of health, safety and welfare on construction projects and apply to almost everyone involved in construction work. The regulations identify key roles and responsibilities for the health, safety, security and environmental management of the works.
The Building Regulations 2010 (Ref. 14.29).	The Building Regulations 2010 Schedule 1 Part C1 (2) require the ground to be covered by the building to be reasonably free from material that might damage the building or affect its

Relevant Legislation and Policy	Relevance to the Assessment
	stability, and also requires that 'reasonable precautions shall be taken to avoid danger to health and safety caused by contaminants on or in the ground covered, or to be covered by the building and any land associated with the building'. Contaminants in this context can include any substance which is or may become harmful to persons or buildings, including substances which are corrosive, flammable, radioactive or toxic.
The Control of Asbestos Regulations 2012 (Ref. 14.30).	The Control of Asbestos Regulations 2012 (CAR 2012) set out the legal framework in the UK for controlling exposure to asbestos. CAR 2012 applies to work on soil and construction and demolition materials that may be, or are known to be, contaminated with asbestos. The regulations can apply to developers, construction firms and others involved in working on and investigating, assessing, managing and remediating land that may be contaminated with asbestos. In the context of ground works for site investigation and redevelopment there is a requirement to prevent or reduce exposure to asbestos.
The Health and Safety at Work Act 1974 (Ref. 14.31).	The Health and Safety at Work etc Act 1974 is the primary legislation governing workplace health and safety in the UK. In the context of land quality, under the act, the employer is required to manage exposure of employees to hazardous substances such as ground contaminants.
National Policy.	
National Planning Policy Framework (NPPF) 2019 (Ref. 14.32)	Under the NPPF there is a requirement to demonstrate that the Project is suitable for use, taking into account risks arising from land contamination and that adequate site investigation information is obtained to inform assessment of the site. Where a requirement for remediation is identified, under NPPF the land after remediation should not, as a minimum, be capable of being determined as 'contaminated land' under Part IIA of the Environmental Protection Act 1990.

Relevant Legislation and Policy	Relevance to the Assessment
	NPPF Section 15 (paragraph 170) sets out requirements to protect and enhance soils, Best and Most Versatile (BMV) agricultural land (land in Grade 1, 2 and 3a of the Agricultural Land Classification), and sites of geological value. Paragraph 170 also includes the requirement to prevent unacceptable levels of soil pollution and land instability.
National Policy Statement for Energy (EN-1) (Ref. 14.33).	Under EN-1, any assessment of the Project is required to identify any effects and seek to minimise impacts on soil quality considering any mitigation measures proposed. As the site has been subject to previous development, risks posed by land contamination must be considered. Section 5 of EN-1 sets out the need for applicants to seek to minimise impacts on Best and Most Versatile (BMV) agricultural land (land in Grade 1, 2 and 3a of the Agricultural Land Classification) and preferably use land in areas of poorer quality except where this would be inconsistent with other sustainability considerations, Section 5 also includes the requirement for applicants to identify effects and seek to minimise impacts on soil quality. For geodiversity, EN-1 sets out the need to conserve and enhance geological conservation interests.
National Policy Statement for Nuclear Power Generation (EN-6) (Ref. 14.34).	EN-6 Section 5 sets out the requirement for applicants to assess and understand the site's soil processes. Section 3 indicates contamination of soils can be mitigated through the EIA process and managed through the implementation of Environmental Management Plans.

Relevant Legislation and Policy	Relevance to the Assessment
Local Policy	
Maldon District Council (MDC) Statutory Contaminated Land Strategy Framework (2017) (Ref. 14.35).	The strategy presents how MDC will inspect its area to identify contaminated land to meet the requirements of Part IIA of the Environmental Protection Act 1990. The strategy aligns with and emphasises the importance of the planning regime in addressing potentially contaminated sites, ensuring they are remediated (where required) to a condition that is suitable for their intended end use. Through planning, an assessment is required to demonstrate the site is suitable for use, taking into account risks associated with land contamination.
MDC Local Development Plan (2017) (Ref. 14.36).	Policy D2 and D4 seek to preserve the best and most versatile land and protect it from adverse impacts. Where possible poor-quality land should be prioritised for development over higher quality land.
Chelmsford City Council (CCC)) Chelmsford Local Plan (2020) (Ref. 14.37)	Under policy DM30, development of land on, or near to, hazardous substance sites, contaminated land or land with a history which may have resulted in contamination, planning permission will be granted only where there are no significant risks to human health receptors, and where there will be no adverse impact to groundwater or surface water quality. Under Strategic Priority 7 and Strategic Policy S4 the Council seeks to minimise the loss of the best and most versatile agricultural land (Grades 1, 2 and 3a) to major new development. Where possible, development on the best and most versatile agricultural land should be avoided, with re-use of existing buildings or building on previously developed land within a site to be prioritised before considering the loss of Grade 2 and Grade 3 agricultural land. Grade 3b agricultural land should be prioritised for development over higher-grade land wherever possible.

14.2.3 Technical guidance that has been used to define the assessment is set out in **Table 14.2.**

Table 14.2: Relevant technical guidance

Guidance Reference	Implications
Land contamination: risk management. (2019) (Ref. 14.38).	The Environment Agency has published technical guidance for applying a risk management process when dealing with land impacted by contamination. The technical approach presented is designed to be applicable to a range of non-regulatory and regulatory contexts. This guidance is based on an earlier guidance document, the Model Procedures for the Management of Land Contamination - Contaminated Land Report (CLR11). The scope, framework and purpose of the 2019 guidance remain the same. It is noted that the Environment Agency is currently working on updating the guidance based on feedback received from a consultation in 2019, however, the general approach to risk management is unlikely to change and the current guidance will, therefore, be applied to land quality assessment for the Project.
Investigation of Potentially Contaminated Sites – Code of Practice. British Standard (BS) BS10175: 2011 + A2: 2017 (Ref. 14.39) and Code of practice for site investigations. BS5930:1999+A2:2010 (Ref. 14.40).	BS10175 provides guidance and recommendations for the investigation of potentially contaminated sites and applies to all stages of site investigation from desk study to all phases of intrusive site investigation. BS5930 provides guidance on the planning and implementation of the intrusive ground investigations. General adherence to both standards helps to ensure a suitably robust site assessment.
The Environmental Protection Act 1990: Part IIA Contaminated Land Statutory Guidance (2012) (Ref. 14.41)	This sets out how local authorities should implement the Part IIA regime, including how they should go about deciding whether land is

Guidance Reference	Implications
	contaminated land in the legal sense of the term. It also elaborates on the remediation provisions of Part IIA, such as the goals of remediation, and how regulators should ensure that remediation requirements are reasonable.
Environment Agency Guidance for Pollution Prevention (GPPs) (Ref. 14.42) and Environment Agency Pollution Prevention for Business (Ref. 14.43).	The GPPs provide environmental good practice guidance on a range of topics including works and maintenance near water, safe storage and disposal of waste oils, treatment and disposal of wastewater and working at construction and demolition sites. Whilst now withdrawn from being 'official' guidance, the documents are still available online and are referred to for good practice guidance during ground investigation, land remediation and construction work. The Environment Agency has published Pollution Prevention for Business on the gov.uk website for topics including storing materials, products and waste, and unloading and moving potential pollutants. The above guidance should be integrated in a Code of Construction Practice (CoCP) for the Project as appropriate.
Guiding Principles for Land Contamination (2010) (Ref. 14.44).	Provides guidance for people who cause or are affected by land contamination.
Groundwater Protection: Principles and Practice (2012) (Ref. 14.45).	This document contains the conceptual method for risk-based decision making and developing policy statements in areas such as the control of groundwater abstraction and diffuse pollution of groundwater. The Policy is presented as a framework within which decisions should be made and sets out the Environment Agency's broad approach to existing risks and

Guidance Reference	Implications
	new developments. The Policy is underpinned by published groundwater vulnerability maps and groundwater Source Protection Zones (SPZ). The protection of key groundwater resources and, in particular, those used for public drinking water supply, is accomplished by the establishment of SPZ. The SPZ provide an indication of the potential risk from pollution, based on the local soil and geological conditions and the depth of the water table. Generally, the closer a polluting activity or release is to a groundwater source, the greater the risk. Three zones (an inner, outer and total catchment) are defined. There are no SPZs within the main development Site. The sensitivity of the study area groundwater will be taken into account when assessing the risks associated with the Project.
Guidance for the Safe Development of Housing on Land Affected by Contamination (2008) (Ref. 14.46).	The Guidance for the Safe Development of Housing on Land Affected by Contamination, whilst written to be relevant to housing development, is also generally applicable to other forms of development, to existing developments and to undeveloped land, where such sites are on land affected by contamination. It was designed to accord with Environment Agency guidance and describes the processes and activities involved in hazard identification and assessment, risk estimation and evaluation and remediation (design, implementation and verification). The approach to risk assessment outlined in the guidance can be applied for desk-based assessments or for intrusive ground investigations for the Project to identify whether significant risks to human health, the environment, and the built environment, require further assessment or investigation or remediation. The assessment of the effects of the Project

Guidance Reference	Implications
	in relation to land contamination will be completed on the basis that if at any stage the land quality assessment identifies a potentially significant risk to humans or to the environment, further assessment, investigation or remediation will be needed to close the risk and pollutant (contaminant) linkage.
SuRF-UK Framework for Assessing the Sustainability of Soil and Groundwater Remediation (2010) (Ref. 14.47).	Provides a framework for assessing the sustainability of remediation and informing the decision-making process where remediation measures are required in order to achieve remediation strategies and options appraisal that are more explicitly linked to the goals of sustainable development. If land remediation is required for the Project, then the framework should be applied to support the wider project goal of sustainable development.
Soil quality – Sustainable remediation: BS ISO 18504:2017 (Ref. 14.48).	Provides a procedure for the delivery of sustainable remediation of land contamination.
Environmental Permitting Regulations (EPR) H5 Site Condition Report guidance (2013) (Ref. 14.49).	This sets out the requirement for operators of installations to carry out site condition assessment (including soil and groundwater conditions) to report on the site condition at permit application stage, during the lifespan of a permit issued under EPR 2016, and to support permit variations or permit surrender. Operation of the power station in accordance with EPR and the associated guidance will be considered in the assessment of effects on land during the operational phase.
Definition of Waste Code of Practice (DoW CoP) (2011) (Ref. 14.50).	The Code of Practice (CoP) sets out good practice for developers to use when: assessing on a site-specific basis whether excavated materials are classified as waste or not; and, determining on a site-specific basis when

Guidance Reference	Implications
	treated excavated waste can cease to be waste for a particular use. Adherence to the CoP during all relevant Project works (notably earthworks) will be taken into account in the assessment of effects during the EIA.
CAR-SOIL: Control of Asbestos Regulations (CAR) 2012, Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials (Ref. 14.51).	The CAR-SOIL guidance provides interpretation of the requirements of CAR 2012 and guidance on how to comply with CAR 2012 for those involved in the management of soils and construction and demolition arisings potentially (or known to be) contaminated with asbestos. Measures to ensure compliance with CAR 2012 and the CAR-SOIL guidance should be integrated into the design of all ground works for the Project.
Site Preparation and Resistance to Contaminants and Moisture (2013) (Ref. 14.52).	This deals with the following requirement of the Building Regulations 2010; "*Reasonable precautions shall be taken to avoid danger to health and safety caused by contaminants on or in the ground covered, or to be covered by the building and any land associated with the building*."
CIRIA Report C692: Environmental Good Practice on Site (2010) (Ref. 14.53).	CIRIA C692 provides practical advice about managing construction on-site to minimise environmental impacts. Application of the guidance contained in CIRIA C692 can help to ensure that construction works are carried out in a manner which avoids or mitigates risks to the environment and it is anticipated that the requirement to work in accordance with the guidance will be integrated into a CoCP for the Project.
Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (2009) (Ref. 14.54).	Outlines current guidance and legislation concerning the use of soil in construction projects, before offering stage by stage guidance on the use,

Guidance Reference	Implications
	management and movement of soil on-site. The CoP will be used in the assessment of soil material management and the related potential effects of the Project.
Code of practice for earthworks. BS6031: 2009 (Ref. 14.55).	Provides recommendations and guidance for unreinforced earthworks forming part of general civil engineering construction, except for dams. This standard also gives recommendations and guidance for temporary excavations such as trenches and pits. Adherence to BS6031 will be assumed in the assessment of the potential effects of the Project.
SAFEGROUNDS: Good Practice Guidance for the Management of Contaminated Land on Nuclear-licenced and Defence Sites (2009) (Ref. 14.56).	Provides the technical framework for applying a risk management process when dealing with land impacted by contamination on a nuclear licensed site, based on the Environment Agency: Model Procedures for the Management of Land Contamination CLR11.
Management of radioactive waste from decommissioning of nuclear sites: Guidance on Requirements for Release from Radioactive Substances Regulation (RSR) (2018) (the GRR) (Ref. 14.57).	Combined regulatory guidance for the process and framework for decommissioning in terms of requirements for the revocation of the RSR outlining high level principles and requirements to protect human health and the environment.
Nuclear Decommissioning Authority (NDA): Nuclear Industry Code of Practice for Routine Water Quality Monitoring (2015) (Ref. 14.58).	Guidance on the principles and practices of water quality monitoring, with specific reference to the nuclear industry. The requirements for water quality monitoring will be determined as part of the operational permit application (Water Discharge Activity) and determination process, and as additional groundwater data becomes available during the forthcoming baseline surveys for the Project.

Guidance Reference	Implications
Guide to assessing development proposals on agricultural land (2018) (Ref 14.59).	Guidance on assessing development proposals on agricultural land that aims to protect BMV agricultural land and soils from significant, inappropriate, or unsustainable development proposals.
MAFF Agricultural Land Classification of England and Wales: Revised criteria for grading the quality of agricultural land (1988) (Ref 14.60).	Guidelines and criteria for grading the quality of agricultural land using the Agricultural Land Classification (ALC) of England and Wales.

14.3 Consultation and Engagement

14.3.1 This chapter has been informed by engagement and discussion with various stakeholders. **Table 14.3** details technical engagement to date which has occurred outside of statutory consultation. **Table 14.4** provides a summary of consultee comments arising from Stage One Consultation, along with a response to identify how the matter are dealt with in this report.

Table 14.3: Technical engagement

Consultee	Points of discussion
Environment Agency.	Following the 18 June 2020 Scoping Workshop, a number of points were agreed, as follows: • The need for flexibility to undertake additional water quality sampling with respect to any identified or suspected local contamination is acknowledged. A revision to the Water Environment SMP was required (actioned in the version presented in **Appendix 15A**). • The groundwater monitoring proposals are appropriate. Abstraction for investigations and tests must be below 20 cubic meters per day or will require an abstraction licence. • Protection of borehole headworks is required.
MDC	Following the 18 June 2020 Scoping Workshop MDC confirmed the requirement to consider the potential impact on the Historic Environment of the site investigation programme. Provisions for monitoring the future site investigations are noted in the Historic Environment SMP (see **Appendix 22A**).
Natural England.	The 18 June 2020 Scoping Workshop highlighted a number of points as follows: • The impacts of pollutants in surface water on the marine environment must be considered. • Clarification of how the impacts of preferential contamination migration pathways associated

Consultee	Points of discussion
	with potentially present airfield drainage will be assessed. Allowance for further field measurements and sampling to be undertaken with respect to any identified or suspected local contamination has been added to the Water Environment SMP (see **Appendix 15A**). • The requirement to protect and manage soil resources sustainably. Existing ALC and soil surveys information to be included in the desk study for the site. The requirements for further surveys are included in Section 2.5 of the Soils, Geology and Land Use SMP. • The requirement to obtain sufficient data on soils to develop a soil resource plan. This is addressed in Section 2.5 of the Soils, Geology and Land Use SMP (see Appendix 14A).

Table 14.4: Stage One Consultation comments

Theme	Summary of Comments and Considerations	How this is Accounted for
Survey and Monitoring.	Natural England required: • Consideration of how the quality of spoil from tunnel boring and pollution risk will be assessed • Assurance that the site investigation would be undertaken to confirm the ground conditions are suitable for the low impact tunnelling methods proposed.	Pollution risk will be assessed through consideration of potential sources of contamination, including materials added to facilitate tunnel boring and spoil recovery, and appropriate sampling and analysis. The tunnelling is understood to be primarily through London Clay underlying the main development site and within the zone for marine infrastructure. Site investigation is proposed which will confirm geological conditions for the tunnelling routes.

Theme	Summary of Comments and Considerations	How this is Accounted for
Mitigation	The Environment Agency and Natural England commented on the environmental measures. Key points raised included the following requirements to: • Avoid significant harm to, and enhance, geological conservation interests. • Ensure that materials management complies with waste management regulations. • Prepare a foundation works risk assessment. • Conduct assessments into ground conditions and risks to the water environment. • Consider how excavated materials, for example, sands and gravels, could be used to benefit local biodiversity • Consider how use of a large volume of aggregates may impact on other users, for example, beach recharge as part of flood risk management.	Review of information as part of this scoping exercise has not identified any geological conservation interests (Sites of Special Scientific Interest (SSSIs) or Local Geodiversity Sites (LoGS)) on land. There is geomorphology of interest in the Dengie SSSI and this is addressed in **Chapter 17**: **Coastal Geomorphology and Hydrodynamics**. The requirement to ensure that materials management complies with waste management regulations will be considered in the design and included in the Code of Construction Practice. A foundation works risk assessment will be prepared once the design is sufficiently advanced. The proposals for data gathering to support assessments into ground conditions and risks to the water environment are contained in the Water Environment SMP (see **Appendix 15A**) and the Soils, Geology and Land Use SMP (see **Appendix 14A**). The proposed assessment methodologies are set out in **Section 14.6** and **Section 15.9** of this scoping report. Consideration will be given to the volume and use of excavated materials for the benefit of local biodiversity, within the constraints of waste management regulations, as the Project design develops.

Theme	Summary of Comments and Considerations	How this is Accounted for
Code of Construction Practice	The Environment Agency requested that measures to protect surface and groundwater during the construction phase are included in a CoCP.	The preparation of a CoCP is identified in **Section 14.8** of this scoping chapter. Further details will be provided in the Preliminary Environmental Information (PEI) for Stage 2 Consultation and the Environmental Statement (ES).

14.4 Data Gathering Methodology

Study area

14.4.1 This section presents study areas for soils, geology and land use. As the design and consultation processes progress and the Project is refined, the exact geographical scope of study areas may continue to evolve to accommodate any changes. If the study areas change, data collection will also be reviewed and updated.

Main development site

14.4.2 The study area comprises the entirety of the main development site, plus a study area buffer of 500m extending from the main development site boundary. Data for this chapter has been obtained for the entirety of the study area, including the study area buffer.

14.4.3 The agricultural land quality and soils study area for the main development site comprises the entirety of the main development site without any buffer. The rationale for the study area is that agricultural land quality and soils is geographically discrete and not substantially influenced by changes to the surroundings.

14.4.4 The main development site boundary is illustrated in **Figure 14.1.**

Off-site Power Station Facilities

14.4.5 Where off-site Power Station Facilities are proposed, a study area extending 500m beyond the redline boundary will be used to identify receptors of direct and indirect effects.

Off-site associated development

14.4.6 The study areas for the off-site associated development areas extend 500m beyond the relevant redline boundary.

14.4.7 These areas are proportionate to the scale of the development for identifying contamination sources which may impact on the study area, and geologically sensitive sites and BMV land which may subject to direct or indirect effects.

Sources of data used in scoping

Desk based

14.4.8 The EIA scoping exercise has been undertaken with reference to **Chapter 3: The Project**, supported by a number of data sources. The principal desk-based data sources used to inform this chapter for potential effects comprise of the following in **Table 14.7**.

Table 14.7: Sources of data used in scoping

Source	Data
Ordnance Survey (OS) Explorer 176, Blackwater Estuary, Scale 1:25,000 (Ref. 14.61).	Mapping details referenced for information on topography and features.
Landmark Information Group, Envirocheck Report 226552816_1_1, dated 27 November 2019 (Ref. 14.62).	Report includes historical OS maps, aquifer designation mapping and contemporary environmental data.
British Geological Survey (BGS), Solid and Drift Edition, Sheet 224 and 242, Colchester and Brightlingsea, 1:50,000, 2010 (Ref. 14.63). BGS GeoIndex, accessed on 2 December 2019 (Ref. 14.64). BGS Geology of Britain Viewer, accessed on 2 December 2019 (Ref. 14.65).	Geological mapping. BGS borehole records.
Multi Agency Geographic Information for the Countryside (MAGIC) interactive map, accessed on 17 April 2020 (Ref. 14.66).	Statutory designations and land uses (including geological SSSIs). Provisional Agricultural Land Classification Mapping. Post 1988 Agricultural Land Classification Mapping.

Source	Data
Maldon District Council, Contaminated Land Register Environmental Protection Act 1990 – Part 2A, accessed on 14 August 2017 (Ref. 14.67).	Local authority registers of sites designated as contaminated land.
Environment Agency, What's in Your Backyard, accessed on the 2 December 2019 (Ref. 14.68). Environment Agency, open electronic Public Register, accessed on 2 December 2019 (Ref. 14.69).	Public register of permitted and licensed sites.
British Geological Survey Group, Summary and Preliminary Appraisal of BGS Hydrochemical Data for Bradwell, FP87/39/81PA, December 1987 (Ref. 14.70). Other available information.	Previous ground investigation reports.
Soil Survey of England and Wales, Sheet 4 Eastern England 1:250 000 (Ref. 14.71).	Soil data.

Survey data

14.4.9 A site walkover was undertaken by Wood on 17 August 2017 for site familiarisation and to review the current status of the main development site with regards to land use and potential sources of ground contamination. The walkover included the majority of the main development site. An additional walkover is planned to cover the full extent of the main development site.

14.4.10 Previous ground investigation has provided data with regard to site geology for the main development site.

14.5 Baseline Information

Current baseline

14.5.1 This section provides a summary of the current baseline data for the study areas, with reference to soils, geology and land use. The baseline conditions will be confirmed in the ES through review of additional data sources and site investigation, where relevant.

Main development site

Current and historical land use

14.5.2 The main development site is located on the southern shore of the Blackwater Estuary, approximately 1km north-east of the village of Bradwell-on-Sea. The main development site is located directly east and south of the existing Bradwell power station. The site currently comprises predominantly agricultural land, though

remnants of the former Bradwell Bay WWII airfield are present in the form of a small number of aircraft hangars (now used for agricultural purposes) and parts of the former runway and taxiways.

14.5.3 The main development site was first developed between 1941 and 1946 when the Bradwell Bay airfield was established. The airfield fog investigation and dispersal operation (FIDO) fuel tanks were shown to be located within the western extents of the airfield, immediately west of the main development site boundary. Records indicate the airfield was disused from the 1960s.

14.5.4 Construction of the existing Bradwell power station (Bradwell A) and adjacent electricity 'switching station' (substation) began in 1957. Bradwell A became operational in 1962. Small scale industrial and commercial activity has been recorded historically in nearby Bradwell-on-Sea and Bradwell Waterside including sand and gravel extraction, a small brick and tile works, and various small commercial properties.

Areas of potential concern for existing contamination

14.5.5 Potential sources of existing radiological and non-radiological contamination have been identified on-site and in the immediate surrounds. **Figure 14.1** highlights the location and nature of potential contaminant sources identified. This includes:

- S1: Former East Wick Farm. Potential contaminants are associated with existing tanks and stockpiled soils at the former farm.
- S2 and S13: Former Bradwell Bay airfield. Potential contaminants are associated with the storage and use of fuels, aircraft maintenance, aircraft breaking (for salvage and disposal purposes), asbestos within hangers etc., and the (FIDO system in place within the airfield. Records indicate the tanks for the FIDO system were located in the west of the airfield.
- S3: Potential infilled pond. Potential infilled ponds have been identified. The ponds were identified on historical OS mapping and are absent from more recent OS mapping, indicating backfilling. They are identified as a potential source of contamination on the basis that they may have been infilled with contaminated material, where backfilling took place prior to licensing (pre-Control of Pollution Act 1974).
- S4: Site wide farming. Potential contaminants are associated with the storage and use of fuels, pesticides, repair and maintenance of farm machinery and stockpiling of materials.
- S5: Existing Bradwell power station. Whilst no longer operational, there remains a potential for contaminants to have migrated from the power station into the study area or to be present because of areas of the site having been used for the construction of the existing power station.

- S6: Electricity substation. Potential contaminants are associated with the former presence of transformers.
- S7: Downhall Farm. Downhall Farm is a large-scale commercial poultry farm. Potential contaminants are associated with the potential storage and use of fuels (for heating or power), pesticides and disinfectants.
- S8: General engineers, distribution services, and engineering works. Small scale commercial premises are located within and in close proximity to the main development site. Potential contaminants are associated with the potential storage and use of fuels, oils and lubricants.
- S9 and S10: Former brick and tile works and former sand and gravel pits. Potential contaminants are associated with possible infilled excavations, where fill material may have included contaminated material.
- S11: Sewage pumping station and works. Potential contaminants are associated with potential pollutants in materials used to possibly infill former sewage beds and potential storage and use of fuels, oils and lubricants.
- S12: Earth mounds. Such mounds may have included contaminated material, where constructed prior to licensing (i.e. pre-Control of Pollution Act 1974).

14.5.6 It will be necessary to investigate the potential on-site sources of contamination by intrusive investigation to confirm baseline conditions. For off-site sources of contamination, investigation will targeted within the footprint of the main development site to areas where contaminant may have migrated into them, for example, sentinel wells located within main development site to investigate the potential for contaminant migration into these areas from the existing Bradwell power station. The proposed scope of investigation for the main development site is set out in the SMP (see **Appendix 14A**).

Topography

14.5.7 A detailed description of topography is presented in **Chapter 15: Water Environment**. In summary, ground elevation for both the main development site increases from approximately 1 metre above Ordnance Datum (m AOD) south of the existing coastal defence embankment, to greater than 10m AOD in the south of the main development site. The defence embankment is typically between 2.5m and 3m high.

Geology

14.5.8 The drift sequence across the main development site essentially comprises Flandrian Coastal Zone Deposits of alluvium and local sub-alluvial muds in the north, with River Terrace Deposits of sand and gravel in the south (see **Figure 15.3**). Available information indicates the superficial deposits are thickest in the north-east of the main development site, where the underlying bedrock has been incised by a

channel that is infilled with Quaternary intertidal sediments, and absent completely within the centre of the main development.

14.5.9 The Asheldham Gravel River Terrace Deposits sit on higher ground at elevations of between 2m AOD and 9m AOD, whilst the shallow angle slopes on either side of the rockhead channel and across the area west of the main development site are mantled with Head deposits, which comprise a complex and variable mixture of weathered bedrock and sands and gravel that have been reworked by slope processes. The intertidal deposits (marine and estuarine alluvium) are present in the north and east of the main development site and comprise soft organic clay, alluvium and interbedded peat.

14.5.10 In summary, the geological sequence below the superficial deposits encountered in boreholes at the main development site comprise the following:

- London Clay (Formation);
- Harwich Formation (previously classified as lower units of the London Clay and the Oldhaven Beds or Member);
- Lambeth Group (previously referred to as the Reading and Woolwich Beds);
- Thanet Formation (previously referred to as the Thanet Beds); and
- Chalk Group.

14.5.11 Drift deposits are absent from the centre of the main development site, where it is shown to be directly underlain by the Thames Group (London Clay and Harwich Formation). The London Clay also sub-crops beneath the drift elsewhere on the main development site. Recent investigations have shown that the total thickness of the London Clay and Harwich Formations at the main development Site varies from approximately 25m to 62m (thickest in the south-west), with the base elevation increasing from approximately -54m AOD to -36m AOD towards the north-east. The increase in base elevation to the north-east of the Dengie Peninsula and reduced thickness has been attributed to uplift and differential erosion into the top of the London Clay Formation in the vicinity of a fault, referred to as the Weymarks Fault. Available information indicates the fault is trending north to south (from TM 0206 0939 to TM 0191 0826) and is believed to be a reverse fault with 10 -15m uplift to the east.

14.5.12 Underlying the Thames Group are the Lambeth Group (typically up to 14m thick) and the Thanet Formation (between 11m and 17m thick). The elevation of the base of the Thanet Formation, or top of the Chalk, is seen to vary from approximately -82m AOD to -56m AOD towards the north-east of the Dengie Peninsula. The Chalk has a regional dip of approximately 2^{o} to the south.

14.5.13 Whilst no made ground is recorded on mapping for the main development site, it is noted that the adjacent existing Bradwell power station (located immediately north) appears to be directly underlain by made ground across its footprint, with records

indicating the site of the power station was raised by around 3m as part of the site preparation works for its construction.

14.5.14 No statutory designated sites of geological interest have been identified within the main development site, or within the 500m buffer.

Hydrogeology

14.5.15 A detailed description for hydrogeology for the main development site is presented in **Chapter 15: Water Environment**. In summary:

- The River Terrace deposits are identified as a Secondary (undifferentiated) Aquifer, with the potential to contain some groundwater within thicker, more permeable sequences found beneath the higher topography, but with unproductive layers at lower elevations.
- The alluvium is identified as unproductive strata.
- The London Clay is also identified as unproductive strata and comprises a clayey sequence with a reported thickness of 40m locally.
- The underlying Chalk Formation is confined by the London Clay above and is identified as a Principal Aquifer.

Hydrology

14.5.16 A detailed description of hydrology is presented in **Chapter 15: Water Environment**.

14.5.17 The main development site is bounded to the north by the Blackwater River estuary (the Blackwater Estuary). Surface water features within the site include:

- Weymarks River, located in the south and east of the main development site, which flows in an approximate north-easterly direction, before joining the borrow dyke, which is located within the main development site, running along the landward toe of the existing flood defences.
- Two agricultural irrigation reservoirs which are located in the south of the main development site.
- Several drains located across the both the main development site connected to the Weymarks River or Borrow Dyke.
- A small pond located adjacent to East Hall Farm in the south of the main development site.

14.5.18 The positions of surface water features on the site are shown in **Figure 14.1.**

Flora, fauna and ecological systems

14.5.19 **Chapter 23**: **Biodiversity - Terrestrial and Freshwater Ecology and Ornithology** provides a detailed account of statutory designations located on, or in the immediate surrounds of either the main development site. The locations of designated sites relative to the main development site are illustrated in **Figure 23.4**.

14.5.20 A summary of statutory designated sites recorded within or at the boundary include:

- Blackwater Estuary (Mid-Essex Coast Phase 4) Special Protection Area (SPA).
- Dengie National Nature Reserve.
- Dengie (Mid-Essex Coast Phase 1) Ramsar Site.
- Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar Site.
- Blackwater Estuary Site of Special Scientific Interest (SSSI).
- Essex Estuaries SPA.
- Dengie (Mid-Essex Coast Phase 1) SPA.
- Dengie SSSI.

14.5.21 Further statutory designated sites are recorded for the area around the main development site, as detailed in **Chapter 23: Biodiversity: Terrestrial and Freshwater Ecology and Ornithology**. However, they are located more than 1km from the main development site and are, therefore, are not considered further with respect to soils, geology and land use.

Soils

14.5.22 The Soils of Eastern England Map (Soils Survey of England and Wales, 1983) indicates that the soils of the main development site are predominantly classified as Hurst (841b) soils, with Wallasea 1 (813f) soils to the north of the study area parallel to the coast. Unripened Gley Soils (22) are indicated as present along the coast to the east and north of the main development site, with Ratsborough (572r) soils to the west.

14.5.23 The Hurst soils are “Coarse and fine loamy permeable soils mainly over gravel variably affected by ground water”. The Wallasea 1 soils are “Deep stoneless non-calcareous and calcareous clayey soils. Soils locally have humose or peaty surface horizons. Groundwater controlled by ditches and pumps. Flat land. Slight risk of Flooding” whilst the Unripened Gley Soils are “Soils of variable texture flooded by high tides. Many are soft and unripened, others, often on higher sites or of sandy texture, are firm and ripened. Frequently calcareous”. The Ratsborough soils are “Fine silty and fine loamy over clayey soils with slowly permeable subsoils and slight

seasonal waterlogging. Some slowly permeable seasonally waterlogged fine loamy over clayey and clayey soils".

Agricultural land classification

14.5.24 The ALC system classifies land into five grades, with Grade 3 subdivided into subgrades 3a and 3b. BMV agricultural land is defined as Grades 1, 2 and 3a.

14.5.25 The Provisional ALC mapping indicates the main development site as predominantly Grade 2 and Grade 3 land with some agricultural land centred around Bradwell on Sea classified as Grade 1. Coastal marshland on the coast to the north and east is classified as Grade 5. Grade 1 is described as "*excellent quality agricultural land*", Grade 2 "*very good quality agricultural land",* Grade 3 "*good to moderate quality agricultural land"* and Grade 5 as *"very poor-quality agricultural land".*

14.5.26 However, it is the site specific ALC survey data carried out according to MAFF guidance, known as 'detailed' ALC field surveys, that provides the detailed information on ALC grades at the level required to identify the presence of BMV agricultural land. There are no publicly available detailed (post 1988) Agricultural Land Classification surveys, which distinguish between Grades 3a and 3b and, therefore, identifies the presence of BMV agricultural land, for the main development site study area.

Geodiversity

14.5.27 The Dengie SSSI recognises the cockleshell spits and ridges that form beaches as being of geomorphological importance, showing coastal erosion and deposition processes. These features are addressed in **Chapter 17: Coastal Geomorphology and Hydrodynamics**.

14.5.28 Currently no local geodiversity sites (LoGS) have been notified for the Maldon District as the notification process is still underway, therefore, no LoGS are present in the main development site study area.

Off-site Power Station Facilities and off-site project-provided accommodation

14.5.29 The study area comprises predominantly agricultural land, adjacent to small settlements and/or villages.

14.5.30 The study area is underlain by superficial strata, which, where present, comprise head deposits and river terrace deposits, or intertidal and tidal flat deposits in areas adjacent to the Blackwater estuary. Bedrock comprises London Clay underlain by either the Harwich Formation or the Lambeth Group, which is subsequently underlain by the Chalk Group.

14.5.31 Superficial deposits are classified as Secondary A or Secondary (undifferentiated) aquifers by the Environment Agency. The chalk is identified as a Principal Aquifer.

14.5.32 Soil mapping for the UK indicates soils within the study area to comprise either:

- loamy and clayey soils of coastal flats with naturally high groundwater;
- loamy soils with naturally high groundwater; or
- slightly acidic loamy and clayey soils with impeded drainage.

14.5.33 ALC mapping indicates land within the study area to be Grade 1 to Grade 3 (BMV agricultural land).

14.5.34 No LoGS have yet been notified in the Maldon district, in which the study area is located. However, the notification process for LoGS was still underway at the time of reporting.

Off-site associated development: park and ride facilities

14.5.35 The study area comprises areas, located on the western periphery of the town of Maldon, the eastern periphery of the city of Chelmsford and to the west of South Woodham Ferrers. Land is predominantly agricultural in each area.

14.5.36 The study area is underlain by superficial strata, which, where present comprise head deposits, glaciofluvial sands and gravels, glaciolacustrine deposits, river terrace deposits or alluvium. To the west of South Woodham Ferrers, superficial strata includes localised areas of tidal flat deposits.

14.5.37 In the areas of Maldon and Chelmsford bedrock comprises London Clay underlain by either the Harwich Formation or the Lambeth Group, and subsequently the Chalk Group. In the area of South Woodham Ferrers bedrock comprises London Clay or the Claygate Member.

14.5.38 Superficial deposits within the study area are classified as Secondary A or Secondary (undifferentiated) aquifers by the Environment Agency. The Claygate Member is classified as a Secondary A Aquifer. The underlying chalk is identified as a Principal Aquifer.

14.5.39 Soil mapping for the UK indicates soils within the study area to comprise either:

- freely draining slightly acid loamy soils;
- slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils; or
- loamy and clayey floodplain soils with naturally high groundwater.

14.5.40 ALC mapping indicates land within the study area to be predominantly Grade 1 to Grade 3 (BMV agricultural land) and to a lesser extent Grade 4 (non-BMV land).

14.5.41 No LoGS have yet been notified in the Maldon district in which the north of the study is located. However, the notification process for LoGS was still underway at the time of reporting. In the Chelmsford district (covering southern and western parts of the study area), a single LoGS has been identified within 1km of the study area relating

to Sandon Gravel Pit (TL 747 043). The disused Sandon gravel pit has good exposures in Kesgrave Sands and Gravels.

Off-site associated development: freight management facilities

14.5.42 The study area comprises two areas, including one area located between the villages of Cold Norton, Maylandsea and Althorne and a second area west of the town of South Woodham Ferrers. Each area comprises predominantly agricultural land, bisected by existing transport routes.

14.5.43 Superficial strata across much of the study area is absent. Where present in the areas of Cold Norton, Maylandsea and Althorne it comprises alluvium and head deposits. Superficial strata in the area of South Woodham Ferrers comprises head and river terrace deposits and tidal flat deposits.

14.5.44 In the areas of Maldon and Chelmsford bedrock comprises London Clay, underlain by either the Harwich Formation or the Lambeth Group, and the Chalk Group. In the area of South Woodham Ferrers bedrock comprises London Clay or the Claygate Member.

14.5.45 Superficial deposits are classified as Secondary A or Secondary (undifferentiated) aquifers by the Environment Agency. The Claygate Member is classified as a Secondary A Aquifer. The underlying chalk is identified as a Principal Aquifer.

14.5.46 Soil mapping for the UK indicates soils within the study area to comprise either:

- freely draining slightly acid loamy soils;
- slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils; or
- loamy and clayey floodplain soils with naturally high groundwater.

14.5.47 ALC mapping indicates land within the study area to be predominantly Grade 1 to Grade 3 (BMV agricultural land) and to a lesser extent Grade 4 (non-BMV land).

14.5.48 No LoGS have yet been notified in the Maldon district in which the study area is located. However, the notification process for LoGS was still underway at the time of reporting.

Off-site associated development: highways works

14.5.49 The study area comprises a forked linear route extending from Bradwell-on-Sea in the east to Chelmsford in the west and South Woodham Ferrers in the south west. The study area comprises predominantly agricultural land.

14.5.50 The study area is underlain by superficial strata in the east comprising head and river terrace deposits, and to a lesser extent intertidal deposit. In the west, between Maldon and Chelmsford superficial strata are predominantly head and glaciofluvial

sands and gravels and to a lesser extent river terrace deposits, alluvium and glaciolacustrine deposits. In the area close to South Woodham Ferrers superficial strata comprises head and river terrace deposits, with minor areas of tidal flat deposits.

14.5.51 Bedrock is predominantly London Clay, with localised areas of Claygate Member of the Bagshot Formation.

14.5.52 The Superficial deposits are classified as a Secondary A or Secondary (undifferentiated) aquifers by the Environment Agency. The Claygate Member is classified as a Secondary A Aquifer. The underlying chalk is identified as a Principal Aquifer.

14.5.53 Soil mapping for the UK indicates soils within the study area to comprise either:

- loamy and clayey soils of coastal flats with naturally high groundwater;
- loamy soils with naturally high groundwater;
- slightly acidic loamy and clayey soils with impeded drainage;
- Freely draining slightly acid loamy soils;
- slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils; or
- Loamy and clayey floodplain soils with naturally high groundwater.

14.5.54 ALC mapping indicates land within the study area to be predominantly Grade 3 (BMV agricultural land) and to a lesser extent Grade 4 (non-BMV land).

14.5.55 No LoGS have yet been notified in the Maldon district in which the eastern part of the study area is located. However, the notification process for LoGS was still underway at the time of reporting. In the Chelmsford district LoGS have been identified relating to Buell Spring (TL 7839 0451), Danbury Common Gravel Pits (TL 784 047 and TL 781 045) and Sandon Gravel Pit (TL 747 043) within 1km of the western part of the study area.

Future baseline

14.5.56 The understanding of future influences of the Bradwell B power station on soils, geology and land use within the study area from outside of the site may require the installation and monitoring of up-hydraulic gradient monitoring wells. Long-term changes in the baseline to be considered are: climate change influencing rainfall; surface water run-off; soil infiltration; and change to groundwater levels and the future hydrogeological flow regime. Climate change projections are set out in **Chapter 12: Climate Change** and indicate long-term changes to seasonal rainfall patterns with an increase in precipitation in winter, with drier summers, along with increases in peak rainfall intensities and increased risk of drought in drier seasons.

Changes to the existing Bradwell power station as a result of future decommissioning will not be considered as the site is expected to remain in Care and Maintenance until 2080.

Planned further surveys and studies

14.5.57 Further works required to confirm the baseline condition are summarised in **Table 14.8**.

Table 14.8: Planned further surveys and studies

Further Surveys and Studies for Soils, Geology and Land-use	Proposed Date
Site walkover - further site reconnaissance to cover the full extent of the main development site.	Q4 2020.
Site walkover - further site reconnaissance to cover the locations of the off-site Power Station Facilities sites and off-site associated development sites. Requirements for intrusive investigation will be determined following the site reconnaissance.	2021
Phased ground investigation, with subsequent surface water and groundwater monitoring and sampling.	Initial phase of investigation in March 2020 in a small area of the main development site to inform design of the load test ahead of a main intrusive investigation which is required to complete geological and geotechnical characterisation of the main development site. A further intrusive investigation for the main development site will include geo-environmental soil sampling and analysis. Intrusive works are planned to commence in 2021 and to be followed by 12 months of groundwater and surface water sampling and monitoring. For further details of the proposed sampling and analysis to be conducted to support the EIA, refer to the Soils, Geology and Land Use SMP (see **Appendix 14A**) and the Water Environment SMP (see **Appendix 15A**).

Further Surveys and Studies for Soils, Geology and Land-use	Proposed Date
Agricultural land classification survey to include all agricultural land within the main development site.	2021

14.6 Proposed Approach to the Assessment

Assessment methodology

14.6.1 The proposed generic approach to the assessment methodology is set out in **Chapter 5: The EIA Process and Methods.** This approach has been adapted to address the aspect-specific requirements for the assessment of effects on soils, geology and land-use (including land contamination).

14.6.2 The approach to the assessment will be as follows:

- establish the scope of the assessment – determine the spatial and temporal scope, i.e. what is the assessment area and what is the applicable assessment timeframe;
- gather baseline data – define existing conditions within the study area and collect key data from appropriate sources, identify the scope of any ground investigation required to support the EIA process;
- consultation – consultation with regulators, and other key stakeholders to agree the baseline characterisation and assessment requirements;
- develop the preliminary conceptual model – present the conceptual understanding of the site and study area to inform site characterisation with regard to the contamination status, soil type and depth, geology and the hydrological and hydrogeological regimes;
- identify the potential receptors and possible significant effects – establish receptors to be assessed, their value (importance) and relevant Project related activities which may affect the receptors;
- determination of significance – identify significant effects in accordance with the methodology outlined in the following paragraphs; and
- identify Project 'design' measures – these are embedded mitigation measures, for example, ground investigation, risk assessment and remediation that will enable management of significant effects.

Assessment of effects and determining significance

14.6.3 The general approach to assessment of effects and determining significance that will be used for the EIA is provided in **Section 5.4**. However, this section sets out how the approach has been applied to soils (notably in the context of contamination), geology and land use and where it has been adapted to deal with the specific requirements of soils, geology and land use. The assessment approach for soils as a resource and in terms of agricultural land value is provided separately.

Determination of significance

14.6.4 The assessment and management of contaminated land is usually based on the risk presented by the contamination for a circumstance, i.e. the probability and consequence of an event occurring. However, EIA seeks to identify the magnitude of a change in status from baseline (impact) caused by the Project and the consequences of those changes (effects).

14.6.5 For the EIA, the impact and its effect will be described as a change in risk relative to the baseline condition during the construction and operational phases of the Project. The methodology used for assessing risk presented by contaminated land is set in the following paragraphs.

Risk assessment

14.6.6 The process of managing contaminated land, as set out in Land contamination: risk management, is based on risk assessment. The assessment of risks from contaminated land is based upon the identification and subsequent assessment of a contaminant linkage. A contaminant linkage requires the presence of a:

- source of contamination;
- receptor capable of being harmed; and
- pathway capable of exposing a receptor to the contaminant.

14.6.7 The risk assessment will evaluate each potential contaminant linkage. Determination of risk will be based upon the consideration of both:

- the magnitude of the potential consequence (i.e. severity). It takes into account both the potential severity of the hazard and the sensitivity of the receptor; and
- the magnitude of probability (i.e. likelihood). It takes into account both the presence of the hazard and receptor and the integrity of the pathway.

14.6.8 The definitions for the qualitative risk assessment have been taken from R&D 66.

14.6.9 The likelihood classifications for the contaminant linkages or effects on hydrogeology and other receptors being realised are presented in **Table 14.9**. The

consequence classifications for the contaminant linkages or effects on hydrogeology and other receptors are presented in **Table 14.10**.

Table 14.9: Likelihood classifications

Classification	Definition	Examples
High Likelihood.	There is a contaminant linkage and an event would appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution.	a) Elevated concentrations of toxic contaminants are present in soils in the top 0.5m in a residential garden. b) Ground or groundwater contamination could be present from chemical works, containing several underground storage tanks, having been in operation on the same site for over 50 years.
Likely	There is a contaminant linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.	a) Elevated concentrations of toxic contaminants are present in soils at depths of 0.5-1m in a residential garden, or the top 0.5m in public open space. b) Ground or groundwater contamination could be present from an industrial site containing a UST present between 1970 and 1990. The tank is known to be single skin. There is no evidence of leakage although there are no records of integrity tests.
Low Likelihood.	There is contaminant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a long period such an event would take place and is less likely in the shorter term.	a) Elevated concentrations of toxic contaminants are present in soils at depths >1m in a residential garden, or 0.5-1m in public open space. b) Ground or groundwater contamination could be present on a light industrial unit constructed in the 1990s containing a UST in operation over the last 10 years – the tank is double skinned but there is no integrity testing or evidence of leakage.
Unlikely	There is contaminant linkage, but circumstances are such that it is improbable that an event would occur even in the very long-term.	a) Elevated concentrations of toxic contaminants are present below hardstanding. b) Light industrial unit <10 years old containing a double skinned UST with annual integrity testing results available.

Table 14.10: Consequence classifications

Classification	Human Health	Controlled Water	Ecology	Property or Structures or Crops and Animals	Examples
Severe	Highly elevated concentrations likely to result in "significant harm" to human health as defined by the Environmental Protection Act (EPA) 1990, Part 2A, if exposure occurs.	Equivalent to Environment Agency Category 1 pollution incident including persistent or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce.	Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term maintenance of the population.	Catastrophic damage to crops, buildings or property.	Significant harm to humans is defined in the Contaminated Land Statutory Guidance as death, life threatening diseases (for example, cancers), other diseases likely to have serious impacts on health, serious injury, birth defects, and impairment of reproductive functions. Major fish kill in surface water from large spillage of contaminants from site. Highly elevated concentrations of Hazardous or priority substances present in groundwater close to small potable abstraction (high sensitivity).

Classification	Human Health	Controlled Water	Ecology	Property or Structures or Crops and Animals	Examples
					Explosion, causing building collapse (can also equate to immediate human health risk if buildings are occupied).
Medium	Elevated concentrations which could result in "significant harm" to human health as defined by the EPA 1990, Part 2A if exposure occurs.	Equivalent to Environment Agency Category 2 pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce.	Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population.	Significant damage to crops, buildings or property.	Significant harm to humans is defined in the Contaminated Land Statutory Guidance as death, life threatening diseases (for example, cancers), other diseases likely to have serious impacts on health, serious injury, birth defects, and impairment of reproductive functions. Damage to building rendering it unsafe to occupy, for example, foundation damage resulting in instability. Ingress of contaminants through plastic potable water pipes.

Classification	Human Health	Controlled Water	Ecology	Property or Structures or Crops and Animals	Examples
Mild	Exposure to human health unlikely to lead to "significant harm".	Equivalent to Environment Agency Category 3 pollution incident including minimal or short-lived effect on water quality; marginal effect on amenity value, agriculture or commerce.	Minor or short-lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long-term maintenance of the population.	Minor damage to crops, buildings or property.	Exposure could lead to slight short-term effects (for example, mild skin rash). Surface spalling of concrete.
Minor	No measurable effects on humans	Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems.	Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems.	Repairable effects of damage to buildings, structures and services.	The loss of plants in a landscaping scheme. Discoloration of concrete.

14.6.10 The risk matrix which will be used to link the likelihood and consequence is shown in **Table 14.11**.

Table 14.11: Risk matrix

		Likelihood			
		Unlikely	**Low Likelihood**	**Likely**	**High Likelihood**
Potential Consequence	Severe	Moderate or low risk.	Moderate risk.	High risk.	Very high risk.
	Medium	Low risk.	Moderate or low risk.	Moderate risk	High risk.
	Mild	Very low risk.	Low risk.	Moderate or low risk.	Moderate risk.
	Minor	Very low risk.	Very low risk.	Low risk.	Low risk.

14.6.11 The overall risk definitions are summarised in **Table 14.12**.

Table 14.12: Risk definitions

Risk	Definition
Very High.	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the Project site location without remediation action or there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to be site owner or occupier. Investigation is required as a matter of urgency and remediation works likely to follow in the short-term.
High	Harm is likely to arise to a designated receptor from an identified hazard at the Project site location without remediation action. Realisation of the risk is likely to present a substantial liability to the Site owner or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation works may be necessary in the short-term and are likely over the longer term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely, that the harm would be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner or occupier. Some remediation works may be required in the long-term.
Moderate / Low.	A risk that lies on the boundary between moderate and low.
Low	It is possible that harm could arise to a designated receptor from identified hazard, but it is likely at worst, that this harm if realised would normally be mild. It is unlikely that the site owner or occupier would face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the

Risk	Definition
	risk may be required. Any subsequent remediation works are likely to be relatively limited.
Very Low.	It is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that this harm if realised would normally be mild or minor.

Significance evaluation methodology

14.6.12 A final judgement is required about whether or not the effects are likely to be significant. **Table 14.13** uses the risk classification pre- and post-development as the basis for a significance evaluation matrix. This matrix sets out whether the effects are likely to be significant, potentially significant or not significant as defined in R&D 66.

Table 14.13: Significance evaluation matrix

			Risk Post-development (Including Embedded Measures)					
			Very Low	Low	Moderate / Low	Moderate	High	Very High
Risk Pre-development	Existing Receptors	Very High	Major Positive (Significant).	Major Positive (Significant).	Moderate Positive (Potentially Significant).	Moderate Positive (Potentially Significant).	Minor Positive (Not Significant).	Negligible (Not Significant).
		High	Major Positive (Significant).	Moderate Positive (Potentially Significant).	Moderate Positive (Potentially Significant).	Minor Positive (Not Significant).	Negligible (Not Significant).	Minor Negative (Not Significant).
		Moderate	Moderate Positive (Potentially Significant).	Moderate Positive (Potentially Significant).	Minor Positive (Not Significant)	Negligible (Not Significant).	Minor Negative (Not Significant).	Moderate Negative (Potentially Significant).
		Moderate / Low	Moderate Positive (Potentially Significant).	Minor Positive (Not Significant).	Negligible (Not Significant)	Minor Negative (Not Significant).	Moderate Negative (Potentially Significant).	Moderate Negative (Potentially Significant).
		Low	Minor Positive (Not Significant).	Negligible (Not Significant).	Minor Negative (Not Significant)	Moderate Negative (Potentially Significant).	Moderate Negative (Potentially Significant).	Major Negative (Significant).
		Very Low	Negligible (Not Significant).	Minor Negative (Not Significant).	Moderate Negative (Potentially Significant).	Moderate Negative (Potentially Significant).	Major Negative (Significant).	Major Negative (Significant).

		Risk Post-development (Including Embedded Measures)					
		Very Low	Low	Moderate / Low	Moderate	High	Very High
	No Receptor Present Pre-development	Minor Negative (Not Significant).	Moderate Negative (Potentially Significant).	Moderate Negative (Potentially Significant).	Major Negative (Significant).	Major Negative (Significant).	Major Negative (Significant).
Risks that remain at moderate, high or very high post-development are unlikely to be considered acceptable and further mitigation will be required to enable the Project to proceed.							

Assessment of effects and determining significance: agricultural land quality and soils

14.6.13 The general approach to assessment of effects and determining significance that will be used for the EIA is provided in **Section 5.4** of **Chapter 5: The EIA Process and Methods**. However, this section sets out how the approach has been applied and adapted to deal with the specific requirements for agricultural land quality and soils.

14.6.14 The approach and associated methodologies have been developed to meet the requirements of national polices and relevant technical guidance.

14.6.15 The methodology for the assessment of likely significant effects on agricultural land quality and soils is based on the extent of BMV agricultural land and soils that might be affected by the Project and whether those effects would be permanent or temporary. Detailed ALC surveys are proposed on all land currently in agricultural use within the study area. This will enable an accurate baseline to be established notably the spatial extent of BMV agricultural land will be determined.

14.6.16 The evaluation of significance for agricultural land quality will be undertaken using professional judgement, drawing upon information about the area of BMV agricultural land (defined as Grade 1, 2 and 3a of the ALC) which might be lost or damaged together with contextual data about BMV land within the study area. The extent of BMV agricultural land being lost due to the Project will be assessed against the extent of BMV agricultural land present within the host county (Essex). As data on BMV land at the county is limited to Provisional ALC mapping which does not distinguish between Grade 3a and 3b, the assessment will be performed using a worst-case scenario. That is to say treating all Grade 3 land as Grade 3b and therefore not BMV land so the total extent of BMV agricultural land at the county level is minimised and the potential loss maximised.

14.6.17 The NPPF (specifically Paragraph 170), EN-6 and Natural England 2018 guidance seek to protect and enhance soils as a resource. Ensuring healthier soils is also recognised in the UK Government 25 Year Environment Plan. Consequently, soils are assessed to be of sufficient value on their own such that an effect on them could be significant. The evaluation of significance for soils will be undertaken using professional judgement, drawing upon information about the nature and extent of the soil resources present.

14.6.18 An informed judgement will then be made as to whether an agricultural land quality, or soil effect is either ‘significant’ or ‘not significant’.

14.7 Scope of the Assessment

Potential receptors

14.7.1 The principal soils, geology and land use receptors that have been identified as being potentially subject to likely significant effects are summarised in **Table 14.14**.

14.7.2 The same potential receptors are identified for the main development site, the off-site Power Station Facilities and the off-site associated development sites, although these will be defined once preferred sites are identified. To avoid repetition in **Table 14.14** the receptors are identified as 'project wide'. It is acknowledged that the magnitude of a potential significant effect on a receptor will likely differ between the main development site, the off-site Power Station Facilities and the off-site associated development sites. The likelihood of a significant effect is undertaken per project element and on a receptor specific basis in **Table 14.15**.

Table 14.14: Receptors subject to potential effects

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Project wide.	Construction (including all earthworks) or Operation Phase.	Hydrogeology	Groundwater in the Secondary A Aquifer in the River Terrace Deposits The groundwater environment and water use.
	Construction (including all earthworks) or Operation Phase.	Hydrology	The surface water environment and water use (local surface water abstraction points).
	Construction (including all earthworks) or Operation Phase.	Human health (current and future site users and adjacent land users).	Potential exposure of current and future site users and adjacent site users to contaminated land.
	Construction (including all earthworks) or Operation Phase.	Property (current and future site buildings and crops currently on-site and in nearby farmland).	Potential impact on property and crops from contaminated land.
	Construction (including all earthworks) or Operation Phase.	Flora, fauna and ecological systems.	Flora, fauna and ecological systems within the Blackwater Estuary environmental designations which may be affected by soil or groundwater contamination.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
	Construction (including all earthworks) or Operation Phase.	Soil resources.	Including both topsoil and subsoil as a resource.
	Construction (including all earthworks) or Operation Phase.	BMV agricultural land.	Agricultural land in Grades 1, 2 or 3a of the ALC.

Likely significant effects

14.7.3 The effects on soils, geology and land use that have the potential to be significant and that will be taken forward for assessment in the ES are summarised in **Table 14.15**.

Table 14.15: Likely significant soils, geology and land use construction effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site.	Ground investigations (for example, borehole drilling and trial pit excavation). Temporary storage of soils during construction. Storage of fuels and oils, including temporary storage during construction or long-term storage during operation. Earthworks and construction, including stabilisation and dewatering activities.	• Disturbance or mobilisation of contamination at the site surface or mobilisation of contaminants (chemical or radiological) beneath the surface may present an unacceptable risk to site users through a number of contaminant specific exposure routes: dermal contact, ingestion, and inhalation (dust and vapours or gases). Migration of dusts and volatile contaminant vapours from the site may also present a risk to adjacent site users. • The mobilisation of existing contamination within the soils can result in leaching of contaminants to site. groundwater which may migrate off-site via shallow groundwater or through surface water drainage; and • The mobilisation of off- site contamination, may result in the migration of contamination onto site, posing an unacceptable risk to onsite controlled water receptors (groundwater and surface water). • The disturbance or mobilisation of existing contamination towards buildings or service pipelines onsite or offsite may result in damage or	• Human health for future site users and adjacent site users. • Controlled waters, including surface water features such as the Weymarks River and the Borrow Dyke and groundwater in the superficial deposits. • Property including buildings and services, crops and soils resources (in terms of soil quality). • Property (crops) and soil resources (in terms of both soil quality and topsoils). • Flora, fauna and ecological systems, including statutory

Element of the Project	Activity	Effect	Receptor or Receptor Group
		deterioration and potential permeation of drinking water pipes by contaminants, due to aggressive conditions caused by the contaminants present. • The potential migration of any existing on-site contamination off-site through dust or shallow groundwater migration may present an unacceptable risk to adjacent farmland receptors. • The mobilisation of existing contaminants may have an adverse impact on the water quality of the surface water drains which may present an unacceptable risk to the offsite ecologically sensitive areas (Blackwater Estuary).	designated sites associated with the Blackwater Estuary.
Main development site.	Earthworks Temporary storage of soils during construction.	Loss of mineral resource (sands and gravels), due to the potential for development of the site to prevent access to mineral resources of value (for example, sand and gravels) located beneath the site.	Soils and geology as a mineral resource.
Main development site.	Construction activities (including all earthworks) on soils permanently taken for the Project.	Permanent loss of topsoil and subsoil. During development topsoils may become buried under sub-soils or topsoils may be sterilised by development. Development may also sterilise sub-soils. Mixing of topsoils and sub-soils or inappropriate use of soils as	Soils (topsoil and subsoil).

Element of the Project	Activity	Effect	Receptor or Receptor Group
		a bulk fill or as waste to landfill will also have an adverse effect on the soil resource. Changes to physical, chemical or biological properties of soil due to inappropriate storage and/or handling of soils or due to the use of heavy machinery which causes compaction. Soil erosion or enhanced water run-off due to inappropriate storage or construction activities.	
Main development site.	Construction activities in agricultural land. permanently taken for the Project.	Permanent loss of BMV agricultural land (agricultural land in Grades 1, 2 or 3a of the ALC).	BMV agricultural land.
Main development site.	Construction activities on soils temporarily required for construction.	Temporary loss of topsoil and subsoil. During development topsoils may become buried under sub-soils or topsoils may be sterilised by development. Development may also sterilise sub-soils. Mixing of topsoils and sub-soils or inappropriate use of soils as a bulk fill or as waste to landfill will also have an adverse effect on the soil resource. Changes to physical, chemical or biological properties of soil due to inappropriate storage and/or handling of soils or due to the use of heavy machinery which causes compaction.	Soils (topsoil and subsoil).

Element of the Project	Activity	Effect	Receptor or Receptor Group
		Soil erosion or enhanced water run-off due to inappropriate storage and/or construction activities.	
Main development site.	Construction activities on agricultural land temporarily required for construction.	Temporary loss of, or damage to BMV agricultural land (agricultural land in Grades 1, 2 or 3a of the ALC).	BMV agricultural land.
All off-site associated development sites and off-site Power Station Facilities.	Ground investigations (for example, borehole drilling and trial pit excavation).	• Disturbance or mobilisation of contamination at the site surface or mobilisation of contaminants (chemical or radiological) beneath the surface may present an unacceptable risk to site users through a number of contaminant specific exposure routes: dermal contact, ingestion, and inhalation (dust and vapours or gases). Migration of dusts and volatile contaminant vapours from the site may also present a risk to adjacent site users. • The mobilisation of existing contamination within the soils can result in leaching of contaminants to site. groundwater which may migrate off-site via shallow groundwater or through surface water drainage; • The mobilisation of off- site contamination, may result in the migration of contamination onto site,	• Human health for future site users and adjacent site users. • Controlled waters, including surface water features and groundwater in the superficial deposits. • Property including buildings and services, crops and soils resources (in terms of soil quality). • Property (crops) and soil resources (in terms of both soil quality and topsoils).
	Temporary storage of soils during construction.		
	Storage of fuels and oils, including temporary storage during construction or long-term storage during operation.		
	Earthworks and construction, including		

Element of the Project	Activity	Effect	Receptor or Receptor Group
	any associated dewatering activities.	posing an unacceptable risk to onsite controlled water receptors (groundwater and surface water); • The disturbance or mobilisation of existing contamination towards buildings or service pipelines onsite or offsite may result in damage or deterioration and potential permeation of drinking water pipes by contaminants, due to aggressive conditions caused by the contaminants present; and • The potential migration of any existing on-site contamination off-site through dust or shallow groundwater migration may present an unacceptable risk to adjacent farmland receptors. The mobilisation of existing contaminants may have an adverse impact on the water quality of the surface water drains which may present an unacceptable risk to the offsite ecologically sensitive areas (Blackwater Estuary).	• Flora, fauna and ecological systems, including statutory designated sites associated with the Blackwater Estuary.
	Construction activities on soils temporarily required for construction.	Temporary loss of topsoil and subsoil. During development topsoils may become buried under sub-soils or topsoils may be sterilised by development. Development may also sterilise sub-soils. Mixing of	Soils (topsoil and subsoil).

Element of the Project	Activity	Effect	Receptor or Receptor Group
		topsoils and sub-soils or inappropriate use of soils as a bulk fill or as waste to landfill will also have an adverse effect on the soil resource. Changes to physical, chemical or biological properties of soil due to inappropriate storage and/or handling of soils or due to the use of heavy machinery which causes compaction. Soil erosion or enhanced water run-off due to inappropriate storage and construction activities.	
	Construction activities on agricultural land temporarily required for construction.	Temporary loss of, or damage to BMV agricultural land (agricultural land in Grades 1, 2 or 3a of the ALC).	BMV agricultural land.

Effects scoped out of further assessment

14.7.4 The effects scoped out from further assessment in the ES are detailed in **Table 14.16.**

Table 14.16: Effects scoped out of the assessment

Potential Effect	Justification for Scoping Out
Effects on geologically important sites.	There an no known geological designations within the study area. The cockleshells and ridges of geomorphological importance in the Dengie SSSI are addressed in **Chapter 17: Coastal Geomorphology and Hydrodynamics**.
Impact on construction workers from exposure to contaminated land.	Construction workers have been scoped out of this assessment as compliance with the law (for example, *The Health and Safety at Work Act 1974* and *The Construction Design and Management Regulations 2015*) means that there will be no significant adverse effects on them during construction. On-site health and safety management controls in relation to contaminated land will be applied.
Effect on groundwater quality in groundwater in the Principal Aquifer in the Thanet Sand and Chalk.	Presence of considerable thickness of low permeability London Clay overlying the Thanet Sand and Chalk, and no deep dewatering of Thanet Sand or Chalk proposed.
Permanent or temporary loss of, or damage to non-BMV agricultural land.	Although the NPPF, EN-1, UK Government's 25 Year Environmental Plan, Natural England guidance and local plan policy does not preclude development on BMV land, it puts emphasis on using poorer quality, non-BMV agricultural land, that is land classified as Grade 3b, 4 and 5 of the ALC. For these reasons, only BMV land (defined as Grade 1, 2 and 3a of the ALC) is assessed to be of sufficient value that an effect on it could be significant in terms of land quality whilst effects on non-BMV agricultural land (land classified as Grade 3b, 4 and 5 of the ALC) is likely to be not significant as non-BMV agricultural land is not a valued land quality receptor. Effects on lower grade land, that is to say non-BMV agricultural land, are not considered in this ES except where this land is valued for different reasons (for example, in the biodiversity chapter).

Potential Effect	Justification for Scoping Out
Potential impact on soil quality and subsequent impact on groundwater quality from pesticides.	Where pesticides are present in association with current and historical agricultural land uses, it is likely that they are present at relatively low levels typical of agricultural land. Elevated concentrations representative of point-source contamination are not anticipated and, therefore, they are unlikely to be of particular significance with regard to the environmental impacts of the proposed future use. In addition, pesticides use is not associated with the proposed future use of the site (the nuclear development) and, therefore, no change in the baseline is anticipated as a direct result of the construction or operation of the proposed facility. Pesticide analysis is proposed in groundwater and surface water to inform the Water Framework Directive assessment (refer to **Chapter 15: Water Environment**). Should this assessment indicate the presence of pesticides at elevated levels, the presence of pesticides in soils and associated impact will be brough back into the scope of assessments for soils, geology and land use.

14.7.5 No other identified potential effects have been scoped out of the assessment at this stage.

14.8 Potential Mitigation

14.8.1 Mitigation measures will be developed and embedded into the design and implementation proposals for the Project, relating to the main development site, off-site Power Station Facilities and off-site associated development as required. Embedded mitigation measures that will be employed as part of the construction phase will incorporate contaminated land management (ground investigation, risk assessment and remediation as necessary) and standard good practice mitigation measures. These will include provision of appropriate storage of potential pollutants such as fuels, oils or lubricants to minimise potential release to the environment, provision for appropriate segregation and storage of waste materials generated as part of the works. They will also include the appropriate storage of soils excavated as part of the works to minimise impact on soil properties.

14.8.2 The development and implementation of a CoCP will take account of standard good practice methods. For example, movement of soils, including site won materials and imported materials, will be documented through use of a materials management plan and will seek to retain clean soils for re-use on the Project and will include

measures to maintain soil integrity during stripping, handling and storage, prevent soil erosion and maintain existing land drainage.

14.8.3 Loss of BMV agricultural land will be one of the evaluation criteria used to ensure that proper consideration will be given to the value of BMV agricultural land in design decision-making and where possible, poorer quality land will be proposed for development of the Project in preference to that of a higher quality.

14.8.4 An Emergency and Incident Response Plan will form part of the CEMP and will seek to limit the impact of potential spills and leaks. A programme of long-term groundwater quality monitoring of key receptors will be undertaken to observe effect and trigger additional mitigation.

14.9 Assumptions and Limitations

14.9.1 The scope of the assessment is based on an overview of desk-based baseline information and will be confirmed for the ES through review of additional data sources and consultation with the relevant stakeholders.

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15. WATER ENVIRONMENT

15.1 Introduction

15.1.1 This chapter sets out the approach for determining the scope of assessment and the methodology for assessment for the Water Environment. **Chapter 5: The EIA Process and Methods** introduces the overall Environmental Impact Assessment (EIA) process including the methodology for assessing effects and determining significance. The topic specific methodology for determining receptor value, sensitivity and impact magnitude for the water environment is provided in **Section 15.6**.

15.1.2 The chapter contains:

- a summary of work undertaken to date;
- an explanation of the scope of assessment, including:
  - legislation, policy and guidance that inform the assessment;
  - a description of consultation and engagement undertaken to date and relevant to the Water Environment;
  - study areas for the assessment;
  - sources of data used in scoping;
  - baseline conditions, including current desk studies and surveys; and
  - planned further surveys and studies;
- the receptors that are proposed to be assessed and the effects which have the potential to be significant;
- the effects that are proposed to be scoped out of the assessment; and
- potential mitigation.

15.1.3 The chapter is supported by a Survey and Monitoring Plan (SMP) (see **Appendix 15A**) that identifies a number of additional surveys and studies that are planned to further inform the EIA. A standalone draft Water Framework Directive (WFD) assessment has been prepared and is currently subject to consultation with the relevant stakeholders. Note that the description and assessment approach relating to drainage and flood risk is presented in **Chapter 16: Flood Risk and Drainage** and the relevant details are not repeated in this chapter.

Work undertaken to date

15.1.4 A combination of desk-based studies have been undertaken to establish surface water and groundwater conditions at the main development site and to support the development of an initial conceptual model that describes the surface water and groundwater flow regime at this site and surrounding areas.

15.1.5 Historical ground investigations (GIs) at the main development site date back to 1987 and a British Geological Survey (BGS) study which assessed the suitability of a proposed nuclear waste repository at the existing Bradwell power station site. This study collated groundwater levels, water quality and permeability data that have been referenced in this chapter.

15.1.6 The most recent GIs have taken place in relation to this Project. These have been undertaken primarily to support a Capable Faulting Study (CFS) and Probabilistic Seismic Hazard Assessment (PSHA) to meet UK regulatory requirements and to provide long-term support to the delivery of the safety case for the Project. Data collected from these GIs relating to the Water Environment include groundwater strikes during exploratory borehole drilling, groundwater observations in trial pits and piezometric monitoring.

15.1.7 Existing GI data have been augmented by public domain data together with Envirocheck (Ref. 15.1) information and historical reporting to inform the current baseline. A data request has been made to the Environment Agency and other organisations for a range of hydrometric, hydrological and hydrogeological data but some of the data were not available at the time of writing this Scoping Report. However, this information will be reviewed and considered for the Environmental Statement (ES).

15.1.8 Further GIs are planned for the Project in 2021 in order to further define baseline conditions and to collect more specific surface water and groundwater monitoring data within the main development site. Notably, for the main development site monitoring of continuous surface water levels and flows, continuous and manual monthly groundwater levels, and monthly surface water and groundwater quality monitoring for both chemical and radiological parameters will be undertaken.

15.1.9 The information derived from existing and future monitoring will be used to further advance the hydrogeological conceptual model presented in the baseline below, such that it will include annotated schematic hydrogeological cross sections to illustrate key flow processes and linkages. This will in turn facilitate the development of a predictive numerical groundwater impact assessment model. This will supplement what would otherwise be the semi-quantitative assessment of the impacts of the Project on the groundwater environment, and the closely related surface water environment.

15.2 Legislation, Policy and Technical Guidance

15.2.1 This section identifies the relevant legislation, national and local policy and guidance which has informed the scope of the assessment relevant to the Water Environment. Further information on policies relevant to the EIA and their status is set out in **Chapter 2: Policy and Regulatory Context**, which should be read in conjunction with this section.

15.2.2 The legislation and policies relevant to the Water Environment are detailed in **Table 15.1**.

Table 15.1: Legislation and policy

Relevant Legislation and Policy	Relevance to the Assessment
Legislation	
European Union (EU) Water Framework Directive (2000/60/EC) (WFD) (Ref. 15.2), currently enacted into domestic law by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, (Ref. 15.3).	The WFD provides the framework under which baseline quality of the water environment for the Project can be assessed. Under the WFD surface water (rivers, lakes, estuaries and the inshore marine environment) and groundwater features are broken down into spatial units referred to as water bodies. There are two principal objectives of the WFD. The first objective requires that all water bodies must reach at least 'Good' overall status, which for surface waters is a combination of Good ecological and Good chemical status and for groundwater is a combination of quantitative and chemical status, by 2027 at the latest. The current baseline status of all water bodies is reported every six years as part of the River Basin Management Planning (RBMP) cycle. The current planning cycle is 2015-2021. The second objective requires that the status of each water body, including all the quality elements which make up overall status, must not deteriorate relative to the baseline reported in the relevant RBMP. All new developments that may have an impact on the water environment are required to comply with objectives of the WFD. This includes ensuring that no changes occur that cause a deterioration of current status of any water body, and that the development does not prevent the achievement of the future status objectives of any water body. The Project has the potential to have an effect on surface water bodies (rivers and lakes), transitional water bodies (estuaries), coastal water bodies and groundwater bodies, during construction and operation. A full WFD Compliance Assessment will be submitted with the Development Consent Order (DCO) application and will comprise an appendix to the ES. This assessment will enable the Secretary of State (SoS) to be confident that the Project is compliant with the domestic objectives of the WFD.

Relevant Legislation and Policy	Relevance to the Assessment
	Two of the WFD's daughter directives are of relevance to the assessment. First, the Groundwater Directive (2006/118/EC) establishes a regime which sets groundwater quality standards and introduces measures to prevent or limit inputs of pollutants into groundwater, to which the development will need to demonstrate compliance (Ref. 15.4). Second, the Environmental Quality Standards Directive (2008/105/EC) established limits on concentrations of priority substances in surface and groundwaters (Ref. 15.5). The Project will need to demonstrate compliance with these limits, as written into UK legislation in the Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 (Ref. 15.6). Both daughter directives provide standards upon which progress towards the objectives of the WFD can be assessed for groundwater and surface water, respectively. As WFD considers both the ecological status of surface waters, including that of estuarine and marine water bodies (known as 'transitional' and 'coastal' water bodies, respectively), this description of the WFD equally applies to the assessments presented in **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology** and **Chapter 24: Marine Ecology**.
Flood and Water Management Act 2010 (Ref. 15.7).	The Flood and Water Management Act sets out the Government's proposals to improve flood risk management and water quality and ensure water supplies are more secure. Appropriate water management must be incorporated into the project through construction and operation, to maintain or improve water quality.
Environment Act 1995 (Ref. 15.8).	The Environment Act 1995 established the Environment Agency and gave it responsibility for environmental protection and flood defence. The Act empowers the Environment Agency to be the primary regulator for this assessment with respect to compliance with national legislation and policy.
Land Drainage Acts 1991 and 1994 (Ref. 15.9) (Ref. 15.10).	The Land Drainage Acts 1991 and 1994 places responsibility for maintaining flows in watercourses on landowners. The Acts give Local Authorities powers to serve a notice on landowners to ensure works are carried out to maintain flow of watercourses. In the context of this assessment, the Act regulates activities that

Relevant Legislation and Policy	Relevance to the Assessment
	interfere with ordinary watercourses, requiring consent of Local Authorities for such activities and requiring riparian landowners to ensure that no obstructions to flow are introduced.
Water Resources Act 1991 (Ref. 15.11), Water Act 2003 (Ref. 15.12), The Environmental Permitting (England and Wales) Regulations 2016 (Ref. 15.13).	The Water Resources Act 1991 states that it is an offence to cause or knowingly permit polluting, noxious, poisonous or any solid waste matter to enter controlled waters. The Act was revised by the Water Act 2003, which sets out regulatory controls for water abstraction, water impoundment and protection of water resources. Of direct relevance to the Project is the requirement to obtain a licence for dewatering of engineering works and to ensure that any impact on the environment can be mitigated. Provisions for the regulation of water discharges to controlled waters are set out in the Environmental Permitting (England and Wales) Regulations 2016, which have replaced provisions in the earlier Acts.
Environment Protection Act 1990 (Ref. 15.14).	The Environmental Protection Act 1990 makes provision for the improved control of pollution arising from certain industrial and other processes. It re-enacts the provisions of the Control of Pollution Act 1974 in respect of the functions of the regulatory and other authorities concerned in the collection and disposal of waste. The Act empowered the National Rivers Authority (NRA, predecessor organisation to the Environment Agency) to be the primary regulator for works associated with this assessment that could have effects on surface water and ground quality. It also gave responsibility to the NRA for holding all abstraction licenses and discharges.
National Policy	
National Policy Statement for Energy (EN-1) (Ref. 15.15).	The overarching National Policy Statement (NPS) EN-1 sets out the generic impacts associated with energy projects during the construction and operation phases. It identifies requirements to assess the potential impacts of energy projects on water quality and water resources (Section 5.15), including consideration of climate change effects over the project lifetime (Section 4.8).

Relevant Legislation and Policy	Relevance to the Assessment
	Paragraph 5.15.2 requires that *"Where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment as part of the ES or equivalent*". Paragraph 5.15.6 outlines that *"The IPC* [now the Secretary of State] *should satisfy itself that a proposal has regard to the River Basin Management Plans and meets the requirements of the Water Framework Directive (including Article 4.7) and its daughter directives, including those on priority substances and groundwater."*.
National Policy Statement for Nuclear Power Generation (EN-6) (Ref. 15.16).	NPS EN-6 recognises that while the generic impacts of new energy infrastructure projects are set out in NPS EN-1, nuclear power projects can have adverse effects on water resources through increased demand, particularly during construction, and from the discharge of cooling water (paragraphs 3.7.1 – 3.7.2 NPS EN-6) that will require assessment to support consenting processes (notably EIA, HRA and operational permitting).
National Planning Policy Framework (NPPF) (Ref. 15.17).	The NPPF sets out planning policy for England and places a general presumption in favour of sustainable development. The policies relating to planning and flood risk are set out in NPPF paragraphs 155 to 165. Paragraph 5 of the NPPF states that the framework "*does not contain specific policies for Nationally Significant Infrastructure Projects (NSIPs)*". However, it states that "*these are determined in accordance with the decision-making framework and relevant national policy statements for infrastructure, as well as any other matters that are relevant (which may include the NPPF)*".
Local Policy	
Maldon District Council (MDC) Local	The approved MDC Local Development Plan sets out the planning strategy for future growth up to 2029. Key policies that are relevant to the inland water environment are summarised.

Relevant Legislation and Policy	Relevance to the Assessment
Development Plan (2017) (Ref. 15.18).	Policy S1: Sustainable Development. When considering development proposals MDC will favour NPPF sustainable development. Policy D2: Climate Change and Environmental Impact of New Development. All forms of possible pollution including water will be minimised (Principle 6). Policy D4: Renewable and Low Carbon Energy Generation. In principle, support will be given for the delivery of large-scale renewable and low carbon energy projects, excluding wind energy, provided adverse impacts (including environmental) have been minimised to an acceptable level. MDC will strongly support the principle of the development of a new nuclear power station at Bradwell-on-Sea. Policy N2: Natural Environment, Geodiversity and Biodiversity. Development which helps to improve the condition of existing environment designations will be encouraged. All development should seek to deliver net biodiversity and geodiversity gain where possible. Any development which could have an adverse effect on sites with designated features, priority habitats and/or protected or priority species, either individually or cumulatively, will require an assessment. Where appropriate, development proposals near any watercourses or water bodies should provide a sufficient buffer which will be beneficial from the perspective of minimising the encroachment of development, providing ecological enhancements, and preventing pollution.
Chelmsford City Council (CCC) Local Plan (2020) (Ref. 15.19).	The CCC Local Plan provides the basis for a new planning framework to meet local development needs up to 2036. Relevant to the inland water environment is Strategic Priority 7: Protecting and enhancing the Natural and Historic Environment, and the Green Belt. The Green Belt and other environmental and heritage designations contribute to the local distinctiveness of the area and need to be protected and enhanced. For example, the river valleys are an important local asset which not only offer natural flood protection but contribute significantly to the local landscape and character of the area. In addition, the water quality of the rivers is an important factor in maintaining diverse natural habitats.

Relevant Legislation and Policy	Relevance to the Assessment
	The following Spatial Principles relevant to the inland water environment will guide how the Strategic Priorities will be achieved: Strategic Policy S1: Spatial Principles. These include locating development to avoid or manage flood risk, and protecting and enhancing the character of landscapes, heritage and biodiversity. Strategic Policy S2: Addressing Climate Change and Flood Risk. CCC will seek to mitigate and adapt to climate change, including promoting the efficient use of natural resources such as water, and minimising the impact on flooding. Strategic Policy S4: Conserving and Enhancing the Natural Environment. CCC "*is committed to the conservation and enhancement of the natural environment through the protection of designated sites and species, whilst planning positively for biodiversity networks and minimising pollution.*". CCC will ensure that new development seeks to improve water-related biodiversity taking account of WFD objectives and RBMPs. The following policy protects and secures important assets relevant to the water environment: Policy DM16: Ecology and Biodiversity. All development proposals should avoid *"negative impacts on biodiversity and geodiversity, mitigate unavoidable impacts and as a last resort compensate for residual impacts.".* Policy DM18: Flooding and SuDS (Sustainable Drainage Systems): Planning permission will only be granted where it can be demonstrated that the site is safe from all types of flooding, and it does not worsen flood risk elsewhere. In addition, in flood risk areas there needs to be a safe means of escape or suitably managed risk through other means; greenfield rates of surface water runoff; and location of most vulnerable development in areas of lowest risk. Water management measures are needed to reduce surface water runoff, for example SuDS.

Relevant Legislation and Policy	Relevance to the Assessment
	Policy DM30: Contamination and Pollution. For developments on or near hazardous substance sites or potentially contaminated land, CCC will need to be satisfied that there will be no effect on the health or safety of future users or occupiers, and no adverse impact on the quality of local groundwater or surface water.

Technical guidance

15.2.3 Technical guidance that has been used to inform EIA scoping is set out in **Table 15.2**.

Table 15.2: Relevant technical guidance

Guidance Reference	Implications
Anglian RBMP (2015) (Ref. 15.20).	Implementation of the WFD is primarily achieved through RBMPs, published every 6 years by the Environment Agency. The current water body classifications, environmental objectives and proposals for programmes of measures to achieve these objectives are brought together in the 2015 Anglian RBMP, which is due to be updated in December 2021.
Essex Abstraction Licensing Strategy (ALS) (2013) (Ref. 15.21).	The Environment Agency's duties in respect of managing water abstraction are set out in the Essex ALS. Under this strategy, the Environment Agency assesses the availability of both surface water and groundwater resources for abstraction, a process formerly called the Catchment Abstraction Management Strategy (CAMS) process. This determines how much water is available for abstraction on a catchment-by-catchment basis, based on the volume of water already licensed for abstraction and taking into account the requirements of the water environment. The Project is located in the Essex ALS.
Groundwater Protection: Principles and Practice (GP3) (2013) (Ref. 15.22).	In executing its responsibilities with respect to groundwater, the Environment Agency acts in accordance with GP3. For its implementation, this policy partly relies on a hierarchy of protection zone maps (water protection zones, safeguard zones, source protection zones (SPZs) and vulnerability maps) that have been made public to allow the wide appreciation of groundwater protection issues. Position statements have also been derived by the Environment Agency that detail how it delivers government policy for groundwater and puts it into action with reference to key legislation, where it has freedom in the

Guidance Reference	Implications
	exercise of its powers and duties. The policy statements and the related maps and zones do not, themselves, have a statutory status. They instead form part of a consistent, risk-based approach to decision-making with respect to the protection of groundwater.
Hydrogeological Impact Appraisal (HIA) for Dewatering Abstractions (2007) (Ref. 15.23)	This report provides practical guidance on how to assess the hydrogeological impact of groundwater abstractions in connection with dewatering operations at quarries, mines and engineering works. The methodology for HIA is designed to align with the Environment Agency's abstraction licensing process, including the changes brought about by the Water Act 2003. It is also designed to operate within the Environment Agency's approach to environmental risk assessment, so that the effort involved in undertaking HIA in a given situation can be matched to the risk of environmental impact associated with the dewatering activity.
NetRegs Guidance for Pollution Prevention Notes (PPGs) (Ref. 15.24). C532: Control of Water Pollution from Construction Sites (2001) (Ref. 15.25). C624: Development and Flood Risk – Guidance for the Construction Industry (2004) (Ref. 15.26). C697: The SuDS manual (Ref. 15.27). C698: Site Handbook for the Construction of SuDS (Ref. 15.28). C692: Environmental Good Practice on Site (2010) (Ref. 15.29). BS6031: Code of Practice for Earthworks (2009) (Ref. 15.30).	Good practice environmental measures, outlined in this series of guidance documents, would occur with or without input from the EIA feeding into the design process. They include actions that would be undertaken to meet other existing legislative requirements, or that are considered to be standard practices. Good practice environmental measures will be taken into account in the assessment of effects on the water environment reported in the ES.
Planning Inspectorate (PINS) Advice Note 18 on WFD (Ref. 15.31).	For Nationally Significant Infrastructure Projects (NSIPs), PINS has produced specific guidance to ensure that WFD compliance is appropriately

Guidance Reference	Implications
	assessed. In summary, the Examining Authority for a NSIP will need, by the close of the examination, to be in a position to report to the SoS on the effects of the Project on the relevant RBMP (and the water bodies therein). This will be achieved through the submission of a WFD Compliance Assessment to support the DCO application.

15.3 Consultation and Engagement

15.3.1 This chapter has been informed by engagement and discussion with various stakeholders. Some technical engagement has occurred to date outside of formal statutory consultation, and discussions relevant to the Water Environment are provided in **Table 15.3**. Stage One Consultation stakeholder comments are provided in **Table 15.4**, along with a response which identifies how each matter is addressed in this chapter.

Table 15.3: Technical engagement

Consultee	Points of Discussion
Environment Agency.	Discussions with the Environment Agency took place via an initial consultation on the Habitats Regulation Assessment (HRA) and Marine Conservation Zone (MCZ) Evidence Plan, on 04 December 2019. It was requested that during dewatering (which is relevant to the main development site only), consideration should be given to whether this is solely a freshwater issue or if dewatering could affect freshwater flow onto the saltmarshes. Following the EIA Scoping Workshop in June 2020 a number of points were agreed, as follows: • The water environment will be taken into consideration to select associated development sites that avoid environmental harm. • The need for flexibility to undertake additional water quality sampling with respect to any identified or suspected local contamination is acknowledged. A revision to the SMP was required (actioned in the version presented in **Appendix 15A**). • The groundwater monitoring proposals are appropriate. Abstraction for investigations and tests must be below 20 cubic meters per day or, if greater will require an abstraction licence. • Protection of borehole headworks is required.

Consultee	Points of Discussion
MDC.	Following the EIA Scoping Workshop in June 2020 MDC asked and the applicant confirmed that the synergies between the Water Environment and Biodiversity and Historic Environment workstreams with respect to site investigation will be taken into account.
Natural England.	Following the EIA Scoping Workshop in June 2020 a number of points were agreed, as follows: • Historical maps and site reports will be inspected as part of the baseline studies to better understand pre-Bradwell A nuclear power station conditions, and this understanding used to inform mitigation, compensation and enhancement measures in the later assessments. • The impacts from drainage on the relevant designated sites outside of the proposed site boundary need to be considered. Consideration will be given to any effects on designated conservation sites in the later series of assessments, for example see **Section 15.7** of this scoping chapter. Appropriate baseline monitoring for the assessment of any effects is proposed in the SMP (see **Appendix 15A**), and monitoring effort will be continued throughout all phases of the project, including post-consent. • The surface water quality parameters to be monitored, as outlined in the SMP (see **Appendix 15A**), appear to be comprehensive. The effect of any changes in surface water quality on Borrow Dyke ecology and the marine environment will be considered as part of the later assessments, for example see **Section 15.7** of this scoping chapter. • The need for flexibility to undertake additional water quality sampling with respect to variability in environmental conditions is acknowledged. A revision to the SMP was required and has been actioned in **Appendix 15A**. • The borrow dyke is a gravity-only system, but a fuller description of the system will be provided as part of the baseline which will be presented in the ES for the DCO application. • The desk study, including the results of previous site investigation, had been used to justify the initial 'scoping out' of the Chalk aquifer mentioned in the SMP (see **Appendix 15A**). However, until further details regarding the development requirements for the main development site and specifically the Bradwell B power station construction are available and the deeper GI and the baseline completed, the Chalk aquifer will instead be retained for assessment, in other words 'scoped

Consultee	Points of Discussion
	in'. This approach is aligned with Natural England's position. Natural England's response to the GI planning application to MDC where it makes comment in relation to borehole location and timetabling is also noted. A revision to the scoping chapter (**Section 15.7**) and the SMP (**Appendix 15A**) has been made to address these issues. • Natural England would like to be provided with details of the development, such as depth of excavations for the foundations and ancillary works of the proposed power station. Such information will be provided once construction design has progressed to identify likely excavation depths.

Table 15.4: Stage One Consultation comments

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
Assessment Scope.	Natural England and the Environment Agency have commented on the assessment scope, the key points being as follows: • The need to mention impacts on groundwater level and quality, with respect to supporting existing and future freshwater habitats and species (Natural England). • Investigations and assessments of risk to the water environment will also be necessary for the associated developments (Environment Agency). • Acknowledge water pollution risks (Natural England).	Noted and agreed. Groundwater and associated development impacts are recognised in **Section 15.7**.
Code of Construction Practice.	The Environment Agency states that it is important to include surface and groundwater protection measures in a Code of Construction Practice (CoCP).	Noted and agreed. A CoCP is mentioned in **Section 15.8**. Full details will be provided in the ES.
Design	The Environment Agency has commented on the design, identifying the need to identify and minimise water requirements of the development, sources of this water and their sustainability.	Noted and agreed. Full details will be provided in the ES, following discussions with both the water companies and the Environment Agency.
Mitigation.	The Environment Agency and Natural England make recommendations regarding relevant environmental measures, including the following:	Noted and agreed.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
	• The need to conduct a full assessment of the ecological value of all affected watercourses within the main development site and mitigate the impacts of backfilling the ditch network, including retaining watercourses where possible, and the provision of new watercourses on compensatory land (Environment Agency). • Use environmental best practice to minimise environmental harm to watercourses (Environment Agency). • Use green buffers along both banks of watercourses to enhance their biodiversity value (Environment Agency). • Avoid using culverts where practical and minimise the length of watercourse affected for all watercourse crossings (Environment Agency). • Consider environmental opportunities for improving water resources and water quality (Environment Agency). • Develop a foul drainage strategy that addresses the drainage needs through each phase of the development and responds to environmental risks (Environment Agency). • Use Sustainable Drainage Systems where possible and following food practice (Environment Agency).	These measures are given consideration in **Section 15.8**. Schematic designs for watercourse crossings and further details of water environment improvement initiatives, a foul drainage strategy and the use of SuDS will be addressed in the ES and considered during design development.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
	• Recognise the importance of the Borrow Dyke and its relevance with respect to Water Management Zones and surface water drainage strategy (Natural England).	
WFD Assessment.	The Environment Agency provide a series of comments regarding the WFD assessment, including the following: • The need to complete such an assessment consistent with the published guidance. • Consult with the Environment Agency during its preparation. • Identify and resolve any evidence gaps that may prevent as assessment of deterioration in status. • Seek opportunities to improve water bodies. • Prepare for an update to RBMPs in 2021 and have regard to the WFD requirements. • Define and secure any required mitigation measures.	Noted and agreed. These comments are addressed in the draft WFD Assessment.

15.4 Data Gathering Methodology

Study area

15.4.1 This section presents study areas for the Water Environment. As the design and consultation processes progress and the Project is refined, the exact geographical scope of study areas may continue to evolve to accommodate any changes. If the study areas change, data collection will also be reviewed and updated.

Main development site

15.4.2 The study area for the surface water component is delineated by the upstream and downstream catchment areas draining to and from the main development site, in order to capture potential effects on surface water receptors from the project (see **Figure 15.1**).

15.4.3 A 3-kilometre (km) radius study area around the main development site has been defined for the groundwater component of the Water Environment (see **Figure 15.1**), based on professional judgement, site knowledge and previous experience from other major projects. Given the distribution and hydraulic properties of both drift and bedrock aquifers, this study area is considered to be conservative and of sufficient extent to include all potentially significant groundwater effects.

Off-site associated development

15.4.4 The study areas for the off-site associated development, project-provided accommodation, power station facilities and potential borrow pit are described in **Table 15.5**.

Table 15.5: Off-site associated development, project-provided accommodation, power station facilities study areas

Site	Study Area	Rationale
Off-site highways works.	1km beyond option locations.	Very conservative, based on professional judgement, site knowledge and previous experience from other major projects. Likely to be significantly reduced as further information regarding the associated development becomes available.
Park and ride facilities.	1km beyond search areas.	Very conservative, based on professional judgement, site

Site	Study Area	Rationale
		knowledge and previous experience from other major projects. Likely to be significantly reduced as further information regarding the associated development becomes available.
Freight management facilities.	1km beyond search areas.	Very conservative, based on professional judgement, site knowledge and previous experience from other major projects. Likely to be significantly reduced as further information regarding the associated development becomes available.
Project-provided accommodation.	Site location(s) yet to be finalised. A ZoI will be defined to form the study area for each once site locations are confirmed.	Site boundaries and search areas still to be finalised.
Off-site Power Station Facilities.	Site location(s) yet to be determined. A ZoI will be defined to form the study area for each once site locations are confirmed.	Site boundaries and search areas still to be defined.
Potential off-site borrow pit.	Site location(s) yet to be determined. A ZoI will be defined to form the study area once location(s) are confirmed.	Site boundaries and search areas still to be defined.

15.4.5 Study areas for the project-provided accommodation, off-site Power Station Facilities and potential borrow pit will be defined and the subsequent data searches, baseline descriptions, and receptor and significant effect assessments undertaken once site boundaries and search areas for these development elements have been identified.

Sources of data used in scoping

Desk-based

15.4.6 The principal desk-based data sources used to inform the scope of the assessment are summarised in **Table 15.6**.

Table 15.6: Principal desk-based data sources

Source	Data
Centre for Ecology and Hydrology (CEH).	Summary river flow statistics for Environment Agency flow gauges from the online National River Flow Archive (Ref. 15.32). The Climate, Hydrology and Ecology research Support System (CHESS) for rainfall and potential evapotranspiration data (Ref. 15.33). Standard average annual rainfall 1961-90 (SAAR61-90) from the CEH Flood Estimation Handbook (FEH) CD ROM v3.
Ordnance Survey (OS).	Ordnance Survey topographic maps, 1:25,000 and 1:50,000 scale (Ref. 15.34). Digital OS vector map (1:10,000) data.
Meteorological Office (Ref. 15.35).	UK climate projections (temperature and rainfall). Meteorological Office Rainfall and Evaporation Calculation System (MORECs) data (Ref. 15.36). UK climate averages (online at https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/u10t6ch7u).
Environment Agency.	Site climate and rainfall data. Environment Agency Flood Map for Planning map (Ref. 15.37). Available river flow data and river level data. Surface water and groundwater discharge consents. Licensed abstractions. Hydrogeology groundwater level data and other available hydrogeological parameter data. Surface water and groundwater quality data (also available from online Environment Agency Water Quality Archive (Ref 15.38). Summary abstraction licence information at WFD water body scale from the Environment Agency's online interactive maps.

Source	Data
	RBMP maps, aquifer vulnerability and status, WFD water body status, Nitrate Vulnerable Zones (NVZs) within the Environment Agency RBMP (2016 cycle 2) information, via the Environment Agency Catchment Data Explorer (Ref. 15.39). Summary of water availability at WFD water body scale from the Essex ALS (May 2017).
MDC	Private water supply (PWS) data.
BGS	Geological mapping and observation borehole data from the BGS Geology of Britain Viewer, the BGS Onshore GeoIndex, BGS Memoirs and the 1:625 000 scale Hydrogeological Map of England and Wales. Borehole logs.
Department for Environment, Food and Rural Affairs (Defra).	Interactive maps for statutory and non-statutory designated nature conservation sites and aquifer status from the MAGIC natural environment map viewer (Ref. 15.40).
Natural England.	Site of Special Scientific Interest (SSSI) citation and information from the Natural England website (Ref. 15.41).
Landmark Information Group (EnviroCheck).	Historical and current OS Mapping. Watercourse locations. Bedrock and Superficial Aquifer Designations. Groundwater Vulnerability Map. Local Authority Landfill Coverage and land use. Surface water discharge consents and licensed abstractions.

Survey data

15.4.7 Recent GIs to date have provided limited data related to the Water Environment. However, considerable relevant hydrogeological information from previous GIs has been reviewed. Where relevant, this information has been used to inform the main development site baseline particularly that relating to the geology and the hydrogeological conceptual model.

15.4.8 Further GIs that are planned for the main development site will advance the baseline and conceptualisation by means of the collection of further surface water and groundwater monitoring data (levels, flow and quality, both chemical and radiological). This will facilitate advancement of the hydrogeological conceptual site models and permit the development of a predictive numerical groundwater model for the main development site.

15.5 Baseline Information

Current baseline

Main development site

Climate

15.5.1 Meteorological Office MORECs and Environment Agency climate station data have been requested, but until such data are available, reliance has been placed on other information sources. For example, derived rainfall standard average annual rainfall (SAAR) estimates for the period 1961-1990 (SAAR61-90) of 517mm/a were obtained from the FEH CD-ROM using catchment descriptors for the Weymarks River catchment that lies within the surface water study area.

15.5.2 Although there is some variability in published rainfall and evapotranspiration estimates that are relevant to the main development site locality, a substantial annual surplus of rainfall over evapotranspiration (hydrologically effective rainfall, HER1) is consistently identified. For example, records show an annual average rainfall for the over the period 1941-1970 of 555mm and a seasonal recharge to ground of between 100mm/a and 150mm/a. The average annual rainfall based on the meteorological data for the Shoeburyness, Landwick Climate Station (1981-2010) is 515mm. Shoeburyness is 25km to the south of the main development site and at an elevation of 2 metres Above Ordnance Datum (mAOD).

15.5.3 Monthly average rainfall, potential evapotranspiration (PE) and HER for the area within which the main development site are located are held within the CEH CHESS. This records average annual rainfall over the period 1980 - 2012 of 526mm. During the winter months, when rainfall is greater than PE, ~237mm of rainfall fell of which some 164mm was available for runoff and recharge over well-watered grass per annum (see **Table 15.7**). It should be noted that these data were collected using PE without a vegetation interception correction. With such a correction applied, values for HER are more in line with other estimates (152mm/a).

[1] HER is that portion of rainfall that contributes to runoff, aquifer recharge and river baseflow. It is calculated as the difference between rainfall and actual evapotranspiration (AE). AE is the quantity of water that is removed due to the processes of evaporation and transpiration and will equate to potential evapotranspiration (PE) where rainfall exceeds PE. PE may therefore be used in the absence of AE data to make some comments about HER, for example HER = Rainfall – PE if rainfall > PE, in winter months.

Table 15.7: Average rainfall, PE and HER in relation to the main development site

Month	Average Rainfall (mm)	Average PE (mm) Well-Watered Grass	Average HER (mm) Well-Watered Grass
January	46	11	35
February	32	17	16
October	58	26	32
November	51	11	40
December	50	8	41
Sum of months when rainfall > PE.	237	73	164
Source: CHESS is a 1km gridded meteorological and land state dataset for Great Britain.			

Topography and watercourses

15.5.4 The main development site is centred on National Grid Reference (NGR) TM 0149 0872 and lies within a generally flat and low-lying landscape. The area is referred to as the Dengie Peninsula and is bounded to the north by the Blackwater River estuary (the Blackwater Estuary) and to the east by the North Sea. The ground elevation increases from approximately 1mAOD south of the existing flood defence embankment, to greater than 10mAOD at Bradwell-on-Sea (TM 0059 0695) in the south of the site (see **Figure 15.2**).

15.5.5 In the north of the main development site, there is a Borrow Dyke running along the landward side of the 2.5 metres (m) to 3m high existing flood defence embankment, with tidal mudflats, saltmarsh and beach habitat beyond. A tongue of elevated ground stretches west – east through the centre of the site, coincident with a disused airfield (TM 0071 0836). The main development site is drained by a series of ditches draining this higher ground towards the east and north-east, and Bradwell-on-Sea and Roman Road towards the north towards into the Weymarks River (TM 0117 0777 to TM 0243 0920) or the borrow dyke. Historical drainage ditches and channels have been interpreted from the LiDAR (Light Detection and Ranging) data as small depressions, approximately 0.3m below the adjacent ground elevation.

15.5.6 The principal watercourse at the main development site is the Weymarks River, which has a catchment area of ~6km2 (Weymarks River catchment of ~5km2, and the smaller Bradwell waterside catchment of ~1km2). The Weymarks River is a designated Main River that flows from Curds Grove (TM 0100 0772), south of the disused airfield, to the north-east, connecting into the network of land drains and eventually to the Borrow Dyke. The borrow dyke drains to the foreshore from the area of the main development site via a buried culvert at Weymarks Sluice. There are two tidal sluice gates that are understood to be installed to allow the area of land behind the existing flood defences to drain onto the foreshore at low tide, namely at

Downhall (TL 9955 0846) 500m to the west, and Weymarks (TM 0188 0942), on the north edge, of the main development site.

15.5.7 The area to the south of the main development site is generally low lying with a number of marshes, including Bradwell Marshes, which are fed by the Bradwell Brook from the west and drain into the North Sea at the Marshhouse outfall to the east (TM 0320 0457), 3km south-east.

15.5.8 Historical and current mapping shows a number of ponds on the main development site, the largest being two artificial reservoirs (TM 0187 0815) in the south, to the north, north-west of East Hall Farm (TM 0174 0808 and TM 0189 0815). These are agricultural irrigation reservoirs, contained by a 2.5m high embankment. A small pond is also located adjacent to East Hall Farm (TM 0211 0784). One spring (TL 9943 0707) has been identified from digital OS Vector 10k data within the groundwater study area at Westwick Farm, 750m south of the Bradwell Marina.

15.5.9 There are no Environment Agency flow gauges located close to the main development site or within the Dengie Peninsula. The nearest gauging station is at Langford along the River Blackwater, 16km to the west at the head of the Blackwater Estuary. Its flow statistics are presented in **Table 15.8**, but the catchment area of this station is considerably larger than those of the local watercourses, being 337km^2 in area and draining land much further to the west.

Table 15.8: Summary of river flows in relation to the main development site

Gauge Reference	Gauge Name	Watercourse	NGR	Catchment Area (km^2)	Mean Flow (m^3/s)	Q10[1] (m^3/s)	Q95[2] (m^3/s)	BFI[3]	Period of Record
37004	Langford	River Blackwater.	TL 835 090.	337	1.376	2.884	0.224	0.45	1932-1968

Table notes:

Source: National River Flow Archive.

[1]Q10: the flow that is equalled or exceeded 10% of the time – an index of high flow.

[2]Q95: the flow that is equalled or exceeded 95% of the time – an index of low flow.

[3]BFI: baseflow index, the proportion of the total river flow that is derived from gradual release from groundwater storage, as opposed to rapid surface or near-surface runoff.

Geology

15.5.10 The geology of the area is described in **Chapter 14: Soils, Geology and Land Use** based on the findings of previous GIs but a summary is provided here to provide context for the remainder of the Water Environment baseline. The drift sequence across the main development site essentially comprises Flandrian Coastal Zone Deposits of alluvium and local sub-alluvial muds in the north (defined by BGS as 'Intertidal Deposits'), with River Terrace Deposits of sand and gravel in the south (see **Figure 15.3**). The superficial deposits are thickest in the north-east of the main development site where the underlying bedrock has been incised by a channel that is infilled with Quaternary intertidal sediments (Ref. 15.40, specifically Figure 8.7) underlain by River Terrace Deposits, and absent completely within the central part of the main development site (Ref. 15.42).

15.5.11 The outcropping Asheldham Gravel River Terrace Deposits sit on higher ground at elevations of between 2mAOD and 9mAOD, whilst the shallow angle slopes on either side of the rockhead channel and across the very western part of the main development site are mantled with Head deposits, which comprise a complex and variable mixture of weathered bedrock and sands and gravel that have been reworked by slope processes. The Intertidal Deposits (marine and estuarine alluvium) in the north and east of the main development site comprise soft organic clay, alluvium and interbedded peat. The long narrow mapped patches of Storm Beach Deposits in the north-east (see **Figure 15.3**) comprise marine shell and beach deposits, and at the western edge of the groundwater study area the BGS mapping shows small patches of Tidal Flat Deposits.

15.5.12 The geological sequence below the superficial deposits encountered in boreholes at the main development site is summarised in **Table 15.9** using the nomenclature from the BGS online lexicon (Ref 15.43).

Table 15.9: Geological sequence for the main development site groundwater study area

Period	Group	Formation
Palaeogene	Thames (previous 'Upper London Tertiaries').	London Clay.
		Harwich
	Lambeth (previous part of 'Lower London Tertiaries').	Reading
	Montrose	Thanet
Cretaceous	Upper Chalk.	

15.5.13 Drift deposits are absent from the central part of the main development site, where it is shown to be directly underlain by the Thames Group (London Clay above Harwich Formation). The London Clay also sub-crops beneath the drift elsewhere on the main development site, and indeed is present at outcrop or sub-crop across the entire groundwater study area (Ref. 15.44).

15.5.14 Recent investigations have shown that the total thickness of the London Clay and Harwich Formations at the main development site varies from approximately 25m to 62m (thickest in the south-west), with the base elevation increasing from approximately -54mAOD to -36mAOD towards the north-east. The increase in base elevation to the north-east of the Dengie Peninsula and reduced thickness has been attributed to uplift and differential erosion into the top of the London Clay Formation in the vicinity of a fault, referred to as the Weymarks Fault. The fault is trending north to south (from TM 0206 0939 to TM 0191 0826) and is believed to be a reverse fault with 10-15m uplift to the east.

15.5.15 Underlying the Thames Group are the Lambeth Group (typically up to 14m thick) and the Thanet Formation (between 11m and 17m thick). The elevation of the base of the Thanet Formation, or top of the Chalk, is seen to vary from approximately -82mAOD to -56mAOD towards the north-east of the Dengie Peninsula. The Chalk has a regional dip of approximately 2^{o} to the south. Notably, this fault is not captured in the 1:50.000 scale BGS geological mapping, with no linear features digital data (such as faults) available for the area.

Aquifer status and hydraulic properties

15.5.16 The MAGIC Aquifer Designation Map identifies the River Terrace Deposits as a Secondary (undifferentiated) Aquifer, which implies that they have the potential to contain some groundwater within thicker, more permeable sequences found beneath the higher topography but with unproductive layers at lower elevations. These deposits could be regarded as either a Secondary B (lower permeability with some limited ability to store and yield limited amounts of groundwater) or, indeed, a Secondary A (higher permeability aquifer within sands and gravels) aquifer. The alluvium is identified as unproductive.

15.5.17 With respect to bedrock aquifer status, MAGIC identifies the London Clay also as unproductive strata, defined as having low permeability that have negligible significance for water supply or river base flow , and so it can be regarded as a non-aquifer with little or no groundwater. The underlying Chalk Formation is confined by the London Clay above and is characterised by MAGIC as “permeable strata capable of supporting water supplies at a strategic scale”.

15.5.18 The on-line BGS GeoIndex Viewer (1:625,000 scale Hydrogeological map of England and Wales) describes the Thames Group at the main development site as having essentially no groundwater. Regionally, the predominantly clayey sequence forms a ~140m thick confining layer to the underlying Chalk, although locally it is ~40m thick.

15.5.19 The 1:625,000 scale Hydrogeological map of England and Wales identifies the Chalk as a "highly productive aquifer". It is described as a Principal Aquifer up to 450 m thick and yielding 50l/s to 100l/s from large diameter boreholes and up to 300l/s from adit (tunnel) systems. However, testing of the Chalk at Bradwell suggests low values of transmissivity in the Thames region (Ref. 15.45), with values less than 20m2/d.

15.5.20 Typical hydraulic conductivities (permeabilities) of 0.0009m/d for the alluvium, 0.4m/d for River Terrace Deposits and 0.0004m/d (horizontal) and 0.000008m/d (vertical) for London Clay are quoted. Proposed values for groundwater flow modelling are also given within Halcrow. Horizontal hydraulic conductivities are assumed to be ~4m/d for River Terrace sands and gravels and 0.01 m/d for alluvium, and 4.3 x 10^{-3}m/d to 8.64 x 10^{-5}m/d (horizontal) for weathered and unweathered London Clay respectively. Modelled values used in the Essex groundwater model developed for the Environment Agency are also quoted (Ref. 15.46). Horizontal conductivities used are 0.11m/d for alluvium, 0.1 m/d for Head deposits, 0.11m/d for Tidal Deposits, 5m/d for sands and gravels at outcrop, 0.1m/d for weathered London Clay and 0.01m/d for unweathered London Clay. The model shows for the combined Chalk model layers a fairly consistent transmissivity distribution in the order of around 5m^2/d over the extent of the main development site groundwater study area, except for underneath the Blackwater Estuary, where the transmissivity ranges between 56 and 87m^2/d.

Groundwater levels and flows

15.5.21 Groundwater levels have been requested from the Environment Agency for the groundwater study area. In the meantime, the following descriptive detail has been based upon relevant historic information provided in available reference documents.

15.5.22 A superficial deposits groundwater level contour map implies a groundwater high in the south-west of that site (~5mAOD) with radial flow towards the Blackwater Estuary in the north and the Weymarks River in the south-east, in line with what would be expected from the topography (see **Figure 15.2**). The flow pattern also appears to be controlled to some extent by the geology (1 mAOD contour parallel to the Intertidal Deposits distribution boundary). The hydraulic gradient along a flow line perpendicular to the contours is ~0.03 and relatively steep, but it becomes much shallower further downgradient (between the 1 m contour line and the coast). The sub-alluvial and River Terrace Deposits are assumed to be in hydraulic continuity, and both are likely to have perched, discontinuous water levels.

15.5.23 Previous reporting on tidal water level variations in the Blackwater Estuary and recorded daily or weekly groundwater level data indicates that the magnitude of the tidal variations in the Estuary ranges between 3 to 5m. The monitoring frequency for the boreholes is however insufficient to determine the equivalent tidal responses in groundwater.

15.5.24 Previous reporting has attempted further groundwater level contouring in the superficial deposits based on the NIREX site investigation data for the north-eastern

part of the main development site. This work shows a more complex contour picture for the Intertidal Deposits, with very shallow gradients and with flow directions in places pointing landwards, implying ingress of seawater. However, it is considered that this contouring should be treated with caution as there is uncertainty regarding installation details and the timings of the dips.

15.5.25 Groundwater levels within the Chalk at the main development site lie between 0.5mAOD and 0.7mAOD, and so are confined by the overlying London Clay. Groundwater flow in the Chalk is believed to be to the south from recharge areas to the north, although the hydraulic gradient is likely very low (0.00025). In contrast, the Environment Agency's regional Essex Groundwater Model simulated, albeit with little monitoring borehole control, a north-easterly flow direction in the Chalk underneath the main development site (see Figure 5.4 in Ref. 15.44).

15.5.26 Historically, there has been a recorded rebound of groundwater levels within the Chalk. Water quality issues in the Chalk since the 1950s led to reduced Chalk abstraction and a rise in groundwater levels throughout the 1970s and 1980s, particularly into the south of Essex. A preliminary hydrogeological conceptual model of the site had suggested that recharge of the Chalk originating at outcrop some 35 to 40km north-west of the main development site would drive groundwater movement underneath the area vertically upwards through the London Clay. This was, however, only partly supported by the site investigation data at the time. This data did show a vertical upward hydraulic gradient from the Upper Chalk through the overlying strata into the Harwich Formation as expected, but also identified the presence of a downward vertical hydraulic gradient from the superficial deposits through the London Clay into the Harwich Formation. The BGS hydrochemical data for Bradwell report (Ref. 15.47) thought this pressure field reflected a differential response to a reduction in abstraction from the Chalk, with water levels in the more permeable upper part of the Chalk recovering quicker than in the overlying strata.

Hydrogeological flow regime

15.5.27 The following paragraphs summarise the hydrogeological understanding of the main development site and surrounding area largely based on these studies and constitute a hydrogeological conceptual model that will be developed further in the ES.

15.5.28 The southern boundary of the surface water study area equates to an approximate surface water divide, with surface water runoff from the higher ground in the south-west and south moving further into the main development site and towards the Weymarks River, the Bradwell Waterside ordinary watercourse, and the drains and ditches to the borrow dyke and sluices and ultimately the Blackwater Estuary (see **Figure 15.2**).

15.5.29 The shallow groundwater catchment and flow directions are likely to be similar. The groundwater level contours for the superficial deposits (introduced in paragraph 5.2.26) cover the north-eastern part of the River Terrace Deposits within the groundwater study area, but also stretch marginally into the Intertidal Deposits, and

over the intervening zone which is free of superficial deposits (as informed by BGS 50k geological mapping). This implies hydraulic continuity between the two main superficial deposits and the weathered London Clay outcrop in between, but as part of this initial conceptualisation it is considered that more data and analysis are required to confirm whether the superficial deposits act as one continuous aquifer or not, and the significance or otherwise of water level 'perching'.

15.5.30 Groundwater within the Intertidal Deposits is considered to be in hydraulic conductivity with the tidal Blackwater Estuary. Under low tide conditions, groundwater is likely to flow towards the Estuary to the north-west and north-east of the main development site, whilst under high tidal conditions a reverse flow in a south-easterly direction will occur, as demonstrated by very high chloride concentrations (>18,000 mg/l).

15.5.31 The groundwater study area is located on the north limb of the major syncline forming the London Basin. Hydrogeologically, the London Basin behaves as an artesian groundwater basin, with the Chalk (Principal Aquifer) being confined by the overlying London Clay which regionally acts as an aquitard. Recharge to the Chalk occurs primarily at its outcrop zones which are located serval tens of kilometres both to the north-west and south-east of the main development site.

15.5.32 Chalk groundwater levels are close to being artesian. There is evidence that hydraulic gradients in the central part of the London Basin are very low and there is minimal Chalk groundwater flow.

15.5.33 A historical conceptual model cross-section shows a shallow groundwater flow system beneath the existing Bradwell power station, with local runoff to ditches, perched water levels, tide-influenced lateral flow to the Blackwater Estuary and limited vertical flow in both the drift and London Clay.

Abstractions and discharges

15.5.34 Abstraction licence and discharge consent details have been requested from the Environment Agency for both the surface water and groundwater study areas, with the former data still awaited and so supplemented with information from other sources below. In addition, PWS data have been provided by MDC.

15.5.35 For abstractions, Envirocheck data identifies three licensed abstraction locations within 100m of the main development site: Weymarks River, East Hall Farm (TM 6013 2079) No. 8/37/39/*s/047; and two at the existing Bradwell power station (TM 5998 2090) No. 8/37/39/*T/0013 with two permit versions.

15.5.36 Historical licensed water abstractions in the Bradwell area have been documented in a number of references. For example, details of all licensed water abstractions within a 6km radius of the main development site were obtained from the NRA. Fourteen licenses were identified, of which five were from well boreholes (often with more than one well referenced on a single licence) and one from a sand and gravel excavation. The remainder were from surface watercourses or reservoirs. One

licence was to the existing Bradwell power station for abstraction for cooling water from the River Blackwater.

15.5.37 Of the historic groundwater abstractions, three were north of the Blackwater Estuary and therefore not of any relevance to the Project. The remainder were all small and located at distances greater than 2km from the main development site. The closest of these (2.4km away) was up hydraulic gradient of the main development site, and is likely to be from sand and gravels, possibly the River Terrace Deposits. It is unlikely to have had any impact on groundwater flow at the main development site.

15.5.38 **Table 15.10** presents information for two PWSs within the groundwater study area as provided by MDC.

Table 15.10: Private water supplies within the main development site groundwater study area

Site Name	Supply Reference	NGR	Source Type	Use
Shingleford	P117SDSHINGLE	TM 0037 0434	Well	Domestic
The bungalow.	P117SDBUNGALOW	TM 0049 0428	Well	Domestic

15.5.39 In 1999 four private licenses (Wick Farm, Steeple Wick, Marsh House Farm and Middlewick Farm) existed for the Chalk within a 10km radius of the main development site. There were also eleven PWSs for groundwater abstractions from the superficial sand and gravel deposits within the Dengie Peninsula, mainly used for agricultural purposes. In addition, recent reporting suggested a possible PWS for farming and domestic at Eastlands (TM 0235 0767), 360m south of the main development site. However, none of these sources were provided within the MDC data set and hence it is concluded that these water supplies are no longer in use.

15.5.40 The Essex ALS indicates that for the Dengie area there is no water available for surface water abstraction and that there is restricted water available for licensing within the catchment. The confined Chalk groundwater in the Essex area is fully committed and no further consumptive abstraction can be considered. In addition, the ALS states that there are many water bodies around the Essex coast which have complex needs in terms of freshwater flows. Many of these are part of or support Habitats Directive sites (see **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**). Further permissions to abstract in these water bodies will be decided on a case-by-case basis.

15.5.41 In areas where shallower aquifers are in continuity with surface water, the groundwater status is linked to the surface water status. Within the Bradwell area the impact of a groundwater abstraction on the Q95 flow (the flow that is equalled or exceeded 95% of the time) in the local rivers may not be considered acceptable.

Where groundwater abstractions directly impact on surface water flows, including reduction of base flow, the impact is measured at the surface water Assessment Point (AP). In these cases, restrictions may be applied to licences, such as Hands-off Level (HoL) conditions that state a groundwater level below which an abstractor is required to reduce or stop abstraction. Other restrictions may apply where availability is limited or to protect the environment, for example to prevent saline intrusion.

15.5.42 **Table 15.11** presents the consented discharges and **Table 15.12** the discharges which are exempt from licensing within the surface water study area, provided by the Environment Agency.

Table 15.11: Consented discharges for the main development site surface water study area

Consent Number	Name	NGR	Discharge Type
ASENF2698	Bradwell Waterside Terminal Pumping Station, Waterside Road.	TL 99500 07900	Pumping Station on sewerage network (water company).
PRENF08529	Bradwell Site, Storage Tank.	TL 99960 08860	Waste collection, treatment, disposal, and materials recovery.
PR2TSE10760	Bradwell Site, Bradwell-on-Sea.	TM 00256 08608	Sub-station, electricity, gas, and air conditioning supply.
PR2NFE03774	Eastland Meadows Country Park, East End Road.	TM 01600 07700	Holiday accommodation camp site, caravan site, hotel and hostel.
PRENF08582	East Hall Farm, East End Road.	TM 03040 08540	Domestic property (single) (including farmhouse).
AW2NFE14366	Bradwell-on-Sea Sewage Treatment Works (STW), Waterside Road.	TL 99300 07400	STW (water company).
AW2NFE09484	Bradwell Village Hall Pumping Station, Bradwell-On-Sea.	TM 00308 06803	Pumping Station on sewerage network (water company).

Table 15.12: Discharges exempt from licensing for the main development site surface water study area

Permit Reference	Site Name	NGR	Description
PR2NF832	West Wyck Farm.	TL 99290 07150	Existing sewage discharge to surface.
EPR/KE5131HT/A001	Monkyns Farm.	TM 02089 07352	Sewage to surface +/-5m^3/d.
PR2LFS12676	Brambles	TM 01732 07560	Existing sewage discharge to ground.
PRENF16142	Eastlands Farm.	TM 02290 07800	Existing sewage discharge to surface.
PR2LFS03784	Othona	TM 03059 08428	Existing sewage discharge to ground.

Water quality

15.5.43 Surface water and groundwater quality data have been provided by the Environment Agency. Other data sources, including historic abstraction licence data, have also been used for the baseline description presented below.

15.5.44 None of the Environment Agency surface water quality monitoring points fall within the surface water study area. However, one Environment Agency groundwater quality monitoring point to the north-east of Tillingham falls within the groundwater study area of the main development site (see **Table 15.13**). Its name implies it is a borehole, but no information with regards to its monitoring strata has been provided. There is also a substantial amount of chemical analysis data available for this monitoring point. Chloride concentrations for samples taken between 2005 and 2014 range between 37.1mg/l and 59.6mg/l and are characteristic for fresh groundwater, albeit with a slight rising trend apparent.

Table 15.13: Environment Agency groundwater quality monitoring point within the main development site groundwater study area

Sampling Point ID	Sampling Point Name	NGR	Sample Type	Sampling Summary
AN-HICKSGRN.	The Cottage B/H, Hicks Green, Tillingham.	TM 00484 04275	Groundwater – wells and adits.	19 samples taken between 2005 and 2014 (Status = open).

15.5.45 The main development site is situated in a mainly rural catchment, and catchment groundwater quality pressures arise predominantly from diffuse pollution from rural sources. There are also localised pressures as a result of historical activities at the existing Bradwell power station site, historic mining, and isolated landfill sites. However, there are no parts of the study areas which have been designated as an NVZ (surface water and groundwater), or as a Drinking Water Groundwater Safeguard Zone. MAGIC also defines the WFD Essex Sands and Gravels as of medium (low) vulnerability to pollution.

15.5.46 A detailed description of the groundwater quality at the main development site is given in an appraisal of BGS hydrochemical data for Bradwell (Ref. 15.47). The following two main groups of groundwater quality are recognised:

- Saline water (>18,000mg/l chloride) within the marine or estuarine alluvium. Essentially this groundwater is the same composition as seawater from the Blackwater Estuary; and

- Fresh groundwater (27 to 150mg/l chloride) in the exposed River Terrace Deposits. The groundwater has a similar trace element chemistry to rainwater and contains very high nitrate concentrations. This suggests that the water has a very short residence time, probably much less than 30 years.

15.5.47 A transition zone between the Asheldham Gravel and the Intertidal Deposits adjacent to the coastline has been identified on the basis of variations in chloride concentrations. This indicates that groundwater in the Asheldham Gravel probably has a freshwater meteoric origin and groundwater in the Intertidal Deposits is influenced to varying degrees by seawater tidal influx. Limited sampling from the London Clay has indicated an almost identical groundwater composition to that within the overlying alluvial deposits, confirming a likely downward movement of groundwater into this formation.

15.5.48 The Chalk at Bradwell has chloride levels in excess of 500mg/l (600 to 700mg/l), which is consistent with surveys undertaken in 1970 by the Anglian Water Authority. Isotopic dating of the waters suggests a residence time of greater than 30,000 years. The position of the aquifer within the centre of the London Basin may explain the older, saline groundwater with apparently no modern recharge influence.

15.5.49 Although the more permeable and sand-rich layers, such as the Thanet Formation, may be in hydraulic continuity with the Chalk, the distinctly different Chalk groundwater chemistry indicates generally little mixing with the groundwater above. The groundwater within the Chalk is a sodium chloride-dominated water, whereas the water within the superficial deposits, for instance, are calcium-bicarbonate-dominated water type (indicative of recently recharged groundwater).

Water Framework Directive water body status

15.5.50 The WFD surface water bodies that overlap with the main development site study areas are the Blackwater transitional (estuarine) and Outer coastal water bodies. Underlying the off-site highways works is the Essex Gravels and North Essex Chalk

groundwater bodies. Information regarding these WFD water bodies is provided in **Table 15.14** and **Figure 15.5.**

15.5.51 Both of the surface water bodies are designated as Heavily Modified Water Bodies (HMWBs), indicating that their physical characteristics have been substantially modified in order to accommodate human activities. Both attain Moderate overall status on account of the ecological impacts of physical modification and water quality pressure.

15.5.52 The WFD Essex Gravels groundwater body comprises the previously mentioned River Terrace Deposits and is present beneath the main development site and more widely. It currently attains Poor overall status on account of the impact of pollution from rural areas (agriculture) that has resulted in a failure of the water body to achieve Good chemical status. The water body does, however, achieve Good quantitative status. The Chalk aquifer at depth is equivalent to the North Essex Chalk WFD water body, which outcrops further north in Essex, upstream of the Stour Estuary. It also attains Poor overall status, for both quantitative and chemical status.

15.5.53 Parts of the main development site coincide with land not associated with a specific WFD river water body, due to these land parcels not being contained within a substantial river catchment and draining directly to the sea, or the Blackwater Estuary, via small watercourses. These small catchments are referred to as 'non-reportable' water bodies and are retained for assessment.

15.5.54 The non-reportable water bodies will be referred to collectively as one receptor, namely 'the Dengie Peninsula non-reportable watercourses'. For example, the principal watercourse at the main development site is the Weymarks River, which has a number of agricultural drainage tributaries. These features were all classified as part of the first RBMP cycle (2009-2015) but were not included as reportable water bodies in the 2015 RBMPs. As a result, there are no baseline WFD data for these water bodies, and neither do they have a WFD status classification.

15.5.55 Adopting a reasonable worst-case, it has been assumed that the quality of all of the watercourses within the 'Dengie Peninsula non-reportable watercourses' receptor category are consistent with the condition of almost all other watercourses in the vicinity of the main development site. Therefore, the assumption is that the baseline status of these watercourses is Moderate overall WFD status. If data on specific watercourses becomes available during the course of the assessment, then this assumption will be revisited. Given the ubiquitous pressures associated with physical modification and pollution in and around the surface water study area, it is not considered that an assignment of Good overall status would be proportionate with the reasonable worst-case principle.

Table 15.14: WFD water bodies for the main development site study area

Water Body (RBMP ID)	Water Body Type (*designation in italics*)	Current Status, Catchment Data Explorer (*supporting components in italics*)	Supporting Elements, less than Good Status or Potential (*quality elements in italics*)	Issues Preventing the Attainment of Good Status
Blackwater GB520503714000.	Transitional water body: *HMWB.*	Moderate status (2016): *Moderate ecological potential.* *Good Chemical status.*	Ecological: *Mitigation measures assessment.* *Invertebrates.* *Macroalgae.* *Phytoplankton.* *Dissolved inorganic nitrogen.* *Zinc.* Chemical: n/a.	No data available.
Blackwater Outer GB650503200000.	Coastal water body: *HMWB.*	Moderate status (2016): *Moderate Ecological Potential.* *Good Chemical status.*	Ecological: *Angiosperms* *Dissolved inorganic nitrogen.*	No data available.

Water Body (RBMP ID)	Water Body Type (*designation in italics*)	Current Status, Catchment Data Explorer (*supporting components in italics*)	Supporting Elements, less than Good Status or Potential (*quality elements in italics*)	Issues Preventing the Attainment of Good Status
Essex Gravels GB40503G000400.	Groundwater body.	Poor status (2016): *Good Quantitative status.* *Poor Chemical status.*	Quantitative: n/a Chemical: Chemical drinking water protected area (DWPA) test - fail; General chemical test – fail.	Pollution from rural areas.
North Essex Chalk GB40501G400700.	Groundwater body.	Poor status (2016): *Poor Quantitative status.* *Poor Chemical status.*	Quantitative: n/a Chemical: Trend assessment; Chemical DWPA test - fail; General chemical test – fail.	Pollution from rural areas.

Water-dependent ecosystems

15.5.56 The Dengie Peninsula is formed by the Blackwater Estuary to the north and the River Crouch to the south. The entire coastal fringes, as well as large parts of the low-lying Dengie Peninsula, are covered by international nature conservation designations, including the Essex Estuaries SAC, the Dengie (Mid-Essex Coast Phase 1) SPA and Ramsar Site, and Blackwater Estuary (Mid-Essex Coast Phase 4) SPA and Ramsar site. Parts of the Estuary are designated as SSSIs and National Nature Reserves (NNRs) and, most recently, a MCZ. The extensive mudflats and saltmarsh of these areas provide rich foraging for tens of thousands of wintering water birds as well as important breeding habitat (see **Chapter 23: Biodiversity-Terrestrial and Freshwater Ecology and Ornithology**).

15.5.57 A number of statutory designated conservation sites around the main development site are likely to be dependent on the freshwater environment. The closest of these to the main development site is the Dengie SPA, Ramsar, SSSI and NNR, located along its north boundary. The Borrow Dyke runs the entire length of the SSSI and contains brackish water with large communities of Sea Club-rush *Scirpus maritimus* or Common Reed *Phragmites* australis. It is likely that flow into the Borrow Dyke is from surface water, rainfall and runoff, with occasional groundwater flow input. The MAGIC website reports the condition of the SSSI to be of 'Unfavourable Recovering' status (as of October 2014).

15.5.58 In addition, the Sandbeach Meadows SSSI (TM 021 050) is a 30.3 hectare (ha) habitat on the Dengie Peninsula, located approximately 2km south of the main development site. It consists of seven fields of unimproved grassland lying on alluvial deposits, and it is almost the only survivor of the formerly extensive Dengie grazing marshes in the area. In the winter it provides supporting habitat for a nationally important number of dark-bellied brent geese, and several ditches have meanders which survive from when they were salt-marsh creeks. Watercourses and ditches in the area are likely to have some groundwater input recharged from the higher ground found to the west of the SSSI site. The MAGIC website reports the condition of the SSSI to be of 'Favourable' status (as of October 2009).

Off-site associated development: off-site highways works

Overview

15.5.59 This section presents the results of preliminary baseline studies for the associated development: off-site highways works and an assumed 1km radius study area. The baseline also provides the regional setting for the other associated developments discussed later, namely the park and ride sites and the freight management facilities.

Climate

15.5.60 Although there is some variability in both the rainfall and evapotranspiration estimates, the climate is predominantly as described for the main development site.

Topography and watercourses

15.5.61 Most of the Route A and B study area occupies the flat and low-lying landscape associated with the Dengie Peninsula. However, the north-western branch of Route B transverses at Danbury (TL 7839 0511) a topographic high at just over 100mAOD, which stretches southward close to the south-western branch of Route A near South Woodham Ferrers. The study area of the combined Route A/Route B to the east of Cold Norton as far eastwards as the main development site is typically between 5 and 20mAOD high, with the exception of a parallel ridge along its southern edge with elevations just above 50mAOD around Grange Farm (TQ 8934 9878).

15.5.62 The Dengie Peninsula and its extension inland are bounded by the River Crouch to the south and the River Chelmer and the Blackwater Estuary to the north. The lower land west of Maylandsea is drained by the Mundon Creek (TL 8932 0226) which flows to the north-east into the Blackwater Estuary. The Sandon Brook (TL 7419 0434) flows from north of South Woodham Ferrers north-west towards and beyond Sandon and into the River Chelmer.

15.5.63 Two springs (TL 9943 0707 and TL 7877 0463) have been identified from digital OS Vector 10k data within the groundwater study areas, the former at Westwick Farm, 750m south of Bradwell Marina, and the latter in Danbury Common, 300m north of Gay Bowers Farm, south-east of Danbury.

15.5.64 There are no Environment Agency flow gauges located close to or within the Dengie Peninsula. The nearest gauging station is at Langford along the River Blackwater to the west, at the head of the Blackwater Estuary. Details are provided in **Table 15.15**. Other flow gauges are on the River Crouch at Wickford 8km to the south-west of South Woodham Ferrers, and at Sandon Bridge measuring the Sandon Brook which flows north into the River Chelmer.

Table 15.15: Summary of river flows in relation to the off-site highways works

Gauge Ref.	Gauge Name	Watercourse	NGR	Catchment Area (km^2)	Mean flow (m^3/s)	Q10[1] (m^3/s)	Q95[2] (m^3/s)	BFI[3]	Period of Record
37004	Langford	River Blackwater.	TL 835 090	337	1.376	2.884	0.224	0.45	1932 – 1968.
37031	Crouch at Wickford.	Crouch	TQ 748 933	72	0.34	0.733	0.044	0.27	1976 – 2018.
37013	Sandon Bridge.	Sandon Brook.	TL 755 054	75.1	0.298	0.628	0.034	0.35	1963 – 2018.

Table notes:

Source: National River Flow Archive

[1]Q10: the flow that is equalled or exceeded 10% of the time – an index of high flow.

[2]Q95: the flow that is equalled or exceeded 95% of the time – an index of low flow.

[3]BFI: baseflow index, the proportion of the total river flow that is derived from gradual release from groundwater storage, as opposed to rapid surface or near-surface runoff.

Geology

15.5.65 The bedrock geology to the west of the main development site in the search area associated with the off-site highways works is dominated by sub-cropping (beneath superficial deposits) London Clay, but the off-site highways works lie predominantly on London Clay outcrop. Intertidal Deposits are found along the estuary fringes, particularly along the southern edge of the Blackwater Estuary, north of Maylandsea and along the northern edge of the River Crouch Estuary at North Fambridge (TQ 8568 9780). To the south-west of the Dengie Peninsula, at Althorne (TQ 9090 9966) and north-west of South Woodham Ferrers, are outcrops of the Claygate Member and the Bagshot Formation. The Claygate Member forms the upper unit of the London Clay Formation and typically consists of an interbedded alternating sand-clay sequence. The Bagshot Formation above consists of fine to coarse grained sand, with thin clay beds and occasional seams of gravel. This stratum formerly covered the whole region, but erosion has now reduced it to isolated patches on hill tops in central Essex.

15.5.66 To the west of Maldon are Quaternary sands and gravels, again forming the higher ground. Further to the north-west is the Chalk outcrop. The deep geological succession in the area has previously been described with respect to the main development site.

Aquifer status and hydraulic properties

15.5.67 The MAGIC Aquifer Designation Map considers the River Terrace Deposits scattered across the higher topography of the Dengie Peninsula and wider area to the west as a Secondary A Aquifer and Secondary (undifferentiated) aquifer. Therefore, these deposits have the potential to contain some groundwater within thicker, more permeable sequences found across the higher topography but with unproductive layers at lower elevations.

15.5.68 With respect to the bedrock aquifer status, MAGIC identifies the London Clay as unproductive, with extremely low permeability, and so can be regarded as a non-aquifer with little or no groundwater. Outcrops areas of the Claygate and Bagshot Beds around Althorne and north and west of South Woodham Ferrers are a Secondary A (higher permeability aquifer within sands and gravels) aquifer. The underlying Chalk Formation is confined by the London Clay above and is characterised by MAGIC as “permeable strata capable of supporting water supplies at a strategic scale”.

15.5.69 The on-line BGS GeoIndex Viewer (1:625,000 scale Hydrogeological map of England and Wales) describes the Thames Group across the off-site highways works study area as rocks with essentially no groundwater. Regionally, the predominantly clayey sequence forms a ~140m thick confining layer to the underlying Chalk.

15.5.70 The 1:625,000 scale Hydrogeological map of England and Wales identifies the Chalk as a *“highly productive aquifer”*. It is described as a Principal Aquifer up to

450m thick and yielding 50 to 100 litres per second (l/s) from large diameter boreholes and up to 300l/s from adit systems.

15.5.71 In terms of aquifer properties, Amec Foster Wheeler's groundwater investigation report quotes Chalk transmissivity values of between 7 and 9m2/d for one location 'Willow PO' (TQ 57900 19630), obtained from the BGS Major Aquifer Properties Manual between Battlesbridge and South Woodham Ferrers, which is in line with the conceptual understanding of very low transmissivities in the confined Chalk.

15.5.72 The calibrated Environment Agency regional Essex groundwater model shows for the combined Chalk model layers a fairly consistent transmissivity distribution in the order of around 5m2/d over the extent of all the associated development study areas, which confirms the low magnitude of the observed data of the single 'Willow PO' location discussed above. The model uses a hydraulic conductivity for the London Clay model layer of 0.01m/d throughout the study areas.

Groundwater levels and flows

15.5.73 Groundwater levels have been requested from the Environment Agency for the groundwater study areas. A description of the groundwater flow regime will be presented in the ES.

Hydrogeological flow regime

15.5.74 The hydrogeological flow regime of the wider area covered by the off-site highways works is complex because of the nature and extent of the geographical area covered. However, as observed at the main development site, the higher topography of sand and gravel River Terrace Deposits are well drained and groundwater flow in these superficial deposits will be topographically controlled. Along the main off-site highways works corridor through the Dengie Peninsula towards South Woodham Ferrers, groundwater through the superficial sand and gravel deposits may be expected to flow in a north-westerly direction. To the west of South Woodham Ferrers and Maldon groundwater flows within these deposits are likely to be towards the east where drainage develops on the London Clay outcrop.

15.5.75 The off-site highways works corridor broadly lies within the centre of the axial trace of the London Basin syncline. As such, the nature and degree of groundwater flows within the Chalk will be similar to that described for the main development site, namely exhibiting very low hydraulic gradients and minimal groundwater movement.

Abstractions and discharges

15.5.76 Abstraction licence and discharge consent details have been requested but not yet received from the Environment Agency for the study area, although PWS data have been supplied by MDC. This and information from other sources have helped to formulate the preliminary description of the abstraction regime presented below, but a fuller description of abstractions and discharges will be provided on receipt of the

Environment Agency information and further details regarding the off-site associated development.

15.5.77 Whilst the groundwater abstraction data have not yet been received from the Environment Agency, the presence of a SPZ is noted on MAGIC with Zone III (Total Catchment) being mapped 1.5km north of the study area and to the north-west of Maldon. Its Zone I (Inner Protection Zone) is close to the River Chelmer and the abstraction is likely to be sourced from the underlying Quaternary Sand and Gravels.

15.5.78 **Table 15.16** presents one PWS within the study area south of Maldon as identified by MDC.

Table 15.16: Private water supplies within the off-site highways works study areas

Site Name	Supply Reference	NGR	Source Type	Use
Bury Farm.	P117SDBURYFARM	TL 8489 0475	Well	Domestic

Water quality

15.5.79 Surface water and groundwater quality data have been provided by the Environment Agency.

15.5.80 A total of seven Environment Agency surface water quality monitoring points falls within the study areas and the details for these are presented in **Table 15.17**. The chemical data obtained will be investigated further as part of the EIA baseline which will be presented in the ES.

Table 15.17: Environment Agency surface water quality monitoring points within the off-site highways works study areas

Sampling Point Code	Sampling Point Name	NGR	Sample Type	Date Last Sampled
CE1520	Fenn Creek South of Eyotts Farm.	TQ 79870 96470.	Saline Water - Estuarine Sites - Non Bathing and Shellfish.	02/07/2019
CE1540	Rettendon Bk.W Arm B1012 Road Bridge.	TQ 79345 97527.	Freshwater – Rivers.	08/02/2017
CE17	R.Crouch Battlesbridge.	TQ 77999 94648.	Saline Water - Estuarine Sites - Non Bathing and Shellfish.	05/01/2016

Sampling Point Code	Sampling Point Name	NGR	Sample Type	Date Last Sampled
CH04	R.Chelmer Sandford Mill.	TL 74000 06040.	Freshwater – Rivers.	12/05/2017
MW4549	Latchingdon Brook downstream of Latchingdon STW.	TL 88400 01820.	Freshwater – Rivers.	26/03/2019
SB0106	Sandon Brook A414 Bridge.	TL 75510 05410.	Freshwater – Rivers.	13/06/2019
SB0135	Sandon Brook upstream of Sandon Brook, East Arm.	TL 74974 04806.	Freshwater – Rivers.	08/02/2017

15.5.81 The off-site highways works are situated in a mainly rural catchment, and catchment groundwater quality pressures arise predominantly from diffuse pollution from rural sources. MAGIC defines the WFD Essex Sands and Gravels as of medium (low) vulnerability to pollution. Other areas are of low vulnerability or defined as unproductive apart from the outcrops of Claygate and Bagshot Beds which are of medium (high) vulnerability. These areas of sand and gravel, south of Maylandsea within the south-west of the Dengie Peninsula are also designated (2017) as a NVZ. A NVZ and Drinking Water Groundwater Safeguard Zone are also found to the north-west of a line from South Woodham Ferrers to Maldon.

15.5.82 There is no Environment Agency groundwater quality data available for the off-site highways works search area.

Water Framework Directive water body status

15.5.83 The WFD surface water bodies that overlap with the off-site highways works study areas are the Chelmer (downstream of the confluence with the Can), Sandon Brook, Sandon Brook (east arm), Sandon Brook (west arm), Crouch (downstream of Wickford), Rettendon Brook, Blackwater and Crouch transitional (estuarine) and the Dengie Peninsula non-reportable water bodies. Underlying the off-site highways works is the Essex Gravels and North Essex Chalk groundwater bodies. Information regarding these WFD water bodies is provided in **Table 15.18** and **Figure 15.5**.

Table 15.18: WFD water bodies for the off-site highways works

Water Body (RBMP ID)	Water Body Type (*designation in italics*)	Current Status, Catchment Data Explorer (*supporting components in italics*)	Supporting Elements, less than Good Status or Potential (*quality elements in italics*)	Issues Preventing the Attainment of Good Status
Chelmer (d/s confluence with Can) GB105037033530.	River water body: *HMWB.*	Poor status (2016): *Poor ecological potential.* *Good chemical status.*	Ecological: *Mitigation measures assessment.* *Macrophytes and phytobenthos combined.* *Phosphate.* Chemical: n/a.	Pollution from rural areas. Pollution from waste water. Physical modification. Pollution from towns, cities and transport.
Sandon Brook GB105037033890.	River water body: *Non-Artificial and/or Heavily Modified Water Body (Non-A/HMWB).*	Moderate status (2016): *Moderate ecological status.* *Good chemical status.*	Ecological: *Macrophytes and phytobenthos combined.* *Phosphate* Chemical: n/a.	Pollution from rural areas Pollution from wastewater. Pollution from towns, cities and transport.
Sandon Brook (east arm)	River water body: *Non-A/HMWB.*	Moderate status (2016): *Moderate ecological status.*	Ecological: *Phosphate.*	Pollution from rural areas.

Water Body (RBMP ID)	Water Body Type (*designation in italics*)	Current Status, Catchment Data Explorer (*supporting components in italics*)	Supporting Elements, less than Good Status or Potential (*quality elements in italics*)	Issues Preventing the Attainment of Good Status
GB1050370 28640.		*Good chemical status.*	Chemical: n/a.	Pollution from towns, cities and transport.
Sandon Brook (west arm) GB105037028630.	River water body: *Non-A/HMWB.*	Moderate status (2016): *Moderate ecological status.* *Good chemical status.*	Ecological: *Macrophytes and phytobenthos combined.* *Fish.* *Phosphate* Chemical: n/a.	Pollution from rural areas Pollution from wastewater. Pollution from towns, cities and transport. Physical modification (barriers to ecological connectivity).
Crouch (d/s Wickford) GB105037028550.	River water body: *HMWB.*	Moderate status (2016): *Moderate ecological potential.* *Good chemical status.*	Ecological: *mitigation measures* *Macrophytes and phytobenthos combined.* *Invertebrates* *Phosphate* Chemical: n/a.	Pollution from wastewater. Pollution from towns, cities and transport.

Water Body (RBMP ID)	Water Body Type (*designation in italics*)	Current Status, Catchment Data Explorer (*supporting components in italics*)	Supporting Elements, less than Good Status or Potential (*quality elements in italics*)	Issues Preventing the Attainment of Good Status
Rettendon Brook GB105037028560.	River water body: *HMWB.*	Moderate status (2016): *Moderate ecological potential.* *Good chemical status.*	Ecological: *Invertebrates* *Dissolved oxygen.* *Phosphate.*	Pollution from rural areas Physical modification. Pollution from towns, cities and transport.
Blackwater GB520503714000.	Transitional water body: *HMWB.*	Moderate status (2016): *Moderate ecological potential.* *Good Chemical status.*	Ecological: *Mitigation measures assessment.* *Invertebrates* *Macroalgae* *Phytoplankton* *Dissolved inorganic nitrogen.* *Zinc* Chemical: n/a.	No data available.

Water Body (RBMP ID)	Water Body Type (*designation in italics*)	Current Status, Catchment Data Explorer (*supporting components in italics*)	Supporting Elements, less than Good Status or Potential (*quality elements in italics*)	Issues Preventing the Attainment of Good Status
Crouch	Transitional water body: *HMWB.*	Moderate status (2016): *Moderate Ecological Potential.* *Good Chemical status.*	Ecological: *Dissolved Inorganic Nitrogen.*	No data available.
Essex Gravels GB40503G000400.	Groundwater body.	Poor status (2016): *Good Quantitative status.* *Poor Chemical status.*	Quantitative: n/a Chemical: *Chemical DWPA test - fail;* *General chemical test – fail.*	Pollution from rural areas.
North Essex Chalk GB40501G400700.	Groundwater body.	Poor status (2016): *Poor Quantitative status.* *Poor Chemical status.*	Quantitative: n/a Chemical: Trend assessment; Chemical DWPA test - fail; General chemical test – fail.	Pollution from rural areas.

Water-dependent ecosystems

15.5.84 The international nature designations and water-dependencies on and surrounding the Dengie Peninsula have been described with respect to the main development site. The off-site highways works corridor runs south-west through the Dengie Peninsula bounded by the Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar site and SSSI to the north and Crouch and Roach Estuaries (Mid-Essex Coast Phase 3) Ramsar site and SSSI to the south.

15.5.85 Other nature designations associated with the off-site highways works include the following, although any water dependency of these designations will need to be established and reported in the ES:

- Danbury Common (TL 7818 0423), Blake's Wood and Lingwood Common (TL 7788 0608) and Woodham Walter Common (TL 7922 0647) SSSIs;
- North Fambridge Hall (TQ 8560 9754) and Pantile Woods (TQ 8394 9914), ancient woodland north-east of South Woodham Ferrers; and
- Bellhill Wood (TL 7817 0574), Hall Wood (TL 7635 0606), Hawes Wood (TQ 8182 9954), Hazeleigh Hall Wood (TL 8346 0417), Hyde Wood (TL 8048 0410), Parsonage Wood (TL 8241 0474) and Thrift Wood (TL 7924 0181), ancient woodland west and south-west of Maldon.

Off-site associated development: park and ride facilities

15.5.86 For a description of the regional baseline setting of this associated development please refer to the associated development: off-site highways works section. A summary description of aspects of the more local baseline are presented in the following section.

Topography and watercourses

15.5.87 The study area of the South Woodham Ferrers park and ride facility is drained in its centre by the west-east flowing Rettendon Brook, whereas its far northern part drains via the Sandon Brook north-westwards, and its southern part drains south and eastwards to the River Crouch. The study area reaches its maximum ground elevation of over 60mAOD in the north-west along the surface water divide between the Sandon Brook and the Rettendon Brook. Its lowest elevation of just below 1mAOD is where the River Couch leaves the study area in the south-east.

15.5.88 The study area of the Maldon park and ride facility is highest with just over 50mAOD in the south, north of Woodham Mortimer (TL 8139 0466), and the ground surface slopes down to below 10mAOD towards the River Chelmer in the north and north-east and the Langford Cut further north-east. The area is drained by both these streams and also by unnamed confluences of the River Chelmer which cross the study area in a broadly northerly direction.

15.5.89 The study area of the Chelmsford park and ride facility is mostly occupied by the Sandon Brook catchment, with the stream entering the area in the south at an elevation of around 27mAOD, crossing the area in a north-easterly direction and leaving it in the north at an elevation of 15mAOD. The east arm of the Sandon Brook joins the stream just east of Sandon (TL 7440 0482). Topography rises eastwards to as high as around 85mAOD at Danbury (TL 7839 0511). The north-western part of the study area is intersected by the River Chelmer which drains this part and leaves the area at an elevation of around 16mAOD in the north-west.

15.5.90 A total of twelve springs have been identified from digital OS Vector 10k data within the study areas of the park and ride facilities and these are presented in **Table 15.19**.

Table 15.19: Spring locations within the park and ride facility study areas

NGR	Location Description
TL 8386 0750	Spring south of Beeleigh Abbey, 650m west of Maldon.
TL 7385 0445	Spring 420m north of Pontlands Farm, 470m west of Sandon.
TL 7400 0444	Spring 450m north-east of Pontlands Farm, 340m west of Sandon.
TL 7380 0444	Spring 390m north of Pontlands Farm, 500m west of Sandon.
TL 8267 0779	Spring in Woodlands 500m east of Guy's Farm, 1.8km west of Maldon.
TL 8143 0633	Spring in 'The Wilderness' near Woodham Walter Hall, 820m south-east of Woodham Walter.
TL 8368 0834	Spring near Beeleigh Falls House, 680m south of Langford.
TL 8270 0770	Spring 600m south-east of Guy's Farm, 1.6km west of Maldon.
TL 8293 0670	Spring west of Brook Farm, 1.2km west of Maldon.
TL 8115 0701	Spring in 'The Wilderness', 300m east of Woodham Walter.
TL 8301 0743	Spring west of Great Beeleigh Farm, 1.2km west of Maldon.
TL 8142 0648	Spring in 'The Wilderness', 750m south-east of Woodham Walter.

Geology

15.5.91 The South Woodham Ferrers park and ride facility study area is entirely underlain by London Clay. For a few small parts within the area, the BGS 50k geology mapping either identifies these as the more specific Claygate Member or as the Bagshot Formation, both of which have already been described for the western part of the off-site highways works Route A study area. The South Woodham Ferrers park and ride facility study area is largely drift free, except for deposits of Head and

some alluvium flanking the streams draining the area. Head, Tidal and River Terrace Deposits are mapped along the River Crouch valley in the south and south-east.

15.5.92 The study area of the Maldon park and ride facility is also entirely underlain by London Clay. The superficial geology comprises predominantly glacial fluvial sands and gravels in the centre with some patches of Head. The small streams draining the area are flanked by Head and alluvium, and along the wider valley of the River Chelmer River Terrace Deposits typically occupy the higher grounds with alluvium along the valley floor. A small part of the western study area is covered by Brickearth.

15.5.93 The study area of the Chelmsford park and ride facility is fully underlain by the London Clay Formation, and a small part in the south is more specifically mapped as Claygate Member. The bedrock is largely covered by superficial deposits with a similar distribution pattern as discussed for the Maldon park and ride facility area.

Abstractions and discharges

15.5.94 Abstraction licence and discharge consent details have been requested but not yet received from the Environment Agency for the study areas, although PWS data have been supplied by MDC and other information is available. A fuller description of abstractions and discharges will be possible on receipt of the Environment Agency information and further details regarding this element of off-site associated development.

15.5.95 The study area of the Maldon park and ride facility overlaps in the north with the SPZ (introduced for the off-site highways work sites) north-west of Maldon. Its inner protection zone lies completely, and its total catchment partly within the Maldon park and ride facility study area.

15.5.96 **Table 15.20** presents three PWSs within the study area south of Maldon as provided by MDC.

Table 15.20: Private water supplies within the park and ride facility study areas

Site Name	Supply Reference	NGR	Source Type	Use
Hollylodge	P117SDHOLLYLODGE	TL 8201 0770.	Well	Domestic
Woodlands	P117SDWOODLANDS	TL 8261 0745.	Spring	Domestic
Themanor	P117SDMANOR	TL 8200 0806.	Well	Domestic

Water quality

15.5.97 Nine Environment Agency surface water quality monitoring points fall within the study areas and the details for these are presented in **Table 15.21**. The chemical data obtained will be investigated further as part of the ES.

Table 15.21: Environment Agency surface water quality monitoring points within the park and ride facility study areas

Sampling Point Code	Sampling Point Name	NGR	Sample Type	Date Last Sampled
BE33	River Blackwater Fullbridge.	TL 85077 07401.	Saline Water - Estuarine Sites - Non-Bathing and Shellfish.	02/03/2020
BL0030	R.Blackwater downstream of Langford Water Treatment Works (WTW).	TL 83609 08828.	Freshwater – Rivers.	06/01/2020
CE1520	Fenn Creek South of Eyotts Farm.	TQ 79870 96470.	Saline Water - Estuarine Sites - Non-Bathing and Shellfish.	02/07/2019
CE1540	Rettendon Brook West Arm B1012 Road Bridge.	TQ 79345 97527.	Freshwater – Rivers.	08/02/2017
CE17	River Crouch Battlesbridge.	TQ 77999 94648.	Saline Water - Estuarine Sites - Non-Bathing and Shellfish.	05/01/2016
CH01	River Chelmer Langford Intake.	TL 83411 08624.	Water for Potable Supply - River Abstraction.	24/10/2019
CH04	River Chelmer Sandford Mill.	TL 74000 06040.	Freshwater – Rivers.	12/05/2017
SB0106	Sandon Brook A414 Bridge.	TL 75510 05410.	Freshwater – Rivers.	13/06/2019
SB0135	Sandon Brook upstream of Sandon Brook East Arm.	TL 74974 04806.	Freshwater – Rivers.	08/02/2017

15.5.98 There is no Environment Agency groundwater quality data available for the study areas.

WFD water body status

15.5.99 The WFD surface water bodies that overlap with the potential park and ride facility study areas are the Blackwater (Combined Essex), Chelmer (downstream of the confluence with the Can), Sandon Brook, Sandon Brook (east arm), Sandon Brook (west arm), Crouch (downstream of Wickford), Rettendon Brook, Blackwater and Crouch transitional (estuarine) and the Dengie Peninsula non-reportable water bodies. Underlying the park and ride facilities are the Essex Gravels and North Essex Chalk groundwater bodies. Information regarding these WFD water bodies is provided in **Table 15.22** and **Figure 15.5**.

Table 15.22: WFD water bodies for the park and ride facility study areas

Water Body (RBMP ID)	Water Body Type (*designation in italics*)	Current Status, Catchment Data Explorer (*supporting components in italics*)	Supporting Elements, less than Good Status or Potential (*quality elements in italics*)	Issues Preventing the Attainment of Good Status
Blackwater (Combined Essex) GB105037041160.	River water body: *HMWB.*	Moderate status (2016): *Moderate ecological potential.* *Good chemical status.*	Ecological: *Mitigation measures* *Macrophytes and phytobenthos combined.* *Phosphate* Chemical: n/a.	Pollution from rural areas. Pollution from wastewater. Physical modification.
Chelmer (d/s confluence with Can) GB105037033530.	River water body: *HMWB.*	Poor status (2016): *Poor ecological potential.* *Good chemical status.*	Ecological: *Mitigation measures assessment.* *Macrophytes and phytobenthos combined.* *Phosphate.* Chemical: n/a.	Pollution from rural areas. Pollution from waste water. Physical modification. Pollution from towns, cities and transport.

Water Body (RBMP ID)	Water Body Type (*designation in italics*)	Current Status, Catchment Data Explorer (*supporting components in italics*)	Supporting Elements, less than Good Status or Potential (*quality elements in italics*)	Issues Preventing the Attainment of Good Status
Sandon Brook GB105037033890.	River water body: *Non Artificial / Heavily Modified Water Body (Non-A/HMWB).*	Moderate status (2016): *Moderate ecological status.* *Good chemical status.*	Ecological: *Macrophytes and phytobenthos combined.* *Phosphate* Chemical: n/a.	Pollution from rural areas Pollution from wastewater. Pollution from towns, cities and transport.
Sandon Brook (east arm) GB1050370 28640.	River water body: *Non-A/HMWB.*	Moderate status (2016): *Moderate ecological status.* *Good chemical status.*	Ecological: *Phosphate.* Chemical: n/a.	Pollution from rural areas. Pollution from towns, cities and transport.
Sandon Brook (west arm) GB105037028630.	River water body: *Non-A/HMWB.*	Moderate status (2016): *Moderate ecological status.* *Good chemical status.*	Ecological: *Macrophytes and phytobenthos combined.* *Fish.* *Phosphate* Chemical: n/a.	Pollution from rural areas Pollution from wastewater. Pollution from towns, cities and transport. Physical modification (barriers to ecological connectivity).

Water Body (RBMP ID)	Water Body Type (*designation in italics*)	Current Status, Catchment Data Explorer (*supporting components in italics*)	Supporting Elements, less than Good Status or Potential (*quality elements in italics*)	Issues Preventing the Attainment of Good Status
Crouch (d/s Wickford) GB105037028550.	River water body: *HMWB.*	Moderate status (2016): *Moderate ecological potential.* *Good chemical status.*	Ecological: *mitigation measures* *Macrophytes and phytobenthos combined.* *Invertebrates* *Phosphate* Chemical: n/a.	Pollution from wastewater. Pollution from towns, cities and transport.
Rettendon Brook GB105037028560.	River water body: *HMWB.*	Moderate status (2016): *Moderate ecological potential.* *Good chemical status.*	Ecological: *Invertebrates* *Dissolved oxygen.* *Phosphate.*	Pollution from rural areas Physical modification. Pollution from towns, cities and transport.
Blackwater GB520503714000.	Transitional water body: *HMWB.*	Moderate status (2016): *Moderate ecological potential.* *Good Chemical status.*	Ecological: *Mitigation measures assessment.* *Invertebrates* *Macroalgae* *Phytoplankton*	No data available.

Water Body (RBMP ID)	Water Body Type (*designation in italics*)	Current Status, Catchment Data Explorer (*supporting components in italics*)	Supporting Elements, less than Good Status or Potential (*quality elements in italics*)	Issues Preventing the Attainment of Good Status
			Dissolved inorganic nitrogen. *Zinc* Chemical: n/a.	
Crouch	Transitional water body: *HMWB.*	Moderate status (2016): *Moderate Ecological Potential.* *Good Chemical status.*	Ecological: *Dissolved Inorganic Nitrogen.*	No data available.
Essex Gravels GB40503G000400.	Groundwater body.	Poor status (2016): *Good Quantitative status.* *Poor Chemical status.*	Quantitative: n/a Chemical: *Chemical DWPA test - fail;* *General chemical test – fail.*	Pollution from rural areas.
North Essex Chalk GB40501G400700.	Groundwater body.	Poor status (2016): *Poor Quantitative status.*	Quantitative: n/a	Pollution from rural areas.

Water Body (RBMP ID)	Water Body Type (*designation in italics*)	Current Status, Catchment Data Explorer (*supporting components in italics*)	Supporting Elements, less than Good Status or Potential (*quality elements in italics*)	Issues Preventing the Attainment of Good Status
		Poor Chemical status.	Chemical: Trend assessment; Chemical DWPA test - fail; General chemical test – fail.	

Water-dependent ecosystems

15.5.100 The international nature designations and water-dependencies on and surrounding the Dengie Peninsula have been described with respect to the main development site. The park and ride facility areas lie to the west of the Dengie Peninsula and to the west of the Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar and SSSI site to the north and Crouch and Roach Estuaries (Mid-Essex Coast Phase 3) Ramsar and SSSI site to the south.

15.5.101 Other nature designations associated within the park and ride facility areas include the following SSSIs:

- Maldon Cutting (TL 841 067) to the west of Maldon; and
- Danbury Common (TL 782 043) and Blake's Wood and Lingwood Common (TL 774 064), to the west of Danbury.

15.5.102 There are also a number of ancient woodlands in the park and ride facility study areas:

- Moorgarden Wood (TL 574 196), Rettendon Shaw (TL 577 196), Pitfield Shaw (TL 575 196) and Scrub Wood (TL 575 197) to the west of South Woodham Ferrers;
- Hazeleigh Hall Wood (TL 583 204) and Parsonage Wood (TL 582 205) to the west of Maldon; and
- Blakes Wood (TL 577 207) and Hall Wood (TL 576 206) to the west of Danbury.

15.5.103 The water dependency of these conservation sites still needs to be ascertained.

Off-site associated development: freight management facilities

Overview

15.5.104 For a description of the regional baseline setting of this associated development please refer to the associated development: off-site highways works section. A summary description of aspects of the more local baseline are presented in the following section.

Topography and watercourses

15.5.105 Both the Rettendon Brook and the River Crouch flow through the study area of the South Woodham Ferrers freight management facility site in an easterly direction, the former in the north and the latter in the south. The divide between the two streams in the centre of the area marks the highest ground with elevations just above 50mAOD. The low points are at the outflow locations at around 10mAOD for the Rettendon Brook and below 1mAOD for the River Crouch.

15.5.106 The study area for the site around Latchingdon features, close to its southern boundary, a surface water divide ranging in height from around 20mAOD to 50mAOD. The majority of the study area drains via the Latchingdon Brook and partly the Mayland Brook to the north towards the Blackwater Estuary. In the south of the divide, water is drained mainly via the Fambridge Wood Brook and the Hydemarsh Brook towards the River Crouch to the south of the study area. The outflow points of rivers discussed above both in the north and the south are close to 0mAOD.

15.5.107 No springs have been identified from the digital OS Vector 10k data within the study areas.

Geology

15.5.108 The entire study area of the South Woodham Ferrers freight management facility site is underlain by the London Clay Formation, with most of the centre covered by the Claygate Member and a small patch of Bagshot Formation above. The area is mostly free of superficial deposits, apart from Head deposits flanking of the tributaries to the Rettendon Brook and the River Crouch. This is accompanied by alluvium in the lower part of the former and by alluvium, Tidal and River Terrace Deposits in the case of the River Crouch.

15.5.109 The study area for the Latchingdon site is entirely underlain by London Clay Formation, with the higher parts of the surface water divide in the south-east showing the uppermost London Clay, namely the Claygate Member. The majority of the study area is drift free, except for Head and alluvium along the streams draining the area. There is some more substantial cover of Tidal Deposits along the middle and lower parts of the Fambridge Wood Brook and the Hydemarsh Brook.

Abstractions and discharges

15.5.110 Abstraction licence and discharge consent details have been requested but not yet received from the Environment Agency for the study areas, although MDC has confirmed that there are no PWSs in the areas. A fuller description of abstractions and discharges will be possible on receipt of the Environment Agency information and further details regarding this element of off-site associated development.

Water quality

15.5.111 Two Environment Agency surface water quality monitoring points fall within the study areas and the details for these are presented in **Table 15.23**. The chemical data obtained will be investigated further as part of the ES.

Table 15.23: Environment Agency surface water quality monitoring points within the freight management facilities study areas

Sampling Point Code	Sampling Point Name	NGR	Sample Type	Date Last Sampled
CE17	River Crouch Battlesbridge.	TQ 77999 94648.	Saline Water - Estuarine Sites - Non-Bathing and Shellfish.	05/01/2016
MW4549	Latchingdon Brook downstream of Latchingdon STW.	TL 88400 01820.	Freshwater – Rivers.	26/03/2019
CE1520	Fenn Creek South of Eyotts Farm	TQ 79870 96470	Saline Water - Estuarine Sites - Non-Bathing/Shellfish	02/07/2019
CE1540	Rettendon Bk.W Arm B1012 Rd.Br.	TQ 79345 97527	Freshwater - Rivers	08/02/2017

15.5.112 There is no Environment Agency groundwater quality data available for the study areas.

Water Framework Directive water body status

15.5.113 The WFD surface water bodies that overlap with the potential freight management facilities study areas are the Crouch (downstream of Wickford), Rettendon Brook, Sandon Brook (east arm), Sandon Brook (west arm), Crouch transitional (estuarine) and the Dengie Peninsula non-reportable water bodies. Underlying the freight management facilities are the Essex Gravels and North Essex Chalk groundwater bodies. Information regarding these WFD water bodies is provided in **Table 15.24** and **Figure 15.5**.

Table 15.24: WFD water bodies for the freight management facilities study areas

Water Body (RBMP ID)	**Water Body Type (*designation in italics*)**	**Current Status, Catchment Data Explorer (*supporting components in italics*)**	**Supporting Elements, less than Good Status or Potential (*quality elements in italics*)**	**Issues Preventing the Attainment of Good Status**
Crouch (d/s Wickford) GB105037028550.	River water body: *HMWB.*	Moderate status (2016): *Moderate ecological potential.* *Good chemical status.*	Ecological: *mitigation measures* *Macrophytes and phytobenthos combined.* *Invertebrates* *Phosphate* Chemical: n/a.	Pollution from wastewater. Pollution from towns, cities and transport.
Rettendon Brook GB105037028560.	River water body: *HMWB.*	Moderate status (2016): *Moderate ecological potential.* *Good chemical status.*	Ecological: *Invertebrates* *Dissolved oxygen.* *Phosphate.*	Pollution from rural areas Physical modification. Pollution from towns, cities and transport.

Water Body (RBMP ID)	Water Body Type (*designation in italics*)	Current Status, Catchment Data Explorer (*supporting components in italics*)	Supporting Elements, less than Good Status or Potential (*quality elements in italics*)	Issues Preventing the Attainment of Good Status
Sandon Brook (east arm) GB1050370 28640.	River water body: *Non-A/HMWB.*	Moderate status (2016): *Moderate ecological status.* *Good chemical status.*	Ecological: *Phosphate.* Chemical: n/a.	Pollution from rural areas. Pollution from towns, cities and transport.
Sandon Brook (west arm) GB105037028630.	River water body: *Non-A/HMWB.*	Moderate status (2016): *Moderate ecological status.* *Good chemical status.*	Ecological: *Macrophytes and phytobenthos combined.* *Fish.* *Phosphate* Chemical: n/a.	Pollution from rural areas Pollution from wastewater. Pollution from towns, cities and transport. Physical modification (barriers to ecological connectivity).
Crouch	Transitional water body: *HMWB.*	Moderate status (2016): *Moderate Ecological Potential.* *Good Chemical status.*	Ecological: *Dissolved Inorganic Nitrogen.*	No data available.
Essex Gravels	Groundwater body.	Poor status (2016):	Quantitative:	Pollution from rural areas.

Water Body (RBMP ID)	Water Body Type (*designation in italics*)	Current Status, Catchment Data Explorer (*supporting components in italics*)	Supporting Elements, less than Good Status or Potential (*quality elements in italics*)	Issues Preventing the Attainment of Good Status
GB40503G000400.		*Good Quantitative status.* *Poor Chemical status.*	n/a Chemical: *Chemical DWPA test - fail;* *General chemical test – fail.*	
North Essex Chalk GB40501G400700.	Groundwater body.	Poor status (2016): *Poor Quantitative status.* *Poor Chemical status.*	Quantitative: n/a Chemical: Trend assessment; Chemical DWPA test - fail; General chemical test – fail.	Pollution from rural areas.

Water-dependent ecosystems

15.5.114 The international nature designations and water-dependencies on and surrounding the Dengie Peninsula have been described with respect to the main development site. The freight management areas overlap marginally in the north-east with the southern fringe of the Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar and SSSI site and also in the south with the most western and northern parts of the Crouch and Roach Estuaries (Mid-Essex Coast Phase 3) Ramsar site and SSSI. No other nature designations lie within the study areas.

Off-site associated development: project-provided accommodation, off-site Power Station Facilities and potential borrow pit

15.5.115 For these components of the Project, details of the baseline will be provided following further design refinement and consultation.

Future baseline

Climate change

15.5.116 As a result of climate change, it is projected that winters will become generally wetter and summers generally drier. This is demonstrated in **Table 15.25**, which provides estimates from UK Climate Projections (UKCP18) of likely change in temperature and rainfall for Eastern England, under a range of emissions scenarios (unlike **Table 12.8** in **Chapter 12: Climate Change**, which provides high emissions projections for the relevant 25km^2 grid square). Changes in rainfall and temperature will result in changes to the magnitude and distribution of river flows and groundwater recharge and subsequently the water resources available for use and for the water environment.

Table 15.25: Climate change projections for Eastern England

Parameter	Potential Change Anticipated for 2020-2039*	Potential Change Anticipated for 2040-2059*	Potential Change Anticipated for 2070-2089*
Changes to winter mean temperature ºC+.			
Low emissions (RCP2.6).	0.9	1.1	1.2
Medium emissions (RCP4.5).	0.8	1.3	1.9
High emissions (RCP8.5).	0.9	1.7	3.0
Changes to summer mean temperature ºC.			
Low emissions.	1.3	1.8	1.9
Medium emissions.	1.1	1.8	2.8
High emissions.	1.2	2.3	4.4
Changes to winter mean precipitation %.			
Low emissions.	5	7	9
Medium emissions.	5	6	13
High emissions.	6	6	20
Changes to summer mean precipitation %.			
Low emissions.	-9	-15	-15
Medium emissions.	-7	-15	-20
High emissions.	-9	-19	-31

Table Notes:

** Central estimates.*

+(50th percentile change).

15.5.117 It is also likely that peak rainfall intensities could increase, and that the magnitude of flood events along with the probability of the existing flood defences failing could also increase as a consequence. The Environment Agency's 'Guidance: Flood risk assessments: climate change allowances' report (Ref. 15.48) provides guidance on the potential future increases in river flood flows and extreme rainfall intensity to guide flood management scheme design, as shown in **Table 15.26**. The Environment Agency guidance is provided on a region scale and for the range of emissions scenarios which explains why the climate change predictions in **Table 15.25** rather than **Table 12.8** are referenced in this chapter.

Table 15.26: Climate change allowances for Anglian Region

Parameter	Total Potential Change Anticipated for the '2020s' (2015 to 2039)	Total Potential Change Anticipated for the '2050s' (2040 to 2069)	Total Potential Change Anticipated for the '2080s' (2070 to 2115)
Changes to peak river flow allowances by river basin district (use 1961 to 1990 baseline).			
Upper end estimate.	25%	35%	65%
Higher Central Estimate.	15%	20%	35%
Central estimate.	10%	15%	25%
Change to peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline) *.			
Upper end estimate.	10%	20%	40%
Central estimate.	5%	10%	20%
Table Notes: *Applies across all of England.*			

Land use change

15.5.118 Changing land use can affect the permeability of the ground, which in turn can alter rates of surface water runoff and infiltration.

15.5.119 The MDC Local Development Plan has a Strategic Objective to focus strategic development growth in the Maldon and Heybridge Strategic (Policy S5) and Burnham-on-Crouch (Policy S6). Development in these centres is likely to be limited to ensuring local services are retained and to providing limited affordable housing to meet local needs within the physical limits of the area. The plan notes that Bradwell-on-Sea (including the Bradwell Waterside), Dengie and Asheldham are historic settlements. In the absence of the Project it is not likely that there will be significant changes to the generally rural local setting of several scattered dwellings and hamlets.

15.5.120 Changes to the existing Bradwell power station as a result of future decommissioning will not be considered as the site is expected to remain in Care and Maintenance until 2080.

WFD change

15.5.121 Given the current Moderate ecological status of the WFD surface water bodies on the Dengie Peninsula, it is likely that future status will improve, ultimately to one of Good status, as required by the WFD. Whereas it is appropriate to assess construction-related effects which may arise from the Project against the existing baseline water environment, potential operational effects could take account of a future baseline environment that assumes Good ecological status will be attained during the operational lifetime of the Project (the RBMP target is to achieve Good status in the water bodies by 2027). Similarly, it is expected that the two WFD groundwater bodies will attain both Good quantitative and chemical status by 2027.

Changes to abstraction

15.5.122 The Essex ALS indicates that for the Dengie area there is no water available for surface water abstraction and that there is restricted water available for licensing within the catchment. Future climate change could exacerbate water supply pressures in the area. In addition, restrictions with respect to groundwater abstraction where the aquifer provides baseflow may also apply.

Planned further surveys and studies

15.5.123 A number of additional surveys and studies are planned to further inform the ES, as indicated in **Table 15.27** and in the SMP (see **Appendix 15A**). Some have recently been completed.

Table 15.27: Planned further surveys and studies

Further Surveys and Studies	Proposed Date
Main development site Load Test GI comprises 6 trial pits, 17 cone penetration test holes, 13 shallow boreholes and 2 deep boreholes with installations.	April to May 2020.
The GI is to be followed by 3 rounds of weekly groundwater sampling to obtain water quality samples from the shallow and deep installations, this will include water level, full chemistry and also some radiological analysis.	May to June 2020.
Main development site EIA investigations (currently at scoping stage) comprises 60 shallow boreholes all with monitoring installations, 21 trial pits and pump tests (slug tests) in a select number of boreholes and constant rate pumping test in a single array of boreholes within the footprint of the proposed main power block. Cone penetration test (CPT) and rotary and sonic holes also scoped for geotechnical purposes (it is not proposed that these will be monitored or sampled).	2021
12-month monitoring programme comprises monthly groundwater level dips of EIA boreholes, monthly surface water monitoring and water quality sampling (8 locations near groundwater installations for comparison), and quarterly groundwater quality monitoring of EIA boreholes.	2021 - 2022.
Off-site associated development GI to be confirmed.	To be confirmed.

15.5.124 The description of the Project, including indicative site boundaries, presented in the SMP (**Appendix 15A**) reflects the Project status at the point that the SMP was issued to consultees to inform technical engagement held in June 2020, with subsequent updates to take into account workshop feedback and responses from consultees. As the Project progresses, further iterations of the SMP will be required as proposals are refined, in particular, with respect to associated development. The technical scope contained in the SMP remains applicable irrespective of any future boundary changes (should this be required), subject to a review of receptors and spatial scope.

15.6 Proposed Approach to the Assessment

Assessment methodology

Assessment of effects and determining significance

15.6.1 The general approach to assessment of effects and determining significance that will be used for the EIA is provided in **Section 5.4**. However, this section of the chapter sets out how the approach has been applied to Water Environment and where it has been adapted to deal with the specific requirements of Water Environment.

Methodology for assessment of potential effects in the EIA

15.6.2 Detailed methodologies for the assessment of the potential effects have yet to be defined. However, it is envisaged that a range of approaches will be used, ranging from the use of professional judgement based on evaluation of qualitative baseline information, through to detailed quantitative impact assessments based on numerical modelling. Assessment methodologies will be scoped in detail as further baseline data and project design information become available. Relevant consultees will be engaged to ensure confirmation and agreement on assessment methodology and scope throughout the evolving project design process.

Significance evaluation methodology

15.6.3 There is no standard significance assessment methodology employed for freshwater EIA in the UK. Potential effects will therefore be assessed using an approach consistent with that developed by the Institute of Environmental Management and Assessment (2011), as set out here.

15.6.4 The assessment of effects will be carried out such that the significance of effects is evaluated as a product of the sensitivity (value) of the receptor and the magnitude of change associated with effects that are a result of the Project. This evaluation assumes that all mitigation measures identified through the course of the assessment are implemented.

15.6.5 **Table 15.28** provides a summary of the methodology used to classify the value of water environment receptors that could be subject to potential effects. This is based on an assessment of a number of criteria, including the following:

- the spatial scale of the receptor;
- the known environmental condition of the receptor;
- the presence of international or national nature conservations designations (where designations relate specifically to water dependent habitats or interest features); and
- its use for public or private water supply.

15.6.6 The magnitude of change on water environment receptors is independent of the value of the feature. The assessment of such change is proposed to be largely qualitative, and hence reliant on professional judgement, but will be informed by quantitative information and analysis where data are available and where appropriate, for example using a numerical groundwater model to assess certain effects pertaining to the main development site. **Table 15.29** provides examples of how magnitudes of change will be determined with respect to water features.

15.6.7 The significance of effects is derived by considering both the value of the feature and the magnitude of change, as summarised in the matrix presented in **Table 15.30**.

Table 15.28: Summary of value of water features

Value	Criteria	Examples
High	Feature with a high quality or rarity, with little potential for substitution. Water use supporting human health and economic activity at a regional scale.	• Surface or groundwater conditions supporting sites with international conservation designations (SAC, SPA, Ramsar site), where the designation is based specifically on aquatic features. • High or Good overall status WFD water body. • Regionally important public surface water or groundwater supply (and associated catchment or management unit) or permitted discharge.
Medium	Feature with a medium quality or rarity, with a limited potential for substitution. Water use supporting human health and economic activity at a local scale.	• Surface or groundwater conditions supporting a site with a national conservation designation (for example, SSSI, NNR), where the designation is based specifically on aquatic features. • Moderate or lower overall status WFD water body. • Local public surface water and groundwater supply (and associated catchment or management unit) or permitted discharge. • Licensed non-public surface water and groundwater supply abstraction (and associated groundwater catchment) which is relatively large in the context of the available resource, or where raw water quality is a critical issue, for example industrial process water, or permitted discharge.
Low	Feature with a low quality or rarity, with some potential for substitution.	• Conditions supporting a site with a local conservation designation (for example, Local Nature Reserve (LNR), County Wildlife Site (CWS)), where the designation is based specifically on aquatic features, or an

Value	Criteria	Examples
	Water use supporting human health and economic activity at household or individual business scale.	undesignated but highly or moderately water-dependent ecosystem, including a Local Wildlife Site (LWS) and a Groundwater-Dependent Terrestrial Ecosystem (GWDTE). • Licensed non-public surface water and groundwater supply abstraction (and associated catchment or management unit), which is relatively small relative to available resource, or where raw water quality is not critical, for example, cooling water, spray irrigation, mineral washing or permitted discharge. • Unlicensed potable surface water and groundwater abstraction (and associated catchment), for example, private domestic water supply, well, spring or permitted discharge.
Very Low.	Commonplace features with low quality or rarity, with good potential for substitution. Water use does not support human health, and of only limited economic benefit.	• Conditions supporting an undesignated and low water-dependent ecosystem, including a LWS, GWDTE and pond. • Unlicensed non-potable surface water and groundwater abstraction (and associated catchment), for example livestock supply.

Table 15.29: Examples of water environment magnitude of change

Magnitude	Criteria	Examples of Negative Change
High	Major change to feature, of sufficient magnitude to affect its use or integrity.	• Deterioration in river flow regime, morphology or water quality, leading to sustained, permanent or long-term breach of relevant conservation objectives (COs) or non-temporary downgrading (deterioration) of status of WFD surface water body (including downgrading of individual WFD elements) or dependent receptors, or resulting in the inability of the surface water body to attain Good status in line with the measures identified in the RBMP. • Deterioration in groundwater levels, flows or water quality, leading to non-temporary downgrading of status of WFD groundwater body or dependent receptors, or the inability of the groundwater body to attain Good status in line with the measures identified in the RBMP. • Complete or severely reduced water availability and, or quality, compromising the ability of water users to abstract.
Medium	Noticeable change to feature, of sufficient magnitude to affect its use or integrity in some circumstances.	• Deterioration in river flow regime, morphology or water quality, leading to periodic, short-term and reversible breaches of relevant COs, or potential temporary downgrading of status of surface water body status (including potential temporary downgrading of individual WFD elements) or dependent receptors, although not affecting the ability of the surface water body to achieve future WFD objectives. • Deterioration in groundwater levels, flows or water quality, leading to potential temporary downgrading of status of WFD groundwater body or dependent receptors, although not affecting the ability of the groundwater body to achieve future WFD objectives.

Magnitude	Criteria	Examples of Negative Change
		• Moderate reduction in water availability and, or quality, which may compromise the ability of the water user to abstract on a temporary basis or for limited periods, with no longer-term impact on the purpose for which the water is used.
Low	Minor change to feature, with insufficient magnitude to affect its use or integrity in most circumstances.	• Slight change in river flow regime, morphology or water quality, but remaining generally within COs, and with no short-term or permanent change to status of WFD surface water body (of overall status or element status) or dependent receptors. • Slight deterioration in groundwater levels, flows or water quality, but with no short-term or permanent downgrading of status of WFD groundwater body or dependent receptors. • Minor reduction in water availability or quality, but unlikely to affect the ability of a water user to abstract.
Very Low.	Little or no change to feature, with insufficient magnitude to affect its use or integrity.	• No or very slight change in river flow regime or surface water quality, and no consequences in terms of COs or status of WFD surface water body or dependent receptors. • No or very slight change in groundwater levels or groundwater quality, and no consequences in terms of status of WFD groundwater body or dependent receptors. • No or very slight change in water availability or quality and no change in ability of the water user to exercise licenced rights or continue with small private abstraction.

Table 15.30: Derivation of significance of potential effects relating to the water environment

		Magnitude of Change			
		High	**Medium**	**Low**	**Very Low.**
Value	**High**	Major (Significant).	Major (Significant).	Moderate (Significant or Not significant).	Minor (Not significant).
	Medium	Major (Significant).	Moderate (Significant or Not significant).	Minor (Not significant).	Negligible (Not significant).
	Low	Moderate (Significant or Not significant).	Minor (Not significant).	Negligible (Not significant).	Negligible (Not significant).
	Very Low.	Minor (Not significant).	Negligible (Not significant).	Negligible (Not significant).	Negligible (Not significant).

15.7 Scope of the Assessment

Potential receptors

15.7.1 The principal receptors that have been identified as being subject to potential effects are summarised in **Table 15.31**.

Table 15.31: Receptors subject to potential effects

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Main development site.	Construction and Operation	Westwick Farm spring.	Spring in main development site groundwater study area.
Off-site associated development: off-site highways works.	Construction and Operation.	Westwick Farm and Danbury Common springs.	Springs in associated development study areas.
Off-site associated development: park and ride facilities.	Construction and Operation.	Twelve springs (**Table 15.19**).	Springs in associated development study areas.
Off-site associated development: project-provided accommodation.	Construction	Springs, to be confirmed.	TBC.
Off-site associated development: off-site Power Station Facilities.	Construction and Operation.	Springs, to be confirmed.	TBC.
Off-site associated development: potential borrow pit	Construction	TBC.	TBC.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Main development site.	Construction and Operation.	East Hall Farm, two PWSs (**Table 15.10**) and possibly other abstractions.	Licensed surface water abstraction on main development site, Weymarks River, and two PWSs in groundwater study area, with possibility of others. (surface water and groundwater), to be confirmed.
Off-site associated development: off-site highways works.	Construction and Operation.	Bury Farm PWS (**Table 15.16**), and possibly other abstractions.	PWS in associated development study areas, with possibility of others (surface water and groundwater), to be confirmed.
Off-site associated development: park and ride facilities.	Construction and Operation.	Hollylodge, Woodlands and Themanor PWSs (**Table 15.20**), and possibly others.	PWSs in associated development study areas, with possibility of others (surface water and groundwater), to be confirmed.
Off-site associated development: freight management facilities.	Construction and Operation.	No abstractions currently identified, but some possibly present.	Possibility of abstractions (surface water and groundwater) in associated development study areas.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Off-site associated development: project-provided accommodation.	Construction	Abstractions, TBC.	TBC.
Off-site associated development: off-site Power Station Facilities.	Construction and Operation.	Abstractions, TBC.	TBC.
Off-site associated development: potential borrow pit	Construction	Abstractions, TBC.	TBC.
Main development site.	Construction and Operation.	WFD Blackwater transitional (estuarine) and Blackwater Outer coastal water bodies (**Table 15.14**).	Surface water bodies downgradient of the main development site.
Off-site associated development: off-site highways works.	Construction and Operation.	WFD Chelmer, Sandon Brook, Sandon Brook (east arm), Sandon Brook (west arm), Crouch and Rettendon Brook river water bodies and Blackwater and Crouch transitional (estuarine) water bodies (**Table 15.18**).	Surface water bodies within or downgradient of the associated development study areas.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Off-site associated development: park and ride facilities.	Construction and Operation.	WFD Blackwater, Chelmer, Sandon Brook, Sandon Brook (east arm), Sandon Brook (west arm), Crouch and Rettendon Brook river water bodies and Blackwater and Crouch transitional (estuarine) water bodies (**Table 15.22**).	Surface water bodies within or downgradient of the associated development study areas.
Off-site associated development: freight management facilities.	Construction and Operation.	WFD Crouch, Rettendon Brook, Sandon Brook (east arm) and Sandon Brook (west arm) river water bodies and Crouch transitional (estuarine) water bodies (**Table 15.24**).	Surface water bodies within or downgradient of the associated development study areas.
Off-site associated development: project-provided accommodation.	Construction	WFD surface water bodies, TBC.	TBC.
Off-site associated development: off-site Power Station Facilities.	Construction and Operation.	WFD surface water bodies, TBC.	TBC.
Off-site associated development: potential borrow pit.	Construction	WFD surface water bodies, TBC.	TBC.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Main development site and off-site associated development.	Construction and Operation.	Dengie Peninsula non-reportable watercourses.	For example, the principal watercourse at the main development site is the Weymarks River, which has a number of agricultural drainage tributaries.
Main development site and off-site associated development.	Construction and Operation.	WFD Essex Gravels groundwater body (**Tables 15.14**, **15.18**, **15.22** and **15.24**).	Groundwater body beneath the main development site and associated development study areas.
Main development site and off-site associated development.	Construction and Operation.	WFD North Essex Chalk groundwater body (**Tables 15.14**, **15.18**, **15.22** and **15.24**).	Groundwater body beneath the main development site and associated development study areas.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Main development site.	Construction and Operation.	Essex Estuaries SAC, Blackwater Estuary SPA, Ramsar and SSSI, Dengie SPA, Ramsar, SSSI and NNR*, and Sandbeach Meadows SSSI.	The extensive mudflats, saltmarsh and meadows of these areas provide rich foraging for tens of thousands of wintering water birds as well as important breeding habitat and are water-dependent.
Off-site associated development: off-site highways works.	Construction and Operation.	Blackwater Estuary SPA, Ramsar and SSSI, Crouch and Roach Estuaries Ramsar and SSSI, Danbury Common, Blake's Wood and Lingwood Common and Woodham Walter Common SSSIs, and a number of woodlands.	Conservation sites within or downgradient of the associated development study areas.
Off-site associated development: park and ride facilities.	Construction and Operation.	Blackwater Estuary SPA, Ramsar and SSSI, Crouch and Roach Estuaries Ramsar and SSSI, Maldon Cutting, Danbury Common and Blake's Wood and Lingwood Common SSSIs, and a number of woodlands.	Conservation sites within or downgradient of the associated development study areas.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Off-site associated development: freight management facilities.	Construction and Operation.	Blackwater Estuary SPA, Ramsar and SSSI, Crouch and Roach Estuaries Ramsar and SSSI.	Conservation sites within or downgradient of the associated development study areas.
Off-site associated development: project-provided accommodation.	Construction	Designated conservation sites, TBC.	TBC.
Off-site associated development: off-site Power Station Facilities.	Construction and Operation.	Designated conservation sites, TBC.	TBC.
Off-site associated development: potential borrow pit	Construction	Designated conservation sites, TBC.	TBC.

** Note that effects on the marine (estuarine and coastal) receptors are assessed in **Chapter 24: Marine Ecology**. Effects on freshwater ecology receptors are assessed in **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**.*

Likely significant effects

15.7.2 The effects on the water environment which have the potential to be significant and that will be taken forward for assessment in the ES are summarised in **Table 15.32.**

Table 15.32: Likely significant water environment effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site and off-site associated development.	Land preparation (earthworks, excavation) and construction activities.	Mobilisation of existing soil or groundwater contamination.	Westwick Farm, Danbury Common and other springs (**Table 15.19**), possibly others; East Hall Farm, PWSs (**Tables 15.10, 15.16** and **15.20**) and possibly other abstractions; WFD surface water bodies (**Tables 15.14**, **15.18**, **15.22** and **15.24**); Dengie Peninsula non-reportable watercourses; WFD Essex Gravels groundwater body (**Tables 15.14**, **15.18**, **15.22** and **15.24**); WFD North Essex Chalk groundwater body (**Tables 15.14**, **15.18**, **15.22** and **15.24**); and Essex Estuaries SAC, Dengie SPA and Ramsar, Blackwater Estuary SPA and Ramsar, SSSIs and NNRs and other designated conservation sites.
Main development site and off-site associated development.	Land preparation (earthworks, excavation) and construction activities.	Alterations to water quality as a result of sediment-laden runoff.	East Hall Farm, PWSs (**Tables 15.10, 15.16** and **15.20**) and possibly other abstractions; WFD surface water bodies (**Tables 15.14**, **15.18**, **15.22** and **15.24**); Dengie Peninsula non-reportable watercourses; and Essex Estuaries SAC, Dengie SPA and Ramsar, Blackwater Estuary SPA and Ramsar, SSSIs and NNRs and other designated conservation sites.

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site and off-site associated development.	Land preparation (earthworks, excavation) and construction activities.	Residual or accidental pollution associated with construction plant.	Westwick Farm, Danbury Common and other springs (**Table 15.19**), possibly others; East Hall Farm, PWSs (**Tables 15.10, 15.16** and **15.20**) and possibly other abstractions; WFD surface water bodies (**Tables 15.14**, **15.18**, **15.22** and **15.24**); Dengie Peninsula non-reportable watercourses; WFD Essex Gravels groundwater body (**Tables 15.14**, **15.18**, **15.22** and **15.24**); WFD North Essex Chalk groundwater body (**Tables 15.14**, **15.18**, **15.22** and **15.24**); and Essex Estuaries SAC, Dengie SPA and Ramsar, Blackwater Estuary SPA and Ramsar, SSSIs and NNRs and other designated conservation sites.
Main development site and off-site associated development.	Land preparation (earthworks, excavation) and construction activities.	Temporary morphological and sediment transport impacts associated with construction of watercourse crossings.	East Hall Farm, PWSs (**Tables 15.10, 15.16** and **15.20**) and possibly other abstractions; WFD surface water bodies (**Tables 15.14**, **15.18**, **15.22** and **15.24**); Dengie Peninsula non-reportable watercourses; and Essex Estuaries SAC, Dengie SPA and Ramsar, Blackwater Estuary SPA and Ramsar, SSSIs and NNRs and other designated conservation sites.
Main development site and off-site associated development.	Temporary change in land use during land preparation and construction.	Alteration of recharge, groundwater flow and baseflow regime due to changes in topography and land use.	Westwick Farm, Danbury Common and other springs (**Table 15.19**), possibly others; East Hall Farm, PWSs (**Tables 15.10, 15.16** and **15.20**) and possibly other abstractions; WFD surface water bodies (**Tables 15.14**, **15.18**, **15.22** and **15.24**); Dengie Peninsula

Element of the Project	Activity	Effect	Receptor or Receptor Group
			non-reportable watercourses; WFD Essex Gravels groundwater body (**Tables 15.14**, **15.18**, **15.22** and **15.24**); WFD North Essex Chalk groundwater body (**Tables 15.14**, **15.18**, **15.22** and **15.24**); and Essex Estuaries SAC, Dengie SPA and Ramsar, Blackwater Estuary SPA and Ramsar, SSSIs and NNRs and other designated conservation sites.
Main development site and off-site associated development.	Groundwater dewatering.	Alteration of recharge, groundwater flow and baseflow regime due to construction dewatering.	Westwick Farm, Danbury Common and other springs (**Table 15.19**), possibly others; East Hall Farm, PWSs (**Tables 15.10, 15.16** and **15.20**) and possibly other abstractions; WFD surface water bodies (**Tables 15.14**, **15.18**, **15.22** and **15.24**); Dengie Peninsula non-reportable watercourses; WFD Essex Gravels groundwater body (**Tables 15.14**, **15.18**, **15.22** and **15.24**); WFD North Essex Chalk groundwater body (**Tables 15.14**, **15.18**, **15.22** and **15.24**); and Essex Estuaries SAC, Dengie SPA and Ramsar, Blackwater Estuary SPA and Ramsar, SSSIs and NNRs and other designated conservation sites.
Main development site.	Groundwater dewatering.	Intrusion of saline groundwater.	Westwick Farm and possibly other springs; East Hall Farm, PWSs (**Table 15.10**) and possibly other abstractions; WFD surface water bodies (**Tables 15.14**, **15.18**, **15.22** and **15.24**); Dengie Peninsula non-reportable watercourses; WFD Essex Gravels

Element of the Project	Activity	Effect	Receptor or Receptor Group
			groundwater body (**Tables 15.14**, **15.18**, **15.22** and **15.24**); WFD North Essex Chalk groundwater body (**Tables 15.14**, **15.18**, **15.22** and **15.24**); and Essex Estuaries SAC, Dengie SPA and Ramsar, Blackwater Estuary SPA and Ramsar, SSSIs and NNRs and other designated conservation sites.
Main development site and off-site associated development.	Permanent change in land use.	Permanent and irreversible removal of features and morphology (riverine habitat).	East Hall Farm, PWSs (**Tables 15.10, 15.16** and **15.20**) and possibly other abstractions; WFD surface water bodies (**Tables 15.14**, **15.18**, **15.22** and **15.24**); Dengie Peninsula non-reportable watercourses; and Essex Estuaries SAC, Dengie SPA and Ramsar, Blackwater Estuary SPA and Ramsar, SSSIs and NNRs and other designated conservation sites.
Main development site and off-site associated development.	Permanent change in land use.	Permanent alteration of morphology (riverine habitat) associated with the requirement for any new, permanent watercourse crossings.	East Hall Farm, PWSs (**Tables 15.10, 15.16** and **15.20**) and possibly other abstractions; WFD surface water bodies (**Tables 15.14**, **15.18**, **15.22** and **15.24**); Dengie Peninsula non-reportable watercourses; and Essex Estuaries SAC, Dengie SPA and Ramsar, Blackwater Estuary SPA and Ramsar, SSSIs and NNRs and other designated conservation sites.
Main development site and off-site associated development.	Placement of permanent below	Alteration of recharge, groundwater flow and baseflow regime due to	Westwick Farm, Danbury Common and other springs (**Table 15.19**), possibly others; East Hall Farm, PWSs (**Tables 15.10, 15.16** and **15.20**) and possibly other

Element of the Project	Activity	Effect	Receptor or Receptor Group
	ground infrastructure.	changes in topography and land use.	abstractions; WFD surface water bodies (**Tables 15.14**, **15.18**, **15.22** and **15.24**); Dengie Peninsula non-reportable watercourses; WFD Essex Gravels groundwater body (**Tables 15.14**, **15.18**, **15.22** and **15.24**); WFD North Essex Chalk groundwater body (**Tables 15.14**, **15.18**, **15.22** and **15.24**); and Essex Estuaries SAC, Dengie SPA and Ramsar, Blackwater Estuary SPA and Ramsar, SSSIs and NNRs and other designated conservation sites.
Main development site and off-site associated development.	Site operation and maintenance.	Residual or accidental pollution.	Westwick Farm, Danbury Common and other springs (**Table 15.19**), possibly others; East Hall Farm, PWSs (**Tables 15.10, 15.16** and **15.20**) and possibly other abstractions; WFD surface water bodies (**Tables 15.14**, **15.18**, **15.22** and **15.24**); Dengie Peninsula non-reportable watercourses; WFD Essex Gravels groundwater body (**Tables 15.14**, **15.18**, **15.22** and **15.24**); WFD North Essex Chalk groundwater body (**Tables 15.14**, **15.18**, **15.22** and **15.24**); and Essex Estuaries SAC, Dengie SPA and Ramsar, Blackwater Estuary SPA and Ramsar, SSSIs and NNRs and other designated conservation sites.

15.8 Potential Mitigation

15.8.1 Mitigation measures will be developed and embedded into the design and implementation proposals for the Project, relating to the main development site and off-site associated development sites, as required.

15.8.2 Embedded mitigation measures within the design with respect to watercourses include retaining watercourses where possible and incorporating green buffers on both banks, and the provision of new watercourses on compensatory land as necessary. To ensure healthy flow and water quality, catchment disruption and loss will be minimised in the design and mitigated where unavoidable by appropriate drainage management systems. The design will also incorporate SuDS and Water Management Zones, and the consideration of environmental opportunities for improving water resources and water quality.

15.8.3 Embedded mitigation that will be employed as part of the construction phase will incorporate standard best practice working methods and will include sediment control measures, timing in-channel works to coincide with low flow conditions, installation of silt fencing, adoption of buffer zones, and placement of sub-surface diaphragm walls where required.

15.8.4 The development and implementation of a CoCP will take account of best practice methods. For example, surface water discharge will be managed so it does not exceed the predetermined greenfield rates in accordance with relevant guidance.

15.8.5 An Emergency and Incident Response Plan will form part of the CoCP and will reduce the impact of spills and leaks. A programme of groundwater level and quality monitoring of key receptors will be undertaken to observe effect and trigger additional mitigation.

15.9 Assumptions and Limitations

15.9.1 The scope of the assessment is based on a high-level review of limited desk-based baseline information and will be confirmed through review of additional data sources, GI and consultation with relevant stakeholders.

15.9.2 A numerical groundwater model will be developed to undertake predictive with-mitigation assessment and will be first calibrated against the expanded baseline. The model will be supplemented where necessary by appropriate, simpler analytical models to resolve key questions.

15.9.3 It is assumed that mitigation will be undertaken in accordance with best practice and that necessary Environmental Permits will be obtained for relevant activities during both the construction and operational phase of the Project.

15.9.4 A detailed CoCP will be developed to address bespoke measures required to manage the sources and pathways of potential effects to the receptors identified in this scoping report chapter, with respect to, for example, water quality and pollution effects.

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16. FLOOD RISK AND DRAINAGE

16.1 Introduction

16.1.1 This chapter sets out the approach for determining the scope of assessment flood risk and drainage. It presents the proposed scope of the assessment for the main development site, off-site Power Station Facilities and off-site associated development. **Chapter 5: The EIA Process and Methods** introduces the overall Environmental Impact Assessment (EIA) process including the methodology for assessing affects and determining significance. The topic specific methodology for determining receptor value, sensitivity and impact magnitude for flood risk and drainage is provided in **Section 16.6**. The chapter contains:

- a summary of work undertaken to date;
- an explanation of the scope of assessment, including:
  - legislation, policy and guidance that inform the assessment;
  - a description of consultation and engagement so far relevant to flood risk and drainage;
  - study area for the assessment;
  - sources of data used in scoping;
  - baseline conditions, including current desk studies and surveys;
  - planned further surveys and studies;
- the receptors that are proposed to be assessed and the effects which have the potential to be significant;
- the effects that are proposed can be scoped out of the assessment; and
- potential mitigation.

16.1.2 The chapter should be read in conjunction with the project description provided in **Chapter 3: The Project** and the standalone Flood Risk Scoping Study Report (Ref. 16.1).

16.2 Work undertaken to date

16.2.1 To date two desk-based studies have been undertaken for the Project which can be used to inform the baseline understanding of flood risk in the locality of the main development site. These studies comprise:

- Coastal flood risk analysis and preliminary platform level (other information available):

- this study involved broadscale coastal flood risk modelling, including breach modelling, for a range of events up to the 0.01% Annual Exceedance Probability (AEP) with the aim of developing an initial understanding of the nature of the marine flood hazard for the purposes of informing early design iteration of the main development site.

- Flood Risk Scoping Report:

  - This report outlines the proposed scope of the Flood Risk Assessment (FRA) and associated modelling that will be undertaken to inform the EIA and nuclear safety assessments. It details the program of hydrological modelling and hydraulic modelling of coastal and pluvial sources of flood risk. To date the Project has considered layout, construction phasing, and mitigation with relation to flood risk and drainage management to understand the initial opportunities and constraints which apply to the main development site. Appraisal of these considerations has directly influenced the Project design (refer to **Chapter 4: Alternatives**). **Chapter 3: The Project** provides further information regarding the Project design.

16.3 Legislation, Policy and Technical Guidance

16.3.1 This section identifies the relevant legislation, national and local policy and guidance which has informed the scope of the assessment relevant to flood risk and drainage. Further information on policies relevant to the EIA and their status is set out in **Chapter 2**: **Policy and Regulatory Context**, which should be read in conjunction with this chapter.

16.3.2 The legislation and policy relevant to flood risk and drainage are detailed in **Table 16.1.**

Table 16.1: Legislation and policy

Relevant Legislation and Policy	Relevance to the Assessment
Legislation	
European Union (EU) Water Framework Directive (WFD (Ref. 16.2).	Focuses on delivering an integrated approach to the protection and sustainable use of the water environment on a river basin scale. Of relevance to drainage in terms of water quality and integrity of existing waterbodies.
Environmental Permitting (England and Wales) Regulations 2010 (Statutory Instrument (SI) 2010 No. 676), as amended (Ref. 16.3).	Details provision for Flood Risk Activities Permits (FRAPs). Further relevance to surface water and drainage design if any infiltration to ground is proposed. The regulations include requirements for the prevention of hazardous substances entering groundwater and the control of non-hazardous pollutants to avoid pollution of groundwater.
Water Resources Act 1991 (Ref. 16.4).	Of relevance to drainage design. States that it is an offence to cause or knowingly permit polluting, noxious, poisonous or any solid waste matter to enter controlled waters. The Act was revised by the Water Act (2003), which sets out regulatory controls for water abstraction, discharge to water bodies, water impoundment and protection of water resources.
The Land Drainage Act 1991 (Ref. 16.5) and 1994 (Ref. 16.6).	Places responsibility for maintaining flows in watercourses on landowners and gives Local Authorities powers to serve a notice on landowners to ensure works are carried out to maintain flow of watercourses.

Relevant Legislation and Policy	Relevance to the Assessment
Flood and Water Management Act 2010 (Ref. 16.7).	Sets out the Government's proposals to improve flood risk management (building on the 2009 Flood Risk Regulations), and also covers approaches to water quality and to ensure water supplies are more secure.
National Policy	
National Planning Policy Framework (NPPF) (Ref. 16.8).	The NPPF sets out the Government's planning policies for England and how these are expected to be applied. NPPF makes it clear that it does not contain specific policies for Nationally Significant Infrastructure Projects (NSIPs) for which particular considerations apply. The NPPF covers climate change, flooding and coastal change. In summary, the NPPF aims to ensure that inappropriate development in areas at risk of flooding is avoided, but that where development in such areas is necessary, the design of the development should make them safe and not increase flood risk elsewhere. Where possible, new development should be used as an opportunity to reduce the causes and impacts of flooding.
National Policy Statement for Energy (EN-1) (Ref 16.9).	Sets out the requirements for new nationally significant energy infrastructure must fulfil. Most are in line with national planning policy with some additional key requirements including: • An FRA should consider and quantify the different types of flooding (whether from natural and human sources and including joint and cumulative effects) and identify flood risk reduction measures; • The effects of a range of flooding events including extreme events on people, property, the natural and historic environment and river and coastal processes should be considered;

Relevant Legislation and Policy	Relevance to the Assessment
	• Where energy infrastructure has safety critical elements, the applicant should apply the high emissions scenario to those elements[1]; and • Consideration should also be given to how the ability of water to soak into the ground may change with development, along with how the proposed layout of the project may affect drainage systems.
National Policy Statement for Nuclear Power Generation (EN-6) (Ref 16.10).	Recognises that as nuclear power stations need access to cooling water, they are most likely to be developed on coastal or estuarine sites, and therefore may be at greater risk of flooding than if they were located inland. The potential effects of climate change may increase these risks further. Sets out additional requirements of an FRA with respect to new nuclear power station stations: • Identify the potential effects of the credible maximum scenario (as derived from the most recent climate projections) and demonstrate that in principle adaptation would be possible; • Demonstrate that further measures for flood management could be achieved at the site in the future if future climate change predictions show they are necessary; and • Site safety and operational critical installations in the areas of the site at least risk of flooding, where possible.

[1] This is potentially at conflict with the ONR (2014b) guidance which suggests the use of the most pessimistic scenario would be seen as too conservative from a current perspective; but recommends a conservative choice is adopted, although not necessarily the most conservative.

Relevant Legislation and Policy	Relevance to the Assessment
Local Policy	
Maldon District Council (MDC) Local Development Plan (2017) (Ref. 16.11).	The Local Development Plan sets out the planning strategy for future growth and sustainable development over the next 15 years. It contains a number of development management policies. Policy D4 and D5 are relevant for this development. Policy D4 covers Renewable and Low Carbon Energy Generation, which includes the principle of developing a new nuclear power station at Bradwell-on-Sea. Policy D5 relates to Flood Risk and Coastal Management. The policy aims to direct strategic growth towards lower flood risk areas and minimise flood risk.
MDC Strategic Flood Risk Assessment (2008) (Ref. 16.12).	A strategic flood risk assessment was developed as part of the evidence base to support the MDC Local Development Plan. The strategic flood risk assessment contains information on flood risk in the area from all sources, as well as recommendations for future development, local policy, and sustainable drainage including: • Steering development towards area of lowest risk, ensuring that development is permissible in areas at risk only in exceptional circumstances, where there are no reasonably available sites in areas of lower risk and the benefits of the development outweigh the risks of flooding. • Promoting use of Sustainable Drainage Systems (SuDS) (where possible) for the management of surface water runoff generated from developments. Runoff rates should not increase following redevelopment. Notably the flood risk assessment included an assessment of residual flood risk through a breach modelling assessment, including the Dengie Peninsula.

Relevant Legislation and Policy	Relevance to the Assessment
Chelmsford City Council (CCC) Local Plan (2020) (Ref. 16.13).	The Local Development Plan sets out the planning strategy for future growth and sustainable development up to 2036. It contains a number of development management policies. Policy S2 and DM18 are relevant to the Project. Strategic Policy S2 – Climate Change and Flood Risk. CCC is seeking a move to a lower carbon future as such this policy seeks to encourage new development that supports this aim. This includes encouraging design and construction techniques which contribute to climate change mitigation and adaptation, and which minimise impact on flooding. Local Policy DM18 – Flooding and SuDS This policy seeks to ensure all development will be safe, taking into account the expected life span of the development and all types of flooding. It also seeks to identify, secure and implement appropriate mitigation measures thus ensuring flood risk is not worsened elsewhere. The policy also intends to ensure that major development will incorporate multi-functional SuDS to reduce surface water run-off and ensure that it does not increase flood risk elsewhere.
CCC Strategic Flood Risk Assessment (2018) (Ref. 16.14).	A strategic flood risk assessment (SFRA) was developed as part of the evidence base to support the CCC Local Development Plan. The SFRA indicates that the principal source of flood risk is from fluvial sources associated with the River Chelmer and its tributaries, the City of Chelmsford benefits from fluvial flood defences. South Woodham Ferrers is shown to be at risk of tidal flooding but is also noted to benefit from tidal flood defences. Pluvial flood risk is generally limited to overland flow routes along topographical flow paths or existing transport routes.

Relevant Legislation and Policy	Relevance to the Assessment
Essex County Council (ECC) Local Flood Risk Management Strategy (2018) (Ref. 16.15).	Builds on the Pluvial Flood Risk Assessment (PFRA) to identify actions for key flooding hotspots where ECC as the Lead Local Flood Authority (LLFA) has responsibility. The document outlines the seven measures for local flood risk management in Essex County: • Investigating floods; • Mapping local routes for water; • Looking after watercourses; • Planning for future floods; • Influencing new development and drainage – promoting use of SuDS to lessen the risk of increased surface water flooding; • Building new flood defences; and • Community flood improvement fund and property level resilience.
Anglian River Basin District Flood Risk Management Plan (2015) (Ref. 16.16).	River Basin District Flood Risk Management Plan (FRMP) outline how flood risk management authorities will manage flood risk over 6 years (2015 to 2021). The Anglian river basin district contains 11 catchments. Bradwell falls within the 'Combined Essex' catchment.

Relevant Legislation and Policy	Relevance to the Assessment
Catchment Flood Management Plans (Ref. 16.17).	Catchment Flood Management Plans (CFMP) outline the policy aims for effectively managing flood risk across England in the future. A CFMP was created for each river basin district in the UK. The main development site and off-site associated development locations span the boundary of two CFMPs – North Essex and South Essex. It falls within Sub-area 1 (Blackwater and Chelmer, Upper Reaches and Coastal Streams) in North Essex and Sub-area 3 (Rural Dengie Tidal and Northern Crouch catchment). Both these sub areas have been assigned Policy Option 2. Policy Option 2 covers areas of low to moderate flood risk where it is considered existing flood risk management actions could be reduced. This policy will tend to be applied where the overall level of risk to people and property is low to moderate. It may no longer be value for money to focus on continuing current levels of maintenance of banks, channels and flood defences. In addition, the policy seeks to investigate changes in land use, development of sustainable farming practices and environmental enhancement to mitigate an increase in flooding in the future. Inappropriate development in the floodplain in a Policy 2 area should be prevented, and any new development should be resilient to flooding and provide opportunities to improve river environments.
Essex and South Suffolk Shoreline Management Plan 2 (2010) (Ref. 16.18).	MDC is part of the East Anglia Coastal Group and is covered by the Essex and South Suffolk Shoreline Management Plan 2 (SMP2). The SMP divides the area into Management Units, of which Management Units F and G are the Blackwater Estuary and Dengie Peninsula, which cover the main development site and off-site associated developments. The current preferred future management policy for the coastline surrounding the main development site is 'hold the line' suggesting the coastal defences will continue to be maintained into the future to protect this area against the impacts of sea level rise and coastal erosion and flooding.

Technical guidance

16.3.3 Technical guidance that has been used to define the assessment is set out in **Table 16.2**.

Table 16.2: Relevant technical guidance

Guidance Reference	Implications
Planning Practice Guidance (Ref. 16.19).	The NPPF is supported by the Planning Practice Guidance online resource. Extensive guidance is provided on flood risk and coastal change. In particular, it provides definitions for Flood Zones, guidance on the flood risk vulnerability for different development types, on the appropriateness of different types of development in different Flood Zones, on requirements for the Sequential and Exception Tests, and on requirements for site-specific FRAs. The Sequential Test is designed to ensure new development is steered towards areas at low or no risk of flooding in preference to areas of high risk. The Exception Test is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, requiring a development proposal to show that it will provide wider sustainability benefits to the community that outweigh the flood risk, and that it will be safe for its lifetime.
Sustainable Drainage Systems – House of Commons: Written Statement (HCWS161) (2014) (Ref. 16.20).	The Government's Planning Guidance website advises that the NPPF should be read alongside other national planning policies, including the House of Commons Written Statement on Sustainable Drainage Systems. This written statement makes clear the Government's expectation that sustainable drainage systems will be provided in new developments wherever this is appropriate. This expectation applies to planning applications for all developments of 10 homes or more and to major commercial development.
Flood risk assessments: climate change allowances (2016) (Ref. 16.21).	Climate change allowances for flood risk assessments have been published by the Environment Agency. This advice updates previous climate change allowances to support NPPF. The Environment Agency has produced it as the Government's expert on flood risk. These allowances will be the primary source of climate change allowances considered in the FRA.
Principles for Flood and Coastal Erosion Risk Management – Joint	This joint advice note, prepared by the Office for Nuclear Regulation (ONR) and the Environment Agency, provides advice on how flood and coastal erosion risk issues are to be

Guidance Reference	Implications
Advice Note (2017) (Ref. 16.22).	taken into account when they are considering proposals for nuclear new-build developments. It makes clear the expectations of the Environment Agency and the ONR in respect of flood and coastal risk management and provides a basis for regulatory decision making and advice under their statutory consultee role in the planning process to Local Planning Authorities and the Planning Inspectorate. These 'principles' cover both planning submissions and flood risk assessments (which are the primary concern of the Environment Agency), as well as nuclear safety case(s) (which are the primary concern of the ONR). Of particular relevance are: Principle 3, which sets out the expectations of a fit for purpose flood risk assessment; Appendix A, which includes definitions including development lifetimes; Appendix C which covers climate change and managed adaption; and Appendix D, which provides advice on the flood scenarios to be considered for Development Consent Order (DCO) FRA and nuclear safety case purposes respectively.
C692: Environmental good practice on site (2012) (Ref. 16.23).	Provides guidance on the use of drainage and SuDS to manage construction site runoff and runoff from landscaping and screening areas. Guidance includes: • Where sufficient ground is available, the use of wetlands in combination with settlement ponds to treat runoff is recommended. • A recommendation to construct SuDS measures at the start of construction phases and to retain them as permanent features following a cleanout at the final phase of construction. • Management of surface runoff and use of SuDS should be used to contain and treat runoff on site to protect waters including coastal water up to 3 miles offshore.
C753: The SuDS Manual (2015) (Ref. 16.24).	Provides guidance on the planning, design, construction and maintenance of SuDS. It examines approaches to maximise amenity and biodiversity benefits and deliver the key objectives of managing flood risk and water quality.
C698: Site handbook for the construction of SUDS (2007) (Ref. 16.25).	Provides guidance for the implementation of SuDS and drainage systems – particularly during development construction stages.

Guidance Reference	Implications
C624: Development and flood risk – guidance for the construction industry (2004) (Ref. 16.26).	Provides detailed guidance on the assessment of flood risk from all sources, including flood defence, tidelocking and floodplain compensation.
C635: Designing for exceedance in urban drainage - good practice (2006) (Ref. 16.27).	This guidance aims to provide best practice advice to reduce the impacts that arise when drainage systems exceed their capacity.
Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems (2015) (Ref. 16.28).	This guidance provides technical standards for the design, maintenance and operation of sustainable drainage systems.
Sewers for Adoption - A Design and Construction Guide for Developers: 8th Edition (2018) (Ref. 16.29).	This guide provides detailed guidance on the design of adoptable surface water sewers and pumping stations.
SuDS Design Guide (2016) (Ref. 16.30).	The SuDS guide aims to demonstrate how new developments can accommodate SuDS, the standards expected of any new SuDS scheme and advice on how SuDS should be maintained.

16.4 Consultation and Engagement

16.4.1 This chapter has been informed by engagement and discussion with various stakeholders. **Table 16.3** details technical engagement to date which has occurred in advance of formal statutory consultation.

Table 16.3: Technical engagement

Consultee	Points of Discussion
ECC Environment Agency. MDC Natural England. ONR	A Flood Risk Scoping Methodology Meeting was held on 22 January 2020, from which specific feedback raised by each consultee is provided in **Table 16.4**.
Environment Agency.	Teleconference with the Environment Agency asset team 19 February 2020. Discussion was focussed on sharing knowledge of the existing coastal flood defences.
ECC Environment Agency. MDC CCC Colchester Borough Council (CBC). Natural England. ONR	A Flood Risk workshop to discuss the proposed flood risk elements of the Water Environment Survey and Monitoring Plan (SMP) (flood risk site walkovers, water quantity monitoring, topographic survey and flood defence condition survey) and Version 1 (main development site) of the Flood Risk Scoping Report was held on 16 June 2020. A range of detailed comments were received, the majority of these are related to the technical aspects of the FRA which will underpin the ES Flood Risk and Drainage chapter. These comments included: • ECC provided advice on the process for agreeing Drainage Consents for works within or adjacent to a watercourse. This will underpin future applications for data collection and the developing program and future permit applications for the Project; • The Environment Agency commented as follows: ▸ stated that flood risk must be assessed over all phases of the development, including over the decommissioning phase. This is noted and will be set out in the suite of

Consultee	Points of Discussion
	documents prepared for the DCO application, the FRA will include a high level appraisal of the proposals for the Bradwell B power station for the decommissioning period, with full detail and assessment set out in the Nuclear Safety Case assessment; ▸ Requested that all receptors must be fully set out over all phases with justifications. The applicant confirmed that this will be provided as set out in the Flood Risk Scoping Report; ▸ Stated that flood risk modelling will need to include appraisal of flood depth, velocity, rate of inundation and hazard and confirm no effect to third parties, submission for early review by the Environment Agency is encouraged. Modelling should tie into the thresholds used for the Environment Agency's existing tidal flood warnings and include suitable assessment of breaches and overtopping. The displacement of flood water by land raising should be fully considered, and if required mitigation to ensure no impacts on third parties included in the design. The applicant confirmed that this will be set out within the FRA underpinning the DCO application. ▸ Requested that the latest UKCIP18 climate change projections should be utilised. Climate change allowances should be consistent across the project assessments. The applicant agrees with this and the latest UKCIP18 projections will be utilised and consistency will be applied across assessments including design and safety case assessment where appropriate. ▸ Highlighted the requirement for Flood Emergency Plans for all project phases. Risks to workers and vulnerable construction phase activities must be appropriately considered. Safe flood evacuation routes must be demonstrated. The applicant confirmed that these will be appraised as of the FRA supporting the DCO application, with reference to additional detail and assessment set out in the Nuclear Safety Case assessment;

Consultee	Points of Discussion
	▸ Suitable managed adaptation measures should be identified with respect to flood defence and future climate change. The Bradwell B power station flood defences should allow for the potential reversion of currently defended areas to saltmarsh. The applicant confirmed that approaches will be appraised, where appropriate, as part of the final FRA underpinning the DCO submission. It should be noted that the Bradwell B power station's flood defences will be new and separate from the existing coastal defence embankment. The Bradwell B power station flood defence will be set back from the current coastline against the existing high ground to the south of the area at high-risk of flooding. ▸ The need for the appropriate application of the Sequential Test for Project elements outside of the Strategic Siting Assessment boundary. If development proposed in locations outside of areas at low risk of flooding, the Exception Test must be met, for all elements of the project. This applies to all phases. The applicant agrees and the sequential approach will be followed for all elements of the Project. ▸ The requirement to appropriately assess the existing coastal defence embankment condition, and identification of suitable approaches to manage development phases vulnerable to rapid inundation should the defence fail. Risk reduction measures need to be identified to ensure the residual risk can be considered acceptable. The applicant agrees. The proposed survey and flood modelling program will enable these measures to be incorporated into the Project design set out in the DCO application. ▸ If a pluvial modelling approach for the Weymarks River – Borrow Dyke system is to be used, rather than a fluvial modelling approach, this must be justified. The applicant

Consultee	Points of Discussion
	acknowledges the request and discussions will be held with the Environment Agency to agree a suitable approach to underpin the ongoing flood modelling program. ▸ Requested that combined probability (i.e. tidal and fluvial or pluvial) events need to be considered. The applicant highlighted that as the project design evolves, a full range of reasonably probable scenarios will be considered within the FRA underpinning the full DCO submission. ▸ Noted that full details of input data, provenance and quality must be provided, alongside justification of model schematic or representation of channels and geometry as 1D or 2D elements. Appropriate model verification, calibration and sensitivity testing are required. The applicant notes the request. These requirements will be met during the delivery of the FRA work program. • MDC commented as follows: ▸ Appropriate reference to the cultural landscape is required. ▸ Key that NPPF Sequential and Exception Test is applied to temporary worker accommodation. ▸ For ground investigation appropriate reference to ecological and archaeological sensitivity is required. The Applicant has taken these comments on board and is in agreement.

Consultee	Points of Discussion
	• CCC requested further detail on the off-site associated development proposals when available. The applicant confirmed that Stakeholders will be provided with information on the off-site associated development proposals as they mature. • CBC requested full information on the how flood risk and climate change will be managed with reference to existing flood risk and proposed land raising. The applicant confirmed that this will be set out in the FRA underpinning the DCO application and provided in detail within the Safety Case Assessment. CBC also noted that Mersea Island is connected to the mainland by a tidal causeway and that this should be considered in light of the need for any emergency evacuation. The applicant confirmed that this will be considered under the scope of the **Chapter 13: Major Accidents and Disasters**. • Natural England commented as follows: ▸ Highlighted the need for integration between coastal process assessment and flood risk assessments. Water should be seen as both a constraint and an opportunity, especially for ecosystems services. The applicant notes this and confirmed that the evolving design proposals will respond to the main development site context and opportunities as well as constraints. ▸ Linkages to the HRA are required. The protection of designated sites, and the sustainable management of the coastal zone needs to be set against the required to provide a protected national infrastructure asset, include for future need for future adaptive management under a range of options to respond to climate change and the ongoing maintenance of the existing earth tidal flood defence line. The applicant notes this requirement. The evolving design and underpinning FRA will be cognisant of these requirements.

Consultee	Points of Discussion
	▸ Requested that flood condition surveys should follow the approach set out by the Environment Agency guidance. The role of intertidal areas in front of existing coastal flood defences should also be considered. The applicant confirmed that these issues will be considered as the Project design evolves. ▸ All data collection should be clearly set against the objectives of the collection, and data should be provided to regulators. The FRA should make reference to the National Flood Risk Assessment for England 2020 (published 14 July 2014). The applicant agrees and highlighted that data that has been collected which has a material influence on the FRA will be made available to regulators. • The ONR commented as follows: ▸ Requested inclusion of a statement or graphic to illustrate how the various flood and coastal process modelling proposals link to physical processes and relationships so as to ensure no processes or linkages are omitted. The applicant will develop this and set out in the FRA underpinning the DCO submission. ▸ Include further consideration of uncertainty, as set out by Environment Agency guidance. The applicant agrees and confirmed that the FRA modelling work will respond to the consideration of uncertainty. ▸ A full range of relevant epochs should be appraised, including for the decommissioning phase. The applicant confirmed that details of appraisals of all relevant epochs will be included as part of the FRA underpinning the DCO submission. ▸ Further detail on the approach to adaptive management is required to ensure that project elements are adaptable to climate change and over what timeframe and triggers.

Consultee	Points of Discussion
	Changing coastal morphology will need to be a key consideration to wider coastal adaptive management. The applicant indicated that details of a potential adaptive management strategy will be developed and where appropriate will inform the evolving design. ▸ The FRA will need to set out the requirements in relation to the 0.1% AEP event for the DCO submission, and 0.01% AEP for the nuclear safety case. This is agreed by the applicant. ▸ Consistent use of current climate change guidance between topics and cognisant of expected guidance updates. The applicant confirmed that when available, the updated UKCP18 guidance will be incorporated. Relevant environmental aspects will use the same updated guidance datasets. ▸ Flood risk from surface water flooding and localised drainage exceedance should be considered separately. The applicant confirmed that the FRA and associated drainage strategies, as well as the assessment informing the nuclear safety case will appropriately respond to these sources of flood risk. ▸ Tidal modelling will need to include for an appropriate level of detail when assessing the risk of flood defence breaches, wave conditions and potential storm sequences. Rainfall magnitudes during extreme high-magnitude short-duration events, potential combined probability events will also need to be considered. The applicant is in agreement and these requirements will be addressed during the assessment process. ▸ Consistency between the DCO FRA investigations and nuclear safety case assessment will need to be clearly set out. The applicant is in agreement.

16.4.2 A Flood Risk Scoping Methodology Meeting 1 (22 January 2020) was held to discuss the Flood Risk Scoping Report. Key discussion points focussed on the coastal flood risk, defence condition, and habitat within the main development site. **Table 16.4** provides a summary of consultee comments arising from the meeting, along with a response which identifies how the relevant matters will be addressed.

Table 16.4: January 2020 flood risk scoping methodology meeting

Consultee	Comments and Considerations	How this is Accounted for
Environment Agency.	Raised comments regarding: • Existing coastal flood defence embankment condition. • funding for ongoing maintenance. • only two outfalls, Downhall and Weymarks Sluice. The Weymarks Sluice is regularly blocked by beach deposits. • Impact on defences of any new access to Project related marine transport infrastructure.	These are key considerations already identified by initial desk studies. Approaches to enable the Project will be developed via a combination of flood risk assessment informed by bespoke flood modelling (both tidal flood risk (failure or overtopping of the Bradwell B power station flood defences, and surface water flood risk or drainage) and engagement with the Environment Agency and other stakeholders. Suitable solutions reflecting appropriate responsibility will be developed for agreement with stakeholders given there will be limited modification of or works to the existing coastal flood defences.
ECC	No further comments provided in addition to the role outlined in **Table 16.3**.	N/A.
MDC	Raised comments on: • Recreational use of coastal path. With regards to local (non-Environment Agency) sources of flood risk - no major recent flood issues in that area, yet some localised pluvial events.	Detailed pluvial (surface water run off) modelling will be undertaken to support the FRA for the Environmental Statement (ES).
Natural England.	Raised comments on:	The existing coastal flood defences will not be modified

Consultee	Comments and Considerations	How this is Accounted for
	• impact on habitat in front of existing coastal flood defences. • Changes in surface water run-off regime potentially impact groundwater infiltration.	and the only marine interaction would be via the marine infrastructure such as a beach landing facility. Detailed pluvial (surface water run off) modelling will be undertaken to support the FRA for ES.
ONR	Confirmed requirements for appropriate assessment of flood risk to ensure appropriate approach to hazard management for construction or operational phase.	Detailed flood modelling will be undertaken to support the FRA for ES.

16.4.3 The teleconference with the Environment Agency (February 2020) focused on understanding the historical development, and current status of the existing coastal flood defence embankment around the main development site and the drainage sluices. The key discussion points included defence condition and the standard of protection currently offered. The outcome was the provision of details of the embankment height, and drainage outfalls along with an agreement that a flood defence condition survey would likely be required to inform the BRB development works the scope of which is described in the overarching Water Environment SMP provided at **Appendix 15A**. A single SMP has been developed to cover all aspects of the Water Environment (including Flood Risk and Drainage).

16.4.4 **Table 16.5** presents a summary of consultee comments provided in response to Stage One Consultation, along with responses which identify how the relevant matters will be addressed.

Table 16.5: Stage One Consultation comments and related responses

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
Stakeholder Engagement.	Natural England have reiterated the need to be consulted on the ongoing assessment of the impact of flood defence proposals on the existing ditch network, and in particular the coastal fringe with its associated designated sites.	Stakeholder Engagement will continue during the DCO pre-application phase. Further assessment of the Bradwell B power station flood defences will be undertaken as development proposals evolve, to ensure appropriate flood risk management measures are in place if required.
Assessment Scope.	The Environment Agency advised that a comprehensive flood risk assessment that informs each phase of the project for the main development site and any associated development sites will be required. The FRAs should demonstrate how flood risk to the development itself or arising from the works will be avoided or managed. The methodology and FRA scope should be agreed via scoping consultation with the Flood Management Authorities (principally the Environment Agency and LLFA). A sequential approach is required to setting out all elements of the development. Particular emphasis is placed on the location of worker accommodation, which	The assessment scope is set out in the Flood Risk Scoping Report. This includes consideration of the different phases of the Project and the risks to the Project and the potential risks to other receptors. The approaches agreed with regulators via this report will underpin all assessment work. The sequential approach principle set out in NPPF will be applied when determining the location of all elements within the main development site, and the location of, and layout of all associated development sites. Specific location strategy documents are being prepared. The assessment scope is set out in the Flood Risk Scoping Report. This includes consideration of flood risk from the Weymarks River and Borrow Dyke system, including sensitivity testing around the functioning of the

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
	should be directed to Flood Zone 1 due to the vulnerability of this use, in particular the use of caravans The Environment Agency have requested that a comprehensive assessment of the drainage needs of the site over the development's full lifetime and the dependency on Weymarks and Borrow Dyke system is developed. This should assess the sensitivity of the system to tide-locking limiting gravity drainage, siltation and/or blockage and climate change. Measures to maintain the required drainage should be set out. The Environment Agency has requested that all proposals, plans, and assessments are based on a robust evidence base, and use the most up to date information available. Additional site-specific flood modelling will be required and should comply with current Environment Agency guidance on flood modelling. Models, results and supporting data will need to be submitted for Environment Agency review. Natural England have requested that the current tidal flood embankment's standard of	drainage network. A baseline model will be prepared which will be used to identify future drainage management strategies through the construction and operation phase. Suitable approaches and/or measures will be included in the final development design to provide for the required drainage over the development's lifetime, including for the restored construction area. The assessment methodology is set out in the Flood Risk Scoping Report. This outlines the proposed sources of model input data. Where gaps in data are identified, additional new data will be acquired. The Water Environment SMP in **Appendix 15A** sets out the plan for acquisition of additional data for the main development site (i.e. discharge in the Weymarks and Borrow Dyke system, topographic survey, and flood defence and tidal outfall condition, dimensions and crest level). A similar document will be produced for the off-site associated development sites and off-site Power Station Facilities in due course. The project will ensure the defence standard and residual life of the facility are considered. The Water Environment SMP in **Appendix 15A** sets out the plan for acquisition of additional data on the existing coastal flood defence and tidal outfall condition, dimensions and crest level. This information will be incorporated in the flood risk

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
	protection is confirmed alongside its residual life. This should be set against strategic planning on the future management of flood risk.	assessment and modelling (see the Flood Risk Scoping Report) to understand the existing standard of protection, and the residual life. The findings will be set against options for the strategic management of flood risk over all phases of the Project's lifetime.
Mitigation	The Environment Agency have requested that the performance and condition of the existing coastal flood defences is surveyed. The survey and resulting recommendations should ensure the defences are satisfactory for the new proposed land use and identify the need for repairs and a maintenance regime to provide the necessary standard of protection during the enabling and construction phases. The Environment Agency requested that full detail of the sequencing and timescales for flood defence construction and adaptive management, to respond to the potential for rare, high-magnitude events, uncertainty, climate change and sea level rise projections over the duration of all project phases and secure these measures within the design. The Environment Agency requested that where possible, alternatives to culverting, such	The Water Environment SMP (**Appendix 15A**) sets out the scope for a flood defence condition survey of the existing earth tidal flood embankment. Emergency plans will be included, commensurate with the level of assessed risk, and the final proposed layout of the construction site, and residual risk to the construction phase following incorporation of any embedded design measures to manage risk. This will be fully set out as part of the DCO FRA. The sequencing of the Bradwell B power station flood defence construction associated with the permanent power station site and adaptive management will be developed and refined as the project design matures. This information will be presented within the DCO application, with the FRA setting out the key approaches proposed and their basis. The preference of the Environment Agency for alternatives to culverting to be used is noted and will be taken into consideration during the design development.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
	as clear span bridges are used. If culverts are proposed it must be demonstrated that there are no other viable alternative means for crossing the watercourse.	
Mitigation	The Environment Agency have requested that comprehensive emergency plans are prepared for the construction and operation phases. These should detail how flood warnings will be received and responded to and how suitable emergency access and egress routes will be provided. In particular parts of the construction area and the workforce and equipment and /infrastructure there would be vulnerable to rapid inundation should the earth flood embankment fail. All routes critical to safe evacuation should be designed to be safe in the event of flooding. South Woodham Ferrers Town Council requested further details of the proposed approach to defend the Bradwell B power station.	The management of flood risk through the development phases is an integral part of the development design. The flood defence condition survey and flood risk modelling will be used to inform the assessment of risk associated with defence failure or exceedance. Alongside this, the evolving construction phase site layout and proposed levels for earthworks will incorporate design measures to manage flood risk, taking account of the flood defence condition survey findings. Appropriate emergency plans for flood evacuation, will be developed to suit the final design proposals. These will include for receipt of flood warnings, set out roles and responsibilities and clear action thresholds. The principles of any necessary flood evacuation plans and procedures will form part of the FRA underpinning the DCO. The Project design will include a suite of embedded measures to ensure appropriate management of flood risk at the main development site, including for climate change over all phases of the development. As required by the ONR, the permanent development will be situated

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
		on a raised platform incorporating additional flood defences designed to protect against extreme flood events including allowances for climate change. The proposed measures will be presented in the DCO application.
Permitting	The Environment Agency have requested that the need for environmental (flood risk) permits is discussed at an early stage to enable suitable measures to be agreed. Pre-application discussions are encouraged.	Consultation has started with the Environment Agency on initial monitoring installations and will be developed further during the DCO pre-application phase and we will seek to discuss any permitting requirements with the regulator in a timely manner.

16.5 Data Gathering Methodology

Study area

16.5.1 This section presents study areas for flood risk and drainage assessments. As the design and consultation processes progress and the Project is refined, the exact geographical scope of study areas may continue to evolve to accommodate any changes. If the study areas change, data collection will also be reviewed and updated.

Main development site

16.5.2 The main development site boundary extends from south of Bradwell Waterside in the west across to the Othona Community in the east, it is bounded in the north by the existing Bradwell power station and the coast. To the south it is bounded by the East End Road. The study area is shown on **Figure 16.1.**

16.5.3 Flood risk and drainage data will be presented and assessed for the main development site Zone of Influence (ZoI). The ZoI is shown on **Figure 16.1** and represents the whole topographical catchment plus a 250m buffer. It captures the area with which the main development site could hydrologically interact and encompasses the catchments of all the main drainage channels within and around the main development site. The ZoI also includes the existing coastal flood defences, extending from the Othona Community in the east to just south of Bradwell Marina in the west where the defence line traverses inland and joins higher ground level. The extent of the ZoI ensures the entire coastal floodplain embayment is captured.

Off-site associated development

16.5.4 The basis for defining study areas for the off-site associated developments and off-site Power Station Facilities are described in **Table 16.6**. The study areas descriptions are based on those descriptions outlined in **Chapter 3: The Project.** The locations of the off-site associated development areas of search are also shown on **Figure 16.2.**

16.5.5 As for the main development site, a ZoI will be defined for each off-site associated development and off-site Power Station Facilities locations. These ZoIs will be delineated once specific sites are confirmed and will be defined following the source-pathway-receptor model. The ZoI would therefore typically include the individual site and the downstream topographic catchment between the site and the sea.

Table 16.6: Off-site associated development and off-site Power Station Facilities study areas

Site	Study Area	Rationale
Off-Site Power Station Facilities.	Site location yet to be determined. Facilities will be sited in accordance with ONR Guidance (Ref 16.31) relating to safety considerations. A ZoI will be defined to form the study area once site location confirmed.	The ZoI will be defined by the source-pathway-receptor approach. It will include all project interactions with sources and pathways of flood risk and potential receptors that could be affected by the development. The ZoI will therefore suitably define the study area for this development element.
Off-site project-provided accommodation.	Site location(s) yet to be finalised. A ZoI will be defined to form the study area for each once site locations are confirmed.	The ZoI will be defined by the source-pathway-receptor approach. It will include all project interactions with sources and pathways of flood risk and potential receptors that could be affected by the development. The ZoI will therefore suitably define the study area for this off-site associated development.
Off-site associated development: park and ride facilities.	Site location(s) yet to be determined. A ZoI will be defined to form the study area for each once site locations are confirmed. The broad search areas of South Woodham Ferrers, Maldon or Chelmsford are identified in **Figure 16.2**.	The ZoI will be defined by the source-pathway-receptor approach. It will include all project interactions with sources and pathways of flood risk and potential receptors that could be affected by the development. The ZoI will therefore suitably define the study area for this off-site associated development.
Off-site associated development: freight management facilities.	Site location(s) yet to be determined. A ZoI will be defined to form the study	The ZoI will be defined by the source-pathway-receptor approach. It will

Site	Study Area	Rationale
	area for each once site locations are confirmed. The broad search areas at South Woodham Ferrers and Latchingdon are identified in **Figure 16.2**.	include all project interactions with sources and pathways of flood risk and potential receptors that could be affected by the development. The ZoI will therefore suitably define the study area for this off-site associated development.
Off-site highways works.	Final options yet to be confirmed. A ZoI will be defined to form the study area for selected option.	The ZoI will be defined by the source-pathway-receptor approach. It will include all project interactions with sources and pathways of flood risk and potential receptors that could be affected by the development. Given the linear nature of this associated development, the ZoI will comprise multiple watercourse catchments. The ZoI will therefore suitably define the study area for this off-site associated development.

Sources of data used in scoping

16.5.6 The EIA scoping exercise with respect to flood risk and drainage, has been undertaken with reference to the description of the Project (see **Chapter 3: The Project**), supported by a number of data sources. The principal desk-based data sources used to inform the identification of potential effects are presented in **Table 16.7**.

Table 16.7: Sources of information

Source	Data
Environment Agency.	Flood Map for Planning - (mapping of tidal flood risk) (Ref. 16.32). Flood Risk from Surface Water mapping (Ref. 16.33).

Source	Data
	Flood Risk from Reservoirs mapping (Ref. 16.34). Groundwater Source Protection Zone mapping (used in determining applicability of infiltration SuDS techniques) (Ref. 16.35). LiDAR Composite Digital Terrain Model (Ref. 16.36). Details pertaining to the existing coastal flood defence embankments (other available information).
Ordnance Survey (OS).	OS 1:25,000 raster mapping (Ref. 16.37).
British Geological Survey.	Surface Geology Map (Ref. 16.38). Aquifer designation maps (Ref. 16.39).

16.6 Baseline Information

Current baseline

Main development site

16.6.1 The main development site hydrological ZoI has been defined as the whole topographical catchment of all the main drainage channels in and around the site with a 250m buffer. This is on the basis that there are direct drainage pathways to and from the main development site into these catchments. These catchments include:

- Weymarks River - from the source at Curds Grove to its confluence with the Borrow Dyke and out to sea via Weymarks Sluice;
- Bradwell Waterside drain – from source north of Trusses Road to confluence with the Borrow Dyke and out to sea via Downhall Sluice; and
- the Borrow Dyke – from Bradwell Waterside to the Othona Community.

16.6.2 **Figure 16.3** shows Environment Agency LiDAR elevation data for the Bradwell area. Elevations across the main development site range from 0.8m Above Ordnance Datum (mAOD) to 14mAOD, with higher land to the south forming a ridge extending from Bradwell Waterside to the Othona Community and including the former Bradwell Bay airfield area. Lower lying land lies to the west, north and east of this ridge associated with the Weymarks River and the low-lying land benefitting from the existing coastal flood defences.

16.6.3 The ZoI is underlain by a bedrock geology comprising of London Clay which overlies chalk at depth. On the more elevated land the London Clay is overlain by River Terrace Deposits (sand, gravel, clay) superficial deposits, which grade into Alluvium (clay and silt) on lower ground to the north and east. There are no Source Protection Zones within the ZoI.

Coastal flood risk

16.6.4 The Environment Agency's Flood Map for Planning (**Figure 16.4**) indicates that parts of the main development site are located within Flood Zones 3 and 2, associated with the risk of coastal flooding from the Blackwater Estuary. A large proportion of the main development site is below Mean High-Water Spring tide levels (MHWS) around 2.5mAOD. For context, the existing earth flood defence embankment crest is variable. LiDAR elevation data indicates crest levels between as low as 4.0mAOD at the less exposed west and up-estuary facing frontage near Bradwell Waterside, and elevations up to 5.0mAOD at the more exposed, easterly North Sea facing coast at Sales Point. The land levels of the fields immediately inland from the existing coastal flood defences are typically 1 to 2mAOD, but as low as 0.8mAOD in some areas. The area of Flood Zone 3 behind the existing coastal flood defence is largely mapped as an 'Area Benefitting from Defence' (ABD). ABD is a designation applied to an area of land by the Environment Agency, it is based on an assessment of the impact a flood defence has on flood extent. ABDs are designated based on present day flood risk and do not account for climate change, which may result in the areas of ABDs reducing in the future. Although the 0.5% AEP coastal flood event is the typical standard of protection for the mapping of an area as benefiting from existing coastal flood defences, further modelling would be required to confirm the level of protection currently provided by the existing coastal flood defence embankment with further precision. The defence means the risk of the main development site flooding due to high tides of magnitudes that are experienced multiple times over periods of 5 to 10 years is minimal. Nevertheless, a residual risk remains of the existing coastal flood defences failing during higher magnitude events, or their design standard being exceeded by events of a magnitude above the design standard.

16.6.5 The existing coastal flood defence embankment ties-in with high ground in the west near Bradwell Marina, and in the east near the chapel of St Peter-on-the-Wall and Othona.

16.6.6 It is understood that the existing coastal flood defences that protect the broader main development site area has a clay core and the seaward face is revetted with stone *or* concrete panels. The revetment consists of areas of ragstone (grouted and ungrouted), 'Essex' and 'Canewdon' Blocks (respectively these are: natural stone, and types of pre-cast concrete interlocking blocks used to clad the seaward defence face). The defence between Bradwell Waterside and the existing Bradwell power station comprises a mixture of these revetment types, due to significant tidal action or grout failure, embankment fill has been exposed to external erosion. The defence face in front of the existing Bradwell power station is also exposed to significant tidal action, but the newer Open Stone Asphalt (OSA) and Canewdon Blocks revetment

is in better condition (although some minor movement or erosion at joints has been noted for monitoring). East of the existing Bradwell power station, extending to the Othona Community, the existing coastal flood defence condition varies. Where a significant beach and saltmarsh is present in front of the existing coastal flood defences, the condition is generally considered to be acceptable by the Environment Agency. However, the grout is failing in the more exposed sections, with tidal action leading to erosion of the material behind. The Environment Agency are currently repairing these minor defects in this section of the existing coastal flood defence every 6 to 12 months.

16.6.7 The Environment Agency has also indicated that two counterwalls (secondary embankments running between the defence and high land to the south, to partially compartmentalise the defended area) are present behind the existing coastal flood defence. One is situated to protect Bradwell Waterside caravan site, and one immediately north-east of the existing Bradwell power station. LiDAR indicates that the power station counterwall has crest levels of around 2.8mAOD.

16.6.8 Regular mowing is required to prevent establishment of an invasive plant (Alexander), which when it dies back can lead to bare, erosion vulnerable patches of ground. Sections that have been recently repaired will also be bare for a time until new grass sufficiently establishes.

16.6.9 Along the whole section of existing coastal flood defence, the Environment Agency considers the crest to be in good condition, although minor low points are present, and usage of the coastal footpath has led to bare unvegetated sections. However, overall, the Standard of Protection is currently considered to be maintained in accordance with the Environment Agency SMP policy of 'hold the line' along this stretch of coast.

16.6.10 The existing coastal flood defence embankment is largely a result of flood defence improvement works undertaken subsequent to the 1953 North Sea Storm Surge flood event repair, raising and revetment improvement works between 1953 and 1972). These works improved and repaired the older historical defences along the Bradwell coastline which had either suffered breaches or damage to the revetment during the 1953 event. In 1986 a row of old Thames Lighter barges were placed offshore 200m north-east of Sales Point to provide a wavebreak. In the last 30 years, the Environment Agency has undertaken multiple operations to repair damage to the existing coastal flood defences, such as the addition of OSA to the Downhall revetment, and after severe storm damage in 2013, the replacement of old or eroded revetment with newer interlocking concrete 'Canewdo' blocks at two locations between the existing Bradwell power station and Sales Point. Other areas of minor erosion through the defence revetment have been infilled with mass concrete.

Fluvial flood risk

16.6.11 The Weymarks River rises within the main development site and flows north-east towards the coast. Whilst the Weymarks River is classed as an Environment Agency 'Main River', it has a catchment area of around 5 kilometres squared (km^2) and is in

reality a drainage ditch. Given its small catchment size, no existing fluvial modelling is available for this watercourse. Therefore, it is considered that the flood risk mapping available for surface water flood risk suitably characterises risks associated with this and other watercourses within the main development site.

16.6.12 A further 1km^2 of land drains towards the coast at Downhall, west of the existing Bradwell power station.

16.6.13 Drainage from both of these areas collects in the Borrow Dyke which runs along the landward toe of the existing coastal flood defence embankment. This water discharges to the foreshore via two tidal sluices, west of Downhall (OS NGR: TL 9957 0846) and north-north-east of Weymarks Farm (OS NGR: TM 0168 0944). It is understood that these are tidelocked during daily high-tides. The Weymarks Sluice is also vulnerable to blockage associated with the drift of beach material along the foreshore. A low point exists between the existing Bradwell power station and the existing coastal flood defence embankment to the north, such that the Borrow Dyke provides a connection between these two low-lying areas.

Pluvial flood risk

16.6.14 Environment Agency surface water (pluvial) flood risk mapping (**Figure 16.5**) indicates a corridor of flood risk extending along the Weymarks River, Borrow Dyke, and in the lowest lying areas of land in the north and east of the main development site. This risk of flooding will be associated with high-intensity rainfall overwhelming the existing capacity of the drainage system, or the tidelocking of the tidal sluice (high tides and storm surges will 'lock' the sluice, preventing drainage until tide levels drop).

16.6.15 Flooding is located in the lower lying fields, which were once the coastal floodplain. The main flow route within the main development site follows the Weymarks River from Curds Grove, past the irrigation reservoirs along the Weymarks River towards the Borrow Dyke.

16.6.16 The highest risk areas, in terms of probability, are located immediately north and west of the irrigation reservoirs and south of Weymarks Farm. There is also an area of higher risk of flooding east of the existing Bradwell power station together with isolated pockets of flood risk in the vicinity of the disused airfield.

Groundwater flood risk

16.6.17 The main development site is underlain by a bedrock geology comprising a thick layer (25 meters (m) to 62m) of London Clay which overlies chalk situated at depth. On the more elevated land the London Clay is overlain by River Terrace Deposits (sand, gravel, clay) superficial deposits, which grade into Alluvium (clay and silt) on lower ground to the north and east of the site. The London Clay is classified as a non-aquifer so contains little or no groundwater. The River Terrace Deposits are 'secondary undifferentiated aquifers', which therefore have the potential to contain some more limited amounts of groundwater.

16.6.18 In the context of the non-aquifer solid geology and minor secondary (undifferentiated) superficial aquifer, groundwater flooding is not considered to be pose a significant risk to the majority of the main development site. In the event of groundwater emergence, the existing drainage network will act to convey flows through the main development site to the tidal sluices.

16.6.19 The risk of groundwater emergence, above ground level is considered to be very low, with the potential for some emergence into below ground excavations. Appropriate dewatering arrangements would be put in place before suitable treatment and discharge of this water.

Sewer flood risk

16.6.20 The main development site area is currently agricultural, and largely undeveloped. Flood risk from this source is therefore negligible. Although the exceedance of systems associated with the exiting developments and the Wastewater Treatment Works at Bradwell Waterside are possible, any flows would be limited compared to other sources of flood risk, and primarily drain towards existing watercourses.

Reservoir flood risk

16.6.21 Two irrigation reservoirs are present within the main development site. These are offline of the Weymarks River, with raised earth embankments constructed to store water pumped up from the watercourse. These could, in the extremely unlikely event of impoundment failure, pose a risk of flooding. Environment Agency reservoir flood risk mapping (**Figure 16.6**) indicates the areas that would flood in the low-probability event that the reservoir embankments were to fail, with areas along the Weymarks River and in the north-east of the main development site shown as being at risk. However, the risk of reservoir impoundment failure is considered to be extremely unlikely.

Off-site Power Station Facilities

16.6.22 The location of the off-site Power Station Facilities (mobile emergency equipment garage (MEEG), environmental survey laboratory (ESL), alternative emergency control centre (AECC)) are yet to be determined and therefore the flood risk and drainage baseline cannot be outlined at this stage. However, these facilities would be classed as 'Essential Infrastructure' in NPPF terms, and due to the critical safety nature of these facilities it will be necessary to site these facilities in areas which are at minimal risk of flooding. Facilities would be located in accordance with ONR guidance (Ref. 16.31).

Off-site associated development: project-provided accommodation

16.6.23 The exact location of these project-provided accommodation is yet to be determined.

16.6.24 The residential nature of the development is classed as 'More Vulnerable' to flood risk in NPPF terms and therefore should be directed to Flood Zone 1. Locations in

Flood Zone 2 and Flood Zone 3 would need to be justified by the NPPF Sequential Test, and the Exception Test met to demonstrate that the development will be safe and not increase flood risk elsewhere.

16.6.25 Parts of the broad area of search for the project-provided accommodation are mapped as being at risk of flooding from coastal, fluvial, and pluvial sources of flooding. Potential sources of flood risk from groundwater, reservoirs and sewers will also need to be considered. An Accommodation Strategy is being developed to ensure that there is adequate accommodation for workers during the construction phase, and the study will take account of flood risk as part of the selection criteria to define specific locations suitable for this associated development type.

16.6.26 Project-provided accommodation will be positioned in areas which avoid flood risk wherever possible. Where flood risk cannot be avoided new development will be sited in line with the sequential approach outlined in NPPF ensuring any development does not increase risk elsewhere and remains safe throughout its lifetime.

Off-site associated development: park and ride facilities

16.6.27 One or more park and ride facilities are proposed to enable worker journeys to be intercepted at key points, before travelling by bus to the main development site.

16.6.28 The exact location of the park and ride facilities is yet to be determined, but broad search areas have been identified at South Woodham Ferrers, Maldon and/or Chelmsford.

16.6.29 A park and ride facility is classified as 'Less Vulnerable' and therefore potentially permitted in all flood zones except Flood Zone 3 subject to application of the Sequential Test and satisfying the Exception Test.

Chelmsford

16.6.30 The Chelmsford search area, shown on **Figure 16.2**, surrounds the A12 and A414 junction and includes the village of Sandon. An Environment Agency Main River (the Sandon Brook) runs through this search area. This has a fluvial floodplain associated with it which should be avoided. If development encroaches then compensatory storage may be required to ensure no increase in flood risk elsewhere along with other embedded design measures.

16.6.31 There are areas of potential pluvial flood risk across the search area, with a wide flow path from the south of the search area along the course of the Sandon Brook. There are flow paths predicted along the A12 and around the village of Sandon. In addition, there are localised areas of ponding within the fields either side of the A12/A414 junction. Future development in these areas will need to ensure these pluvial flow routes are not interrupted so as to not increase flood risk elsewhere and that risk to the Project is managed sustainably through embedded mitigation.

16.6.32 There is a risk of reservoir flooding across the Chelmsford search area, arising from the risk of failure of the Hanningfield Reservoir. As potential locations within the search area are appraised for suitability, the level of flood risk from reservoirs will be one consideration that will feed into the final location choice. Where possible the risk will be avoided, however if a risk is present, appropriate design approaches and mitigations will be incorporated commensurate with the assessed level of flood risk from this and other sources of flood risk.

16.6.33 There are also potential sources of flood risk from groundwater and sewers. All sources of flood risk will be assessed in detail when a specific location is identified.

Maldon

16.6.34 The Maldon search area, shown in **Figure 16.2**, covers the area west of Maldon adjacent to the A414. The area is not shown to be at risk of coastal or fluvial flood risk and is in Flood Zone 1.

16.6.35 There are some narrow pluvial flooding flow paths across the search area coinciding with the minor watercourse Lime Brook and other unnamed drainage channels. There are also localised areas of potential ponding of surface water flooding identified within the search area.

16.6.36 There is no risk of reservoir flooding across the Maldon search area.

16.6.37 There may be other potential sources of flood risk from groundwater and sewers. All sources of flood risk will be assessed in detail when a specific location is identified.

South Woodham Ferrers

16.6.38 The South Woodham Ferrers search area, shown in **Figure 16.2**, covers the area to the west of South Woodham Ferrers from the River Crouch north of Wickford, across the A130/A132 junction and along the A132 towards Woodham Ferrers. The majority of the area is within Flood Zone 1, with two narrow strips of floodplain associated with tributaries to Fenn Creek which traverse the search area north-east of the A130. There is also an area of fluvial risk to the west of the A130/A132 junction and along the southern boundary associated with the River Crouch and its tributary.

16.6.39 Pluvial flood risk is extensive, with a network of multiple flow paths covering the search area.

16.6.40 There is no risk of reservoir flooding across the South Woodham Ferrers search area.

16.6.41 There may be other potential sources of flood risk from groundwater and sewers. All sources of flood risk will be assessed in detail when a specific location is identified.

16.6.42 Park and ride facilities will be positioned in areas which avoid flood risk wherever possible. Where flood risk cannot be avoided new development will be sited in line with the sequential approach outlined in NPPF ensuring any development does not increase risk elsewhere and remains safe throughout its lifetime.

Off-site associated development: freight management facilities

16.6.43 One or more freight management facilities are proposed to manage the flow of HGVs on the highway network and potentially the storage of material off-site.

16.6.44 The exact location of the freight management facilities is yet to be determined, but two broad search areas have been identified at South Woodham Ferrers and in the vicinity of Latchingdon.

16.6.45 A freight management facility is classified as 'Less Vulnerable' and therefore potentially permitted in all flood zones except Flood Zone 3 subject to application of the Sequential Test and satisfying the Exception Test.

South Woodham Ferrers

16.6.46 The South Woodham Ferrers search area, shown in **Figure 16.2**, covers the area to the west of South Woodham Ferrers from the River Crouch north of Wickford, across the A130/A132 junction and along the A132 towards Woodham Ferrers. The majority of the area is within Flood Zone 1, with two narrow strips of floodplain associated with tributaries to Fenn Creek which traverse the search area north-east of the A130. There is also an area of fluvial risk to the west of the A130/A132 junction and along the southern boundary associated with the River Crouch and its tributary.

16.6.47 Pluvial flood risk is extensive, with a number of flow paths traversing the search area.

16.6.48 There is no risk of reservoir flooding across the South Woodham Ferrers search area.

16.6.49 There may be other potential sources of flood risk from groundwater and sewers. All sources of flood risk will be assessed in detail when a specific location is identified.

Latchingdon

16.6.50 The Latchington search area has been identified from the B1010 in the west to the eastern side of the village, shown in **Figure 16.2**. The majority of the area is within Flood Zone 1, with the northern portion of the search area intersecting with an area of coastal flood risk (Flood Zone 3) from tributaries of Lawling Creek, a tributary of the River Blackwater.

16.6.51 Pluvial flood risk is extensive, with a number of flow paths traversing the search areas, all draining towards Lawling Creek and the Blackwater Estuary.

16.6.52 There is no risk of reservoir flooding across the Latchingdon search areas.

16.6.53 There may be other potential sources of flood risk from groundwater and sewers. All sources of flood risk will be assessed in detail when a specific location is identified.

16.6.54 Freight management facilities will be positioned in areas which avoid flood risk wherever possible, where flood risk cannot be avoided new development will be sited in line with the sequential approach outlined in NPPF ensuring any development does not increase risk elsewhere and remains safe throughout its lifetime.

Off-site associated development: off-site highways works

16.6.55 A package of highway improvement works is required to facilitate the anticipated number of vehicle movements on the local road network resulting from the construction of the Project. Two options for early years' highways improvements and two options with wider search areas for highway improvements during peak construction are proposed (see **Figure 16.2**).

16.6.56 Whilst transport links necessary to support a new nuclear power station would be classified as 'Essential Infrastructure' and therefore potentially permitted in all flood zones, application of the Sequential Test and satisfaction of the Exception Test would have to be demonstrated for routes that passed through areas of Flood Zone 2 and 3.

Early Years' Route A

16.6.57 The Early Years' Route A begins at the A132 west of South Woodham Ferrers, continues along the B1012 and B1010 joining the B1018 west of Latchingdon, before travelling through Maryland and Steeple joining the B1021 at Bradwell-on-Sea. The majority of this corridor is not shown to be at risk of coastal or fluvial flood risk and is in Flood Zone 1. The exception is a small expanse of coastal flooding (Flood Zone 2 and 3) in Steeple associated with a minor tributary to Mayland Creek, which flows out to the Blackwater Estuary.

16.6.58 There are a number of pluvial flood risk flow paths intersecting with the route. From South Woodham Ferrers to B1010 these flow paths extend south into the River Crouch. From the B1010 to the main development site these flow paths extend north towards the Blackwater Estuary. The flow paths follow the topographic drainage catchments, with some coinciding with minor watercourses or drainage channels.

16.6.59 There is no risk of reservoir flooding along this route. There may be other potential sources of flood risk from groundwater and sewers. All sources of flood risk will be assessed in detail when a specific location is identified.

Early Years' Route B

16.6.60 The Early Years' Route B beings at the A414 west of Danbury and continues along to the B1018 in Maldon, before picking up the same course as Route A from Latchingdon. The majority of this corridor is not shown to be at risk of coastal or fluvial flood risk and is in Flood Zone 1. The exception is the B1010 south of Maldon which is shown to be at risk of coastal flooding (Flood Zone 2 and 3) associated with the Mundon Wash and other minor watercourse draining to the Blackwater Estuary. There is also a small area of coastal flooding predicted in in Steeple associated with a minor tributary to Mayland Creek, which flows out to the Blackwater Estuary.

16.6.61 There are a number of pluvial flood risk flow paths intersecting with the route from Maldon along to the main development site. From the B1010 to the main development site these flow paths extend north towards the Blackwater Estuary. The flow paths follow the topographic drainage catchments, with some coinciding with minor watercourses or drainage channels.

16.6.62 There is no risk of reservoir flooding along this route. There may be other potential sources of flood risk from groundwater and sewers. All sources of flood risk will be assessed in detail when specific location details are confirmed.

Off-site highways works during peak construction

16.6.63 The off-site highways works during peak construction follow Route A with some wider search areas along the length including an alternate route south of Latchingdon. The majority of this corridor is not shown to be at risk of coastal or fluvial flood risk and is in Flood Zone 1. The exception is a small expanse of coastal flooding (Flood Zone 2 and 3) in Steeple associated with a minor tributary to Mayland Creek, which flows out to the Blackwater Estuary, and a small section of coastal flooding along the B1010 south of Latchingdon associated with a minor tributary draining to the River Crouch. The area south of Latchingdon is shown as an area benefiting from defences.

16.6.64 There are a number of pluvial flood flow paths intersecting with the route from Maldon along to the main development site. From the B1010 to the main development site these flow paths extend north towards the Blackwater Estuary. The flow paths follow the topographic drainage catchments, with some coinciding with minor watercourses or drainage channels.

16.6.65 There is no risk of reservoir flooding along this route. There may be other potential sources of flood risk from groundwater and sewers. All sources of flood risk will be assessed in detail when a specific location is identified.

16.6.66 Off-site highways works route options will avoid or minimise interactions with areas of flood risk wherever possible. Where flood risk cannot be avoided due to the nature of this linear infrastructure, justification will be set out in line with the sequential approach outlined in NPPF. The development design will ensure the preferred option does not increase risk elsewhere and remains safe throughout its lifetime.

Where possible existing flow routes will be preserved and watercourse crossings will be free-spanning bridges in preference to culverts.

Future baseline

16.6.67 The Flood Risk and Drainage future baseline will be influenced by land use change and climate change. The major land use change that will influence the future baseline will be the Project itself. Land use changes associated with the Project will be assessed as part of the FRA.

16.6.68 The effects of climate change are expected to alter the baseline over time. As a result of climate change, it is predicted that there will be an increase in peak rainfall intensities and resulting fluvial and pluvial flood flows over time. This means that for a given frequency of storm the magnitude of the event will increase in the future. The latest climate change guidance, which includes UKCP18 and the Environment Agency guidance on climate change allowances to be applied in England (updated in December 2019), indicates the potential for enhanced rainfall intensity and seasonality with wetter winters and drier summers. The guidance also indicates climate change will increase coastal flood risk, with increases in sea level and surge forecast. Increases in sea level and surge could result an increase in magnitude and frequency of overtopping of flood defences in the future, which could increase the risk of a breach occurring. The management and continued provision of existing coastal flood defences could also change in the future depending on policy decisions made in future (i.e. hold the line or managed realignment). The guidance provides a set of recommendations for climate change allowances for England, these will be applied to the FRA.

Planned further surveys and studies

Main development site

16.6.69 Additional supporting information to define the baseline will be obtained via data requests and consultations with the stakeholders listed in **Section 16.3**. Site and catchment walkovers are planned to observe and identify key hydrological features, and gain understanding of the context of the site within its wider hydrological and topographical catchment. The site walkover will also be key for determining locations where detailed topographic survey would be required.

16.6.70 Hydrological monitoring is proposed to gain an understanding of regular water levels within the surface water drainage system. Monitoring will be achieved through the installation of number of gauges across the drainage system to provide a continuous level and flow data. This will also be paired with regular spot gauging. The locations of the gauges will be agreed following full site walkover to ensure gauges are positioned at optimal positions in the drainage network.

16.6.71 A detailed hydraulic flood modelling study (coastal, fluvial and pluvial) for the main development site area is proposed alongside surface water quantity monitoring to

inform subsequent assessments to support the EIA. The Flood Risk Scoping Study Report contains further details of this proposed modelling study.

16.6.72 Topographic surveys of on-site watercourses and hydraulic and flood risk management structures will be undertaken as required to underpin these assessments. Topographic data will be key to understanding the connectivity and capacity of the existing watercourses, notably the Weymarks River and Borrow Dyke.

16.6.73 A defence condition survey will be undertaken of the existing coastal defences around the main development site to confirm their dimensions and condition.

16.6.74 An overarching Water Environment SMP (see **Appendix 15A**) has been prepared to capture these proposed surveys.

Off-site associated development

16.6.75 Once the location for each associated development site is confirmed a similar process to that undertaken for the main development site will be followed. Data gaps will be identified and requirements for additional survey data, and the proposed means of collecting this data defined. Additional survey data will include site walkovers, and potentially topographic survey of the land and any watercourses. The outcome will be a SMP covering the off-site associated development, which will be used to agree these proposals with regulators as for the SMP prepared for the main development site.

16.7 Proposed Approach to the Assessment

Assessment methodology

Significance evaluation methodology

16.7.1 The significance level attributed to each effect has been assessed based on the 'sensitivity' (value) of the affected receptor and the potential magnitude of change resulting from the Project. The level of significance is then determined by the combination of sensitivity and magnitude.

16.7.2 Sensitivity is assessed on a scale of high, medium, low and very low, whilst magnitude is assessed on a scale of high, medium, low and negligible. The criteria for defining sensitivity and magnitude can be found in **Table 16.8** and **Table 16.9**, along with example applications. These criteria are defined and applied based on professional judgement, using recognised approaches to classification relevant to the receptor types.

Sensitivity of receptor

16.7.3 Definitions of receptor sensitivity used in the assessment are provided in **Table 16.8**, with examples of receptors that would be placed in each class.

Table 16.8: Definitions of sensitivity criteria

Sensitivity	Criteria	Examples
High	Features with a high vulnerability to flooding.	Land use type defined as 'Essential Infrastructure' (i.e. critical national infrastructure, such as essential transport and utility infrastructure) and 'Highly Vulnerable' (for example, police or ambulance stations that are required to operate during flooding, mobile homes intended for permanent residential use) in the NPPF (Ref. 16.8) flood risk vulnerability classification.
Medium	Features with a moderate vulnerability to flooding.	Land use type defined as 'More Vulnerable' in the NPPF flood risk vulnerability classification (for example, hospitals and health centres, educational institutions, most types of residential development).
Low	Features with a low vulnerability to flooding.	Land use type defined as 'Less Vulnerable' in the NPPF flood risk vulnerability classification (for example, most types of business premises, including land and buildings used for agriculture).
Very Low.	Features that are resilient to flooding.	Land use type defined as 'Water-compatible development' in the NPPF flood risk vulnerability classification (for example, flood control infrastructure; water transmission infrastructure), and undeveloped land.

Magnitude of change

16.7.4 The magnitude of change from baseline conditions includes a consideration of the duration and reversibility of the change, and relevant legislation, policy standards and guidance. **Table 16.9** provides examples of how various magnitudes of change could be determined with respect to flood risk and drainage.

16.7.5 For flood risk and drainage, it is proposed to relate the magnitude of change to changes in flood hazard classification. The flood hazard classification, as defined by Defra (Ref. 16.40) is a function of flood depth and velocity, and classifies flood hazard into four categories: "danger for all" (high); "danger for most" (medium); "danger for some" (low); and "caution" (very low).

16.7.6 Magnitude of change may be either positive or negative. The criteria and examples in **Table 16.9** focus on negative changes, but positive changes may also occur and will be considered on a case by case basis as required.

Table 16.9: Definitions of magnitude of change

Magnitude	Criteria	Examples
High	Flood hazard classification increased to high. Results in complete loss or major change to feature, of sufficient magnitude to affect its use or integrity.	Change in flood risk resulting in a danger to all. Potential loss of life or major damage to property or infrastructure.
Medium	Flood hazard classification increased to medium. Results in partial loss or noticeable change to feature, of sufficient magnitude to affect its use or integrity in some circumstances.	Change in flood risk resulting in a danger for most. Potential for moderate damage to the property or infrastructure.
Low	Flood hazard classification increased to low. Results in minor change to feature, with insufficient magnitude to affect its use or integrity in most circumstances.	Change in flood risk resulting in a danger to some. Potential for minor damage to property or infrastructure.
Very low	Flood hazard classification remains unchanged. Results in little or no change to feature, with insufficient magnitude to affect its use or integrity.	Increased frequency of flood flows, but which does change the flood hazard classification, and does not pose an increased risk to property or infrastructure.

Evaluation of significance

16.7.7 During the assessment of effects for each identified receptor, the sensitivity value in **Table 16.8** will be combined with the magnitude of change from **Table 16.9** to produce an overall significance rating based on the evaluation matrix shown in **Table 16.10**. A 'Significant' effect is assessed as Major rating whereas a Moderate rating will be considered to be potentially significant at this stage of the EIA process. The latter will be subject to further investigation as part of the EIA following refinement of design information. This approach will be based on professional judgement and carried out on a precautionary basis.

Table 16.10: Significance evaluation matrix

	Magnitude of Change			
Sensitivity	**High**	**Medium**	**Low**	**Very low**
High	Major (Significant).	Major (Significant).	Moderate (Significant/ Not Significant).	Minor (Not significant).
Medium	Major (Significant).	Moderate (Significant/ Not Significant).	Minor (Not significant).	Negligible (Not significant).
Low	Moderate (Significant/ Not Significant).	Moderate (Significant/ Not Significant).	Negligible (Not significant).	Negligible (Not significant).
Very Low.	Moderate (Significant/ Not Significant).	Negligible (Not significant).	Negligible (Not significant).	Negligible (Not significant).

16.8 Scope of the Assessment

Potential receptors

Identification of receptors that could be subject to likely significant effects

16.8.1 On the basis of the baseline appraisal, the following classes of flood risk receptors have been identified:

- people and residential property;
- commercial and industrial property;
- infrastructure;
- ecological;
- agricultural land; and
- heritage.

16.8.2 On the basis of the baseline sources and pathways of flood risk presented for the ZoI principal flood risk and drainage receptors have been identified. The principal

flood risk and drainage receptors that have been identified as being potentially subject to effects are summarised in **Table 16.11**.

Table 16.11: Receptors subject to potential effects

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Main development Site.	Construction	Bradwell B power station construction site - people, equipment or plant.	Considered by NPPF as being Essential Infrastructure. Sensitive to flooding and due to location of works in an area with significant flood risk, potentially exposed to flood hazard.
Main development site.	Construction	Existing Bradwell power station site, all roads and critical utilities - located inside of, and within the ZoI (unless excluded below).	Considered by NPPF as being Essential Infrastructure. Surface water runoff pathways onto the existing Bradwell power station site could be changed by the development proposals. With regards to roads and utilities there are multiple pathways and potential points of interaction, (displacement of coastal flood water, changes in surface water runoff) disruption at one point would affect other sections.
Main development site.	Construction	Developments such as caravan parks (principally Bradwell Waterside, but also Eastland Meadows).	Caravans are considered to be 'highly' vulnerable to flooding by NPPF. Bradwell waterside caravan park is in the coastal floodplain. Eastlands is located adjacent to site earthworks where changes in runoff could potentially occur.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Main development site.	Construction	Existing residential properties (including Othona community settlement, Downhall Estate, Weymarks Farm and East Hall Farm) - located inside of, and within the ZoI (unless excluded below).	Existing residential dwellings. NPPF considers as 'more' vulnerable, therefore considered as a separate receptor class. Included due to potential effect associated with displacement of floodwater or changes to runoff pathways (flow rates and direction).
Main development site.	Construction	Existing ecology, agricultural land, commercial or industrial development located within the ZoI (unless excluded below).	Existing ecology, agricultural land and commercial or industrial buildings. NPPF considers as 'less' vulnerable, therefore considered as a separate receptor class. Included due to potential effect associated with displacement of floodwater or changes to runoff pathways (flow rates and direction).
Main development site.	Construction	The Chapel of St Peter-on-the-Wall.	The Chapel is of national (potentially international) importance as a heritage asset and is therefore considered as a separate receptor class. For the purposes of this assessment it is therefore considered as highly vulnerable. The chapel is located adjacent to site earthworks where changes in runoff could potentially occur (flow rates and direction).

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Main development site.	Construction	Bradwell Waterside Marina and related development.	Existing Marina development. NPPF considers as 'water compatible', therefore considered as a separate receptor class. Included due to potential effect associated with displacement of floodwater or changes to runoff pathways (flow rates and direction).
Main development site.	Operation	Bradwell B development with flood defences.	Potential risk due to surface water flooding from accumulated rainfall and capacity of the Project's drainage system.
Off-site Power Station Facilities.	Construction	Existing people and property.	Included due to potential effect associated with displacement of floodwater or changes to runoff pathways (flow rates and direction) and risks associated with run-off generated from the site.
Off-site Power Station Facilities.	Operation	Existing people and property.	Included due to potential effect associated with displacement of floodwater or changes to runoff pathways (flow rates and direction) and risks associated with runoff generated from the site.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
All off-site associated development.	Construction	Existing people and property.	Included due to potential effect associated with displacement of floodwater or changes to runoff pathways (flow rates and direction) and risks associated with runoff generated from the site.
All off-site associated development.	Operation	Existing people and property.	Included due to potential effect associated with displacement of floodwater or changes to runoff pathways (flow rates and direction) and risks associated with runoff generated from the site.

16.8.3 Development considered too distant or not in potential hydraulic continuity (i.e. no 'pathway') with the main development site have been scoped out of the assessment and have not been included as potential receptors. These include the following:

- Areas of Bradwell-on-Sea village greater than 100m distance from the main development site boundary. These areas are located at a significantly higher elevation relative to the Project sites and outside of the coastal flood risk zone and are therefore unlikely to be affected by any changes in surface water runoff associated with landforming (for example, screening embankments) that would be provided near the boundaries of the Project; and

- Waterside Road (B1021) is at a higher elevation than the main development site and outside of the coastal flood risk zone and is therefore unlikely to be affected by any changes in surface water runoff.

16.8.4 Other potential receptors have been scoped out of the flood risk and drainage topic during the Operational Phase. This is because by the end of the construction phase, all major earthworks would have been completed and all of the land outwith the Power Station Permanent Development area will have been restored. The permanent landscape restoration strategy will ensure flood risk to receptors is sustainably managed alongside biodiversity, amenity and cultural heritage requirements of the landscape.

16.8.5 Surface water runoff collecting inside the defended power station permanent development area will be collected, treated where required and discharged either to the terrestrial environment or directly to the marine environment. For marine discharges of surface water runoff there are no flow rate constraints although quality standards will apply. The assessment of potential water quality effects on the terrestrial environment associated with such discharge arrangements will be presented in **Chapter 15: Water Environment**. Similarly, **Chapter 18: Marine Water Quality and Sediments** will assess the impact of discharges direct to the marine environment. The power station permanent development platform will be designed to satisfy the requirements of the Nuclear Safety Case ensuring the site remains safe from coastal flooding during the development's lifetime.

16.8.6 The assessment presented within the ES will be informed by supporting studies including FRAs and Drainage Strategies (DS). The assessment will be undertaken with reference inter-related EIA aspects, including: **Chapter 12: Climate Change**; **Chapter 14: Soils, Geology and Land-use**; **Chapter 15: Water Environment**; **Chapter 17: Marine and Coastal Processes**; **Chapter 23: Biodiversity – Terrestrial and Freshwater Ecology and Ornithology;** and, **Chapter 24: Marine Ecology and Fisheries**.

Likely significant effects

16.8.7 The likely effects of the Project on these receptors that have the potential to be significant are:

- new flowpaths and areas of flood risk due to landform changes and floodwater displacement; and
- an increase in volume and speed of runoff and off-site flood risk due to the construction of new areas of impermeable surfaces and piped drainage systems.

16.8.8 Those effects that will be taken forward for assessment in the ES are summarised in **Table 16.12**.

Table 16.12: Likely significant flood risk and drainage construction effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site.	Construction	Start of phase - Land preparation – earthworks or excavation, construction phase drainage.	Residential properties and communities, ecological, agricultural land, and historic monuments
Main development site.	Construction	End of phase - Land restoration – earthworks.	Residential properties and communities, ecological, agricultural land, and historic monuments.
Off-site Power Station Facilities.	Construction	Possible landform and drainage changes.	Residential properties and communities, ecological, agricultural land, and historic monuments.
All off-site associated development.	Construction	Possible landform and drainage changes.	Residential properties and communities, ecological, agricultural land, and historic monuments.

16.8.9 No effects have been scoped out of the assessment.

16.9 Potential Mitigation

16.9.1 A range of environmental measures will be embedded into the Project design. **Table 16.13** outlines the proposed embedded measures with a direct influence on the flood risk and drainage assessment. These mitigation measures will be controlled via DCO requirements, and associated permits and consents. These measures are considered to be effective and deliverable and address the likely significant effects of the Project.

Table 16.13: Summary of likely embedded mitigation

Receptor Type	Changes and Effects	Embedded Mitigation
All receptors at risk of flooding.	Increased flood risk hazard or new infrastructure at risk of flooding.	Where required appropriate flood protection measures will be included in the design for construction and operational phases for the main development, off-site associated development and off-site Power Station Facilities. For example: at the construction stage these would range from the sequential setting out of components of the construction infrastructure, the use of localised bunding and raising or flood resistance and resilience measures, and the preparation of a suitable flood evacuation plan or flood warning system for any element of the temporary construction activities that could potentially be at risk of flooding. For the main development site operational phase, these measures include for the raising of the permanent power station platform and associated defences for this platform.
All receptors at risk of flooding.	Changes to levels and surfaces associated with landform changes could displace floodwater and/or block or alter existing surface water flow paths.	Landform changes during the construction phase (main development site, off-site associated development and offsite Power Station Facilities) will be designed to ensure no detrimental loss of flood storage and therefore no increase in flood risk. The restored landscape will seek to sustainably manage the combined requirements of flood risk, landscape character, amenity, heritage and biodiversity requirements. Appropriate

Receptor Type	Changes and Effects	Embedded Mitigation
		flood storage compensation will be included if required. Drainage management systems to sustainably manage runoff from the main development site, off-site associated development and off-site Power Station Facilities will be incorporated.
All receptors at risk of flooding.	Additional hard surfaces and disturbed and compacted ground will reduce direct infiltration of rainfall or interception storage. This has the potential to increase the rate of surface water runoff and so increase flood risk.	Owing to the extensive spatial range and large scale of construction operations associated with the Project, suitable measures will be specifically defined in the Code of Construction Practice (CoCP) for the construction phase works pertaining to the main development site, off-site associated development and off-site Power Station Facilities. Runoff from hardstanding or earthworks for all components of the development will be directed to suitably designed sustainable drainage systems, appropriate to local conditions in order to manage runoff rates and volumes appropriately (taking account of proposed discharge arrangements). These measures will prevent an increase in flood risk associated with greater runoff.
All receptors at risk of flooding.	New crossings of watercourses and/or floodplains by linear infrastructure: potential to affect downstream conveyance.	Where possible development will avoid or minimise the number of watercourse crossings required. Where crossings are required existing conveyance rates will be maintained by the use of appropriately designed crossings.

16.9.2 **Table 16.14** describes the means for implementing the proposed environmental measures to be embedded within the Project design, i.e. how they are anticipated be secured.

Table 16.14: Summary of potential mitigation to be implemented – surface water and flood risk

Mitigation Measure	Compliance Mechanism
Flood Defence, protection and risk management measures.	Approval of designs and proposed implementation measures by the ONR, Environment Agency, LLFA or LPA secured under DCO requirements (with reference to CoCP) and construction and operational Environmental Permits.
Avoiding an increase in flood risk due to displacement.	Approval of designs and proposed implementation measures by the ONR, Environment Agency, LLFA or LPA secured under DCO requirements (with reference to CoCP) and construction and operational Environmental Permits.
Management of surface water runoff - attenuation and suitable discharge points.	Approval of designs and proposed implementation measures by the ONR, Environment Agency, LLFA or LPA secured under DCO requirements (with reference to CoCP) and construction and operational Environmental Permits.

16.10 Assumptions and Limitations

16.10.1 The scope of the assessment is based on a high-level review of limited desk-based baseline information and will be confirmed through review of additional data sources, field surveys or monitoring and consultation with relevant stakeholders.

16.10.2 It is assumed that mitigation will be undertaken in accordance with best practice and that necessary Environmental Permits will be obtained for relevant activities during both the construction and operational phase. For example, all temporary and permanent watercourse crossings would be consented via a Flood Risk Activities Permit, issued post-DCO.

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17. COASTAL GEOMORPHOLOGY AND HYDRODYNAMICS

17.1 Introduction

17.1.1 This chapter sets out the approach for determining the scope of the assessment of impacts to coastal geomorphology and hydrodynamics, as it relates to the main development site and the temporary project-provided accommodation which may be located in the near vicinity of the main development site**. Chapter 5: The EIA Process and Methods** introduces the overall Environmental Impact Assessment (EIA) process including the methodology for assessing effects and determining significance. The topic specific methodology for determining receptor value, sensitivity and impact magnitude for this chapter are provided in **Section 17.6**.

17.1.2 This chapter contains:

- a summary of the work undertaken to date;
- an explanation of the scope of assessment, including:
  - legislation, policy and guidance that inform the assessment;
  - a description of consultation and engagement for coastal geomorphology and hydrodynamics to date;
  - the study area for the assessment;
  - sources of data used in scoping;
  - baseline conditions from completed desk studies and surveys; and
  - planned further surveys and studies;
- the proposed receptors for assessment and the effects which have the potential to be significant;
- the effects proposed to be scoped out of the assessment; and
- potential mitigation.

17.1.3 The chapter should be read in conjunction with the project description provided in **Chapter 3: The Project**.

Work undertaken to date

17.1.4 In **Section 17.3**, details of the engagement to date with relevant consultees for the Project are provided. Details of historical desk-based and survey data sources used to inform the coastal geomorphology and hydrodynamics assessment can be found in **Section 17.4**.

17.2 Legislation, Policy and Technical Guidance

17.2.1 This section identifies the relevant legislation, national and local policy and guidance that has informed the scope of the assessment relevant to coastal geomorphology and hydrodynamics. Further information on policies relevant to the EIA and their status is set out in **Chapter 2: Policy and Regulatory Context**, which should be read in conjunction with this chapter.

17.2.2 The legislation and policies relevant to coastal geomorphology and hydrodynamics are detailed in **Table 17.1**.

Table 17.1: Legislation and policy

Relevant Legislation and Policy	Relevance to the Assessment
Legislation	
International: Ramsar Convention on Wetlands of International Importance 1975 (Ref. 17.1).	Ensures the conservation and sustainable use of wetlands, requires consideration in the assessment. Relevant qualifying features of designated sites must be assessed to ensure conservation objectives for each relevant site are met.
International: EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC). National: The Conservation of Habitats and Species Regulations 2017 (Ref. 17.2).	Ensures the conservation of a wide range of rare, threatened or endemic animal and plant species. Relevant qualifying features of designated sites must be assessed to ensure conservation objectives for each relevant site are met.
International: EC Directive on the Conservation of Wild Birds (2009/147/EC) (Ref. 17.3).	The Birds Directive is the means by which the UK and the European Union meet the objectives of the Bonn Convention of migratory species and the Bern Convention of conservation of wild species. Vulnerable and rare species listed in Annex I are afforded protection under the Natura network of protected areas through designated Special Protection Areas (SPAs). Migratory species and internationally important wetlands are also protected with SPA designations. Relevant qualifying features of designated sites must be assessed to ensure conservation objectives for each relevant site are met. Elements of the Birds Directive were transposed into national law in England and Wales through the Conservation of Habitats and Species Regulations and the Wildlife and Countryside Act.

Relevant Legislation and Policy	Relevance to the Assessment
National: Wildlife and Countryside Act 1981 (Ref. 17.4).	Primary legislation which protects animals, plants and habitats in the UK. It is the legal framework for designating Sites of Special Scientific Interest (SSSI).
National: Marine and Coastal Access Act 2009 (Ref. 17.5).	Ensures sustainable marine management. Relevant marine plan(s) and marine conservation zone(s) will be considered in the coastal geomorphology and hydrodynamic assessment.
National Policy	
National Policy Statement for Energy (EN-1) (Ref. 17.6).	This Overarching National Policy Statement for Energy (EN-1) is part of a suite of NPSs issued by the Secretary of State for Energy and Climate Change. It sets out the Government's policy for delivery of major energy infrastructure. The coastal geomorphology and hydrodynamic assessment will address the NPS topic requirements (for example, climate change, biodiversity and geological conservation, noise).
National Policy Statement for Nuclear Power Generation (EN-6) (Ref. 17.7).	NPS EN-6 sets out the Government's policy on nuclear electricity generation. The coastal geomorphology and hydrodynamic assessment will address the NPS topic requirements (for example, climate change, biodiversity and geological conservation, noise).
National Planning Policy Framework (Ref. 17.8)	The National Planning Policy Framework sets out the Government's planning policies for England and how these should be applied1. It provides a framework within which locally-prepared plans for housing and other development can be produced. The coastal geomorphology and hydrodynamic assessment will address the NPS topic requirements (for example, climate change, biodiversity and geological conservation, noise).

Relevant Legislation and Policy	Relevance to the Assessment
Shoreline Management Plan 2 Sub-cell 8: Essex and South Suffolk (Ref. 17.9).	Shoreline Management Plans (SMPs) are applied to individual sediment cells along the coast for the purpose of managing flood and erosion risk during the short, medium and long-term. They identify the best ways to manage coastal flood and erosion risk to people and the developed, historic and natural environment. Management Unit F (Blackwater Estuary) and G (Dengie Peninsula) are of relevance for the Project.
Local Policy	
Draft South East Inshore Marine Plan (2020) (Ref. 17.10).	Presents a strategic approach to planning within the inshore waters between Felixstowe, in Suffolk and near Dover, in Kent. The EIA coastal geomorphology and hydrodynamics assessment will assess the relevant resources to ensure the Project is not detrimental to achieving the plan's objectives.
Essex Coast Recreational Disturbance Avoidance and Mitigation Strategy (2018-2038) (Ref. 17.11).	The Essex coast Recreational disturbance Avoidance and Mitigation Strategy (the "Essex coast RAMS" or the Strategy) aims to deliver the mitigation necessary to avoid significant adverse effects from 'in-combination' impacts of residential development that is anticipated across Essex; thus protecting the Habitats (European) sites on the Essex coast from adverse effects on site integrity.
Maldon District Council (MDC) Local Development Plan (2017) (Ref. 17.12).	The Maldon District Local Development Scheme (LDS) sets out a description of the development plan documents (DPDs) being prepared by the Council and outlines the timetable for their production. Of relevance to Project design and climate change issues Policy D2 considers climate change and the environmental impact of new development.

Relevant Legislation and Policy	Relevance to the Assessment
The Colchester Borough Local Plan (2008, policies revised in 2014)[1] (Ref. 17.13).	The Colchester Local Development Plan sets out the policy for nature conservation requirements and developments within the Coastal Protection Belt and covers areas of the Colne and Blackwater estuaries where effects from the Project may occur.

[1] Colchester Borough Council is in the process of reviewing its Local Plan and a submission draft was issued for examination in 2017, with consultation on proposed main modifications planned in October 2020. The environmental aspect chapters will refer to emerging policy where relevant and greater weight will be applied depending on the extent to which the policies have moved towards adoption.

Technical guidance

17.2.3 Technical guidance that has been used to define the scope of the assessment is set out in **Table 17.2**. Although there is no specific guidance for assessing physical change to geomorphic receptors, the Marine Evidence-based Sensitivity Assessment (MarESA; see Ref. 17.14 and Ref. 17.15) approach will be adapted for geomorphic receptors. Impact prediction will align with that undertaken for the other marine environment related EIAs and will include the use of process-based numerical models and equations suitable for impact quantification. The long-term changes to the environment in the locality of the main development site will be assessed using all available evidence assimilated into an Expert Geomorphological Assessment. This assessment will determine a future baseline against which any additional impacts which are not apparent given the present baseline can be considered.

Table 17.2: Relevant technical guidance

Guidance Reference	Implications
Tyler – Walters et al. (2018). Marine Evidence-based Sensitivity Assessment (MarESA) – A Guide. Marine Life Information Network (MarLIN). (Ref. 17.14, Ref. 17.15).	This document sets out an assessment approach that is based on the methods outlined under MarESA framework (Ref. 17.14) and Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines (Ref. 17.15) to ensure compatibility with the marine ecology assessments. The MarESA framework does not provide specific guidance for assessment of coastal geomorphology receptors, so the benchmarks and magnitude scales have been developed specifically to address the assessment requirements of the Project.
Guidelines for ecological impact assessment in Britain and Ireland: Terrestrial, Freshwater, Coastal and Marine (2018).	The assessment is based on the methods outlined under the MarESA framework (Ref. 17.14) and CIEEM guidelines (Ref. 17.15) to ensure compatibility with the marine ecology assessments. The MarESA framework does not provide specific guidance for assessment of coastal geomorphology receptors, so the benchmarks and magnitude scales have been developed specifically to address the assessment requirements for the Project.

Guidance Reference	Implications
Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities (2011) (Ref. 17.16).	Provides guidance for risk management authorities to build strategies seeking governmental flood and coastal erosion risk management grant in aid (FCRM GiA) funding. By following the guidance, risk management authorities would be able to carry out credible economical appraisals that take account of the uncertainties associated with climate change. It should be noted that this report is now out of date as it is based on data from UK Climate Projections 2009 (UKCP09).
UKCP18 Marine report and UKCP18 Science overview report (Ref. 17.17, Ref. 17.18).	The UK Climate Projections 2018 (UKCP18) marine projections have been devised in consultation with a variety of UK stakeholder groups. The purpose of this report, along with the associated data products, is to facilitate vulnerability assessments to aid coastal decision makers. The emphasis of the UKCP18 marine projections is on changes in coastal sea level, including extreme water levels that arise from storm surges and surface waves.

17.3 Consultation and Engagement

17.3.1 This section has been informed by engagement and discussion with various stakeholders. **Table 17.3** details technical engagement to date that has occurred outside of formal statutory consultation. **Table 17.4** provides a summary of consultee comments arising from Stage One Consultation, along with a response to identify how the relevant matters are dealt with in this report.

Table 17.3: Technical engagement

Consultee	Points of Discussion
Natural England. Marine Management Organisation. Environment Agency.	Marine baseline data early survey design considerations (27 November 2018). Note that these discussions reflected that direct cooling was still an option at that time.

Consultee	Points of Discussion
Environment Agency.	Hydrodynamic modelling strategy report reviewed by the Environment Agency. Outlines the high-level approach to hydrodynamic model setup, calibration and validation (11 November 2019).

Table 17.4: Stage One Consultation comments

Theme	Summary of Comments and Considerations	How this is Accounted For
Alternative Options.	Natural England noted that the Beach Landing Facility (BLF) options were described as low impact on coastal processes, and this should be justified with evidence. They also noted that intertidal habitat loss from should be assessed with specific mention of saltmarsh habitat.	Geomorphic impacts from both the construction and operation of the marine transport delivery infrastructure (notably potential BLF(s)) are scoped into this assessment (**Tables 17.8** and **17.9**) thus specifically including physical loss of all types of the seabed.
Assessment Methodology.	Natural England noted that the impact of abstraction needs to be fully assessed in terms of how removing this volume of water will alter sediment transport and hydrodynamics in the area, and that potential differences in seasonal conditions, as well as climate change need to be accounted for.	Abstraction of sediment from the cooling water intakes is scoped into the assessment. This chapter outlines how future baseline conditions, including climate change scenarios will be considered for the geomorphic assessments.
Assessment Scope.	Historic England noted that there are significant designated heritage assets within the marine and intertidal zone within proximity to main development site and that a full coastal processes assessment should be undertaken to inform the historic environment assessment.	Implications for coastal geomorphology are being assessed in detail as outlined in this scoping chapter to inform the historic environment assessment.

Theme	Summary of Comments and Considerations	How this is Accounted For
Mitigation.	The Environment Agency noted that specific effects on the coast should be assessed including effect on coastal geomorphology in-combination with climate change, implications for the shoreline management plans and flood and coastal defences and the integrity of designated features. The aim should be to minimise impacts and propose mitigation measures with restorations plans for directly affected areas. Pre- and post-consent monitoring plans with triggers for intervention should also be established.	Impacts on the coast have been scoped into the assessment and include current and future baseline assessments and consider implications to management plans and policies. Specific attention will be given to minimising impacts and mitigation and the requirement for pre- and post- construction monitoring will be established during the assessment in consultation with the relevant stakeholders.
Marine Works.	Natural England noted that the location and design of the cooling water infrastructure was not defined in the Stage 1 consultation and requested input to the process. Impacts of this aspect of construction on the sub-tidal habitat, intertidal habitat and below the sea defence sections should also be considered.	Stakeholders will be consulted at various stages through the EIA process on the proposed infrastructure options and design considerations. Potential environmental constraints on the locations of the marine infrastructure are being considered including intertidal and sub-tidal habitats.
Policy and Legislation.	The Environment Agency noted that the assessments should take note of the Essex and South Suffolk Shoreline Management Plan.	This requirement is noted, and the Plan is included in **Table 17.1**.

17.4 Data Gathering Methodology

Study area

17.4.1 This section presents study areas for coastal geomorphology and hydrodynamics. As the design and consultation processes progress, and the Project is refined, the exact geographical scope of study areas may evolve further to accommodate any

changes. If the study areas change, data collection will also be reviewed and updated.

17.4.2 The initial geographical extent of the study area for coastal geomorphology includes the tidal Blackwater Estuary and coastal areas within a 15-kilometre (km) radius of Bradwell B. The landward limit is generally delineated by the mean high water springs (MHWS) tidal mark, but the supra-tidal zone will also be considered where coastal processes, or impacts to coastal processes, reach this far.

17.4.3 The Blackwater Estuary is located on the east coast of England, within the Outer Thames Estuary geomorphological system. It is a macro-tidal, bell-shaped estuary characterised by saltmarsh, mudflat, estuarine channels and islands. Evolution of the Blackwater Estuary has been influenced by both geological and anthropogenic (i.e. flood defences) factors.

17.4.4 The underlying geology is dominated by London Clay. Intertidal sediments comprise coarse, medium and fine silts with some fine sand in the upper estuary and some coarse and medium sand at the estuary mouth. Coarser shell fragments create chenier ridges, which are found on the upper intertidal and supra-tidal coast between the existing Bradwell power station and Sales Point. Subtidal sediments range from medium silt in Tollesbury Wick to medium gravel at Stansgate (see **Figure 17.1** for locations).

17.4.5 The Outer Thames Estuary system is characterised by numerous offshore banks that affect the incoming wave regime (propagating from the Southern North Sea and Dover Straits). Specifically, Gunfleet Sands and Buxey Sands contribute to refraction, diffraction, and shoaling effects, and alter the characteristics of waves reaching the Dengie Peninsula and Blackwater Estuary.

17.4.6 The Dengie Peninsula is fronted by intertidal mud and sandflats, and a continuous stretch of fringing, eroding saltmarsh, including shelly chenier ridges towards the northern end. A flood embankment protects land behind it, which is below MHWS, except for the promontory of the chapel of St Peter-on-the-Wall in the north (reclaimed land, with continued sedimentation on the marsh to seaward). Longshore drift is dominantly southward along the Peninsula coast, and westwards into the Blackwater Estuary at the northern end, around Sales Point.

17.4.7 The estuary is notionally divided into sections with the middle and inner estuaries west of the main development site the outer estuary and approaches to the Blackwater and Colne Estuaries to the east (**Figure 17.1**). The boundary between the Blackwater Coastal Water Body and Blackwater Estuarine Transitional Water Body is adjacent to the main development site.

Sources of data used in scoping

Desk based

17.4.8 The scoping exercise has been undertaken with reference to **Chapter 3: The Project** supported by several data sources. The principal desk-based data sources used to inform this chapter are listed in **Table 17.5**.

Table 17.5: Principal desk-based data sources

Source	Data
Magnox Ltd.	Environmental process data held (for example, currents, fine sediment transport). Sediment and water quality sampling at Bradwell.
Environment Agency and Channel Coastal Observatory.	Saltmarsh extent and zonation. Saltmarsh extent shapefiles 2007, 2011, 2016 for Blackwater, Colne, Crouch and Essex coast. Saltmarsh zonation shapefiles 2007 and 2011 for Outer Blackwater. Aerial Orthorectified Red Green Blue Near-infrared images for 2013, 2015, 2016. AWAC (waves, currents) deployments at Clacton and Dengie Flats (2006 – 2009). LiDAR data from 1999, 2001, 2002, 2008, 2009, 2012 – 2019.
British Energy Estuarine and Marine Studies (BEEMS).	Historical data on bathymetry, topography, tidal movements, and sediments (2008 – 2009).
UK Coastal Monitoring and Forecast service.	South Knock directional wave rider (2010 – 2020).
British Geological Survey (BGS).	Bathymetry.
United Kingdom Hydrographic Office (UKHO).	Bathymetry.
Defra (Ref. 17.19).	Designated conservation site boundaries and areas (Multi Agency Geographic Information for the Countryside (MAGIC)).

Survey data

17.4.9 Cross-disciplinary work at Bradwell was carried out by BEEMS during 2008 – 2009. This involved the collection of physical data on bathymetry, topography, tidal movements, and sediments. These historical datasets will be used as background information to the receptor specific coastal geomorphology and hydrodynamic assessments.

17.4.10 **Table 17.6** presents details of the recently completed surveys whilst ongoing surveys are listed in **Table 17.7**. Information from past and present surveys will be used to inform the EIA for coastal geomorphology and hydrodynamics.

Table 17.6: Completed 2019 surveys and studies relevant to coastal geomorphology and hydrodynamics

Source	Methods	Description	Duration
Bathymetry and backscatter (interpreted to habitat map).	Multi-beam echosounder.	Blackwater outer estuary to 0m CD.	Completed May 2019.

Planned further surveys and studies

17.4.11 **Table 17.7** identifies the marine surveys and data collection activities that are currently underway. This information will be used to increase the understanding of coastal hydrodynamics and geomorphology and will be extensively analysed. It will also form the basis for calibration and validation of numerical models used to determine the present state and to predict impacts. Modelling reports that quantify or describe predicted impacts that will feed into the assessments will be available for regulatory comment.

Table 17.7: Ongoing and planned further surveys and studies for coastal geomorphology and hydrodynamics

Further surveys and studies	Proposed Date	Scope relevant to coastal geomorphology
MetOcean surveys.	12 months (October 2019 – October 2020).	To acquire further information on the currents, tides, waves, meteorological parameters, turbidity, and suspended sediment.
Suspended sediment surveys.	Seasonal suspended sediment concentrations and particle size profiles from Spring 2020 to Spring 2021	To acquire estimates of the sediment volumes abstracted by the station.
Marine water quality.	Every 3 months for 12 months (November 2019 to October 2020).	To acquire further information on water quality turbidity, and suspended sediment.
Marine sediment quality.	Survey to be specified once location of marine infrastructure is determined. Planned for 2021.	To acquire further information on sediment characteristics (turbidity, and suspended sediment).
Hydrodynamic models *	Desk study underway (Metocean data will be used for calibration and validation). Measurements and numerical models will be used to assess baseline and impacts.	To acquire further information on the hydrodynamic state and plume dispersion.
Sediment transport models.	Scoping of requirement in 2020 and development of any required models in 2020 – 2021.	To acquire further information on sediment transport.

** see **Chapter 18: Marine Water Quality and Sediments** for details on thermal-saline and chemical models.*

17.5 Baseline Information

Current baseline

17.5.1 This section provides a brief description of the baseline that will be used for the EIA for coastal geomorphology and hydrodynamics including data from numerous deployments (AWACs, tide gauge, wavebuoy).

Tidal regime

17.5.2 The Blackwater Estuary is a macro-tidal estuary with semi-diurnal tides that show a small diurnal inequality (up to 0.4 metre (m) difference at high water springs at Osea) and a tidal range of 4.8m at spring and 2.9m at neap at Bradwell Waterside (Ref.17.19). In terms of general characteristics:

- The estuary is well-mixed and features a typical boundary layer with current slowest at the bed and increasing towards the surface.
- Current magnitudes typically decrease with increasing distance up-estuary.
- In terms of peak currents, the estuary mouth is ebb dominant.
- The currents become more flood dominant with increasing distance from the mouth.

Waves

17.5.3 Shallow sandbanks seaward of the Blackwater Estuary mouth and very wide intertidal mud flats attenuate incoming wave energy before it reaches the estuarine shorelines and flood defences. Further protection is offered by the lighter Sales Point Barges and the Chenier ridges between the existing Bradwell power station and Sales Point – these ridges prevent waves from attacking defences (embankments) and salt marshes except under extreme water levels (i.e., storm surge) and waves when they will dissipate rather than stop wave energy. Modelling of the estuary has shown that wave heights of 1.2m (1 in 1 year return period) can propagate upstream as far as Mill Point (10km, from Blackwater Estuary mouth, see **Figure 17.1**), beyond this point waves are more limited by the shallower morphology and locally generated waves become more dominant (Ref. 17.21).

Shoreline change

17.5.4 The broad form of the estuary is atypical of macro-tidal estuaries (being narrow mouthed with lesser landward narrowing). General changes in the recent past (the last 400 years) can be summarised as reclamation of saltmarsh all around the estuary perimeter, followed by erosion, largely considered a consequence of sea level rise (Ref.17.20).

17.5.5 The inner and outer estuaries presently exhibit contrasting trends: the mouth shows widening and shallowing that reflects erosion at the coastline and deposition in the channel, whilst the inner estuary is experiencing channel erosion and shoreline deposition. Previous attempts to generate a sediment budget for the Blackwater have resulted in contradictory conclusions, indicating the significant difficulties in deriving an accurate estimate (Ref. 17.20, Ref. 17.21 and Ref. 17.22). The Institute of Estuarine and Coastal Studies (IECS) in 1993, concluded that morphological change may be redistributive rather than net, with erosion of the intertidal zone compensated by infill of the channel; however, the Cambridge Coastal Research

Unit (CCRU) in 1996, suggest a net deposition within the estuary as a whole, with losses in the outer estuary exceeded by deposition within the inner estuary.

17.5.6 Nevertheless, the dominant shoreline change trend reported in studies of the Blackwater Estuary is erosional, with the northern shores under most pressure. In the 1970s, the beach in front of the Bradwell Power Station A, and specifically at Eastern pillbox, the overall gradient of the beach was 1 in 10 with the mudflat having a slope of 1 in 50. The maximum height of the beach was 2.8m ODN consisting mainly of shell. Once the beach dropped down to 2m ODN a horizontal outcrop of grey clay appeared, with a steep ridge feature capped with shell at 1.0m ODN. At the foot of the beach, some 27m from the pillbox at 0m ODN, there was an abrupt transition from sand to mud. The upper shore of the beach between the reactor buildings consisted of the high shell ridge starting some 25m out from the base of the wall at a height of 4.0m ODN. This ridge then progressed to sand at 3.0m ODN with an overall beach gradient of 1 in 10 before the mudflat was reached at -0.5m ODN.

17.5.7 At Sales Point, the lighter barges have allowed a steady build-up of mud at their landward side since the late 1980s. There is no evident movement at MHWS due to the existing sea defence and at the Mean High Water Neaps (MHWN) due to the lighter barge. At Othona Roman Fort, there is a strong erosion trend at MHWS and MHWN, whilst significant accretion is apparent at Mean Sea Level (MSL) and MLWN. At Dengie Flats, there is slight erosion at MHWS at the edge of the saltmarsh, and at MHWN. There is significant accretion at MSL and less at MLWN (Ref. 17.20).

17.5.8 Factors likely to contribute to the net erosional trend include sea level rise (contributing to 'roll-over' of the estuary landward and upward over time) (Ref. 17.21, Ref. 17.23). Other (theoretical) influences suggested by general models of estuarine function (Ref. 17.24 and Ref. 17.25) include changes to the tidal symmetry and prism as the estuary geometry is modified, leading to withdrawal of the ebb tide delta and increasing exposure of the outer marshes. Migration of chenier ridges (initially formed as a probable geomorphological response to sea level rise) may also indicate a change in wave behaviour and increased exposure.

17.5.9 However, there is little evidence of clear causal links between observed changes and specific environmental factors, nor that changes in the Blackwater Estuary are related to cyclic switching from ebb to flood dominance.

17.5.10 The Blackwater Estuary shoreline has been heavily modified by shoreline protection or realignment measures (see **Figure 17.1**). Though mostly on the northern shore, these may contribute to small-scale changes in tidal flows, which in turn might have consequences for the exposure of the southern shore of the outer estuary, where the Bradwell B power station is to be located.

Morphology and sedimentology in the indicative zone for marine infrastructure

17.5.11 This section briefly describes the morphology and sedimentology in the indicative zone for marine infrastructure. The zone for marine infrastructure features several

morphological components: the main channel of the Blackwater Estuary, the southern channel flank, intertidal mud flats, a perched sandy-shelly high-tide beach, supra-tidal chenier ridges and two small patches (c. 3 – 4ha) of salt marsh.

17.5.12 The bed sediments differ between each of the morphological zones. Preliminary results indicate the main channel consists of sandy (very fine sand) mud with a median size corresponding to coarse silt. The low sloping flats (1° – 5°) vary from circa 70 – 650m wide and are mud dominated with lesser mixtures of sand or gravel. The sediments of the perched beach on the upper intertidal are sandy gravel (sand and shells) typically sloping at 2° – 8° with isolated parts exceeding 15°.

17.5.13 Resting on top and landward of the beach faces are chenier ridges composed mainly of *Cerastoderma (Cardium) edule* valves, and a wide range of other molluscs including *Crepidula, Gibbula, Littorina, Macoma, Mya, Mytilus, Nucula* and *Ostrea*. In cross-section, they generally exhibit a relatively steep seaward face slope (10° – 20°) that is up to 25m wide. To landward a gently inclined upper surface dips landward at 2° – 5° for up to 30m. Chenier ridges are sandy or shelly beach ridges that are part of a strand plain separated by mud-flat deposits. They are wave-built coastal landforms that are found inland of their originating location and are generally characterized by low wave energy, low gradient, muddy shorelines, and abundant sediment supply.

Future baseline

17.5.14 The current baseline is considered appropriate for the duration of the construction and commissioning phases, and a large proportion of the operational phase of the Bradwell B power station.

17.5.15 The effects of operational impacts on coastal geomorphology receptors would be considered against current baselines, but the operational design life of the proposed Project (specifically the operational phase of the Bradwell B power station) means that some impacts must be considered in relation to potential shifts in future baselines due to climate change, such as changes in wave climate, sea level and shoreline position. The most up-to-date marine climate change predictions will be incorporated into numerical models and expert geomorphological assessments (EGA).

17.5.16 Standard computational environmental modelling techniques are inadequate to Project changes over the full lifespan of the development. Longer term predictive methods (for estuarine environments, Ref. 17.23) include historical trend analysis, application of regime theory, rollover methods and expert geomorphological assessment (EGA). In general, each of these methods ultimately relies on expert interpretation to evaluate what is reasonable, and this will be determined using EGA panels.

17.5.17 Following an established method, the expert panel comprising local and context-specific knowledge will review the evidence from all available data (measured and modelled), including techniques to derive future projections of shoreline change.

The aim will be to identify the likely future context (baseline) in which the Project would operate, and any impacts upon it. The outputs of the EGA will be scrutinised by an independent expert panel to ensure that the logic and scientific underpinning of the EGA is broadly sound, proposing changes where necessary.

17.5.18 Future impacts of the Project will then be assessed in narrative form (standard EIA tables cannot be used due to uncertainties over the long term) with reference to the future shoreline baseline developed.

17.6 Proposed Approach to the Assessment

Assessment methodology

17.6.1 The assessment will consider impacts during the construction and the operation phases of the main development site, and potential effects on coastal receptors. It will also consider impacts of any marine structures still present post-operation.

17.6.2 Particular regard will be given during the assessment and design development to relevant legislation and policies concerned with coastal geomorphology and coastal processes (see **Table 17.1**).

17.6.3 Assessments broadly consider the magnitude of impacts and sensitivity of receptors that could be affected in order to classify effects.

17.6.4 The impacts of the Project will be assessed based on the known design criteria, to establish the scale, timing and location of interaction with the marine environment. Impacts will be estimated using computational models where appropriate or using expert assessment where modelling is considered inappropriate or impractical (largely due to timescale).

Assessment of effects and determining significance

17.6.5 The general approach to the assessment of effects and determination of significance that will be used for the EIA is provided in **Chapter 5: The EIA Process and Methods**. However, this section sets out how the approach has been applied and where it has been adapted to deal with the specific requirements of coastal geomorphology and hydrodynamics.

17.6.6 Receptors would be assessed against relevant (medium-high) pressures identified in the Joint Nature Conservation Committee (JNCC) pressures-activities database (PAD) (see **Table 17.8**), For consistency, the list of pressures provided in the EIA will be consistent with those proposed for the HRA and MCZ assessment. It should be noted that list may be revised following stakeholder engagement on either the HRA Screening or EIA Scoping processes. The PAD uses the information provided within Natural England's Advice on Operations (AoO) and supplements it with information on activities relevant to Scotland (based on Feature Activity Sensitivity Tool (FeAST)) and a range of new activities that occur or may occur in UK waters.

Table 17.8: Assessment scale for the resistance and resilience of geomorphic receptors to a given pressure

Broad Pressure Themes	Pressure description for statutory marine sites
Alteration of coastal processes.	Water flow (tidal current) changes, including sediment transport considerations.
	Emergence regime changes, including tidal level change considerations.
	Wave exposure changes.
Water quality effects.	Changes in suspended sediment solids (water quality).
Direct habitat loss and indirect habitat fragmentation.	Physical change (to another seabed type).
	Physical change (to another sediment type).
	Abrasion or disturbance of the substrate on the surface of the seabed.
	Penetration or disturbance of the substrate below the surface of the seabed, including abrasion.
	Physical loss (to land or freshwater habitat).
	Sedimentation rate changes.

Receptor sensitivity

17.6.7 Sensitivity is a measure of a receptor's resistance and resilience to a given pressure. Resistance determines the receptor's susceptibility to (or tolerance of) a pressure, whilst resilience gives an indication of the ability to recover from a perturbation or stress. Assessment scales for resistance and resilience are provided in **Table 17.9**.

17.6.8 The defined values of resistance and resilience are combined to give an overall sensitivity score for each receptor-pressure combination according to the schedule provided in **Table 17.10**.

Table 17.9: Assessment scale for the resistance and resilience of geomorphic receptors to a given pressure

Resistance	Description	Resilience	Description
None	Feature is easily altered – historic variability is high; presence of feature is not permanent. Pressure could result in complete loss of geomorphic function i.e. loss of beach; change or loss of longshore sediment transport pathway; loss of chenier ridges or salt marshes.	Very low.	Negligible; or prolonged recovery (greater than 25 years) recovery.
Low	Feature is highly variable and responds quickly to changes in hydrodynamic conditions – historic variability is high. Pressure could cause deviation in geomorphology that is beyond the measured range (decadal scale 1990 to present).	Low	Full recovery within 10-25 years.
Medium	Feature is essentially permanent but varies within a defined range, largely unaffected by typical hydrodynamic conditions – historic variability is low. Pressure could change geomorphic features within the range of historical trends.	Medium	Full recovery in 2-10 years.
High	Receptor is stable over a wide range of conditions – historic variability is low or negligible. Pressure could not conceivably result in significant changes to morphology or process.	High	Full recovery within two years.

Table 17.10: Classification of effect based on sensitivity of receptors and magnitude of impact

	Resistance			
Resilience	**None**	**Low**	**Medium**	**High**
Very low.	High	High	Medium	Low
Low	High	High	Medium	Low
Medium	Medium	Medium	Medium	Low
High	Medium	Low	Low	Very low.

Impact magnitude

17.6.9 Impact magnitude is characterised as the combination of three separate components: duration, spatial extent and amount of change introduced by the impact. The criteria used for assessing impact magnitude are shown in **Table 17.11**. In some cases, the likelihood of the impact occurring, and the reversibility of the impact are also considered, and reported where these factors may affect the assessment of the impact magnitude.

17.6.10 The combination of these components into a single indicator of magnitude is an undefined process, so requires an element of expert judgement, for example, whether the magnitude is defined by the highest single factor or (more reasonably, but less clearly) by some combination.

Table 17.11: Description of effect classifications

Impact Magnitude	Description	Spatial Extent	Amount of Change	Duration
High	Large-scale changes to receptor over the ZoI.	Affecting whole area, possibly beyond.	Clear, measurable, beyond normal range of natural variability.	Long-term temporary greater than 5 years.
Medium	Medium-scale changes to receptor over the ZoI.	Majority of receptor area, perhaps beyond.	Clear, measurable, within normal range.	Medium-term temporary 1-5 years.
Low	Noticeable but small-scale change to a partial area of the receptor.	Partial area.	Slight change within normal range.	Short-term temporary, less than one year.
Very low.	Noticeable, but very small-scale change, or barely discernible changes to a small area of the receptor.	Small area of receptor.	Possibly unmeasurable or not easy to separate from natural change.	Spring-Neap cycle or less.

Classification of effects

17.6.11 The significance of effects is determined by combining the impact magnitude and sensitivity assessments to determine an effect classification, using **Table 17.12**. Minor and negligible effects are not considered to be significant. Moderate and major effects are significant. The classification of effects is coupled to a descriptor

outlined in **Table 17.13**, which can be used to confirm the overall conclusions of the assessment.

17.6.12 Effects classification makes no explicit distinction between adverse or beneficial effects, as these are potentially variable judgments according to different stakeholder perspectives. However, effects identified will be discussed in terms of being either adverse or beneficial from a geomorphic perspective. An adverse effect arises from an impact which damages or accelerates change in an existing geomorphic feature or process; a beneficial effect occurs where a feature or process is preserved for longer than would be the case without the impact, or where a feature is specifically intended to bring benefits (for example, habitat creation).

Table 17.12: Classification of effect based on sensitivity of receptors and magnitude of impact

Magnitude of Impact	Sensitivity of Receptor			
	Very Low	Low	Medium	High
Very low.	Negligible	Negligible	Minor	Minor
Low	Negligible	Minor	Minor	Moderate
Medium	Minor	Minor	Moderate	Major
High	Minor	Moderate	Major	Major

Table 17.13: Description of effect classifications

Effect	Description
Major	Adverse and beneficial effects that are likely to be important considerations because they contribute to achieving national or regional objectives, or, are likely to result in exceedance of statutory objectives and or breaches of legislation, i.e. affecting viability of site for infrastructure.
Moderate	Effects that are likely to be important considerations, at a regional or local level.
Minor	Effects that could be important considerations, but of small change in environmental or socio-economic conditions.
Negligible	An effect that is likely to have a negligible or neutral influence, irrespective of other effects.

Receptor value

17.6.13 Value is applied independently of the effect assessment above (see **Tables 17.12** and **17.13**) and is used to determine the significance of a predicted effect on a receptor in relation to its socio-economic or conservation value. For example, higher value would be ascribed to a geomorphic feature in a statutory site designated for nature conservation or a beach that offers natural protection to the foundations of a flood defence embankment.

17.6.14 Value is determined by expert judgement and considers the location of the receptor relative to the impact, its distribution and rarity, its conservation status, and its socio-economic value. **Table 17.14** is a guide giving a general description for each of the value categories.

17.6.15 The significance of an assessment is determined using expert judgement based on the effect and value decisions and using **Table 17.15** as a guide. This table shows indicative significance ratings for different combinations of effect (with impact magnitude and receptor sensitivity) and value. Grey boxes indicate categories where receptor value is least likely to alter the significance of the effect judgement from **Table 17.13**. Underlined text indicates categories where value may lead to a reduction in the significance of effects. Bold text indicates categories where value may lead to an increase in the significance of effects.

Table 17.14: General description for assigning value

Value	General Description for Assigning Value
High	• High geomorphic value (other geomorphic features depend on it). International conservation value such as designated geomorphic feature of Special Areas of Conservation (SAC), SPA or Ramsar sites. • Habitats and Species "of principle importance for the purpose of conserving biodiversity" listed in Section 41 (England) of the Natural Environment and Rural Communities (NERC) Act 2006. • National or international socio-economic value.
Medium	• Moderate geomorphic value (for example, common or another feature partially depends on it). • National conservation value such as designated geomorphic features of regional or county importance, such as SSSIs or County Wildlife Sites (CWSs), Conservation Areas. • Moderate national regional socio-economic value.
Low	• Low geomorphic value (for example, abundant or common feature and or limited connection to other geomorphic features). • Regional or local conservation value such as local nature reserves. Local socio-economic value.
Very low.	• Nationally abundant feature that is not common locally and has no functional dependencies. • Receptors with no conservation designation. No immediate socio-economic value.

Table 17.15: Indicative significance rating for effect and value.

Sensitivity	Magnitude	Effect	Value		
			Low	Medium	High
Not sensitive.	Very Low.	Negligible	Not significant.	Not significant.	Not significant.
Not sensitive.	Low	Negligible	Not significant.	Not significant.	Not significant.
Not sensitive.	Medium	Minor	Not significant.	Not significant.	Not significant.
Not sensitive.	High	Minor	Not significant.	Not significant.	Not significant.
Low	Very Low.	Negligible	Not significant.	Not significant.	Not significant.
Low	Low	Minor	Not significant.	Not significant.	Not significant.
Low	Medium	Minor	Not significant.	Not significant.	**Potentially significant.**
Low	High	Moderate	Not significant.	Potentially significant.	Potentially significant.
Medium	Very Low	Minor	Not significant.	Not significant.	Not significant.
Medium	Low	Minor	Not significant.	Not significant.	**Potentially significant.**
Medium	Medium	Moderate	Not significant.	Potentially significant.	Potentially significant.
Medium	High	Major	Potentially significant.	Significant	Significant
High	Very Low.	Minor	Not significant.	Not significant.	**Potentially significant.**
High	Low	Moderate	Not significant.	Potentially significant.	Potentially significant.
High	Medium	Major	Potentially significant.	Significant	Significant
High	High	Major	Significant	Significant	Significant

**Grey boxes show where receptor value is less likely to change the significance of effect judgements. Underlined scores indicate where value may lead to a reduction in the significance of effects. Bold scores indicate where value may result in an increase in the judgement of significance of effects.*

Approach to cumulative assessment

17.6.16 The overarching approach to the cumulative effects assessment (CEA) is described in **Chapter 5: The EIA Process and Methods**. Specific issues relating to the scope of this chapter are addressed in the following paragraphs.

In-combination effects

17.6.17 The in-combination effect assessment for coastal geomorphology receptors is undertaken in three stages, as follows.

- First, in-combination effects are clustered into temporal combinations of installing and using marine components of the station. Use of components may occur in the station construction phase – for example, the BLF.
- Secondly, the spatial overlaps of components for each temporal combination are identified.
- Finally, qualitative assessment of the effects of all identified spatially and temporally overlapping combinations is undertaken.

17.6.18 The assessments will result in the following categories of interactions:

- Subtractive: interactions that result from spatially and temporally coincident impacts that act counter to one another, thereby lessening the combined impact.
- Additive: interactions that result from spatially and temporally coincident impacts that act together, thereby increasing the combined impact.
- Neutral: interactions that have no or negligible impacts even when combined, or which balance out.
- Implausible: where no interaction is likely between two activities having a spatial overlap within the temporal combination, generally because of sequencing.

Cumulative effects

17.6.19 The topic specific impact assessments assess potential impacts from a range of sources resulting from the Project and the associated effects on the identified sensitive receptors. Where the project-wide impacts from the Project could combine with an impact from a third-party project, plan and or programme, it may have the potential to result in a larger, or different, effect on a given receptor.

17.6.20 A staged process will be followed to assess cumulative impacts with other projects, plans and programmes, as recommended by the Planning Inspectorate's Advice Note Seventeen (Ref. 17.26). Further detail is provided in **Chapter 5: The EIA Process and Methods.**

17.7 Scope of the Assessment

Potential receptors

17.7.1 Hydrodynamics – the movement of water – is not an environmental receptor, but is the primary driver of geomorphic change, both natural and as environmental impacts. Hydrodynamics also underpin the assessments for marine water quality and marine ecology.

17.7.2 Components of the Bradwell B power station and related construction and operational infrastructure within the main development site and zone for marine infrastructure that could have impacts on coastal geomorphology are:

- installation, presence, use and removal of cooling water infrastructure;
- installation, presence, use and removal of the BLFs, which would be used to receive deliveries of Abnormal Indivisible Load (AILs), aggregate, steel and other freight by sea during construction and, for the permanent BLF, intermittently throughout the power station's operational life;
- installation, presence, use and removal of any other marine infrastructure for which details are not currently available, such as drainage infrastructure;
- installation and use of the Bradwell B power station flood defences; and
- the potential creation of new ecological habitat (the details of which are yet to be developed).

17.7.3 The principal coastal geomorphology receptor elements that have been identified as being potentially subject to likely significant effects are summarised in **Table 17.17** and **Table 17.18**.

17.7.4 The EIA will address the risks and effects on coastal geomorphology associated with the construction and operation stages of the Bradwell B power station and related activities within the main development site and zone for marine infrastructure. Any marine elements of the Bradwell B power station that remain after operations cease will be assessed for their full lifetime as part of the future baseline assessment.

17.7.5 The activities associated with each element of the proposed Project which can be expected to have an impact on marine geomorphology are listed in **Table 17.17** and **Table 17.18**, which also identifies the resulting pressures and effects that would affect specified receptors**.**

Likely significant effects

17.7.6 The effects on coastal geomorphology receptor elements that have the potential to be significant and will be taken forward for assessment in the EIA are summarised in **Tables 17.17** and **Table 17.18**.

Table 17.17: Likely significant coastal geomorphology construction phase effects

Activity	Description	Pressure or Pressure Theme	Effect	Receptor or Receptor Group
Construction activities - BLFs.	BLF installation (including effects of jack-up barges and any excavation or temporary structures required), use, and presence of BLF(s), and, if required removal at the end of construction phase. Presence of terrestrial pilling vehicle beach or nearshore, vehicle traffic, insertion of marine piles, vessel or jack-up barge anchoring.	Alteration of coastal processes, including sediment transport.	Changes to currents (for example tides) and waves, penetration and disturbance of the seabed, suspended sediment, and sedimentation.	Beach features including the shoreline position, mudflats, chenier ridges, salt marsh and embankments. Subtidal seabed.
Construction activities - marine intakes and outfalls.	Installation of cooling water intakes and outfalls, combined drainage outfalls and potentially Fish recovery and return (FRR) outfalls and other marine infrastructure: excavation, temporary structures, drilling plumes, dredging, vessel anchoring (including jackup barges).	Alteration of coastal processes, including sediment transport.	Changes to currents (for example tides) and waves, penetration and disturbance of the seabed, suspended sediment, and sedimentation.	Beach features including the shoreline and mudflats.

Activity	Description	Pressure or Pressure Theme	Effect	Receptor or Receptor Group
Construction activities - BLFs.	BLF installation (including effects of jack-up barges and any excavation or temporary structures required), use, and presence of BLF(s), and, if required removal at the end of construction phase. Presence of terrestrial pilling vehicle beach or nearshore, vehicle traffic, insertion of marine piles, vessel or jack-up barge anchoring.	Alteration of coastal processes, including sediment transport.	Changes to currents (for example tides) and waves, penetration and disturbance of the seabed, suspended sediment, and sedimentation.	Beach features including the shoreline position, mudflats, chenier ridges, salt marsh and embankments. Subtidal seabed.
Construction activities - marine intakes and outfalls.	Scour (and scour protection) around cooling water infrastructure (including jet scour) and other outfalls (FRR outfalls and any drainage outfalls).	Alteration of coastal processes, including sediment transport	Changes in flows in flows (currents and waves) and seabed lowering and changes.	Beach features including the shoreline, mudflats and embankments. Subtidal seabed.
Construction activities Bradwell B power station-flood defences.	Physical interaction with existing flood defences.	Alteration of coastal processes, including sediment transport.	Changes to currents (for example, tides) and waves, penetration and disturbance of the seabed, suspended sediment and sedimentation.	Beach features including the shoreline, mudflats and embankments.

Table 17.18: Likely significant coastal geomorphology operation phase effects

Activity	Description	Pressure or Pressure Theme	Effect	Receptor or Receptor Group
Operational activities - BLF(s).	BLF presence, use and removal: scour at BLF piles, effect of the BLFs piles on hydrodynamics, effects of the BLFs in use on hydrodynamics, nearshore reprofiling of the BLF approach (capital and maintenance dredging plumes), dredged areas for BLF approach and subsequent infilling, effect of dock barge at the BLFs.	Alteration of coastal processes, including sediment transport.	Changes to currents (for example tides) and waves, penetration and disturbance of the seabed and suspended sediment. Physical loss of the seabed.	Foreshore including the shoreline, mudflats, chenier ridges, salt marsh and embankments. Subtidal seabed.
Operational activities - marine intakes and outfalls.	Scour (and scour protection) around cooling water infrastructure (including jet scour) and other outfalls (FRRs and any drainage outfalls and other marine structures). Suspended sediment abstraction.	Alteration of coastal processes, including sediment transport	Changes in flows (currents and waves) seabed lowering and changes to sediment transport. Abstraction of suspended sediment.	Foreshore including the shoreline, mudflats, embankments and the subtidal seabed.

Activity	Description	Pressure or Pressure Theme	Effect	Receptor or Receptor Group
	The effects of thermo-saline plumes on sediment transport will be considered, although these are not expected to be detectable (with respect to density and sediment transport) due to the small uplift and the small plume footprint.			
Operational activities – Bradwell B power station flood defences.	Presence of the Bradwell B power station flood defences, if exposed to coastal processes. The Bradwell B power station flood defences are expected to be set back from the present shoreline.	Potential future alteration of coastal processes, including sediment transport.	Potential future changes in hydrodynamics and sediment transport.	Foreshore including the shoreline mudflats, chenier ridges, salt marsh.

Effects scoped out of further assessment

17.7.7 Off-site associated development (off-site highways works, park and ride facilities, freight management facilities) and the off-site Power Station Facilities are scoped out of the assessment as they are remote from the marine environment (see **Chapter 3: The Project; Figures 3.3** to **3.6**). Potential effects associated with the temporary project-provided accommodation in the locality of the main development site will be considered under the main development site construction effects.

17.7.8 Effects scoped out of further assessment are shown in **Table 17.19**.

17.7.9 Although Gunfleet Sands and Buxey Sands are prominent features seaward of the Blackwater Estuary, within the study area and affect the wave climate on the Project's frontage, there is no pathway for impacts from the Project's activities to these sandbanks. Impacts will be in, or close to, the nearshore zone. There are no project plans involving navigational dredging, aggregate extraction or dredge disposal on these sandbanks.

Table 17.19: Effects scoped out of the assessment

Potential Effect	Justification for Scoping Out
Marine works effects on sandbanks.	Effects are expected to be in the nearshore zone close to the main site development and will not reach the sandbanks.

17.8 Potential Mitigation

17.8.1 Mitigation measures would be integrated into the design of the Project (embedded design measures) throughout the iterative planning stages to minimise negative impacts, for example the design of the cooling water system.

17.8.2 Following the assessment of preliminary effects, if a significant environmental effect remains, additional mitigation will be considered to avoid, reduce or compensate this effect. The residual effects following inclusion of any additional measures will give a transparent assessment of its effectiveness.

17.8.3 Additional mitigation for coastal geomorphology and hydrodynamics would include, but not necessarily be limited to:

- consideration of design measures for the beach landing facilities based on the results of numerical modelling to minimise, as far as possible, their impact on coastal geomorphology; and
- the potential use of scour protection as an additional measure at intakes, outfalls and the BLF.

17.9 Assumptions and Limitations

17.9.1 The assessment approach assumes that natural variability in the system in the absence of development can be adequately characterised.

17.9.2 Drainage infrastructure discharges will be constructed in the Blackwater Estuary.

17.9.3 The Bradwell B power station would be protected from extreme flooding events by the Bradwell B power station flood defences constructed landward of the existing coastal flood defences. The Bradwell B power station flood defences would not be exposed to wave action during construction and most, or all, of the station operation.

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18. MARINE WATER QUALITY AND SEDIMENTS

18.1 Introduction

18.1.1 This chapter sets out the approach for determining the scope of the assessment for marine water quality and sediments. It defines the scope of assessment as it relates to the main development site, project-provided worker accommodation (which has the potential to be in close proximity to the main development site) and the zone for marine infrastructure. **Chapter 5: The EIA Process and Methods** introduces the overall Environmental Impact Assessment (EIA) process including the methodology for assessing effects and determining significance. The topic specific methodology for determining receptor value, sensitivity and impact magnitude for this chapter are provided in **Section 18.6**.

18.1.2 This chapter contains:

- a summary of work undertaken to date;
- an explanation of the scope of assessment, including:
  - legislation, policy, and guidance that inform the assessment;
  - a description of consultation and engagement so far relevant to marine water quality and sediments;
  - study area for the assessment;
  - sources of data used in scoping;
  - baseline conditions, including current desk studies and surveys;
  - planned further surveys and studies;
- the receptors that are proposed to be assessed and the effects which have the potential to be significant;
- the effects that are proposed can be scoped out of the assessment; and
- potential mitigation.

18.1.3 The chapter should be read in conjunction with the project description provided in **Chapter 3: The Project** and the aspect specific chapters; **Chapter 15: Water Environment, Chapter 17: Coastal Geomorphology and Hydrodynamics** and **Chapter 24: Marine Ecology and Fisheries**.

Work undertaken to date

18.1.4 There have been a number of historical desk-based and survey data sources used to inform the marine water quality and sediments assessment to date and details of these sources are presented in **Section 18.4**.

18.1.5 A water quality literature search was undertaken in during Q4 2019. A survey for the gathering of marine water quality data was commenced in January 2020 and will be repeated at three-monthly intervals throughout 2020. Each survey will take place during a single day at six different locations in the Blackwater Estuary (see **Figure 18.1**). This survey includes sampling that will characterise water quality in the vicinity of the proposed cooling water intake and outfall locations for the Bradwell B power station.

18.1.6 Details of engagement with statutory consultees and stakeholders to date are presented in **Section 18.3**.

18.2 Legislation, Policy and Technical Guidance

18.2.1 This section identifies the relevant legislation, national and local policy and guidance which has informed the scope of the assessment relevant to marine water quality and sediments. Further information regarding policies relevant to the EIA and their status is set out in **Chapter 2: Policy and Regulatory Context**, which should be read in conjunction with this chapter.

18.2.2 The legislation and policy relevant to marine water quality and sediments are detailed in **Table 18.1**.

Table 18.1: Legislation and policy

Relevant Legislation and Policy	Relevance to the Assessment
Legislation	
International: Water Framework Directive (Ref.18.1). National: The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (Ref.18.2) Updated Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref.18.3) and as modified Floods and Water (Amendment etc.) (EU Exit) Regulations 2019 (Ref. 18.4)	Aim is to achieve good qualitative and quantitative status of all water bodies (including marine waters up to one nautical mile from shore). The marine water quality and sediments EIA will assess the chemical elements to ensure the Project is not detrimental to achieving the relevant water body objectives.
International: EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC; Ref. 18.5). National: The Conservation of Habitats and Species Regulations 2017 (Ref.18.6).	Ensures the conservation of a wide range of rare, threatened, or endemic animal and plant species. Relevant qualifying features of designated sites must be assessed to ensure conservation objectives for each relevant site are met. The EIA marine water quality and sediments assessment will run parallel to the Habitats Regulations Assessment (HRA) and Water Framework Directive (WFD) assessments.
International: EC Directive on the Conservation of Wild Birds (2009/147/EC; Ref.18.7). National: Part I of the Wildlife and Countryside Act 1981 (Ref.18.8) and The Conservation of Habitats and Species Regulations 2017 (Ref.18.6).	Ensures the conservation of wild bird species. Relevant qualifying features of designated sites must be assessed to ensure conservation objectives for each relevant site are met. The EIA marine water quality and sediments assessment runs parallel to the HRA and WFD assessments.

Relevant Legislation and Policy	Relevance to the Assessment
Priority Substances Directive (2008/105/EC; Ref. 18.9).	Sets Environmental Quality Standards (EQS) for the substances in surface waters (river, lake, transitional and coastal) and confirms their designation as priority or priority hazardous substances.
Dangerous Substance Directive (76/464/EEC; Ref.18.10).	Addresses pollution caused by certain dangerous substances discharged into the aquatic environment of the European Community.
Urban Waste Water Treatment Directive (91/271/EEC; Ref.18.11).	Concerns urban waste water "*collection, treatment and discharge of urban waste water and the treatment and discharge of waste water from certain industrial sectors*."
Revised Bathing Waters Directive (2006/113/EC; Ref.18.12).	The directive seeks to ensure the quality of bathing water throughout the EU, both for freshwater and coastal water bathing areas, in order to protect the environment and public health. It lays down bacteriological, chemical and physical water quality standards.
International: Marine Strategy Framework Directive (2008/56/EC; Ref.18.13). National: The Marine Strategy Regulations 2010 (Ref.18.14).	Aim is to achieve or maintain Good Environmental Status (GES) in European seas. Relevant biological indicators or descriptors of GES will be considered in the marine water quality and sediments assessment.
International: Ramsar Convention on Wetlands of International Importance 1975 (Ref.18.15).	Ensures the conservation and sustainable use of wetlands which require consideration in the assessment. Relevant qualifying features of designated sites must be assessed to ensure conservation objectives for

Relevant Legislation and Policy	Relevance to the Assessment
	each relevant site are met. The EIA marine water quality and sediments assessment runs parallel to the HRA and WFD assessments.
International: Convention on Biological Diversity 1992 (Ref.18.16). National: Natural Environment and Rural Communities (NERC) Act 2006 (Ref.18.17).	Ensures the conservation and sustainable use of biological diversity. Biodiversity Action Plan (BAP) species and habitats lists have been superseded by statutory lists of priority species and habitats under the NERC Act 2006. Relevant species and habitats will be considered in the marine water quality and sediments assessment.
International: Convention for the Protection of the Marine Environment of the North East Atlantic (OSPAR) 1992 (Ref.18.18).	Legislative instrument regulating international cooperation on environmental protection in the North-East Atlantic. Relevant species, habitats and ecological processes that are threatened and/or declining will be considered in the marine water quality and sediments assessment.
Environmental Permitting (England and Wales) Regulations 2010 (Ref.18.19)	These regulations provide a consolidated system of environmental permitting for England and Wales and extend the range of activities that require an environmental permit. These include activities involving discharges to the marine environment.
Pollution Prevention and Control Act 1999 (Ref.18.20).	Concerns regulation of pollution from industrial processes, including the prevention or reduction in pollution of the environment due to the release of substances into the air, water or land.
National: Salmon and Freshwater Fisheries Act 1975 (Ref.18.21).	The Act consists of several sections some which relate to methods of fishing. The Act also deals with problems of pollution making it an offence to knowingly permit the flow of poisonous matter and polluting effluents

Relevant Legislation and Policy	Relevance to the Assessment
	into river courses. Part II of the Act deals with obstructions to the passage of salmon and trout (including sea trout).
National: Wildlife and Countryside Act 1981 (Ref.18.22).	Primary legislation which protects animals, plants and habitats in the UK. Relevant species listed under Schedule 5 will be considered in the marine water quality and sediments assessment.
National: Marine and Coastal Access Act 2009 (Ref.18.23).	Ensures sustainable marine management. Relevant marine plan(s) and Marine Conservation Zone(s) will be considered in the marine water quality and sediments assessment.
International: Eel Recovery Plan (Council Regulation No 1100/2007; Ref.18.24). National: Eel Management Plans 2010 (Ref.18.25).	Management actions that will ensure the long-term viability of the eel population. Relevant eel management plans will be considered in the marine water quality and sediments assessment.
National Policy	
National Policy Statement for Energy (EN-1) Overarching NPS for Energy (Ref.18.26).	"*A project that is likely to effect the water environment requires an assessment as part of an environmental statement that sets out current status, the presence of existing discharges and the potential impacts of proposed discharges or other activities on water quality. EN-1 also sets out that the ES should take into account how the proposal will take account of the projected impacts of climate change adaptation*."

Relevant Legislation and Policy	Relevance to the Assessment
National Policy Statement for Nuclear Power Generation (EN-6) (Ref.18.27).	"*In addition to fulfilling the requirements of Section 5.15 of EN-1, the applicant's assessment should also set out the characteristics of the cooling water for new nuclear power stations and the specific implications of the proposal on marine and estuarine environments.*"
National Planning Policy Framework (NPPF) 2012 (Ref.18.28).	The NPPF sets out the Government's planning policy at the national level. The NPPF states that new and existing developments should be prevented from contributing to water pollution. It also states that local plans should take account of climate change over the long-term.
Regional Policy	
Draft South East Inshore Marine Plan (2020) (Ref.18.29).	Provides a strategic approach to planning within the inshore waters between Felixstowe, in Suffolk and near Dover, in Kent. The plan is intended to be a means of holistic management to deliver the vision of *"clean, healthy, safe productive and biologically diverse oceans and seas*". The marine water quality and sediments assessment will assess the relevant resources to ensure the development is not detrimental to achieving the plan's objectives.
Essex and South Suffolk Shoreline Management Plan 2 (2010) (Ref. 18.30).	Shoreline Management Plans (SMP) are applied to individual sediment cells along the coast for the purpose of managing flood and erosion risk

Relevant Legislation and Policy	Relevance to the Assessment
	during the short, medium and long term. They identify the best ways to manage coastal flood and erosion risk to people and the developed, historic and natural environment. Management Unit F (Blackwater Estuary) and G (Dengie Peninsula) are of interest for the Project.
Local Policy	
Maldon District Local Development Plan (LDP) (2014) (Ref. 18.31).	The Maldon District Local Development Scheme (LDS) sets out a description of the development plan documents (DPDs) being prepared by the Council and outlines the timetable for their production. Of relevance to Project design and climate change issues Policy D2 considers climate change and the environmental impact of new development.
The Colchester Borough Local Plan (2008, policies updated in 2014) (Ref. 18.32)[1].	The Colchester Local Development Plan sets out the policy for nature conservation requirements and developments within the Coastal Protection Belt and covers areas of the Colne and Blackwater estuaries where effects from the Project may occur.

[1] Colchester Borough Council is in the process of reviewing its Local Plan and a submission draft was issued for examination in 2017, with consultation on proposed main modifications planned in October 2020. The environmental aspect chapters will refer to emerging policy where relevant and greater weight will be applied depending on the extent to which the policies have moved towards adoption.

Technical guidance

18.2.3 The technical guidance that has been used to define the assessment is set out in **Table 18.2**. The marine water quality and sediments assessment will draw on a range of guidance documents including, but not limited to, chemical and thermal standards, and cooling water infrastructure best practice guidance. Standards and guidelines applied will be detailed in the Environmental Statement (ES).

18.2.4 **Table 18.2** provides the technical guidance framework that would be followed for the WFD compliance assessment.

18.2.5 There are no quantitative EU or UK EQS values for sediments. The only pertinent guidance for sediment quality is given for most of the European Commission (EC) Dangerous Substances Directive List 1 substances and is defined as 'standstill (no deterioration)'. In the absence of any quantified UK standards, common practice is to compare values against two separate criteria sets:

- Cefas Guideline Action Levels for the disposal of dredged materials (Ref. 18.33); and
- Interim Canadian Sediment Quality Guidelines (ISQGs) for the Protection of Aquatic Life (Ref.18.34).

18.2.6 Sediment quality results would be compared against these standards, as part of the Environment Agency Clearing the Waters for All technical guidance (**Table 18.2**).

Table 18.2: Relevant technical guidance

Guidance Reference	Implications
WFD assessment also referred to as Environment Agency Clearing the Waters for All (Ref.18.35).	This guidance presents the approach that will be adopted to record the findings of the scoping, screening, and impact assessment stage of the WFD assessment for an activity in an estuary or coastal water. The water quality WFD assessment will focus on whether the Project: • could affect water clarity, temperature, salinity, oxygen levels, nutrients, or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days). • is in a water body with a phytoplankton status of moderate, poor, or bad.

Guidance Reference	Implications
	• is in a water body with a history of harmful algae. Water quality will be included in the impact assessment if the activity uses or releases chemicals, for example through sediment disturbance or building works. This is necessary when either the: • chemicals are on the Environmental Quality Standards Directive (EQSD) list. • activity disturbs sediment with contaminants above Cefas Action Level 1 (Ref. 18.31). If the activity releases chemicals on the EQSD list and has a mixing zone, like a discharge pipeline or outfall, the Environment Agency's surface water pollution risk assessment guidance will be followed. This is part of the Environmental Permitting Regulations guidance (Ref. 18.36). This guidance also includes what was originally termed a H1 screening process to identify significant chemical inputs to surface waters including from cooling water discharges.
Chartered Institute of Ecology and Environmental Management (CIEEM) good practice guidelines (Ref.18.37).	Marine water quality and sediments methods apply an assessment-based approach to assess the potential effects of the proposed development based on the principles used for marine ecology receptors following the CIEEM good practice guidelines.
JNCC pressures-activities database (PAD; Ref.18.38).	The PAD uses the information present within Natural England's Advice on Operations (AoO) and supplements it with information on activities relevant to Scotland and a range of new activities that occur or may occur in UK waters. Marine water quality and sediment receptors would be assessed against relevant (medium-high) pressures (see **Section 18.6**).

Guidance Reference	Implications
BEEMS Science Advisory Report SAR008 v2. Thermal Standards for Cooling Water from New Build Nuclear Power Stations. (Ref. 18.39).	This report produced by an independent Expert Group summarises the available evidence on thermal effects on marine biota and the existing draft recommendations for thermal standards.
Quality control manual for computational estuarine modelling (Ref. 18.40).	Guidance for undertaking a computational estuary model study: The overall aim of this study is to establish best practice, shortcomings and future research needs in determining freshwater flow needs of estuaries. In particular, the study has examined the use of computational, including statistical, modelling in determining these needs.
Nuclear New Build – Guidance on Hydrodynamic Modelling Requirements (Ref. 18.41).	This paper provides outline Agency requirements for the modelling that must be undertaken.
Cooling water options for the New Generation of Nuclear Power Stations in the UK (Ref. 18.42).	This report provides an overview of power station cooling water systems in use in the UK and abroad. Details of cooling water options for new nuclear power stations in the UK are given.
Review and development of temperature standards for marine and freshwater environments. (Ref. 18.43)	This document addresses the development of UK classification methods and standards that aim to meet the requirements of the WFD.

18.3 Consultation and Engagement

18.3.1 This chapter has been informed by engagement and discussion with various stakeholders. **Table 18.3** details technical engagement to date which has occurred outside of formal statutory consultation. **Table 18.4** provides a summary of consultee comments arising from Stage One Consultation, along with a response to identify how the relevant matters are dealt with in this report.

Table 18.3: Technical engagement

Consultee	Points of Discussion
Natural England. Marine Management Organisation (MMO). Environment Agency.	Marine baseline data early survey design considerations (27 November 2018). Note that these discussions reflected that direct cooling was still an option at this stage.
Natural England. MMO Environment Agency. Essex Native Oyster Restoration Initiative (Essex University).	Oyster literature review and environmental tolerances (28 November 2018). Discussions on preliminary data and knowledge reviews of key species and sensitivities and identification of knowledge gaps. Note that these discussions reflected that direct cooling was still an option at this stage.
Natural England. MMO Environment Agency. Essex Native Oyster Restoration Initiative (Essex University). Kent and Essex Inshore Fisheries and Conservation Authority.	Cooling water strategy optioneering and implications for marine studies (11 June 2019). Sharing preliminary temperature model results and update on benthic survey design. Discussion of oyster studies programme. Comments from Natural England requested an official HRA Evidence Plan.
Natural England. MMO Environment Agency.	Marine ecology survey plans (03 September 2019). Discussion of marine survey/data requirement plans including benthic (subtidal and intertidal), fish, plankton and marine mammals. Recommended changes to the fish and plankton surveys adopted to target a full tidal cycle. Modification to eel survey adopted to cover day and night sampling.
Environment Agency.	Hydrodynamic modelling strategy report reviewed by the Environment Agency. Outlines the high-level approach to the hydrodynamic model setup, calibration, and validation (11 November 2019).

Table 18.4: Stage One Consultation comments

Theme	Summary of Consultee Comments and considerations	How this is accounted for
Assessment Methodology.	Natural England noted the following: Discharge modelling of the thermal plume needs to be assessed on precautionary worst-case basis. A map of the full chemical footprints should be provided and details of all chemicals including chlorination should be accounted for. Furthermore, a map of the saline plume should be provided. Waste streams from the project-provided worker accommodation including accidental discharges and impacts on coastal habitats should be assessed.	The proposed discharge modelling is described in further detail in this chapter. Maps of thermal/saline and chemical plumes (for chemicals which do not pass initial screening) will be part of the assessments. Waste streams from the project-provided worker accommodation which may be located in close proximity to the main development site are screened into the assessment. Accidental spills are screened in for consideration within the assessment.
Assessment Scope.	Natural England noted that the impact pathways described in the Stage 1 consultation document are not full or finalised and recommended conservation advice packages are referred to. Essex Wildlife Trust had a similar comment noting that the Southern North Sea Special	The Stage One Consultation document only provided a high-level summary of the assessment scope. Further detail is provided in **Chapter 24: Marine Ecology and Fisheries**. A detailed assessment of the thermal-saline, chemical discharges and abstraction impacts is underway as described in this chapter. Furthermore, the effects on designated sites are considered in

Theme	Summary of Consultee Comments and considerations	How this is accounted for
	Area of Conservation (SAC) should be scoped in. Essex Wildlife Trust also noted that lack of detail in Stage 1 document regarding the thermal or saline impacts and abstraction effects. Natural England noted that climate change should be considered when determining the zone of influence for thermal effects and stated that the project should be planned in such a way as to reduce the zone of influence. Natural England noted that the Stage 1 document omitted reference to chemical plumes.	detail in the HRA processes and associated HRA Evidence Plan. The Southern North Sea SAC has been scoped into the HRA assessment. The assessment of thermal effects will take into account future baseline scenarios (for example under climate change) as described in **Section 18.5**. Environmental considerations are being taking into account during the planning stages and consultation on preferred options has or will be held with key stakeholders or regulators. The effects of chemical discharges are scoped into this chapter (see **Table 18.23** and **Table 18.24**).
Baseline	Essex Wildlife Trust noted that a low 'refresh rate' in the Blackwater would mean that the influence of recirculation would be greater than in the open sea.	Following the Environment Agency guidelines, two separate calibrated and validated hydrodynamic models of the estuary have been created. Modelling will investigate the rates of recirculation and will be considered as a factor in the siting of the intakes and outfall in the estuary.
Cumulative Effects.	Essex Wildlife Trust noted that in-combination effects of different chlorinated by-products and suggested that 'The cumulative impacts of	Chlorinated by-products are being determined through experiments as detailed in this chapter. These will be assessed and modelled to

Theme	Summary of Consultee Comments and considerations	How this is accounted for
	increased temperature and biocide pollution will potentially result in a large area of sterility around the outfall'.	determine mixing zones. Evidence from calibrated and validated modelling will be provided to establish mixing zones and determine any areas where quality standards may be exceeded. As detailed in this chapter in-combination (synergistic) effects of temperature, salinity and chemical contaminants will be included in the assessment.
Marine Works.	The Environment Agency noted the following: Eutrophication of the estuary in relevant assessments. Further details of the modelling approach and effects from dead biota are requested. Noted that even with indirect cooling the abstraction and discharge is still a significant volume of water for the estuarine setting and a full assessment is still required.	Nutrient enrichment is scoped into the assessment (see **Table 18.24**). Organic matter discharge from the fish recovery and return system is scoped into the assessment (see **Table 18.24**). As outlined in this chapter and accompanying chapters on other topics, discussions are underway with stakeholders on the HRA and WFD scope and a full assessment of the abstraction and discharge effects is being undertaken.
Permitting	Natural England noted that outfalls and other discharges require permits. Natural England also noted it expects details of the anticipated frequency, volume and nature of material to be discharged to the marine	Construction phase and operational phase Water Discharge Activity permits will need to be granted by the Environment Agency and these permits will be applied for all applicable discharges during the relevant Project phases including operational

Theme	Summary of Consultee Comments and considerations	How this is accounted for
	environment and in particular with details of the likelihood of untreated discharges in the event of severe rainfall events.	discharges from the Bradwell B power station. The permit applications will require the details requested and an assessment of the effects.
Stakeholder Engagement.	Natural England noted that it should be consulted about the potential effects of the aggregate pipeline option and seawater abstraction to deliver aggregate ashore and that the scale of potential entrainment effects should be assessed.	If this option is taken forward in the project, there will be consultation on the assessment of the potential effects.
Survey and Monitoring.	The MMO noted a formal sample plan for dredging or disposal of dredge material should be requested.	A dredge sample plan will be requested and agreed at the appropriate time in advance of any dredging work. The scope of sediment sample analysis to inform the ES will be consulted on with the MMO.

Theme	Summary of Consultee Comments and considerations	How this is accounted for
WFD Assessment.	The Environment Agency noted a number of comments relating to the WFD assessment including: A separate WFD compliance assessment should be undertaken. There should be consultation with the Environment Agency and other stakeholders in the WFD process. It is important to identify gaps in the WFD elements.	A separate WFD compliance assessment will be provided. There will be ongoing consultation with the Environment Agency on the scope of the WFD compliance assessment. The lack of a Fish Quality Element status is noted and this will be subject to further consultation with the Environment Agency to address any information gaps.

18.4 Data Gathering Methodology

Study area

18.4.1 This section presents study areas for marine water quality and sediments. As the design and consultation processes progress and the Project is refined, the exact geographical scope of study areas may continue to evolve to accommodate any changes. If the study areas change, data collection would also be reviewed and updated.

18.4.2 The geographical extent of the marine water quality and sediments study area is the tidal Blackwater Estuary; extending from Maldon approximately 15 kilometres (km) to the west of the main development site, to the eastern boundary of the Essex estuaries SAC (the MCZ boundary extends just beyond the most easterly extent and would be accounted for). Mersea Island defines the initial northerly extent for direct effects. The potential for effects on the Colne Estuary and further afield is scoped in (see **Section 18.7**). The landward limit is delineated by the mean high water springs (MHWS) tidal mark.

18.4.3 For the actual assessment of the Project the marine water quality and sediments Zones of Influence (ZoIs) for different construction and operational activities will be revised following initial thermal, chemical, dredge modelling, but the preliminary ZoI will be based on the largest-scale (precautionary) potential impacts associated with the Project, these include:

- water quality effects (changes in suspended solids) associated with dredging and for drilling associated with vertical connection of shafts through the superficial deposits and bedrock for cooling water infrastructure;
- water quality effects (changes in suspended solids and chemical discharge) associated with the terrestrial groundworks or sewage treatment discharge during construction and spoil return from offshore tunnelling; and
- water quality effects (thermal and saline plume and chemical discharge) associated with the discharge of heated and chlorinated cooling water and process effluent during the main development site operation.
- water quality effects (organic matter discharge, chemical and nutrient inputs) associated with the discharge of moribund fish from the Fish Recovery and Return (FRR) system.

18.4.4 Effects on marine water quality and sediments will be determined based on absolute areas of exceedance relative to the model domain for the pressures being assessed, for example thermal plume modelling of cooling water discharges. The extent of intersection with bathing water and shellfish water protected areas and designated areas will also form part of the assessment.

Sources of data used in scoping

Desk based

18.4.5 The EIA scoping exercise has been undertaken with reference to **Chapter 3: The Project**, supported by several data sources. The principal desk-based data sources used to inform this chapter comprise of the following in **Table 18.5**.

Table 18.5: Principal desk-based data sources

Source	Data
Environment Agency WFD Essex Transitional (Estuarine) and Coastal catchment data. (Ref. 18.44).	Chemical baseline information. Routine monitoring data from Environment Agency water and sediment stations sampled between 1992 and 2019 including the following water bodies: Blackwater and Colne transitional waterbody, and Blackwater Outer and Essex coastal waterbody. Parameters include ecological and chemical status data. Data include the 45 Environment Agency WFD priority substances for the water column and metals, organic and inorganic determinands sampled in sediments.
Characterisation of European Marine Sites: for example, the Essex Estuaries European Marine Site (Ref. 18.45).	Chemical and biological baseline information.
Bathing water quality – Environment Agency bathing water profiles (Ref. 18.46).	Water quality at designated bathing water sites in England is assessed by the Environment Agency. From May to September, weekly assessments measure current water quality, and at several sites daily pollution risk forecasts are issued. Annual ratings classify each site as excellent, good, sufficient, or poor, based on measurements taken over a period of up to four years.
Blackwater and Dengie Sanitary Survey Report (Ref. 18.47).	Defines specific rules for the organisation of official controls on products of animal origin intended for human consumption, sanitary surveys of bivalve mollusc production areas

Source	Data
	and their associated hydrological catchments and coastal waters are required in order to establish the appropriate representative monitoring points for the monitoring programme.
Food Standards Agency shellfish classifications (Ref. 18.48).	The classification of a production area determines the treatment required before Live Bivalve Molluscs (shellfish) may be marketed for human consumption. Shellfish production and relay areas are classified according to the levels of E. coli detected in shellfish flesh.
Sensitive areas under the Urban Waste Water Treatment Directive (Ref. 18.49).	The Urban Wastewater Treatment Directive (91/271/EEC) regulates the collection and treatment of waste water from homes and from industry. In the UK, the directive is implemented through the Urban Wastewater Treatment regulations 1994. Under these regulations, water bodies where treatment more stringent than secondary is necessary to fulfil the requirements of the Bathing Waters Directive should be designated as sensitive areas by Defra.
Radioactivity in Food and the Environment (RIFE) reports Ref. 18.50).	Annual joint Agency assessment reports of radioactivity in food and the environment and the public's exposure to radiation.

Survey data

18.4.6 Cross-disciplinary work at Bradwell was carried out by British Energy Estuarine and Marine Studies (BEEMS) during 2008-2009. This involved the collection of physical data on bathymetry, topography, tidal movements, and sediments, and included a series of marine water quality and sediment surveys (fisheries, fish, shellfish, and other invertebrates). These historical datasets will be used as background information to support the specific marine water quality and sediments assessments.

18.4.7 Historic Environment Agency WFD monitoring data, which includes a wide range of chemical determinands collected in water and sediments will also be used as

background information. The Environment Agency data will be used to supplement data from ongoing surveys of marine water and sediment quality (see **Section 18.5**).

18.4.8 **Table 18.6** details the surveys and studies to inform the EIA. Receptor specific characterisation studies would be produced for marine water quality and sediments.

18.5 Baseline Information

Current baseline

18.5.1 The Blackwater Estuary is of significant ecological importance, along with the Crouch, Roach and Colne estuaries, and are protected by international and national nature conservation designations (see **Figure 24.1**). Other relevant conservation designations with marine mobile species are shown in **Figure 24.2**.

18.5.2 To assess the potential for impacts from future discharges from the main development site, water quality baseline information has been gathered through a desk study on water quality of the Essex estuaries and the Blackwater Estuary in the vicinity.

18.5.3 The most recent water quality WFD assessment (2019) for chemical status in the Blackwater, Blackwater Outer, Colne and Essex water bodies was 'fail' (Ref.18.44). With respect to the hydromorphology status of the four water bodies, Blackwater and Colne are categorised as 'supports good', while Blackwater Outer and Essex were 'not assessed'. All four water bodies are classed as 'heavily modified'.

18.5.4 Phytoplankton communities are light limited in the turbid estuaries (notably the Colne), therefore extensive blooms do not generally occur (Ref 18.45). Flagellates, largely euglenophytes, dominate the phytoplankton (Ref 18.45). Benthic microalgae are the major primary producers, with diatoms dominating (Ref 18.51, Ref 18.52). Increased occurrences of macroalgal mats of *Enteromorpha* spp. were observed for the Colne and Blackwater (Ref. 18.45). There is a history of harmful algal blooms observed in the Blackwater and Essex water bodies.

18.5.5 The data from successive Environment Agency surveys in previous reports focused on a wide range of determinands in seawater for the period 1990 – 2019. The most relevant concentrations of metals, organic and inorganic substances are generally below relevant Environmental Quality Standards in recent years (2018-2019). During this period, various determinands exceed the Annual Average Environmental Quality Standard (AA EQS), especially in the earlier years as the limits of detection at that time were above some of the present AA EQS values. Within this baseline review the focus is on the most recent survey results to get an indication of water quality close to the main development site. Certain metals including; cadmium, lead, mercury, nickel, arsenic, chromium VI, copper and zinc sampled at EA18, EA19 and EA55 (see **Figure 18.1**) were all below the AA EQS or Maximum Allowable Concentration (mercury does not have an AA EQS) during the last sampled survey year, while some PAHs like benzo(k)fluoranthene, benzo(g,h,i)perylene and

benzo(a)pyrene for example exceeded the relevant AA EQS at sites EA55 and EA19 in the last sampled year.

18.5.6 Sediment samples were also collected at two stations (North Sea – Essex Coast-EA8 and Outer Blackwater WFD Benthic Invert-EA14; **Figure 18.1**) in the Blackwater Estuary, giving an indication of the concentrations of various key determinands present in 2012 and 2017 Determinants were compared to Cefas Action Levels (CAL) 1 and 2. All sampled determinands for which there are CAL assessment criteria were below CAL 2. Chromium and nickel concentrations were above CAL 1 in the most recent monitoring survey of 2017. The sum of the ICES 7 PCBs stayed below CAL 1. Of the eight PAHs sampled in sediments, seven (benzo(a)anthracene, benzo(a)pyrene, chrysene + triphenylene, fluoranthene, naphthalene, pyrene and phenanthrene) were above the Canadian Threshold Effects Level assessment criteria, but none were above the Canadian Probable Effects Level standard.

Future baseline

18.5.7 The current baseline is considered to be appropriate for the duration of the construction and commissioning phases of the Bradwell B power station.

18.5.8 The effects of operational impacts on marine water quality and sediment receptors would be considered against well-established current baselines. However, the operational design life of the Bradwell B power station means that some impacts must be considered in relation to long-term climate change. Climate change has the potential to interact with development pressures and influence the future baseline environment. Climate change is, for example, predicted to result in sea temperature rises with relevant marine water quality implications for the Project. The interaction between thermal discharges and climate related increases in seawater temperature on marine water quality will be considered. Climate change will also be considered in relation to sea level rise in conjunction with **Chapter 17: Coastal Geomorphology and Hydrodynamics** and impacts of thermal elevation and physicochemical changes on marine ecology (**Chapter 24: Marine Ecology and Fisheries**). The influence of climate change on chemical fate, behaviour and effects for example reducing pH and dissolved oxygen and increasing temperature will be considered in this chapter.

Planned further surveys and studies

18.5.9 **Table 18.6** details the further surveys and studies planned to inform the EIA. The purpose of the surveys and studies is to characterise the area, provide site specific information for use in future surveys, modelling, and assessments, or investigate topics i.e. thermal tolerances of species.

Table 18.6: Ongoing and planned further surveys and studies for marine water quality and sediments

Survey or Study	Methods	Description	Duration / Proposed Date
MetOcean survey.	Landers, buoys wave riders.	Measurements of currents, tides, suspended sediments, waves, and temperature at subtidal and intertidal sites.	12 months (commenced October 2019).
Bathymetry and backscatter (interpreted to habitat map).	Multi-beam echosounder.	Blackwater outer estuary to 0m chart datum.	Survey completed May 2019, interpretation in progress.
Marine Water Quality baseline surveys.	Collection of water samples at surface and near bed levels for chemical analysis.	Six stations are sampled on a 3-monthly basis in the Blackwater Estuary using Niskin sampler or similar.	Commenced November 2019; ongoing.
Chlorine and chlorination byproduct decay study.	A series of experiments conducted to support modelling studies on the decay of chlorine based anti-biofouling chemicals and by-products.	Using seawater collected every three months, the demand and decay rates will be derived to characterise seasonal variability.	December 2019 until October-November 2020.
Hydrazine decay study.	An experiment was conducted to support modelling studies on the decay of hydrazine.	Using seawater collected during Q1, the demand and decay rates were derived.	Completed Q1 2020.

Survey or Study	Methods	Description	Duration / Proposed Date
Marine sediment quality.	Core samples.	Survey scope to be determined once the locations of the marine infrastructure to be installed in the Blackwater Estuary are defined.	Expected Spring 2021.
Plankton (phytoplankton, zooplankton, fish eggs and larvae).	Gulf VII plankton sampler with 2 nets plus water samples.	4 sites trawled repeated over tidal cycle.	12 months. Monthly between November 2019 to October 2020. (Every two weeks in December 2019 and from March 2020 to September 2020).
Hydro-dynamic models (thermal-saline and chemical).	GETM and TELEMAC 3D hydrodynamic models.	Following the modelling strategy agreed with the Environment Agency.	Desk study underway (MetOcean data required for model calibration and validation).
Sediment transport models.	Computer modelling.	Scoping of requirement in 2020 and development of any required models in 2020-2021.	Desk-based study.

18.5.10 Water quality surveys as described in **Table 18.6** are being conducted every three months for 12 months at six stations (see **Figure 18.1**). These started in November 2019. The data generated from these surveys will inform background values including nitrogen, ammonia, and phosphate as well as a full suite of relevant selected metals, and organic and inorganic chemicals.

18.5.11 The six sampling stations include one in the likely area of the currently proposed intakes and one at the likely area of the currently proposed outfall locations. The other four sites include one further upriver in the Blackwater Estuary, one south-west and one south-east off Mersea Island and one to the east off the Dengie National Nature Reserve.

18.5.12 It is necessary to establish hydrodynamic models to predict the impact of the discharged thermal saline and chemical plumes on a variety of sensitive ecological receptors in the Estuary.

Hydrodynamic modelling studies

18.5.13 In accordance with Environment Agency New Nuclear Build modelling guidelines, Environment draft guidelines: "Nuclear New Build - Guidance on Hydrodynamic Modelling Requirements" and the independent Expert Panel recommendations in (Ref. 18.53) two different 3D hydrodynamic models, setup by two different modelling teams will be used to simulate the proposed discharge of the main development site. The models will be built using TELEMAC 3D and GETM. Both models are well established, capable models and both can be used to derive absolute and excess temperatures, respectively.

18.5.14 The plume modelling methodology will use the following approach:

- Stage 1: Setup and validation of 2 different models against field data. Use of the validated models to examine different options for the cooling water (CW) configuration.
- Stage 2a Review: The model results will be compared and the preferred model for thermal or chemical studies will be selected. The preferred cooling water option on environmental, recirculation and other engineering grounds will be selected for the applicant and then subjected to engineering refinement and iteration to produce a proposed design.
- Stage 3: Model the proposed design.

18.5.15 Submissions for regulatory approval will be made at Stage 1, 2a and 3. Environmental assessments will only be based on predictions from the model that has achieved Stage 2a approval from the Environment Agency.

18.5.16 Laboratory studies are being conducted to determine source term data and degradation rates for use in future modelling of potential chemical discharges from the planned cooling water system at the main development site.

Derivation of chemical degradation terms for modelling studies

18.5.17 In seawater chlorine reacts with bromine to form hypobromous acid, which at the natural seawater pH of around 8 dissociates to form hypobromite ions and hydrogen ions, the primary agents of the biocidal effect of chlorinated seawater (Ref. 18.54, Ref. 18.55). Due to the rapid dissociation of chlorine its biocidal effect in seawater is expressed as the total residual oxidant concentration (TRO) Cl_2 equivalent mg L^{-1}.

18.5.18 Organic and inorganic compounds present in seawater, also form various compounds collectively called chlorination by-products (CBPs). These CBPs are also assessed as they have toxicological effects and persist for longer than TRO.

18.5.19 As listed in **Table 18.6** the decay rate for chlorine produced oxidants derived from studies of seawater from the Blackwater Estuary that has been chlorinated is being established for use in modelling the planned cooling water discharge from the main

development site. During the same studies, the most dominant chlorination by-product will be determined and its source term established for modelling.

18.5.20 Hydrazine (N_2H_4) is added to secondary and primary cooling water circuits of power stations to prevent corrosion by suppressing dissolved oxygen level.

18.5.21 Following treatment, some residual hydrazine present in wastewater from primary and secondary circuits is likely to be discharged. Dosing studies using seawater samples from the Blackwater Estuary will be conducted to assess the effect of natural background water quality parameters upon hydrazine degradation rate. Resulting data will be used to derive modelling source terms and degradation rate parameters for hydrazine discharge modelling.

18.5.22 Hydrazine analysis of seawater samples collected in preliminary monitoring studies of the Blackwater Estuary show that the background concentrations were all below detection limits of 5 ng L^{-1} at the six sampling stations (see **Figure 18.1**).

18.6 Proposed Approach to the Assessment

Assessment methodology

18.6.1 The proposed contaminant discharges from the main development site (within which the Bradwell B power station will be situated) during construction, commissioning and operation will be assessed against the water quality baseline using the risk assessment for specific activities (Ref.18.36), based on the Environment Agency's H1 screening assessment methodology.

18.6.2 The former H1 Assessment process was a risk assessment screening methodology developed by the Environment Agency to be used by developers to identify discharges that have chemical and physical properties that exceed natural background levels and that require more detailed impact assessment studies (for example, where required including the use of chemical discharge plume modelling, Ref.18.36)

18.6.3 Discharge concentrations of any substances during different phases of the Project will be assessed against their relevant EQS where available or derived using recommended approaches or if appropriate by referencing background concentrations.

18.6.4 For those substances that exceed the EQS, the extent of the exceedance will be determined using a hydrodynamic model specific to the Project, where appropriate.

18.6.5 The direct thermal influence of the cooling water discharge will also be assessed using computational modelling to determine its influence on temperature elevation of the Blackwater and in terms of its in combination influence on dissolved oxygen concentration and upon the proportion of un-ionised ammonia in the discharge and receiving water.

18.6.6 Modelling will be used to identify the extent of potential areas of exceedance of thermal, chemical and sediment standards within model domains and with respect to bathing water and shellfish water protected areas and those designated under the Habitats Regulations (Ref. 18.6) and WFD (Ref. 18.4). Impact magnitude will consider the duration and extent of exceedance. Additional factors such as frequency, timing and reversibility will be taken into consideration and reported where appropriate.

18.6.7 The different scenarios to be modelled will be agreed in advance with the statutory consultees including the Environment Agency.

18.6.8 Marine water quality and sediments receptors will be assessed against relevant (medium-high) pressures identified in the Joint Nature Conservation Committee (JNCC) pressures-activities database (PAD, Ref.18.38) (see **Table 18.7**). The PAD uses information provided within Natural England's Advice on Operations (AoO, Ref. 18.56). The Natural England AoO identifies activities capable of affecting qualifying features of designated sites and provides advice on how to fulfil the conservation objectives of the site. For consistency, the list of pressures provided in the EIA will be consistent with those proposed for the HRA and MCZ assessment. It should be noted that the list of pressures may be revised following stakeholder engagement on either document.

Table 18.7: Relevant pressures-activities database for marine water quality and sediments receptors (pressures in bold are key for water quality and sediments)

Broad Pressure Themes*	Pressure Description in Statutory Marine Conservation Advice Packages
Alteration of coastal processes and sediment transport.	Water flow (tidal current) changes, including sediment transport considerations.
	Emergence regime changes, including tidal level change considerations.
	Wave exposure changes.
Water quality effects - marine environment. Including: Cooling water discharges, for example, thermal and saline plume and chemical plumes.	**Temperature increase.**
	Salinity increase.
	Salinity decrease.
	Smothering and siltation rate changes (Heavy).
	Smothering and siltation rate changes (Light).
	Transition elements and organo-metals contamination.
	Hydrocarbon and polycyclic aromatic hydrocarbons (PAH) Contamination.

Broad Pressure Themes*	Pressure Description in Statutory Marine Conservation Advice Packages
Indirect prey effects from entrainment or impingement of biota.	**Synthetic compound contamination.**
	Introduction of other substances (solid, liquid or gas).
	Nutrient enrichment.
	Organic enrichment.
	De-oxygenation.
	Introduction of microbial pathogens.
	Introduction or spread of invasive non-indigenous species (INIS).
	Changes in suspended solids (water quality).
	Barrier to species movement.
Radiological effects.	**Radionuclide contamination.**
Direct habitat loss and indirect habitat fragmentation.	Physical change (to another seabed type).
	Physical change (to another sediment type).
	Habitat structure changes – removal of substratum (extraction).
	Abrasion or disturbance of the substrate on the surface of the seabed.
	Penetration and or disturbance of the substrate below the surface of the seabed, including abrasion.
	Physical loss (to land or freshwater habitat).
	Introduction or spread of INIS.
	Siltation rate changes.
Population disturbance effects.	Electromagnetic changes.
	Underwater noise changes.
	Vibration.
	Above water noise.
	Visual disturbance.
Disturbance due to increased recreational pressure.	Visual disturbance.
	Above water noise.
	Underwater noise changes.
	Barrier to species movement.
	Death or injury by collision.

Broad Pressure Themes*	Pressure Description in Statutory Marine Conservation Advice Packages
Physical interaction between species and project infrastructure. Including: entrainment and impingement of biota.	Collision above water with static or moving objects not naturally found in the marine environment (for example, boats, machinery, and structures).
	Collision below water with static or moving objects not naturally found in the marine environment (for example, boats, machinery, and structures).
	Removal of non-target species.

** Where the same pressure falls within two or more broad pressure themes, the pressure would be assessed once where most appropriate. †Marine water quality and sediments assessments will consider pathways for contamination of existing radionuclides. Sediment quality surveys proposed at the site will determine the baseline radionuclide concentrations and determine the potential for activities associated with the Project to resuspend sediment-bound radionuclides.*

Assessment of effects and determining significance

18.6.9 The general approach to assessment of effects and determining significance that will be used for the EIA is provided in **Chapter 5: The EIA Process and Methods**. This section sets out how the approach has been applied to marine water quality and sediments and where it has been adapted to account for specific requirements.

18.6.10 The assessment would consider impacts in terms of 'sensitivity' (in this context this will depend on whether formal quality standards exist or whether there are guidance values only) and magnitude (taking account of the extent of the area of exceedance and regulatory decisions on the area of acceptable mixing zones).

18.6.11 A hierarchical approach would be adopted to the criteria used as follows:

- where a substance has an EQS defined under the WFD, the EQS would be the standard against which the assessment is made;
- where there is no WFD EQS, the pre-WFD EQS is the standard against which the assessment will be made;
- where there is no EQS available then a predicted no effect concentration (PNEC) would be used as the assessment criterion; and
- where there is neither an EQS nor PNEC available, comparison would be made to the baseline concentrations determined from the 2019-2020 sampling programme.

18.6.12 Most environmental standards for marine water quality are those provided within the Directions for Transitional and Coastal (TRaC) Waters as determined for the WFD.

Receptor value

18.6.13 The baseline characterisation of the water quality and sediment of the study area and the extent and degree of any changes in them are considered relative to existing quality standards or equivalent derived values. The exceedance of standards or equivalents also provide a trigger for consideration of potential ecological impacts for associated habitat.

18.6.14 Value in terms of water quality and sediment is set on the basis of the conservation, economic or functional value of the study site or is designation as a shellfish or bathing water relative to the extent and overlap of changes to water quality and sediment. The criteria for assessing value are read across from the ecology receptors or other designations and are given in **Table 18.8**.

18.6.15 Value of the receptor for water quality and sediment is uncoupled from assessment of sensitivity so that the latter can be undertaken for a given impact independently of value. The highest scoring value for ecological, socio-economic and/or conservation importance will determine the overall value of a receptor.

18.6.16 In general terms, high value receptors that are sensitive to an impact can increase the significance of an effect particularly when the effect may contravene a conservation objective or result in economic implications. For example, a minor effect within a protected or designated area may be considered significant. This is particularly relevant when considering in-combination effects, where a series of interacting minor effects may result in a greater effect outcome that has the potential to become significant.

18.6.17 Assessments are made using magnitude and sensitivity with further evaluation made in **Chapter 24: Marine Ecology and Fisheries** for those results that indicate minor or greater effects for marine water quality and sediments.

18.6.18 For marine water quality and sediments, the receptor is the physical and chemical quality of the water, whether this exceeds set quality standards and what influence it may have on good ecological quality or status.

18.6.19 For marine water quality and sediments, assessment of the extent of effects on the receptor is made for the model domain for the relevant water quality parameter, or if relevant for a defined water body area. The outcome indicates where further detailed assessment of impacts on designated areas or species are indicated.

Table 18.8: Guidelines for the assessment of receptor value

Value	Description
High	High functional value (for example contributes towards the designation of an internationally or nationally important feature, another ecosystem feature dependent on it), international or national conservation value or is designated as a bathing water or a Class A Shellfish protected area. National or international socio-economic value.
Medium	Moderate functional value (for example another features partially dependent on it), national, regional conservation value or Class B shellfish protected area. Moderate national or regional socio-economic value.
Low	Low functional value (for example limited connection to other ecosystem features), local conservation value or Class C shellfish protected area. Local socio-economic value.
Very low.	Very low functional value (for example no dependencies), no conservation designation. No immediate socio-economic value.

18.6.20 No specific sediment receptors or resources have been identified as part of this assessment because changes or disturbances to marine sediments may affect marine water quality status and potentially marine ecology. It is the consequential impacts on those receptors or resources that would be assessed in the EIA. For example, disturbance of bed sediments because of construction activities may potentially cause the mobilisation of pollutants into the water column and an increase in suspended solid concentrations, with associated effects upon water quality status or marine ecology.

Impact magnitude

18.6.21 Impact magnitude primarily considers the spatial extent of the impact, the duration of the impact and the amount of change (positive or negative) relative to baseline conditions. Additional factors such as frequency, timing and reversibility will be taken into consideration and reported where appropriate as these factors can contribute towards the sensitivity to an impact of the features that are supported.

18.6.22 The predicted amount of change for a given impact is assessed in relation to standardised pressure benchmarks applied in sensitivity assessments (Ref. 18.38).

18.6.23 Benchmark thresholds, for example EQSs, are applied to trigger further ecological investigation and do not necessarily infer sensitivity of all receptor groups.

18.6.24 The duration of the impact is considered in relation to pressure benchmarks and constructions timelines. Impacts during the construction phase are considered short

to medium-term whilst impacts that occur (or persist) for longer durations are considered long-term. Pressure benchmarks often consider changes over the course of a year, therefore impacts under one year are considered low duration.

18.6.25 Impact magnitude is assessed on a four-point scale: very low, low, medium, and high and is outlined in **Table 18.9**.

Table 18.9: Marine water quality and sediments descriptions of impact magnitude

Impact Magnitude	Generic Description	Spatial Extent	Amount of Change	Duration
High	Large-scale measurable changes, which are typically permanent or long-duration over most of the study area and potentially beyond.	Changes occur across a large proportion of the area of interest and possibly beyond.	Clear, measurable changes beyond natural variation and exceeds site-specific pressure benchmark.	Long-term or even permanent, for example, beyond the construction phase.
Medium	Medium-scale measurable changes over much of the study area. Impacts are not permanent.	Changes occur across a substantial proportion of the area of interest.	Measurable changes beyond natural variation.	Medium-term temporary impacts, for example, during the construction phase.
Low	Noticeable but small-scale changes over a partial area. Impacts are typically short-term.	A partial spatial area is exposed to changes.	Measurable changes within range of natural variation.	Short-term temporary, less than a year.
Very Low.	Very small-scale or barely discernible changes, over a small area. Impacts are short-lived.	Very small extent is exposed to changes.	Changes possible but cannot be discriminated from natural background.	Very short-term, for example spring-neap cycle or less.

Sensitivity

18.6.26 Sensitivity assessments determine the resistance (or tolerance) of a receptor to a pressure and the ability to recover following the cessation of the pressure, termed resilience. Within the context of the ES, sensitivity assessments will be completed relative to the site-specific magnitude of changes predicted during construction and operational phases of the development.

18.6.27 Sensitivity is assessed on a four-point scale: not sensitive, low, medium, and high. A general guide for sensitivity is provided in **Table 18.10**.

Table 18.10: Guidelines for the assessment of receptor sensitivity

Value	Description
High	The water quality of the resource has a very low capacity to accommodate any change to current water quality status, compared to baseline conditions, no capacity for resilience.
Medium	The water quality of the resource supports high biodiversity and has low capacity to accommodate change to water quality status, low capacity for resilience (for example recovery after 10 years).
Low	The water quality of the resource has a high capacity to accommodate change to water quality status due, for example, to large relative size of the receiving water and capacity for dilution and flushing. Background concentrations of certain parameters already exist. Moderate capacity for resilience (for example recovery after 5 years).
Very low.	Specific water quality conditions of the resource are likely to be able to tolerate proposed change with very little or no impact upon the baseline conditions detectable. High capacity for resilience (for example recovery after 1 year).

18.6.28 The resistance of marine water quality and sediments is assessed against the predicted impact magnitude. Resistance is evaluated in terms of the extent of water quality change, for example, the degree of exceedance of an EQS or equivalent value and likely extent of effects for associated habitats and species. Nominally water quality applies the same scale as the ecology features but taking account of, for example, inherent chemical persistence:

- None**:** A severe decline in the extent, density or abundance of the habitat indicated by level of exceedance of EQS or equivalent effects thresholds.

- Low: A significant decline in the extent, density or abundance of the habitat or species indicated by level of exceedance of EQS or equivalent effects thresholds.
- Medium: A moderate decline in the extent, density or abundance of the habitat or species indicated by level of exceedance of EQS or equivalent effects thresholds.
- High: No or very minor changes in the extent, density or abundance of the habitat or species indicated by level of exceedance of EQS or equivalent effects thresholds.

18.6.29 The resilience of a receptor is assessed in terms of its ability to recover once the pressure is removed and the environment returns to pre-impact conditions. For marine water quality and sediment assessment of resilience primarily considers the chemical or physical changes to water quality and of the return to baseline or background conditions of quality for example based on duration of activity or input and local hydrodynamic regime, refreshment rate, tidal currents.

Determination of significance

18.6.30 A cross tabulation of the magnitude of impacts and sensitivity of the receptor provides a guideline for the classification of effects in **Table 18.11**.

Table 18.11: Classification of effects based on sensitivity of receptors and magnitude of impact

Magnitude of Change	Sensitivity of Receptor			
	High	Medium	Low	Not Sensitive
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Minor
Low	Moderate	Minor	Minor	Negligible
Very Low	Minor	Minor	Negligible	Negligible

18.6.31 The definitions of effect for marine water and sediment quality are shown in **Table 18.12**. The tabulation is treated as a guideline and expert judgement must be applied once all the factors of the assessment have been considered and reported.

Table 18.12: Generic definitions and description of effects classification

Value	General Description for Assigning Effects
Major	Very large or large changes in ecological receptors, which may alter the structure or function or the overall diversity of the ecosystem or food web. Very large or large socio-economic implications. Effects, both adverse and beneficial, that are likely to be important considerations at an international or national level because they contribute to achieving international or national objectives or are likely to result in exceedance of statutory objectives and or breaches of legislation. Very large or large changes to key characteristics of the water quality status of the receiving water feature, for example modelled as significant under the Environment Agency H1 assessment. Water quality status degraded to the extent that permanent change and inability to meet (for example) EQS is likely.
Moderate	Intermediate changes that are likely to be important and could cause subtle changes in other ecosystem features. Intermediate changes to key characteristics of the water quality status taking account of the resource volume, mixing capacity, flow rate, etc. Water quality status likely to take considerable time to recover to baseline conditions.
Minor	Small changes with limited discernible effects on other ecosystem features. These effects may be raised as local issues but are unlikely to be instrumental in the decision-making process. Small changes to the water quality status of the receiving water feature. Activity not likely to alter local status to the extent that water quality characteristics change considerably or EQS are compromised.
Negligible	No discernible change in the water quality features above natural variability. An effect that is likely to have a negligible or no influence, irrespective of other effects.

18.6.32 Following the classification of an effect as presented in **Table 18.12**, a clear statement is made as to whether the effect is 'significant' or 'not significant'. In general, major, and moderate effects are evaluated as significant and minor and negligible effects are evaluated as not significant. However, expert judgement is also applied where appropriate.

18.6.33 To allow consistency with the wider ES a matrix system is applied to determine effects and their significance. However, the matrix should be regarded as a framework not a strict formulaic process. CIEEM (2018) guidelines for EcIA discourage overreliance on matrices for categorising significance and residual effects and advise clarity in presenting the relative importance of the factors underpinning the ecological assessment (Ref. 18.37). The distinction between evidence-based and value-based judgements needs to be communicated allowing

stakeholders and statutory regulators to understand the judgement of significance (Ref. 18.37).

18.6.34 Value should be applied independently of the effect assessment to determine the significance of a predicted effect in relation to socio-economic, conservation and ecological value considerations.

18.6.35 The determination of significance thus requires knowledge of the impact magnitude, sensitivity, and value of the receptor. Expert judgement is required to apply value to determine significance of effects and every effort will be made to allow a transparent assessment detailing both evidence and value-based judgements. In general terms, where high value receptors sensitivity to an impact can increase the significance of an effect particularly when the effect may contravene a quality standard, conservation objective, result in economic implications or influence marine ecology receptors.

18.6.36 **Table 18.13** provides a simplified process for using value to determine significance, which should be applied in combination with the effect descriptions in **Table 18.12**.

Table 18.13: Indicative significance ratings for effect assessments based on receptor value*.

Sensitivity	Magnitude	Effect	Value		
			Low	Medium	High
Not Sensitive.	*Very Low.*	Negligible	Not Significant.	Not Significant.	Not Significant.
Not Sensitive.	*Low*	Negligible	Not Significant.	Not Significant.	Not Significant.
Not Sensitive.	*Medium*	Minor	Not Significant.	Not Significant.	Not Significant.
Not Sensitive.	*High*	Minor	Not Significant.	Not Significant.	Not Significant.
Low	*Very Low.*	Negligible	Not Significant.	Not Significant.	Not Significant.
Low	*Low*	Minor	Not Significant.	Not Significant.	Not Significant.
Low	*Medium*	Minor	Not Significant.	Not Significant.	**Potentially Significant.**
Low	*High*	Moderate	Not Significant.	Potentially Significant.	Potentially Significant.
Medium	*Very Low.*	Minor	Not Significant.	Not Significant.	Not Significant.
Medium	*Low*	Minor	Not Significant.	Not Significant.	**Potentially Significant.**
Medium	*Medium*	Moderate	Not Significant.	Potentially Significant.	Potentially Significant.

Sensitivity	Magnitude	Effect	Value		
			Low	Medium	High
Medium	*High*	Major	Potentially Significant.	Significant	Significant
High	*Very Low.*	Minor	Not Significant.	Not Significant.	**Potentially Significant.**
High	*Low*	Moderate	Not Significant.	Potentially Significant.	Potentially Significant.
High	*Medium*	Major	Potentially Significant.	Significant	Significant
High	*High*	Major	Significant	Significant	Significant

**Grey boxes show where receptor value is less likely to change the significance of effect judgements. Underlined scores indicate where value may result in down-weighting of the significance of effects. Bold scores indicate where value may result in an increase in the judgement of significance of effects.*

Baseline data gathering for the assessment of Marine water quality and sediments

18.6.37 A comprehensive dataset of water quality data for Environment Agency survey of two sites in the Blackwater Estuary and sites located in the creeks around West Mersea Island and the Colne estuary and associated creeks is available for the period 1990 – 2019.

18.6.38 The datasets include dissolved and total metal concentrations of relevance to those likely to be present as corrosion and process discharges from the proposed development and nitrate, nitrite, phosphorus and ammoniacal nitrogen data are also available, and these provide relevant background values for evaluation of treated sewage and other process discharges from the proposed development.

18.6.39 Temperature data are available from 1964 - 2002 from temperature monitoring conducted for the Bradwell A power station and these will be used to provide context for the thermal effluent discharge from the planned development.

Assessment criteria for the assessment of Marine water quality and sediments

Sediment standards

18.6.40 There are no statutory thresholds to assess the quality of marine sediment in the UK. However, there are upper threshold limits of sediment contamination which are acceptable for disposal to sea.

18.6.41 These contaminant disposal limits are regulated in England by the MMO under the Marine and Coastal Access Act 2009 (Ref 18.23).

18.6.42 The aim of these limits is to prevent accumulation of high levels of contamination in offshore sediments and to avoid direct toxic effects on marine flora and fauna.

18.6.43 Levels of contamination in dredged sediment are assessed against Centre for Environment, Fisheries and Aquaculture Science (Cefas) Action Levels (Ref. 18.33). The Canadian Interim Sediment Quality Guidelines (Ref. 18.34), although not specific to the UK, are commonly also used to provide supporting information for assessment of sediment quality.

18.6.44 In the UK there are no standards for levels of suspended sediment in transitional and coastal waters.

18.6.45 The Marine Life Information Network (MARLIN) (Ref.18.57) identified benchmark definitions of change in suspended particulate matter that are used as supporting information for WFD assessment of nutrient status of a waterbody (Ref.18.58).

18.6.46 There are four WFD waterbody 'types' defined by annual mean concentration of suspended particulate matter, see **Table 18.14**. The benchmark for suspended sediment is a change from one waterbody type for a period of one year.

Table 18.14: Criteria for identifying types of transitional and coastal water to which the dissolved inorganic nitrogen standards apply

Type	Annual Mean Concentration of Suspended Particulate Matter (mg L^{-1})
Very turbid.	>300
Turbid	100 – 300.
Intermediate turbidity.	10 <100.
Clear	<10

18.6.47 The major potential concern for increased inputs of nutrients, mainly nitrogen (nitrate) and phosphorus (phosphate) is the enhanced growth of attached and planktonic plants which if it reaches excessive levels can lead to oxygen depletion.

18.6.48 For this reason, under the WFD, dissolved inorganic nitrogen (DIN) thresholds are set for classification of WFD waterbodies.

18.6.49 The assessment of nutrient status considers waterbody turbidity as more turbid waters limit light penetration and the depth within which phytoplankton can readily grow.

18.6.50 In more turbid conditions a higher DIN threshold may be considered to represent good status as it is less likely to result in undesirable increases in plant growth relative to a waterbody that is less turbid.

18.6.51 **Table 18.15** shows the DIN standards for coastal waters.

Table 18.15: Dissolved inorganic nitrogen standards (micromoles per litre) for coastal waters (salinity 32), or part of such water, (coastal waters categorised by type in accordance Ref.18.6)

Type	High	Good	Moderate	Poor
Clear	12[1]	18[1]	27[1]	40.5[1]
Intermediate turbidity.	12 (168µg L^{-1})[2]	70 (980µg L^{-1})	105	157.5
Turbid	12	180	270	405
Very turbid.	12	270	405	607.5

[1] The standard refers to the concentration of dissolved inorganic nitrogen at a mean salinity of 32 for the period of 1 November to 28 February – for the 'Clear' type the standard is based on the mean but for all other types it is the 99th percentile; 2 Example values also shown as microgram equivalent. A full assessment taking account of annual average inputs from any discharge and using phytoplankton and macroalgal modelling is likely to also be required

Dissolved oxygen standards

18.6.52 The presence of dissolved oxygen (DO) at high enough levels in all waterbodies including estuaries and coastal waters is essential to the survival and normal functioning of biological communities.

18.6.53 Oxygen depletion may occur over different timescales influenced by both seasonal and anthropogenic factors.

18.6.54 The solubility of oxygen varies with salinity, temperature and pressure and an increase in water temperature will lead to a decrease in oxygen saturation.

18.6.55 The other major factor controlling DO concentration is biological activity: photosynthesis produces oxygen while respiration and nitrification consume oxygen.

18.6.56 During construction and operation, discharges of treated sewage would contribute biochemical oxygen demand as would decaying organic matter that results from discharges of moribund organisms from the FRR system during operation.

18.6.57 The WFD threshold for DO is the 5th percentile, i.e. that concentration which will be exceeded 95th percent of the time and values associated to classification status are shown in **Table 18.16**.

Table 18.16: Dissolved oxygen standards for transitional and coastal waters with salinities <35

Boundaries	High
High	=7 – (0.037 x (salinity)).
Good	=5 – (0.028 x (salinity)).
Moderate	=3 – (0.017 x (salinity)).
Poor	=2 – (0.011 x (salinity)).

Microbial standards

18.6.58 The current EU standard to assess microbial pollution in bathing waters involves the enumeration of faecal indicator organisms, *Escherichia coli* and intestinal enterococci as indicators of pathogen content.

18.6.59 Discharges from sewage treatment on the construction site and during site operation must ensure that treatment of sewage discharges is at a standard that ensures the compliance of the nearest bathing waters and shellfisheries is not compromised.

18.6.60 The standards for bathing water compliance for monitoring points within designated bathing waters are shown in **Table 18.17**.

Table 18.17: Microbiological standards for coastal and transitional waters

Boundaries	Intestinal [1] Enterococci	Escherichia coli
Excellent	100[2]	250[2]
Good	200[2]	500[2]
Sufficient	185[3]	500[3]

[1]Colony forming units per 100 millilitres; [2]Based upon a 95th percentile evaluation; [3]Based upon a 90th percentile evaluation.

Chemical effects and standards

18.6.61 Waste chemicals from various operations will contribute to the discharge as will chlorine produced oxidants and by-products resulting from chlorination of the system to prevent biofouling.

18.6.62 As for the construction discharge, the mixing zone within which there is exceedance of any given EQS or derived Environmental Assessment limit must be sufficiently limited.

18.6.63 Under the WFD, chemical status is assessed by compliance with environmental standards for priority chemicals and other substances that are listed in the European Council Environmental Quality Standards Directive (2008/105/EC as amended by Directive 2013/39/EU implemented by the WFD (Standards and Classification) Directions (England and Wales) 2015 which increased the list of priority chemicals to 45.

18.6.64 Chemical status is recorded as “good' or 'fail”. The chemical status classification for the water body is determined by the worst scoring chemical.

18.6.65 For the Project, the relevant priority hazardous substances, priority substances and other pollutants would be assessed to determine any potential input sources. For these existing EQS would apply.

18.6.66 As well as screening ‘priority hazardous pollutants’ against relevant EQS values the chemical load would also be assessed against annual significant load limits.

18.6.67 For other substances, standards derived at a National level would be used. This list of compounds or specific pollutants is defined as substances that can have a harmful effect on biological quality, and which may be identified by Member States as being discharged to water in “significant quantities”.

18.6.68 For the Project, the full list of substances for assessment is being finalised based on an assessment of all potential inputs from direct use of chemicals and from the generation of waste streams from different activities.

18.6.69 EQSs are concentrations below which a substance is not believed to be detrimental to aquatic life. To provide a safety factor, the EQS is set substantially below the concentration observed to have a toxic effect on selected test organisms.

18.6.70 In the absence of EQS values for some toxic chemicals, the use of PNEC values is proposed. PNEC values are used where there is no existing EQS standard and where a relevant saltwater PNEC standard has been determined by independent authorities as recommended in Common Implementation Strategy (CIS) Guidance (Ref.18.59) and EU Technical guidance (Ref.18.60).

18.6.71 The determination of PNEC values follow the EU Technical Guidance Document (Ref.18.60) on risk assessment of new and existing chemicals following a review of the ecotoxicological literature. Under the guidelines from the WFD and the EQS Directives, WFD EQS values are, for the most part, also based on PNEC values.

18.6.72 Depending on the release pattern of a chemical and its environmental fate, chemical exposure may occur over long periods - or even continuously - in the water column, in biota and in sediments. In the water column, exposure may also occur intermittently for short periods, for example, coinciding with storm events or short periods of chemical use.

- To cover both long- and short-term effects resulting from exposure, two water column EQSs will normally be required: a long-term standard, expressed as an annual average concentration and normally based on chronic toxicity data; and
- a short-term standard, referred to as a maximum acceptable concentration which is based on acute toxicity data.

18.6.73 Annual average data are usually based on taking the lowest chronic ecotoxicological value. The values derived for chronic PNEC are usually based on a No Observed Effect Concentration (NOEC) and are the chemical concentrations for which it is predicted that there will be no effect on aquatic biota or where this is not available an effect concentration for 50% of the test individuals (EC_{50}).

18.6.74 A safety factor is then applied by dividing with an assessment factor (1 to 10,000) depending on the quality, quantity, diversity, and specificity of the ecotoxicological data available the European Union Technical Guidance Document (Ref.18.60).

18.6.75 For exposures resulting from shorter term (typically over 24 hours) exposure maximum acceptable concentration values are derived from the lowest acute toxicity data and use 50% effect concentrations (EC_{50}) derived from studies of 24 - 96 hours duration.

18.6.76 WFD EQS standards for substances potentially discharged during the construction period but also of relevance to other phases of development including operation are shown in **Table 18.18**.

18.6.77 During construction, tunnelling will be required to establish cooling water intake and outfall systems.

18.6.78 During the tunnelling process, dependent on soil conditions, chemicals may be required to assist the tunnel boring and spoil removal. To assess the potential chemical use and likely discharges, representative scenarios will be used.

Table 18.18: Marine water EQS (Directive 2013/39/EU; Ref.18.61); and microbiological standards from bathing water regulations (2013. No. 1675)

Determinands	WFD EQS Annual Average Values	WFD EQS Maximum Allowable Concentration (MAC) Values (as 95 percentile) (µg L^{-1})
Cadmium and its compounds (dissolved).	0.2	1.5
Lead and its compounds (dissolved).	1.3	14
Mercury and its compounds (dissolved).	-	0.07
Nickel and its compounds (dissolved).	8.6	34
Chromium VI (dissolved).	0.6	32
Arsenic (dissolved).	25	Not applicable.
Copper (dissolved).	3.76 (2.677 x ((DOC/2) - 0.5)) µg L^{-1} dissolved, where dissolved organic carbon (DOC) > 1 mg L^{-1}.	Not applicable.
Iron (dissolved).	1000	Not applicable.
Zinc (dissolved).	6.8 (plus ambient background 1.1 in salt water).	Not applicable.
Boron	7000[1]	Not applicable.
Unionised ammonia (NH_3).	21	-
Winter dissolved inorganic nitrogen.	Not applicable.	To be determined.[2]
Escherichia coli.	Not applicable.	≤500 colony forming units/100mL[3].
Intestinal enterococci.	Not applicable.	≤200 colony forming units/100mL[3].

[1] (Ref.18.62); [2] The standard value for initial screening for nitrogen for 'not clear' waterbodies is based on WFD 99th percentile for Good status and is derived based on the

turbidity of the waterbody [3] This assessment is from (Ref.18.58) for coastal and transitional waters and represents Good standard.

18.6.79 As freshwater organisms are generally easier to obtain and test, this has led to fewer marine toxicity datasets being available. This often leads to the development of marine PNEC values based on extrapolation from freshwater PNEC values or high assessment factors applied to marine ecotoxicological data (uncertainty regarding the sensitivity of other taxa).

18.6.80 Several studies in recent years indicate that this approach is probably particularly precautionary (Ref.18.63, 18.64, 18.65 and 18.66).

18.6.81 For large scale cooling water discharge during operation, background loads of discharged chemicals will also be accounted for in the discharge assessment.

18.6.82 For those chemicals that do not pass the initial screening, more detailed chemical modelling will be conducted to determine mixing zones and potential areas of exceedance of EQS or equivalent values.

Approach to in combination and cumulative effects

18.6.83 The overarching approach to the cumulative effects assessment (CEA) is described in **Chapter 5: The EIA Process and Methods**. Specific issues relating to the scope of this chapter are addressed in the following paragraphs.

In combination effects

18.6.84 In-combination effects occur when individual pressures co-exist and can influence the overall effect on a receptor. In combination effects are an important consideration as individually effects may be assessed as insignificant but combine to greater effect.

18.6.85 There is no established methodology for assessing the effects on sensitive receptors resulting from the interaction or in-combination of different effects. The Project-wide in combination effects assessment considers the sequence of construction and subsequent use of development components in the construction and operational phases. Impacts with the potential to overlap temporally and or spatially thereby altering the outcome of effects are assessed.

18.6.86 In-combination effects can act additively, synergistically, or antagonistically. For example, sensitivity to chemical contaminants is often temperature dependent, thus the thermal plume could enhance the toxicity of chemical discharges.

18.6.87 In-combination effects during the Project that would be considered in the assessments include, but are not limited to:

- Dredging and disposal or drilling activities co-occurring to increase suspended sediment plumes.

- The potentially synergistic effects of temperature, salinity, and chemical contaminants in the thermal plume.
- The effects from combination of factors thermal, chemical, saline, suspended sediment plumes and the potential for contaminants release from sediment remobilisation.

Cumulative effects

18.6.88 The cumulative effects of the Project in relation to other plans, projects and permissions with the potential for overlapping ZoI will be assessed, noting that ZoIs would be receptor dependent. It is assumed that infrastructure and anthropogenic activities currently occurring (operational) in the ZoI represent part of the pressure landscape during which baseline conditions were collected. As such, they will not be considered as part of the CEA.

18.6.89 The CEA will apply a temporal and spatial screening approach at relevant receptor-specific scales in order to determine the potential for cumulative effects between the Project and other plans, projects and permissions. This approach is based on the stage of projects within the planning and development process and allows for different levels of uncertainty and differences in quality of data to be taken into account.

18.7 Scope of the Assessment

Potential receptors

18.7.1 The general approach to assessment of effects and determining significance that will be used for the EIA is provided in **Section 18.6** which sets the approach and how it has been adapted and applied to marine water quality and sediments including consideration of in combination and cumulative effects.

18.7.2 The Project has the potential to affect the following WFD waterbodies as they are within the potential ZoI:

- Blackwater transitional (GB520503714000);
- Blackwater Outer coastal (GB650503200000);
- Colne transitional (GB520503713800); and
- Essex coastal (GB650503520001).

18.7.3 Additionally, the Blackwater surface water operational catchment may also be affected, although this will be assessed within **Chapter 15: Water Environment**.

18.7.4 In parallel with the WFD compliance assessment, the marine water quality and sediments assessments would consider the potential impact pathways on chemical and biological elements of the WFD.

18.7.5 **Table 18.19** provides the technical guidance framework that will be followed within the WFD compliance assessment.

18.7.6 The Project has the potential to affect ecological sites designated as being of European or International importance for nature conservation. Consequently, a HRA will be submitted to the Planning Inspectorate for Development Consent Order. The HRA will set out the likely significant effects on the designated features of European Sites including Special Protection Areas (SPA), SACs and Ramsar sites within the ZoI of the Project.

18.7.7 In parallel with the HRA, the marine water quality and sediments assessments would consider the specific marine components (below MHWS) of designated European sites.

18.7.8 Furthermore, a MCZ Assessment will be required for MCZ designated features potentially exposed to pressures from the Project. The EIA will be progressed in parallel to the MCZ assessment to consider relevant species and habitats.

18.7.9 A summary of the designated sites with potential marine impact pathways that would be assessed in the EIA is presented in **Table 18.19**. It should be noted this is not an exhaustive list and the HRA will consider other designated sites and protected areas in greater detail.

Table 18.19: Scoping of qualifying features of relevant designated sites

Designated Site	Qualifying Features and Supporting Habitats [2] Scoped into Marine Water Quality and sediments Assessments	Scoping Justification
SAC		
Essex Estuaries SAC.	***Qualifying features.*** • Estuaries (sub-features: Atlantic salt meadows, intertidal coarse sediment, intertidal mixed sediments, intertidal mud, intertidal rock, intertidal sand and muddy sand, intertidal seagrass beds, subtidal coarse sediment, subtidal mixed sediment, subtidal mid, subtidal sand and subtidal seagrass beds). • Mudflats and sandflats not covered by seawater at low tide (sub-features: intertidal mixed sediments, intertidal mud, intertidal sand and muddy sand, intertidal seagrass beds). • Sandbanks which are slightly covered by sea water all the time (sub-features: subtidal coarse sediment, subtidal mixed sediment, subtidal mud, subtidal sand, subtidal seagrass beds).	Features below MHWS are within the potential ZoI. Saltmarsh features above MHWS would be assessed in **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**, however the function of this habitat as a marine resource (i.e. as a nursery or spawning habitat) will be considered in the marine water quality and sediment assessments.

[2] Qualifying features are taken from https://designatedsites.naturalengland.org.uk

Designated Site	Qualifying Features and Supporting Habitats [2] Scoped into Marine Water Quality and sediments Assessments	Scoping Justification
Southern North Sea SAC.	***Qualifying features.*** • Harbour porpoise (*Phocoena phocoena*).	Harbour porpoise is known to be present within the potential ZoI (Ref.18.18 and Ref.18.19).
The Wash and North Norfolk Coast SAC.	***Qualifying features.*** • Common seal (*Phoca vitulina*).	The foraging trips of up to 220km have been recorded for common seal during tagging studies at The Wash (Ref.18.20), therefore could be present within the potential ZoI.
Humber Estuary SAC.	***Qualifying features.*** • Sea lamprey *(Petromyzon marinus*) (potential supporting habitat: water column). • River lamprey *(Lampetra fluviatilis)* (potential supporting habitat: water column). • Grey seal (*Halichoerus grypus)* (potential supporting habitats, dunes with *Hippophae rhamnoides*, embryonic shifting dunes, fixed dunes with herbaceous vegetation, intertidal mixed sediment, intertidal mud, intertidal sand and muddy sand, shifting dunes along the shoreline with *Ammophila arenaria* and water column).	Grey seal, river and sea lamprey are wide-ranging species undertaking extensive movements between sites over distances of several hundred kilometres (Ref.18.19 and Ref.18.21). Therefore, could be present within the potential ZoI. Saltmarsh features above MHWS would be assessed in the terrestrial ecology chapter (**Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology)**, however the function of this habitat as a marine resource (i.e. as supporting habitat for seals) will be considered in the marine water quality and sediment assessments.

Designated Site	Qualifying Features and Supporting Habitats [2] Scoped into Marine Water Quality and sediments Assessments	Scoping Justification
SPA and Ramsar Site.		
Dengie (Mid-Essex Coast Phase 1) SPA and Ramsar.	***Supporting habitats.*** • Intertidal course sediment. • Intertidal mud. • Intertidal sand and muddy sand. • Water column.	Bird features will be assessed in the terrestrial ecology chapter (**Chapter 23: Biodiversity- Terrestrial and Freshwater Ecology and Ornithology)**, however marine supporting habitat (below MHWS) and marine prey will be considered in the marine water quality and sediment assessments.
Blackwater Estuary (Mid-Essex Coast Phase 4) SPA and Ramsar**.**	***Potential supporting habitats.*** • Intertidal course sediment. • Intertidal mixed sediment. • Intertidal mud. • Intertidal rock. • Intertidal sand and muddy sand. • Intertidal seagrass beds. • Water column. • Intertidal biogenic reef: mussel beds.	Bird features will be assessed in the terrestrial ecology chapter (**Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology)**, however marine supporting habitat (below MHWS) and marine prey will be considered in the marine water quality and sediment assessments.
Outer Thames Estuary SPA.	***Potential supporting habitats.*** • Intertidal sand and muddy sand. • Water column.	Bird features will be assessed in the terrestrial ecology chapter (**Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology)**, however marine supporting habitat (below MHWS) and marine prey will be

Designated Site	Qualifying Features and Supporting Habitats [2] Scoped into Marine Water Quality and sediments Assessments	Scoping Justification
	• Circalittoral rock. • Subtidal coarse sediment. • Subtidal mixed sediments. • Subtidal mud. • Subtidal sand.	considered in the marine water quality and sediment assessments.
Colne Estuary (Mid-Essex Coast Phase 2) SPA and Ramsar.	***Potential supporting habitats.*** • Intertidal course sediment. • Intertidal mixed sediment. • Intertidal mud. • Intertidal sand and muddy sand. • Water column. • Intertidal biogenic reef: mussel beds.	Bird features will be assessed in the terrestrial ecology chapter (**Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology)**, however marine supporting habitat (below MHWS) and marine prey will be considered in the marine water quality and sediment assessments.
Foulness (Mid-Essex Coast Phase 5) SPA and Ramsar.	***Potential supporting habitats.*** • Coastal lagoons. • Intertidal course sediment. • Intertidal mixed sediment. • Intertidal mud. • Intertidal sand and muddy sand. • Intertidal rock. • Intertidal seagrass beds. • Water column.	Bird features will be assessed in the terrestrial ecology chapter (**Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology)**, however marine supporting habitat (below MHWS) and marine prey will be considered in the marine water quality and sediment assessments.

Designated Site	Qualifying Features and Supporting Habitats [2] Scoped into Marine Water Quality and sediments Assessments	Scoping Justification
	• Subtidal seagrass beds. • Intertidal biogenic reef: mussel beds. • Intertidal stony reef.	
Abberton Reservoir SPA and Ramsar.	***Principal supporting habitats.*** • Standing open water.	Bird features will be assessed in the terrestrial ecology chapter (**Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology)**, however marine supporting habitat (below MHWS) and marine prey will be considered in the marine water quality and sediment assessments.
Crouch and Roach Estuaries (Mid-Essex Coast Phase 3) SPA and Ramsar.	***Potential supporting habitats.*** • Intertidal mud. • Water column.	Bird features will be assessed in the terrestrial ecology chapter (**Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology)**, however marine supporting habitat (below MHWS) and marine prey will be considered in the marine water quality and sediment assessments.
Stour and Orwell Estuaries SPA and Ramsar.	***Potential supporting habitats.*** • Intertidal course sediment. • Intertidal mixed sediment. • Intertidal mud.	Bird features will be assessed in the terrestrial ecology chapter (**Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology)**, however marine supporting habitat (below MHWS) and marine prey will be

Designated Site	Qualifying Features and Supporting Habitats [2] Scoped into Marine Water Quality and sediments Assessments	Scoping Justification
	• Intertidal sand and muddy sand. • Intertidal seagrass beds. • Water column.	considered in the marine water quality and sediment assessments.
Alde-Ore Estuary SPA and Ramsar.	***Potential supporting habitats.*** • Coastal lagoons. • Intertidal course sediment. • Intertidal mixed sediment. • Intertidal mud. • Intertidal sand and muddy sand. • Intertidal biogenic reef: mussel beds. • Intertidal rock. • Water column.	Bird features will be assessed in the terrestrial ecology chapter (**Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology)**, however marine supporting habitat (below MHWS) and marine prey will be considered in the marine water quality and sediment assessments.
MCZ		
Blackwater, Crouch, Roach and Colne Estuaries MCZ.	***Qualifying features.*** • Clacton Cliffs and Foreshore. • Intertidal mixed sediments. • Native oyster (*Ostrea edulis*). • Native oyster (*Ostrea edulis*) beds.	Features below MHWS are within the potential ZoI.

Designated Site	Qualifying Features and Supporting Habitats [2] Scoped into Marine Water Quality and sediments Assessments	Scoping Justification
Medway Estuary MCZ.	***Qualifying features.*** • Smelt (*Osmerus eperlanus*).	There is evidence of smelt occurring in Blackwater Estuary (Ref. 18.22.)

18.7.10 The Project has the potential to affect bathing waters as defined under the Urban Waste Water Treatment Directive (91/271/EEC) (**Table 18.20**) and also shellfish waters protected areas close to the main development site (**Table 18.21**). Discharges of treated sewage effluent have the potential to affect the microbiological quality of the local seawater and to influence bathing water quality. The nearest bathing water is West Mersea at around 3km from potential discharge locations for the main development site. Other bathing waters, the next nearest at Brightlingsea at over 16km, are less likely to be influenced by discharges from the main development site. Shellfish water protected areas are areas designated for the protection of shellfish growth and production.

18.7.11 Good microbiological and other water quality parameters are important high-quality shellfish production and so the potential for the proposed development to influence these will be assessed.

Table 18.20: Scoping of nearby Bathing Waters

Bathing water	Site description	Classification
West Mersea.	The beach is in the Blackwater estuary and close to that of the Colne both of which drain large catchments. lat, long: 51.77,0.9302 Over ca.,3k from potential discharge locations for the Bradwell B power station.	Current water quality classification is Good, based on samples taken from 2016 through to 2019.
Brightlingsea	The beach is at the bottom of the Colne estuary which drains a large part of central Essex. Nearby is Brightlingsea Creek which remains part navigable for commercial shipping. lat, long: 51.81,1.010 Over ca.,16k from potential discharge locations for the Bradwell B power station.	Current water quality classification is Excellent, based on samples taken from 2016 through to 2019.
Jaywick	Jaywick is a small coastal village with large caravan parks to the west. The quiet and sandy beach has recently been extended with additional sand. lat, long: 51.77,1.113 Over ca., 20k from potential discharge locations for the Bradwell B power station.	Current water quality classification is Good, based on samples taken from 2016 through to 2019.

Table 18.21: Scoping of nearby Shellfish production areas

Protected Area	Classification zones	Species	Class	Approximate distance development
Blackwater	Buxey Sands.	*C.edule*	B-LT	Ca., 9km.
	Central Blackwater.	*C.gigas* *O.edulis*	B-LT B-LT	Ca., 4km.
	Dengie flats.	*C.edule*	B-LT	Ca., 4.5km.
	Goldhanger.	*C.gigas* *O.edulis*	B-LT B-LT	Ca.,11km.
	Osea South.	*C.gigas* *O.edulis*	B-LT B-LT	Ca., 11km.
	Outer Blackwater.	*C.gigas* *O.edulis*	B-LT B-LT	Within development area.
	Ray Channel.	*C.gigas* *O.edulis*	B-LT B-LT	Ca.,3.5km.
	St Peter's Flats.	*C.gigas*	A	Ca., 3km.
	St Peter's and Batchelor.	*C.gigas* *O.edulis*	A A	Ca., 7km.
West Mersea	Little Ditch.	*C.gigas* *O.edulis*	A A	Ca., 7km.
	Mersea Flats East.	*C.gigas* *O.edulis*	B-LT B-LT	Ca., 7.5km.
	Mersea Flats West.	*C.gigas* *O.edulis*	A A	Ca., 3.5km.
	Ray Creek.	*C.gigas* *O.edulis*	A A	Ca., 3.5km.
	Salcott Channel.	*C.gigas* *O.edulis* *M.mercenaria*	B B B	Ca., 1.5km.

Protected Area	Classification zones	Species	Class	Approximate distance development
	Strood Channel.	*C.gigas* *O.edulis*	A A	Ca., 1.5km.
	Tollesbury North.	*C.gigas* *O.edulis* *M.mercenaria*	B-LT B-LT B-LT	Ca., 3km.
Colne	Brightlingsea Creek Inner.	*C.gigas* *M.mercenaria*	B-LT B-LT	Ca., 17.5km.
	Brightlingsea Creek Outer.	*C.gigas* *M.mercenaria*	B-LT B-LT	Ca., 14.5km.
	Geedon Creek.	*C.gigas* *O.edulis* *C.edule*	B-LT B-LT C	Ca., 14km.
	Main Channel Central.	*C.gigas* *M.mercenaria* *O.edulis* *Tapes spp.*	B-LT B-LT B-LT B	Ca., 13.5km.
	Main Channel Outer.	*C.gigas* *O.edulis*	B-LT B-LT	Ca., 12.5km.
	Pyefleet Channel.	*C.gigas* *O.edulis* *C.edule*	B-LT B-LT C	Ca., 9km.

18.7.12 The main expected contaminants that would be subject to the Environmental Risk Assessment for the Project include:

- Construction: Treated sewage from staff welfare facilities (including the potential project-provided worker accommodation) will contribute ammonia, phosphorus, other organic and inorganic chemicals, suspended solids, biochemical oxygen demand and microbiological contaminants.
- Surface drainage and groundwater dewatering discharges may also contribute to some of the same contaminants.

- Dependent on the technical requirements for tunnelling to establish cooling water abstraction and discharge, additional pump ashore operations including abstracted groundwater discharges and tunnelling chemicals may also be discharged.
- Some other construction activities such as the production of concrete wash water may contribute additional contaminants to the construction discharge or effect water quality. The most conservative assessment will be derived based on the overlapping activities and combined sources during construction.
- The influence of sediment remobilisation from dredging and disposal activities on turbidity status and sediment-bound contaminant release will also be considered.
- The approach to management of accidental spillages during construction activities will also be considered.
- Cold commissioning where discharge is via a construction discharge outfall: details to be confirmed but potentially suspended solids; ammonia (with derivation of the un-ionised ammonia concentration based on pH, temperature and salinity of the discharge and receiving water); phosphate; ethanolamine; hydrazine; iron and iron oxide; TRO and trihalomethanes.
- Operation including the use of a fish recovery and return system: details to be confirmed but potentially nitrogen, phosphate, hydrazine; TRO; BOD; ammonia and un-ionised ammonia; suspended solids; microbiological contaminants; metals (dissolved and total) and various residual organic and inorganic process chemicals.
- The approach to management of accidental spillage during operational activities and of types and quantities of chemicals stored on site to meet the requirements of COMAH regulations will also be considered.

18.7.13 Several construction activities would take place in the marine environment and it is therefore necessary to characterise the contaminant content of the sediments that would be subject to disturbance and may require disposal. This would involve a geotechnical survey comprising vibrocores taken at relevant locations associated with the construction and operational activities of the Bradwell B power station. The vibrocores would need to be analysed for the following determinands:

- Particle size analysis (PSA);
- Radionuclide composition;
- Heavy metals: Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), Zinc (Zn);
- Organotins: Monobutyl-tin (MBT), Dibutyl-tin (DBT), Tributyl-tin (TBT);

- Organochlorine pesticides: dichloro-diphenyl-trichloroethane (DDT) and Dieldrin;
- Polyaromatic Hydrocarbons (PAHs) and Total Hydrocarbon Content (THC); and
- Polychlorinated biphenyls (PCBs).

18.7.14 Sediment quality results would be compared against Cefas Action Levels and ISQGs, as part of the Environment Agency Clearing the Waters for All technical guidance (see **Table 18.2**).

18.7.15 For water quality and sediments, the receptor is the physical and chemical quality of the water and the extent and degree of any changes are considered relative to existing quality standards or equivalent derived values. The exceedance of standards or equivalents also provide a trigger for consideration of water body or protected area status or for potential ecological impacts for associated habitat. Aspects of water quality that have been identified as being subject to potential effects are summarised in **Table 18.22.**

18.7.16 For marine water quality and sediments, assessment of the extent of effects on the receptor is made for the model domain for the relevant water quality parameter or, if relevant, for a defined water body or protected area. The outcome indicates where further detailed assessment of impacts on designated areas or species are indicated (see also **Section 18.4** and **Section 18.6**).

Table 18.22: Receptors subject to potential effects

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Main development site.	Operation phase.	Marine water quality effects - marine environment.	Temperature increase from cooling water discharge for the Bradwell B power station.
Main development site.	Operation phase.	Marine water quality effects - marine environment.	Salinity increase contributed by cooling water discharge for the Bradwell B power station.
Main development site.	Construction and Operation phase.	Marine water quality effects - marine environment.	Hydrocarbon including PAH contamination in surface drainage, groundwater and tunnelling wastewater.
Main development site.	Construction and	Marine water quality effects -	Synthetic compound contamination from activities

Element of the Project	Phase	Potential Receptor	Reason for Consideration
	Operation phase.	marine environment.	such as tunnelling and from residual process chemicals.
Main development site.	Construction and Operation phase.	Marine water quality effects - marine environment.	Introduction of other substances (solid, liquid or gas) from activities such as tunnelling and from residual process chemicals.
Main development site.	Construction and Operation phase.	Marine water quality effects - marine environment.	Nutrient enrichment from groundwater inputs, cold commissioning discharges and from residual process chemicals.
Main development site.	Construction and Operation phase.	Marine water quality effects - marine environment.	Organic enrichment from treated sewage and from decaying biomass from fish recovery and return.
Main development site.	Construction and Operation phase.	Marine water quality effects - marine environment.	De-oxygenation from treated sewage and from decaying biomass from fish recovery and return.
Main development site.	Construction and Operation phase.	Marine water quality effects – marine. environment	Introduction of microbial pathogens from treated sewage.
Main development site.	Construction and Operation phase.	Marine water quality effects - marine environment.	Changes in suspended solids (water quality) from dredging and drilling offshore and in discharges of groundwater and surface water, tunnelling wastewater and treated sewage.

Likely significant effects

18.7.17 The effects on marine water quality and sediments which have the potential to be significant and that will be taken forward for assessment in the EIA are summarised

in **Tables 18.23** (construction) and **Table 18.24** (operation). These will be further defined in an approach that associates pressures on the marine environment with different construction and operational activities termed a full pressures-activity approach. Cumulative effects and indirect effects on food webs will also be taken forward for assessment, the approach to these assessments is included in **Section 18.6**.

Table 18.23: Likely significant marine water quality and sediments construction effects

Activity	Description	Pressure or Pressure Theme	Effect	Receptor or Receptor Group
Dredging and dredge disposal.	Dredging and dredge disposal activities for beach landing facilities (BLF) and cooling water infrastructure. Dredging and any associated dredged material disposal at sea, are licensable activities managed by the MMO under the Marine and Coastal Access Act 2009. If required, an appropriate disposal site, the type of material (including contaminants) and total volume of dredge disposal would be confirmed in consultation with the MMO.	Changes in suspended solids (water quality). Potential release of sediment associated contaminants: • Transition elements and organo-metals contamination. • Radionuclide contamination (see **Chapter 9: Radiological**). • Hydrocarbon and PAH contamination*. • Synthetic compound contamination*. • Nutrient enrichment.	• Changes in suspended solids that could lead to a change in the turbidity classification. • Exceedance of WFD quality standards, or derived predicted no effect concentrations and thermal defined limits and nutrient and oxygen thresholds.	Marine water quality effects in defined waterbody and protected areas.

Activity	Description	Pressure or Pressure Theme	Effect	Receptor or Receptor Group
Construction activities including piling, drilling and potential aggregate pipeline discharges	Installation of BLF jetty piles (if required) is anticipated to be by piling (impact or vibratory) either from a jack-up vessel or a terrestrial piling vessel, however, this will be confirmed following information on detailed designs. Drilling of vertical connecting shafts through the underlying geology for cooling water infrastructure is anticipated. Installation of piles to secure headworks to the bedrock to ensure seismic qualification is also assumed. If an aggregate pipeline is utilised for onshore delivery of bulk aggregate waste water may be discharged to sea via a pipeline.	Changes in suspended solids (water quality) with potential release of sediment associated contaminants: • Transition elements and organo-metals contamination. • Radionuclide contamination (see **Chapter 9: Radiological**). • Hydrocarbon and PAH contamination*. • Synthetic compound contamination*. • Nutrient enrichment.	• Changes in suspended solids that could lead to a change in the turbidity classification. • Exceedance of WFD quality standards, or derived predicted no effect concentrations and thermal defined limits and nutrient and oxygen thresholds.	Marine water quality effects in defined waterbody and protected areas.
Increased anthropogenic	Increased vessel traffic within the Zone for marine infrastructure could occur, particularly in	Potential for spills leading to inputs of:	• Exceedance of WFD quality standards, or derived predicted no	Marine water quality effects in defined

Activity	Description	Pressure or Pressure Theme	Effect	Receptor or Receptor Group
activity or vessel activity.	association with BLF deliveries but also vessel traffic activities associated with construction vessel operations (for example anchoring and positioning of jack-up barges).	• Transition elements and organo-metals contamination. • Hydrocarbon and PAH contamination*. • Synthetic compound contamination*. • Nutrient enrichment. • Introduction microbial pathogens	effect concentrations, exceedance of microbiological standards for bathing and shellfish waters and nutrient thresholds.	waterbody and protected areas.
Construction and commissioning discharges.	Discharges including tertiary treated sewage, groundwater from dewatering, surface run-off, tunnelling wastewater, and commissioning discharges are expected via a combined drainage outfall. It is anticipated that discharges would be subject to treatment such as oil or water	Water quality effects on marine environment with potential for: • Transition elements and organo-metals contamination. • Radionuclide contamination (see **Chapter 9: Radiological**).	• Changes in suspended solids that could lead to a change in the turbidity classification. • Exceedance of WFD quality standards, or	Marine water quality effects in defined waterbody and protected areas.

Activity	Description	Pressure or Pressure Theme	Effect	Receptor or Receptor Group
	separation and “silt-buster” or similar technology to reduce sediment loading.	• Hydrocarbon and PAH contamination*. • Synthetic compound contamination*. • Nutrient enrichment. • Introduction of microbial pathogens.	derived predicted no effect concentrations, or radiological limits or exceedance of microbiological standards for bathing and shellfish waters, dissolved oxygen defined limits and nutrient thresholds.	

**Sediment quality surveys proposed at the site would determine the baseline concentrations of these determinands and determine the potential for activities associated with the Project to resuspend sediment-bound contaminants.*

†Marine water quality and sediments assessments would consider pathways for contamination of existing radionuclides. Sediment quality surveys proposed at the site would determine the baseline radionuclide concentrations and determine the potential for activities associated with the Project to resuspend sediment-bound radionuclides.

18.7.18 Dredging activities associated with the BLF navigational channel and sediment management for the cooling water infrastructure would result in elevated suspended sediment concentrations (SSC) and sediment deposition rates. Drilling the vertical tunnels to connect the cooling water infrastructure headworks to the subterranean tunnels would also cause smaller scale increases in SSC and sediment deposition rates. Changes in SSC may have direct influence on the primary receptor (marine water quality in the relevant waterbody), or indirect effects on marine ecology.

18.7.19 Construction of a BLF, cooling water system, and associated activities including dredging for their construction and operation would generate elevated suspended sediment levels over periods of days dependent on overlap of activities.

18.7.20 In the UK there are no standards for levels of suspended sediment in transitional and coastal waters. But as supporting data for nutrient assessment under the WFD, waterbody types are defined in terms of annual mean concentration of suspended particulate matter (SPM). These type definitions have been recommended as benchmark definitions for assessing change in SPM. The magnitude and duration of changes in suspended sediment levels during construction would be evaluated against their likely influence on the current waterbody type definition for annual suspended sediment levels for the relevant waterbodies.

18.7.21 Discharges to surface waters that enter the marine environment may include surface water drainage containing suspended sediment and contaminants and treated sewage effluent. All such discharges would have an appropriate level of treatment to minimise input concentrations and to meet permit conditions before discharge to the marine environment.

18.7.22 Metals, un-ionised ammonia, dissolved inorganic nitrogen, phosphorus, biochemical oxygen demand and faecal indicator organisms will be assessed.

18.7.23 Groundwater dewatering and treated sewage effluent are expected to be the main discharges to the marine environment during the construction period that will require assessment. Discharges are anticipated to be via a subtidal combined drainage outfall. Concrete batching effluents would also be considered as part of the discharge assessment via the combined drainage outfall. Dependent on the approach to surface water management discharges to the marine environment would be evaluated for assessment.

18.7.24 Tunnels for the cooling water system and potential fish recovery and return system outfall would be excavated from landward. Any wastewater generated by drilling of the horizontal cooling water tunnels will be returned to land for treatment before potential discharge through the combined drainage outfall. Any sediment discharged during this process will be considered relative to sediment disturbance that results from other construction activities. Some residual tunnelling chemicals may be present in wastewater and the likely concentrations of these present would be considered as part of the discharge risk assessment.

18.7.25 Commissioning of the two UK HPR 1000 reactor units is proposed to take place in two stages, namely (i) cold flush testing (CFT) and (ii) hot functional testing (HFT).

The commissioning process for each unit would potentially last for about 24 months. Both CFT and HFT processes will produce liquid effluents.

18.7.26 Liquid effluents produced during conditioning tests in cold commissioning would be discharged via a combined drainage outfall subject to permit. Any substances present will be screened in a similar way to construction discharges and appropriate modelling will be conducted for any that fail screening.

18.7.27 Chemical or organic matter discharges from terrestrial groundworks or sewage treatment may have local impacts on receiving waters and organisms with limited mobility such as benthic species and phytoplankton. Discharge of treated sewage is anticipated and will be assessed.

Table 18.24: Likely significant marine water quality and sediment during operation

Activity	Description	Pressure or Pressure Theme	Effect	Receptor or Receptor Group
Cooling water discharge.	Discharge during commissioning hot functional testing and during operation cooling water discharge. Abstracted cooling water would be returned to the receiving waters at elevated temperature and salinity. The thermal and saline effluent is expected to be seasonally chlorinated. Additional discharges would include surface drainage water, treated sewage and hydrazine discharges.	Water quality effects – marine environment with potential: • Temperature increase • Salinity increase • Suspended solids • Transition elements and organo-metals contamination. • Radionuclide contamination (see **Chapter 9: Radiological**). • Hydrocarbon and PAH contamination*. • Synthetic compound contamination*. • Nutrient enrichment.	• Changes in suspended solids that could lead to a change in the turbidity classification. • Exceedance of WFD quality standards, or derived predicted no effect concentrations, or radiological limits, exceedance of microbiological standards for bathing and shellfish waters, or of thermal, dissolved oxygen and salinity defined limits and nutrient and organic enrichment thresholds.	Marine water quality effects in defined waterbody and protected areas.

Activity	Description	Pressure or Pressure Theme	Effect	Receptor or Receptor Group
		• Organic enrichment • Introduction microbial pathogens		
Other site discharges.	Discharge from the FRR.	Water quality effects – marine environment. with potential for: • Nutrient enrichment. • Organic enrichment • De oxygenation • Inorganic chemical release	The decay of moribund fish discharged from the FRR could lead to: • Changes in suspended solids that could lead to a change in the turbidity classification. • Exceedance of WFD quality standards or derived predicted no effect or of dissolved oxygen defined limits and organic enrichment and nutrient thresholds.	Marine water quality effects in defined waterbody and protected areas.

Activity	Description	Pressure or Pressure Theme	Effect	Receptor or Receptor Group
Dredging and dredge disposal.	Maintenance dredging and dredge disposal activities would be required potentially to allow grounding of barges associated with the BLF during the operational phase. Dredging, requiring dredge disposal, is a licensable activity managed by the MMO under the Marine and Coastal Access Act 2009. An appropriate disposal site, the type of material (including contaminants) and total volume of dredge disposal would be confirmed in consultation with the MMO.	Changes in suspended solids (water quality). Potential release of sediment associated contaminants: • Transition elements and organo-metals contamination. • Radionuclide contamination (see **Chapter 9: Radiological**). • Hydrocarbon and PAH contamination*. • Synthetic compound contamination*. • Nutrient enrichment.	• Changes in suspended solids that could lead to a change in the turbidity classification. • Exceedance of WFD quality standards, or derived predicted no effect concentrations, radiological limits and dissolved oxygen limits and nutrient thresholds.	Marine water quality effects in defined waterbody and protected areas.

**Sediment quality surveys proposed at the site would determine the baseline concentrations of these determinands and determine the potential for activities associated with the Project to resuspend sediment-bound contaminants.*

†Marine water quality and sediment assessments would consider pathways for contamination of existing radionuclides. Sediment quality surveys proposed at the site would determine the baseline radionuclide concentrations and determine the potential for activities associated with the Project to resuspend sediment-bound radionuclides.

18.7.28 Discharges of thermal and more saline cooling water effluent from the Project have the potential to affect marine water quality and sediment in the receiving waters. The assessments would consider discharges in terms of:

- absolute temperatures and salinity reaching thermal and saline maxima relative to standards;
- changes in mean temperature and salinity;
- fluctuating temperature and salinity interaction; and
- potential thermal and saline barriers to species movement.

18.7.29 Chemical discharges, including seasonal chlorinated discharges and other process chemicals would be assessed.

18.7.30 Operations associated with the occasional use of the beach landing facilities would cause sediment resuspension potentially changing the turbidity classification which would also be assessed.

18.7.31 As well as the use of biocide, operational chemical discharges would also include inputs from treated sewage effluent, and discharge of other process chemicals. Chemical discharges will be screened using the Defra and Environment Agency screening assessment for discharges into cooling water which are then discharged to estuaries or coastal waters (Ref.18.35). Any chemicals that do not pass the screening assessment will be assessed using modelling to determine areas over which plume concentrations are likely to exceed relevant standard or reference values.

18.7.32 Thermal (temperature) elevation can also affect oxygen concentration– warmer water at standard air pressure will hold less oxygen than it would at lower temperature – and the thermal influence on mean background dissolved oxygen concentrations for the Project will be assessed against WFD standards for waterbody status.

18.7.33 The oxidants (TRO) produced from chlorination of seawater and the main chlorination by-products determined based on laboratory studies of seawater from the Blackwater Estuary, will be assessed using the model selected via the applicants hydrodynamic modelling strategy. The area over which determinands may exceed their respective standard values will be determined.

18.7.34 Hydrazine is an ammonia-derived compound that is an oxygen scavenger and is used in power plants to inhibit corrosion in steam generation circuits and will be screened. If discharges exceed initial assessment criteria, then hydrodynamic modelling will be used to predict areas of the discharge plume that exceed the PNEC for hydrazine. Initial surveys to establish the background status of the Blackwater Estuary show that background concentrations for hydrazine at the six sampling locations (see **Figure 18.1**) were below detectable limits of 5 ng L^{-1}.

18.7.35 The potential FRR system will have a relatively low discharge rate (ca., a tenth of the cooling water discharge). Chlorination downstream of the filtration screens would mitigate potential impacts on fish in the FRR, but should it be necessary to chlorinate at the screens for operational and or safety reasons the Applicant would provide a reasoned case and environmental assessment to the Environment Agency. Any discharged contaminants and organic enrichment from this source due to decay of moribund fish will be assessed using the same screening approach as applied to the construction discharge.

Effects scoped out

18.7.36 Potential marine water quality effects associated with potential project-provided accommodation in close proximity to the main development site are considered under the main development site construction effects. Associated development (off-site highways works, , park and ride facilities, freight management facilities) and off-site Power Station Facilities are scoped out of the assessment as they are remote from the marine environment (see **Chapter 3: The Project; Figures 3.3** to **3.6**). Impacts on terrestrial and freshwater receptors will be considered in **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology.**

18.7.37 There are no effects that are to be scoped out of the assessment at this stage, pending outcome of modelling to determine the ZoI, receptor specific characterisation reports and further stakeholder consultation.

18.8 Potential mitigation

18.8.1 Potential design solutions would be considered in further detail in the ES. Assessments would consider preliminary effects and residual effects following implementation of design or good practice measures allowing a transparent assessment of the effectiveness of planned options.

18.8.2 Several design measures and good practice measures would be identified through the iterative EIA process and incorporated into the design and construction planning of the Project. These embedded elements of design are legal requirements or standard practices that would be implemented. The impact assessment covered in this chapter would assume that these design and good practice measures are in place.

18.8.3 For the operational phase, storage and disposal of wastes and hazardous substances would be managed in accordance with current guidance and legislative requirements.

18.8.4 Bradwell B power station would be subject to a COMAH Consent and a Hazardous Substances Consent (Ref. 18.68) which set out requirements for the storage and use of hazardous materials. Radioactive materials would be managed in accordance with the requirements of the Radioactive Substances Regulations, Environmental Permit and Nuclear Site Licence. Operational drainage from the power station would be discharged into the Blackwater Estuary under an Operational Water Discharge Activity permit. Operational management

arrangements would be set out within an integrated management system for the Project.

18.8.5 For marine water quality and sediment, design measures and good practice measures would be embedded into the design and construction management of the proposed development.

18.8.6 Design measures includes modifications to the location or design of the development made during the pre-application phase that are an inherent part of the Project, become a fundamental part of the design for which consent is sought, and do not require additional action to be taken.

18.8.7 In some instances where it is possible to make an assessment with and without design measures the assessments would include both scenarios with intent to demonstrate the effectiveness of design measures in reducing environmental effects (i.e. residual effects).

18.8.8 To avoid any impact on water quality various measures would be adopted. Work undertaken in the marine environment or in close proximity should have regard to best practice for pollution prevention as identified in Guidance for Pollution Prevention, i.e. Guidance for Pollution Prevention 5 works and maintenance in or near water (Ref. 18.69 and Ref. 18.70), Guidance for Pollution Prevention P6 working at construction and demolition sites (Ref. 18.71 and Ref. 18.72) Guidance for Pollution Prevention P2 oil storage tanks and Guidance for Pollution Prevention 8 safe storage and disposal of used oils, (Ref. 18.73 and Ref. 18.74), Guidance for Pollution Prevention 22 dealing with spills (Ref. 18.75 and Ref. 18.76).

18.8.9 For construction of the beach landing facility all substances and objects deposited would be inert (or appropriately coated or protected) and not contain toxic elements. Any coatings or treatments applied to the BLF or other infrastructure must be suitable for use in the marine environment in accordance with best environmental practice (i.e. be on the list of substances approved for use by the offshore oil and gas industry or have undergone a similar level of risk assessment).

18.8.10 Any dredging activity required would be undertaken using the most feasible methods that minimise resulting suspended sediment concentrations.

18.8.11 Measures would be implemented to mitigate potential effects of vessel traffic at the site. These include:

- vessel waste management procedures would be in place to mitigate impacts of marine litter;
- the potential for chemical and oil spills whilst recognised would be mitigated by compliance with International Maritime Organisation regulations and the Marine Licence;
- transport of chemicals would be in line with the International Maritime Dangerous Goods Code (Ref. 18.77); and

- storage of chemicals would be in line with the Control of Substances Hazardous to Health Regulations (COSHH) 2002 (Ref. 18.78); the REACH Enforcement Regulations 2008 (Ref. 18.79), the Classifying, labelling and packaging of substances (CLP) Regulation (European Regulation (EC) No 1272/2008) (Ref. 18.80); and Health and Safety Executive (HSE) guidance on offshore storage of chemicals (Offshore Chemicals Management guidance note 8) (Ref. 18.81); in addition to applicable manufacturer's guidance on storage.

18.8.12 Construction discharges associated with the Project would be treated with siltbuster or similar technology to reduce suspended sediments and oil separators to remove residual oily waste.

18.8.13 Discharges during construction and part of commissioning (cold flush testing) and part of commissioning (hot functional testing) and all of operation would be subject to the granting of separate environmental permits for operation as described in Schedule 21 of the Environmental Permitting Regulations.

18.8.14 Permits would set out the locations that discharges may take place and the discharge limits for identified substances that must be applied.

18.9 Assumptions and Limitations

18.9.1 The assessment approach would assume that natural variability exists in the biological resources and, where appropriate, the future baseline in the absence of the Project can be adequately characterised.

18.9.2 There are no quantitative EU or UK EQS values for sediments. The only pertinent guidance for sediment quality is given for most of the EC Dangerous Substances Directive List 1 substances and is defined as 'standstill (no deterioration)'. In the absence of any quantified UK standards, common practice is to compare against Cefas Guideline Action Levels for the disposal of dredged materials. The Canadian ISQGs are commonly also used to provide supporting information for assessment of sediment quality.

18.9.3 The marine water quality baseline surveys of the Blackwater Estuary will represent the current conditions within the Blackwater Estuary.

18.9.4 Additional general limitations include:

- Assessment of effects on marine water quality and sediments is dependent on the baseline situation. High levels of background variation in parameters of relevance to water quality and sediment and contributions from other input sources would reduce the potential to determine development effects. For the assessment, the magnitude of effects will be considered in relation to natural variation.

- Sensitivity assessments for water quality and sediments consider waterbody hydrodynamics and chemical behaviour and fate. Where specific information is lacking, representative chemical groups and scenarios would be considered. In

cases of limited evidence, a precautionary assessment using expert judgement would be applied and the confidence in the assessment reported accordingly.

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19. NAVIGATION

19.1 Introduction

19.1.1 This chapter sets out the approach for determining the scope of assessment for marine navigation. **Chapter 5: The EIA Process and Methods** introduces the overall Environmental Impact Assessment (EIA) process including the methodology for assessing affects and determining significance. The topic specific methodology for determining receptor value, sensitivity and impact magnitude for navigation are provided in **Section 19.6**.

19.1.2 This chapter contains:

- a summary of work undertaken to date;
- an explanation of the scope of assessment, including:
  - legislation, policy and guidance that inform the assessment;
  - a description of consultation and engagement so far relevant to navigation;
  - study area for the assessment;
  - sources of data used in scoping;
  - baseline conditions, including current desk studies and surveys;
  - planned further surveys and studies;
- the receptors that are proposed to be assessed and the effects which have the potential to be significant;
- the effects that are proposed can be scoped out of the assessment; and
- potential mitigation.

19.1.3 The chapter should be read in conjunction with the project description provided in **Chapter 3: The Project**.

Work undertaken to date

19.1.4 Work undertaken to date has entailed desk-based baseline data investigation to identify the principal shipping and marine navigational features in the study area, defined in **Section 19.4** and **Figure 19.1**. Data was collated from a variety of sources including vessel tracking Automatic Identification System (AIS) data (Ref. 19.1), the Royal Yachting Association's (RYA) 'Sharing the Wind' (Ref. 19.2), the Marine Management Organisation's (MMO) UK fishing vessel lists (Ref. 19.3), and other publicly available documents (for example, aggregate dredging statistical reports and offshore wind farm development application documents).

19.2 Legislation, Policy and Technical Guidance

19.2.1 This section identifies the relevant legislation, national and local policy and guidance which has informed the scope of the assessment relevant to navigation. Further information on policies relevant to the EIA and their status is set out in **Chapter 2: Policy and Regulatory Context**, which should be read in conjunction with this chapter.

19.2.2 The legislation and policy relevant to navigation are detailed in **Table 19.1**.

Table 19.1: Legislation and policy

Relevant Legislation and Policy	Relevance to the Assessment
Legislation	
United Nations Convention on the Law of the Sea (1982) (Ref. 19.4).	Defines the rights and responsibilities of nations with respect to their use of the world's oceans, establishing guidelines for businesses, the environment and the management of marine natural resources. The EIA navigation assessment would ensure compliance with these regulations.
International Maritime Organisation (IMO) International Regulations for Preventing Collisions at Sea, as implemented in the United Kingdom through Merchant Shipping Notices (Ref. 19.5).	Navigation rules to be followed by ships and other vessels at sea to prevent collisions between two or more vessels. Merchant shipping notices are used to convey mandatory information that must be complied with under UK legislation regarding important safety, pollution prevention and other relevant information. The EIA navigation assessment would ensure compliance with these regulations.
Chapter V, Safety of Navigation, of the Annex to the International Convention for the Safety of Life at Sea 1974, as amended, as implemented under UK legislation by The Merchant Shipping (Safety of Navigation) Regulations 2019 (Ref. 19.6).	Specifies minimum standards for the construction, equipment and operation of ships, compatible with their safety. The EIA navigation assessment would ensure compliance with these regulations.

Relevant Legislation and Policy	Relevance to the Assessment
National Policy	
Overarching National Policy Statement (NPS) for Energy (NPS EN-1) (Ref. 19.7).	The NPSs set out the Government's energy policy; the need for new infrastructure; and guidance for determining an application for a Development Consent Order (DCO). EN-1 para 5.8 states "*The MoD operates military training areas, military danger zones (offshore Danger and Exercise areas), military explosives storage areas and Tactical Training Areas. There are extensive Danger and Exercise Areas across the UK Continental Shelf Area (UKCS) for military firing and highly surveyed routes to support Government shipping that are essential for national defence. It is important that new energy infrastructure does not significantly impede or compromise the safe and effective use of any defence assets.*"
UK Marine Policy Statement (MPS) (Ref. 19.8).	This sets out the framework for preparing marine plans and taking decisions affecting the marine environment. The UK MPS states that "*marine plan authorities and decision makers should take into account and seek to minimise any negative impacts on shipping activity, freedom of navigation and navigational safety; and ensure that their decisions are in compliance with international maritime law*".
Regional Policy	
Draft South East Inshore Marine Plan 2020 (Ref. 19.9).	This plan is intended to inform and guide regulation, management, use and protection of the inshore waters between Felixstowe, in Suffolk and near Dover, in Kent. The EIA navigation assessment would ensure the Project is not detrimental to achieving the plan's objectives.

Technical guidance

19.2.3 Technical guidance that has been used to define the assessment is set out in **Table 19.2**.

Table 19.2: Relevant technical guidance

Guidance Reference	Implications
IMO Guidelines for Formal Safety Assessment – MSC/Circ. 12/Rev.2 (Ref. 19.10).	The guidelines provide a structured and systematic methodology, aimed at enhancing maritime safety, including protection of life, health, the marine environment and property, by using risk analysis and cost benefit assessment.
MGN (Marine Guidance Note) 543 Maritime and Coastguard Agency (MCA) Offshore Renewable Energy Installations – Guidance on Navigational Practice, Safety and Emergency Response Issues (Ref. 19.11).	Although the MGN 543 is focused on offshore renewable developments, it highlights issues to be taken into consideration when assessing the effects of offshore developments on navigational safety and it is therefore relevant to the Project.
UK Port Marine Safety Code (Ref. 19.12).	The UK Port Marine Safety Code sets out the national standard for every aspect of port marine safety. Its aim is to enhance safety for everyone who uses or works in the UK port marine environment. It is strongly recommended that organisations or facilities which are not a statutory harbour authority, such as marine berths and terminals, seek a proportionate compliance with this Code through the adoption of a formal risk assessment process and the implementation of a marine safety management system (MSMS) which complies with this Code or any alternative similar standard applicable to their sector.
A Guide to Good Practice on Port Marine Operations Prepared in conjunction with the Port Marine Safety Code 2016 (Ref. 19.13).	Provides general guidance and examples of how an organisation could meet its commitments in terms of compliance with the UK Port Marine Safety Code.

19.3 Consultation and Engagement

19.3.1 There has been no structured technical engagement to date outside of formal consultation, however there is a fisheries liaison group which includes Kent and Essex Inshore Fisheries and Conservation Authority (KEIFCA), local commercial fishermen, cocklers and oystermen (for example, The Tollesbury and Mersea Native Oyster Fishery Co. Ltd), Leisure Fishermen (for example, Maldon Sea Angling Club), the Crown Estate and the MMO, who have been regularly updated via

informal communications with regards to the survey work in the area planned by the applicant. Initial views about existing vessel usage in the area have also been sought through this group (see **Section 19.5**). **Section 19.5** also details planned future engagement. The local sea users, relevant to navigation are shown **in Table 19.3**, however this is not an exhaustive list. **Table 19.4** provides a summary of consultee comments arising from Stage One Consultation, along with a response to identify how the matter is dealt with in this report.

Table 19.3: Local sea users relevant to navigation assessment

Type	Name
Organisation	KEIFCA. MCA UK Hydrographic Office. Trinity House. RYA Kingfisher Information Services.
Fishing	Private native oyster bed owners (Tollesbury). Local fin-fishermen.
Harbour	Brightlingsea Harbour. Maldon Harbour. West Mersea Boatyard and Harbour. Fingringhoe Harbour. Wivenhoe Harbour.
Marina	Bradwell marina. Tollesbury marina. Heybridge Basin marina. Blackwater marina.
Recreational groups.	West Mersea Yacht Club. Maldon Little Ship Club. Maldon Yacht Club. Blackwater Sailing Club. Saltcote Sailing Club. Millbeach Marine Club. Goldhanger Sailing Club. Tollesbury Cruising Club. Dabchicks Sailing Club.

Type	Name
	Wivenhoe Sailing Club. Brightlingsea Sailing Club. Colne Yacht Club. Stone Sailing Club. Marconi Sailing Club. Harlow (Blackwater) Sailing Club. Maylandsea Bay Sailing Club. Bradwell Quay Yacht Club.

Table 19.4: Stage One Consultation comments

Theme	Summary of Consultee Comments and Considerations	How this is Accounted For
Assessment Methodology.	The MMO noted a lack of detailed assessment of the potential impacts of marine transport options and advise a 'Rochdale Envelope' approach. The MMO also noted the Project will need to consider the level of existing marine transport.	The scope of the navigation assessment has been discussed with the MMO and adopts a worst-case approach. As detailed in **Table 19.6**, baseline marine traffic will be assessed.
Stakeholder Engagement.	The MMO advised the Project to engage with the MCA, neighbouring Harbour Authorities, and Trinity House for matters pertaining to the safety of navigation and marking. The Project may wish to employ the services of a fisheries liaison officer. The MMO also noted the Blackwater Estuary is popular for sailing.	Stakeholder engagement is proposed for the navigation assessment as detailed in **Section 19.5** of this chapter. The project has a fisheries liaison group established and has notified this group of all marine survey activities. Effects on recreational users (i.e. sailing) are scoped into the assessments and described in this chapter. Effects on recreation are also considered in **Chapter 21: Recreation**.

19.4 Data Gathering Methodology

Study area

19.4.1 This section presents the study area for marine navigation. As the design and consultation processes progress and the Project is refined, the exact geographical scope of the study area may continue to evolve to accommodate any changes. If the study area changes, data collection will also be reviewed, updated and agreed with relevant stakeholders.

19.4.2 The study area is defined as a 12 nautical mile (nm) radius around the main development site. This encompasses the proposed offshore infrastructure for the main development site (for example, cooling water intake and outfall head structures and beach landing facilities) and will capture the relevant navigational routes used by commercial vessels and recreational craft. The area is therefore considered sufficient to provide an overview of marine navigation activity in proximity to the marine elements of the Project.

Sources of data used in scoping

Desk based

19.4.3 The EIA scoping exercise has been undertaken with reference to **Chapter 3: The Project**, supported by a number of data sources. The principal desk-based data sources used to inform this chapter for potential effects comprise of the following in **Table 19.5**.

Table 19.5: Desk-based data sources

Source	Data
Vessel tracking AIS data (Ref. 19.1).	Ship AIS data, Thames Dover area.
The RYA and the Cruising Association (2004). 'Sharing the Wind', Recreational Boating in the Offshore Wind Farm Strategic Areas, Identification of recreational boating interests in the Thames Estuary, Greater Wash and North West (Liverpool Bay) (Ref. 19.2).	Recreational boating data in the Thames Estuary.
MMO UK fishing vessel lists (Ref. 19.3).	Details of registered and licensed fishing vessels over 10 metres (m) and 10m and under as at 01 January 2020 (Lowestoft as the administrative port).

Source	Data
MMO (2014). Mapping UK Shipping Density and Routes from AIS (Ref. 19.14).	Ship AIS data, Thames Dover area.
ABPMer (2020). Maritime 2017 AIS data (Ref.19.15).	AIS vessel transit data for 2017, Thames Dover area.

Survey data

19.4.4 No site-specific marine traffic surveys have been carried out to date (see **Section 19.5** for details of planned surveys).

19.5 Baseline Information

Current baseline

Main development site

19.5.1 Marine navigation receptors include a range of commercial and recreational users (and associated participants and economies) which require the safe passage and access for vessels and craft within the study area.

19.5.2 Commercial marine navigation activity in the study area comprises various vessel movements and activities at varying distances offshore. Commercial shipping transiting the study area includes cargo vessels, passenger vessels and tankers using the principal east coast ports including the London ports (for example, Tilbury) and Harwich Haven ports (for example, Felixstowe, Harwich and Ipswich). There are also vehicle carriers and dredgers visiting local aggregate, offshore windfarm and dredging disposal sites. Vessels passing southwards through the study area also head for the Dover Strait and ports beyond.

19.5.3 Commercial activity affecting marine navigation within the study area includes:

- dredging for aggregates in offshore waters, with vessels sailing to and from designated extraction areas situated beyond the 12nm territorial sea limit within the Thames Estuary Region;
- fishing involving 23 vessels of over 10m in length generally fishing offshore (for example beam trawling) and 234 vessels of less than 10m length generally fishing inshore (for example, netting, potting, demersal trawling and long-lining) (based on the MMO's UK vessel lists for Lowestoft as the administrative port for vessels working between the River Thames Estuary and The Wash, dated 1 January 2020);

- offshore windfarm development (for example Gunfleet Sands I, Gunfleet Sands II, London Array, Kentish Flats, Thanet) generating various changes to marine navigation (such as in shipping routes) and additional movements (for example, plant and supplies associated with offshore wind farm construction, operation and maintenance activities); and

- Commercial shipping associated with the aggregate trade and the maintenance of Gunfleets Sands Offshore Windfarm takes place in the Colne at Olivers Wharf, Ballast Quay and Brightlingsea harbour (Ref. 19.16).

19.5.4 The study area has a relatively low vessel density, comprising mainly passenger vessels, fishing vessels and recreational vessels (see **Figure 19.1** and **Figure 19.2**).

19.5.5 According to local fishers around Mersea Island, Bradwell-on-Sea, Brightlingsea and Wivenhoe there are approximately 20 boats who are trawling, netting and potting and approximately eight oyster boats plus many leisure boats.

19.5.6 There are nine marinas or harbours within the study area. The Maldon Harbour Improvement Commissioners (MHIC) are the statutory harbour authority for the Port of Maldon. The Commissioners are incorporated by Act of Parliament through The Maldon Harbour Order 1865 for "*the improvement, maintenance and regulation of the Harbour at Maldon in the County of Essex*". The harbour area extends "in and over the whole of the River Blackwater" from Fullbridge, up Heybridge Creek, and downstream to approximately 70 metres above the Chelmer and Blackwater Canal lock entrance at Heybridge Basin (see **Figure 19.1**). Most of these waters are included within the Blackwater Estuary Management Plan area.

19.5.7 Blackwater marina, Bradwell marina and Tollesbury marina, all in the Blackwater Estuary, have a diversity of craft from traditional vessels to racing yachts and modern motor cruisers. Heybridge Basin marina is predominantly for leisure craft accessing the Chelmer and Blackwater Navigation canal. Brightlingsea harbour at the mouth of the Colne Estuary has the following vessels: coasters to 100m length, windfarm support vessels, fishing and leisure. West Mersea Marine is a boatyard on Mersea Island on the River Blackwater. There is a private commercial harbour at Fingringhoe in the River Colne for the export of sand and gravel. Wivenhoe harbour in the River Colne is predominantly for leisure craft and there is a passenger only ferry service between Wivenhoe, Rowhedge and Fingringhoe.

19.5.8 Recreational marine navigation tends to be highly seasonal and generally restricted to daylight hours. Regular events (regattas etc.) are conducted in the spring and summer. Recreational marine navigation involves various activities and forms of watercraft, including:

- sea kayaking and canoeing and sailboarding in the creeks and minor rivers;

- dinghy and other small boat sailing (and training) up to about 15nm offshore;

- cruising (both passage making and day sailing) under motor and sail between shore facilities; and

- personal watercraft use.

19.5.9 Recreation activity is based at a number of locations to the north and south of the main development site (i.e. marinas, clubs and training centres), and is particularly popular in the Blackwater Estuary around Maldon, St. Lawrence and Tollesbury and the Colne Estuary around Brightlingsea.

19.5.10 The RYA's 'Sharing the Wind' document, which identifies the recreational boating interest in the Thames Estuary shows multiple recreational sailing routes passing the main development site, some of which are classed as 'Heavy Recreational Use'. The RYA has classed the Blackwater Estuary and coastal waters extending offshore as a racing area and general sailing area.

Future baseline

19.5.11 The current baseline is considered appropriate for the duration of the construction and commissioning phases of the Bradwell B power station.

19.5.12 The effects of operational impacts on navigation receptors would be considered against current baselines, but the operational design life of the Bradwell B power station means that some impacts must be considered in relation to potential shifts in future baselines and change in usage. Marine usage could change, for example, following future coastal infrastructure development or expansions, which in turn could increase navigational usage in the study area.

Planned further surveys and studies

19.5.13 Additional baseline data on marine navigation, shipping and other vessel movements will be collected from existing available sources.

19.5.14 Marine traffic surveys will be undertaken to record vessel movements (winter 2020 and summer 2021) in the navigational study area (see **Section 19.4**). These surveys will entail either AIS surveys or combined AIS and radar surveys, subject to consultation and agreement with the MCA.

19.5.15 The EIA process will be informed by a staged approach to studying marine navigation, as identified in **Table 19.6**, following the IMO Guidelines for Formal Safety Assessment (FSA).

Table 19.6: Planned further surveys and studies

Further Surveys and Studies for Navigation	Proposed Date
Stage 1 Preliminary Hazard Assessment: Desk-based study to review baseline marine navigation and vessel data availability (including AIS data) and to clarify the scope of work for surveys and Navigation Risk Assessment (NRA),	Autumn 2020.

Further Surveys and Studies for Navigation	Proposed Date
informed by consultation with principal sea users relevant to the study area (see **Table 19.3**).	
Stage 2 Hazard Identification (HAZID) workshop: Structured round-table consultation with principal consultees to identify and agree risk scenarios and qualitatively assess hazards through expert opinion and local knowledge. The workshop's findings will be recorded and used to inform the NRA.	Winter 2020.
Stage 3 NRA: Detailed assessment of agreed risk scenarios, including vessel-to-vessel collision risks and other collision risks (for example with seabed features or human infrastructure). Risks are quantified using dedicated software and assessed by combining a risk's consequence and frequency to determine whether it is broadly acceptable, As Low As Reasonably Practicable (ALARP) or unacceptable.	Autumn 2021.

19.6 Proposed Approach to the Assessment

Assessment methodology

19.6.1 The EIA will consider whether impacts of the Project would have a significant effect on any relevant receptors. The focus of the assessment will be upon the risk to navigation posed by the Project. The IMO Formal FSA process approved by the IMO in 2002 under SC/Circ.1023/MEPC/Circ392, as amended (Ref. 19.17), will be applied. This is a structured and systematic methodology based on risk analysis and cost benefit analysis. This risk-based approach requires expert judgement to be applied about the tolerability of risks that is typically agreed by a range of experts, for example, via a HAZID workshop.

19.6.2 The FSA assigns each risk a "*severity of consequence*" and a "*frequency of occurrence*" to evaluate the significance of each risk.

Severity of consequence

19.6.3 The severity of consequences is assessed on a five-point scale. The defined consequence bands are presented in **Table 19.7**.

Table 19.7: Assessment of the severity of consequence for marine navigation

Severity	People	Property	Environment	Business
Negligible	Zero injury.	Minimal damage (<£10k).	Zero effect.	Zero impact (<£10k).
Minor	Minor injury.	Minor damage (£10k-£100k).	Minor effect (Local assistance required).	Minor impact (£10k-£100k).
Moderate	Major injury.	Moderate damage (£100k-£1M).	Moderate effect (Limited external assistance required).	Considerable impact (£100k-£1M) Local publicity.
Serious	Single fatality.	Major damage (£1M-£10M).	Major effect (Regional assistance required).	Major national impact (£1M-£10M) National publicity.
Major	Multiple fatalities.	Extensive damage (>£10M).	Extensive effect (National assistance required).	Major international impact (>£10M) International publicity.

Frequency of consequence

19.6.4 The frequency of occurrence is also assessed on a five-point scale, as presented in **Table 19.8**.

Table 19.8: Assessment of frequency of occurrence for marine navigation

Frequency	Criteria
Negligible	< 1 occurrence per 10,000 years.
Extremely Unlikely.	1 per 100 to 10,000 years.
Remote	1 per 10 to 100 years.

Frequency	Criteria
Reasonably Probable.	1 per 1 to 10 years.
Frequent	Yearly

Assessment of effects and determining significance

19.6.5 The general approach to assessment of effects and determining significance that will be used for the EIA is provided in **Chapter 5: The EIA Process and Methods**. However, this section sets out how the approach has been applied to navigation and where it has been adapted to deal with the specific requirements of navigation.

Risk matrix

19.6.6 The severity of consequence and frequency of occurrence rankings are used to determine the level of risk for each impact. Levels of risk are described as "*Unacceptable*", "*Tolerable*" or "*Broadly Acceptable*" using the risk matrix shown in **Table 19.9** and the IMO Guidelines for FSA.

Table 19.9: Risk Matrix

		Frequency of Occurrence				
		Negligible	Extremely Unlikely	Remote	Reasonably Probable	Frequent
Severity of Consequence	Negligible	Broadly Acceptable.	Broadly Acceptable.	Broadly Acceptable.	Broadly Acceptable.	Broadly Acceptable.
	Minor	Broadly Acceptable.	Broadly Acceptable.	Broadly Acceptable.	Tolerable	Tolerable
	Moderate	Broadly Acceptable.	Tolerable	Tolerable	Tolerable	Unacceptable
	Serious	Tolerable	Tolerable	Tolerable	Unacceptable	Unacceptable
	Major	Tolerable	Tolerable	Unacceptable	Unacceptable	Unacceptable

19.6.7 Definitions for risk categories are provided in **Table 19.10**.

Table 19.10: Risk definitions

Risk	Definition
Unacceptable	Under EIA terms unacceptable is considered to be significant and would require risk mitigation or design modification to reduce to tolerable (ALARP).
Tolerable	Under EIA terms tolerable is considered to be not significant, however there is an expectation that such risks are properly assessed, appropriate control measures are in place, residual risks are ALARP and that risks are periodically reviewed to monitor if further controls are appropriate.
Broadly Acceptable.	Under EIA terms broadly acceptable is considered to be not significant and impacts are regarded as acceptable and adequately controlled.

Approach to cumulative assessment

19.6.8 The approach to the cumulative effects assessment (CEA) is described in **Chapter 5: The EIA Process and Methods**.

In-combination

19.6.9 The key in-combination effects could occur where the cooling water intake and outfall head structures' construction works and operations have the potential to interfere with the navigation of vessels and, therefore, interfere with activities associated with such navigation.

Cumulative effects

19.6.10 The Project, in cumulation with other relevant plans or projects affecting the marine environment, could pose additive risks or impacts on marine navigation (for example increasing collision risks due to additional traffic movements and or compressed sailing routes). Relevant permitted and or implemented plans, programmes and projects would be considered in the assessment.

19.7 Scope of the Assessment

19.7.1 EIA methodology considers whether impacts of the Project would have an effect on any resources or receptors. However, for the navigation assessment, the risk to navigation posed by the Project is considered. The IMO FSA process has and will continue to be applied during the EIA process.

Potential receptors

19.7.2 The principal navigation receptors that have been identified as being potentially subject to effects are summarised in **Table 19.11**.

Table 19.11: Receptors subject to potential effects

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Main development site.	Construction and Operation.	Commercial shipping (including cargo vessels, passenger vessels and tankers).	Evidence of receptor within study area (Ref. 19.1).
Main development site.	Construction and Operation.	Commercial craft (including fishing vessels, dredgers and vehicle carriers).	Evidence of receptor within study area (Ref. 19.1 and Ref. 19.3).
Main development site.	Construction and Operation.	Recreational craft (including fishing vessels and leisure craft).	Evidence of receptor within study area (Ref. 19.2).

Likely significant effects

19.7.3 The effects on navigation which have the potential to be significant and that will be taken forward for assessment in the Environmental Statement (ES) are summarised in **Table 19.12** and **Table 19.13.** Significance with regards to the navigation EIA terms are set out in **Section 19.6**. In-combination and cumulative effects will also be taken forward for assessment, the approach to these assessments is included in **Section 19.6** and detailed within **Chapter 5: The EIA Process and Methods**.

Table 19.12: Likely significant navigation construction effects associated with the main development site

Activity	Effect	Receptor or Receptor Group
Works vessels (jack-up platforms, construction material and equipment deliveries).	Increased collision risk with installation vessels.	Commercial shipping, Commercial craft and Recreational craft.
	Displacement of craft leading to increased grounding and collision risk.	Commercial shipping, Commercial craft and Recreational craft.
	Grounding risk whilst at the main development site or on transit to or from the development site.	Commercial shipping, Commercial craft and Recreational craft.
Dredging and disposal activity.	Increased collision risk with dredgers.	Commercial shipping, Commercial craft and Recreational craft.
	Displacement of craft leading to increased grounding and collision risk.	Commercial shipping, Commercial craft and Recreational craft.
	Grounding risk whilst at the main development site or on transit to or from the development site.	Commercial shipping, Commercial craft and Recreational craft.
Abnormal Indivisible Load (AIL) and other construction materials and equipment deliveries during the construction phase.	Increased collision risk with vessels.	Commercial shipping, Commercial craft and Recreational craft.
	Displacement of craft leading to increased grounding and collision risk.	
	Increased risk of AIL delivery vessel grounding whilst at the development site or on transit to or from the development site.	
Marine structures.	Passing vessel grounding.	

Activity	Effect	Receptor or Receptor Group
	Fishing gear snagging.	Commercial shipping, Commercial craft and Recreational craft.
	Risk from vessel anchors.	
	Passing vessel foundering.	
Temporary exclusion zones.	Re-routing impact leading to increased collision risk and grounding.	Commercial shipping, Commercial craft and Recreational craft.

Table 19.13: Likely significant navigation operation effects associated with the main development site

Activity	Effect	Receptor or Receptor Group
AIL deliveries during the operation phase.	Increased collision risk with dredgers.	Commercial shipping, Commercial craft and Recreational craft.
	Displacement of craft leading to increased grounding and collision risk.	
	Increased collision risk with AIL delivery vessels.	
	Increased risk of AIL delivery vessel grounding whilst at the development site or on transit to or from the development site.	
Marine structures.	Passing vessel grounding.	Commercial shipping, Commercial craft and Recreational craft.
	Fishing gear snagging.	
	Risk from vessel anchors.	
	Passing vessel foundering.	

19.7.4 Off-site associated development sites (off-site highway works, park and ride facilities, freight management facilities and off-site Power Station Facilities) are scoped out of the assessment as they are remote from the marine environment, with respect to navigation, and even where a theoretical pathway exists (for example river to sea navigation pathways), the impacts on the marine environment would be negligible. However, when further information is available on the off-site associated development sites, they will be scoped into future assessments if a pathway exists between any proposed activity and potential risk to navigation.

Effects scoped out of further assessment

19.7.5 There are no effects that are to be scoped out of the assessment at this stage, pending outcome of the studies and assessments detailed in **Table 19.6** and further stakeholder consultation.

19.8 Potential Mitigation

19.8.1 Potential mitigation solutions would be considered in further detail in the Preliminary Environmental Information to support the Stage Two consultation and in the ES to support the DCO application. Assessments would consider preliminary effects and residual effects following implementation of mitigation measures allowing a transparent assessment of the effectiveness of mitigation options.

19.9 Assumptions and Limitations

19.9.1 The navigation assessment inherently assumes that:

- awareness of marine navigation hazards can and will be raised, as appropriate, through standard measures such as Notices to Mariners, aids to navigation, etc.; and
- all marine activities will be undertaken in a competent manner, and all appropriate navigation information (for example, Admiralty Charts) will be updated.

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20. LANDSCAPE AND VISUAL AMENITY

20.1 Introduction

20.1.1 This chapter sets out the approach for determining the scope, and content of the landscape and visual impact assessment (LVIA) which will be reported in the 'landscape and amenity' chapter of the Environmental Statement (ES). It contains:

- a summary of work undertaken to date;
- an explanation of the scope of assessment, including:
  - legislation, policy and guidance that inform the assessment;
  - a description of consultation and engagement undertaken to date that is relevant to landscape and visual amenity;
  - study area for the assessment;
  - sources of data used in scoping;
  - baseline conditions, including current desk studies and surveys; and
  - planned further surveys and studies;
  - the approach to the assessment;
- the receptors that are proposed to be assessed and the effects which have the potential to be significant;
- the receptors that are proposed to be scoped out of the assessment, or where a proportionately reduced assessment is proposed; and
- potential mitigation.

20.1.2 **Chapter 5: The EIA Process and Methods** introduces the overall Environmental Impact Assessment (EIA) process including the methodology for assessing affects and determining significance. The topic specific methodology for determining receptor value, sensitivity and impact magnitude for the LVIA is provided in **Section 20.6**. The chapter should be read in conjunction with the project description provided in **Chapter 3: Project Description.**

Work undertaken to date

20.1.3 Initial appraisal work has involved the collation of relevant literature covering legislation, policy, assessment guidance, baseline data, site area history and related library sources. A review has also been undertaken of existing background technical reports and assessments relevant to landscape and amenity.

20.1.4 Work to date has primarily focused on main development site familiarisation visits, technical support to guide project design evolution and preliminary assessment. Similar site visits will be undertaken in relation to the off-site associated developments and the off-site Power Station Facilities in due course, once preferred sites have been selected.

20.1.5 Main development site familiarisation visits were undertaken in August and October 2019 and August 2020, as follows:

- August 2019 Site Visit: focused on the main development site and surrounding area within 5 kilometres (km), including site and viewpoint photography from public locations in settlements and on roads, recreational routes or places and local attractions and visitor destinations, including a visit to West Mersea;
- October 2019 Site Visit: focused on a wider area within a 5-10km radius from main development site, including viewpoint photography from public locations in settlements and on roads, recreational routes or places and local attractions and visitor destinations; and
- August 2020 Site Visit: focused on the boundaries of the main development site, with an emphasis upon a survey of the current site boundary conditions.

20.2 Legislation, Policy and Technical Guidance

20.2.1 This section identifies the relevant legislation, national and local policy and guidance which has informed the scope of the assessment relevant to landscape and visual amenity. Further information on policies relevant to the EIA and their status is set out in **Chapter 2: Policy and Regulatory Context**, which should be read in conjunction with this chapter.

20.2.2 The legislation and policy relevant to landscape and visual amenity are detailed in **Table 20.1**.

Table 20.1: Legislation and policy

Relevant Legislation and Policy	Relevance to the Assessment
Legislation	
The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (Ref. 20.1).	Paragraph 2 of Section 5 of the Regulations states that the "*EIA must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development*" on a number of factors including "*population and human health*" (including the visual amenity of people) and "*material assets, cultural heritage and the landscape*." The ES will therefore include a LVIA to meet the requirements of the EIA Regulations.
National Policy	
National Policy Statement for Energy (EN-1) (Ref. 20.2).	Section 4.5 offers advice on what constitutes 'good design'. Section 5.9 of EN-1 provides insight into how an applicant should assess the landscape and visual impacts an energy generation development has on the surrounding area. Paragraph 5.9.8 recognises that landscape effects depend on the existing character of the local landscape, its current quality, how highly it is valued and its capacity to accommodate change. Paragraph 5.9.12 advises that there may be effects on designated landscapes, including nationally designated landscapes even though the development may be outside and some distance away the *"aim should be to avoid compromising the purposes of designation and such projects should be designed sensitively given the various siting, operational, and other relevant constraints".* Paragraph 5.9.18 notes that coastal areas are particularly vulnerable to visual intrusion because of the potential high visibility of development on the foreshore, on the skyline and affecting views along stretches of undeveloped coast. Paragraph 5.9.20 places a requirement on applicants to take the landscape and visual impacts of visible plumes from chimney stacks and/or the cooling assembly into account.

Relevant Legislation and Policy	Relevance to the Assessment
	Paragraphs 5.9.21 to 5.9.23 provide advice on mitigation including the design of the development in terms of its scale and through appropriate layout and siting of infrastructure, choice of colours, materials and landscaping schemes, including where appropriate off-site landscaping. Section 5.10 of EN-1, refers to the need to consider the creation of new green infrastructure (5.10.6), mitigation and maintenance of existing green infrastructure (5.10.20) and paragraph 5.10.16 advises that "*In considering the impact on maintaining coastal recreation sites and features, the IPC should expect applicants to have taken advantage of opportunities to maintain and enhance access to the coast".* The ES will therefore include LVIA which considers designated landscapes, landscape character the coast, seascape and related visual receptors. The LVIA will consider the likely landscape and visual effects including any visible plumes from cooling towers. Appropriate mitigation measures will need to be embedded in the design to ensure that the landscape and visual effects of the Project are reduced.
National Policy Statement for Nuclear Power Generation (EN-6) (Ref. 20.3).	Section 3.10 of Volume I provides detail on the landscape and visual impacts of new nuclear development although refers to Section 5.9 of EN-1 in terms of expectations with respect the applicant's assessment. Paragraph 3.10.8 highlights that the Infrastructure Planning Commission (IPC) should not expect the visual impacts associated with a new nuclear power station to be eliminated with mitigation and recognises that the scope for visual mitigation will be quite limited. It continues "*Mitigation should, however, be designed to reduce the visual intrusion of the project as far as reasonably practicable*." Appropriate mitigation measures will need to be embedded in the design to ensure that the landscape and visual effects of the Project are reduced are far as possible. Of specific reference to Bradwell, paragraphs C.2.91 to C.2.100 record that "*The Appraisal of Sustainability has noted that there are no significant adverse effects anticipated on nationally*

Relevant Legislation and Policy	Relevance to the Assessment
	designated landscape due to the distance and probable intervening topography." Paragraph C.2.93 notes that whilst there is "*some scope for mitigation and potential for a new landscape framework to contribute to existing published local landscape management and restoration guidelines for this local area, it is likely that some adverse effects on the local landscape will remain*". As a consequence, the scoping exercise and LVIA will need to consider the effects on landscape designations and landscape character. In particular the scoping exercise should provide information to confirm if significant effects on nationally designated landscape such as Areas of Outstanding Natural Beauty (AONB) are likely and provide sufficient information to confirm if this aspect can be scoped in or out of further assessment. The Special Landscape Area referred to in paragraph C.2.93 is no longer a local landscape designation within the Maldon Local Plan.
UK Marine Policy Statement (Ref. 20.4).	Paragraph 2.6.5.1 discusses the definition of the term "seascape". The paragraph uses the definition established by the European Landscape Convention: "*An area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors*." Paragraph 2.6.5.3 states "*In considering the impact of an activity or development on seascape, the marine plan authority should take into account existing character and quality, how highly it is valued and its capacity to accommodate change specific to any development*." The LVIA will consider the effects on seascape character.
National Planning Policy Framework (NPPF) (Ref. 20.5).	Paragraph 170 states that planning policies and decisions should contribute to and enhance the natural and local environment. This will be achieved by (amongst other criteria) "*protecting and enhancing valued landscapes…… (in a manner commensurate with their statutory status or identified quality in the development plan)*", "*recognising the intrinsic character and beauty of the countryside*" and "*maintaining the character of the undeveloped coast, while improving public access to it where appropriate*".

Relevant Legislation and Policy	Relevance to the Assessment
	Policy 180 requires that planning decisions ensure that new development is appropriate for its location. In doing so they should (amongst other criteria): "*c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation*." As a consequence, the scoping exercise and LVIA will consider the likely effects upon landscape character and landscape designations in particular recognising undeveloped coastlines and areas with dark skies.
Local Policy	
Maldon District Council (MDC) Local Development Plan (2017) (Ref. 20.6).	Policy S8 states that "*The countryside will be protected for its landscape, natural resources and ecological value as well as its intrinsic character and beauty. Outside of the defined settlement boundaries, the Garden Suburbs and the Strategic Allocations, planning permission for development will only be granted where the intrinsic character and beauty of the countryside is not adversely impacted upon*". As a consequence, the LVIA will consider the effects on landscape character including its key characteristics and scenic value. Policy D1 requires all development to (amongst other criteria) respect and enhance the character and local context and make a positive contribution in terms of architectural style, use of materials, detailed design features and construction methods; height, size, scale, form, massing and proportion; landscape setting, townscape setting and skylines, and layout, orientation, and density (item 1). The policy also requires development to protect the amenity of surrounding areas including light and visual impact (item 4) and also contribute to and enhance local distinctiveness (item 8). As a consequence, the LVIA will consider the effects on landscape character and visual amenity and the design will need to demonstrate consideration of the criteria listed under item 1 in relation to light and visual impact.

Relevant Legislation and Policy	Relevance to the Assessment
	Policy D2 requires that all development must minimise its impact on the environment by incorporating a number of principles including minimising "*negative impacts on ecology, landscape and green infrastructure" and minimising all forms of possible pollution including (amongst other criteria) light*". The design of the Project will need to demonstrate consideration of the criteria listed under Policy D2. Policy D4 states that development proposals for large-scale renewable and low carbon energy projects will be approved where it can be demonstrated, to the Council's satisfaction, that the development will not have an adverse impact, either individually or cumulatively, on a number of criteria including (of relevance to the LVIA): "*1) The purpose or function of internationally, nationally or locally designated sites of protected wildlife or landscape areas* *3) Landscape and the character of the undeveloped coast and areas, which by nature of their topography, are sensitive to development* *4) Neighbouring amenity, in respect to visual impact, flicker, vibration, glare, overshadowing, active or background noise levels and any other emissions*." The LVIA will consider both landscape and visual impact including cumulative impact as required under Policy D4 including the assessment of designated landscapes, landscape character and undeveloped coasts and neighbouring visual amenity.
Chelmsford City Council (CCC) Chelmsford Local Plan (2020) (Ref. 20.7).	Policy DM8 states: *"Planning permission will be granted for new buildings and structures in the Rural Area where the development will not adversely impact on the identified intrinsic character and beauty of the countryside and where the development is for:* …

Relevant Legislation and Policy	Relevance to the Assessment
	iii. local transport infrastructure and other essential infrastructure or development which supports existing or potential utility infrastructure …" As a consequence, the LVIA will consider the effects on landscape character including its key characteristics and scenic value/beauty. Policy DM17 requires that development does not *"result in unacceptable harm to natural landscape features that are important to the character and appearance of the area"*. The design of the Project will need to demonstrate consideration of landscape features such as trees, woodlands, hedgerows and water features.
Colchester Borough Council (CBC) Core Strategy (2008, policies updated in 2014) (Ref. 20.8 and Ref. 20.9)[1].	Policy ENV1 states: *"The Borough Council will conserve and enhance Colchester's natural and historic environment, countryside and coastline … In particular, developments that have an adverse impact on … the Dedham Vale Area of Outstanding Natural Beauty will not be supported.* *Within the Coastal Protection Belt development will not be permitted that would adversely affect the open and rural character of the undeveloped coastline …* *Unallocated greenfield land outside of settlement boundaries … will be protected and where possible enhanced, in accordance with the Landscape Character Assessment. Within such areas development will be strictly controlled to conserve the environmental assets and open character of the Borough.".*

[1] CBC is in the process of reviewing its Local Plan and a submission draft was issued for examination in 2017, with consultation on proposed main modifications planned in October 2020. The environmental aspect chapters will refer to emerging policy where relevant and greater weight will be applied depending on the extent to which the policies have moved towards adoption.

Relevant Legislation and Policy	Relevance to the Assessment
	Whilst the Project is located outside Colchester Borough, the LVIA will consider both landscape and visual impacts, as well as any potential effects on the Dedham Vale Area of Outstanding Natural Beauty. Policy DP1: Design and Amenity requires all development to be designed to a high standard, including: *(i) Respect and enhance the character of the site, its context and surroundings in terms of its architectural approach, height, size, scale, form, massing, density, proportions, materials, townscape and/or landscape setting, and detailed design features. Wherever possible development should remove existing unsightly features as part of the overall development proposal; …* *(v) Respect or enhance the landscape and other assets that contribute positively to the site and the surrounding area …"* The Project is not located within Colchester Borough, but principles of good design will be applied and effects on landscape character will be considered in the LVIA. Policy DP22: Dedham Vale Area of Outstanding Natural Beauty states: *"Development will only be supported in or near to the Dedham Vale Area of Outstanding Natural Beauty (AONB) that:* *(i) Makes a positive contribution to the special landscape character and qualities of the AONB;* *(ii) Does not adversely affect the character, quality views and distinctiveness of the AONB or threaten public enjoyment of these areas, including by increased vehicle movement; …".*

Technical guidance

20.2.3 Technical guidance that has been used to define the assessment is set out in **Table 20.2**.

Table 20.2: Relevant technical guidance

Guidance Reference	Implications
Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3) (Ref. 20.10).	GLVIA3, produced by the Landscape Institute is widely regarded by landscape and planning professions as the 'industry standard' together with best practice and professional experience. The LVIA will be undertaken in accordance with the guidance set out in this document.
Technical Guidance Note 06/19 Visual Representation of Development Proposals (Ref. 20.11).	This document produced by the Landscape Institute provides supplementary guidance to GLVIA3 as to appropriate techniques to capture site photography and the selection, production and presentation of types of visualisation appropriate to the circumstances in which they will be used.
An Approach to Landscape Character Assessment (Ref. 20.12).	This document produced by Natural England describes the landscape character assessment process. Any landscape characterisation that may be required at a local level will be undertaken in accordance with the approach and stages set out in this document.
An Approach to Landscape Sensitivity Assessment (Ref. 20.13).	This document produced by Natural England describes the process for considering landscape sensitivity across large areas and in relation to particular change scenarios. Any landscape characterisation that may be required at a local level will be undertaken in accordance with the approach and stages set out in this document. The principles in the document will inform consideration of sensitivity within the LVIA.
An Approach to Seascape Character Assessment (Ref. 20.14).	Produced by Natural England, this document sets out an approach to undertaking Seascape Character Assessments and principally applies to coastal and marine areas seaward of the low water mark. Any seascape characterisation that may be required at a local level will be undertaken in accordance with the approach and stages set out in this document.

Guidance Reference	Implications
An Approach to Seascape Sensitivity Assessment (Ref. 20.15).	Produced by the Marine Management Organisation, this document sets out an approach to assessing the sensitivity of marine or seascape character areas (SCAs) to defined development types and scales of change. The principles in the document will inform consideration of seascape sensitivity within the LVIA.
Townscape Character Assessment Technical Information Note 05/2017 (Ref. 20.16).	The Technical Information Note produced by the Landscape Institute explains how the principles and general approach of landscape character assessment can be applied to townscape character assessment. Any townscape characterisation that may be required at a local level will be undertaken in accordance with the approach and stages set out in this document.
Residential Visual Amenity Assessment (RVAA) Technical Guidance Note 02/19 (Ref. 20.17).	This document produced by the Landscape Institute provides supplementary guidance to GLVIA3 assist landscape professionals when undertaking Residential Visual Amenity Assessments (RVAA). Any RVAA undertaken in relation to the Project will be undertaken in accordance with the approach and stages set out in this document.

20.3 Consultation and Engagement

20.3.1 This chapter has been informed by engagement and discussion with various stakeholders. **Table 20.3** details technical engagement to date which as occurred outside of formal statutory consultation. **Table 20.4** provides a summary of comments arising from Stage One Consultation and outlines how these will be addressed.

Table 20.3: Technical engagement

Consultee	Points of Discussion
Essex County Council (ECC).	As an initial discussion held on 14 October 2019, questions were wide ranging about the design, assessment and mitigation strategy and the possibility of an early draft of the LVIA being made available. Bradwell A was noted as a 'key' visual impact – how would this 'fit' with the proposed Bradwell B development? Discussion considered mitigation and a request was made for a cross section from the England Coast Path (ECP) through to the proposed permanent development platform level. It was agreed that a cross section would be provided and that the resolution of questions regarding the design, assessment and mitigation strategy will be addressed through further consultation workshops supported by early LVIA outputs where possible. Discussion also considered the viewpoint assessment and if this would cover night-time assessment (preservation of dark skies) and changing seasons. It was confirmed that this would form part of the assessment. Some initial assessment viewpoints within 5km had been selected and confirmation of these needs to be agreed. Some viewpoint receptors were suggested as follows: • St Lawrence; • Tilbury Marina; • Brightlingsea; and • Fambridge Road (B1018) south of Maldon. Assessment viewpoint agreement is ongoing and the current proposed list of viewpoints is provided in **Table 20.9**. This list includes the suggestions listed here.

Consultee	Points of Discussion
MDC ECC	A workshop was held with representatives of MDC, CBC, CCC, the Environment Agency and Natural England in June 2020 in relation to emissions. The potential effects of lighting associated with the Project was raised by ECC and MDC as a concern requiring consideration in relation to landscape and visual effects. The methodology for night-time assessment is provided in section 20.6.
MDC CCC ECC CBC.	A workshop was held with representatives of MDC, CBC, CCC and ECC in June 2020. This was to further discuss matters relating to both cultural heritage and landscape and visual amenity. The assessment methodology and an initial list of viewpoints were presented to stakeholders and the process of agreeing these has begun. The current proposed list of viewpoints provided in **Table 20.9** indicates where these have been agreed with stakeholders and where agreement is yet to be reached.

Table 20.4: Stage One Consultation comments

Theme	Summary of Comments and Considerations	How this is Accounted for
Mitigation	A number of consultees commented on mitigation measures; key points raised include: • retention of as much of the 'Estuarine Marsh and Mudflats' character as possible (Marine Management Organisation (MMO)).	The effects of the proposals on the surrounding landscape character will be assessed as part of the LVIA and the iterative design of the proposals will seek to minimise effects on the 'Estuarine Marsh and Mudflats', informed by all of the early stages of assessment work. Interaction with other EIA delivery teams, notably with respect to biodiversity will occur to

Theme	Summary of Comments and Considerations	How this is Accounted for
	• restoring the landscape in a manner in keeping with the Dengie Peninsula, including expecting the habitats to be treated as connected networks not in isolation and recognising the open nature of the landscape is important for some species (Natural England). • The landscape strategy should be informed by full understanding of the likely impacts of the proposals (The Royal Society for the Protection of Birds (RSPB)). • It will not be possible to fully mitigate the visual impact on Mersea landscape and its immediate seascape through the use of earth-contouring, planting or other screening measures. There will be a need to demonstrate how the developing LVIA is being used as an integral part of the design process to inform siting, layout, form and massing of buildings as well as details such as lighting strategies and informing construction and operational constraints, for example,. construction working hours (CBC).	ensure that the design evolution and any resultant mitigation measures are properly recorded in the assessment.

Theme	Summary of Comments and Considerations	How this is Accounted for
Baseline.	Natural England considers that the estuarine marsh areas identified in the local landscape character assessment are generalised and that Natural England's habitat types mapping should be used to refine the areas.	GLVIA3 indicates that existing landscape character assessments should inform the assessment of effects on landscape character. However, the appropriateness of the identified boundaries within the published landscape and seascape character assessments will be tested as part of the LVIA.
Assessment scope.	A number of consultees commented on the assessment scope, key points raised include: • The need for a lighting strategy (Natural England, West Mersea Town Council). • Early consideration of landscape constraints to development, scale and visual impact – including in relation to the cooling towers (MDC and ECC, West Mersea Town Council). • Sensitivity of the landscape and seascape character of the Dengie Peninsula (South Woodham Ferrers Town Council, Bradwell-on Sea Town Council), and potential loss of woodland and hedgerows (Bradwell-on Sea Town Council). • The need for a colour study (CBC).	The lighting strategy and the resultant effects of the lighting will be considered within the LVIA. An iterative design process will be undertaken, informed by all of the early stages of assessment work and appropriate mitigation measures. The LVIA will fully consider the likely effects of the Project on the landscape and seascape character of the Dengie Peninsula and landscape and visual amenity from West Mersea. Colour Studies will be considered as a tool to inform the next stage of design development.

Theme	Summary of Comments and Considerations	How this is Accounted for
Stakeholder engagement.	MDC and ECC consider that the proposed development of the main site is likely to have adverse landscape and visual effects, with the open nature of the area visually sensitive to new development and having a sense of historic integrity. A comprehensive landscape assessment of the site's landscape value, qualities and characteristics should inform the landscape strategy and the Council's would welcome discussion of the baseline and early consideration of the impacts and mitigation strategy. CBC would wish to comment on the Zone of Theoretical Visibility (ZTV) of the proposals in relation to how it affects this borough, before the viewpoints and photomontages are produced	The baseline for the LVIA will consider the site's landscape value, qualities and characteristics, which will inform the assessment of effects. Baseline, early consideration of the impacts and mitigation strategy will be discussed with MDC and ECC.

20.4 Data Gathering Methodology

Study area

20.4.1 This section presents proposed study areas for landscape and visual amenity. As the design and consultation processes progress and the Project is refined, the exact geographical scope of study areas may continue to evolve to accommodate any changes. If the study areas change, data collection will also be reviewed and updated.

20.4.2 The LVIA study area for the main development site have been determined by the scale and maximum height of the proposed development within the main development site. Development of the Bradwell B power station within the main development site includes the tallest and largest scale elements of the Project and consequently has the largest LVIA study area.

20.4.3 The study areas for the off-site associated developments and the off-site Power Station Facilities are being considered and will vary according to the focus of the assessment. They may, for example, be encompassed by the larger study area for the main development site.

Main development site

20.4.4 The process outlined in **Table 20.5** has been applied in defining the proposed study area for the main development site. Should the project-provided accommodation be located within close proximity to the main development site, the study area for such accommodation will be overlapped by the main development site study area and a common LVIA study area will be applied for the two components of the Project, although in practice the study area for the operation of the project-provided accommodation would be limited according to the height of proposed accommodation blocks.

Table 20.5: Defining the main development site study area

Description	Distance	Rationale
Study area.	25km	A preliminary ZTV has been prepared (see **Figure 20.1**), representing a 25km radius study area extending from the main development site. Based on the preliminary 25km ZTV and initial discussions with stakeholders, a 25km study area would represent the area beyond which the development would not be visible or significantly visible.
Detailed study area.	10km	A detailed study area, extending out to approximately 10km from the main development site, within which significant effects are most likely to occur (see **Figure 20.2**).
Residential visual amenity assessment (RVAA) study area.	2km	A detailed study area, extending out to approximately 2km from the main development site (see **Figure 20.3**). The Landscape Institute Technical Guidance Note on Residential Visual Amenity Assessment indicates that a preliminary study area of 1.5-2km radius should be appropriate to begin to identify properties for inclusion in the RVAA, when considering relatively conspicuous structures.

Off-site associated development

20.4.5 The study areas for the off-site associated development are described in **Table 20.6.**

Table 20.6: Off-site associated development and off-site Power Station Facilities study areas

Site	Study Area	Rationale
Project-provided accommodation.	5km	A study area 5km radius from the site boundary(ies) of the project-provided accommodation is initially anticipated, if located away from the main development site, based on the height of up to 6 storey accommodation blocks and the likelihood that this would be unlikely to be visible or significantly visible beyond 5km due to intervening hedgerows and vegetation.
Off-site highways works.	2km	A study area 2km wide, either-side of the route corridors for highway works. A 2km radius will be applied from the site

Site	Study Area	Rationale
Park and ride facilities.	2km	boundaries of the park and ride facilities and freight management facilities. This is based on the height of a Heavy Goods Vehicle (HGV) and the likelihood that this would be unlikely to be visible or significantly visible beyond 2km due to intervening hedgerows and vegetation.
Freight management facilities.	2km	
Off-site Power Station Facilities.	2km	A study area 2km radius from the site boundary of the off-site Power Station Facilities is initially anticipated, based on the height of a single storey building and the likelihood that this would be unlikely to be visible or significantly visible beyond 2km due to intervening hedgerows and vegetation.

Sources of data used in scoping

Desk based

20.4.6 The EIA scoping exercise has been undertaken with reference to the description of the Project (**Chapter 3: The Project)**, supported by a number of data sources. The principal desk-based data sources used to inform this chapter for potential effects comprise of the following in **Table 20.7**.

Table 20.7: Desk based data sources

Source	Data
Natural England.	National Character Area Profile: 81 Greater Thames Estuary (Ref. 20.18). National Character Area Profile 111: Northern Thames Basin (Ref. 20.19) Multi-Agency Geographic Information for the Countryside (MAGIC) (Ref. 20.20) Natural England's Proposals for the following stretches of the England Coast Path: • Southend-on-Sea to Wallasea Island; • Wallasea Island to Burnham-on-Crouch; • Burnham-on-Crouch to Maldon;

Source	Data
	• Maldon to Salcott; • Mersea Island; • Salcott to Jaywick; and • Jaywick to Harwich. (Ref. 20.21). GIS datasets for: • County Parks; • Open Access Land; and • Registered Common Land.
MMO	Seascape Character Assessment for the South East Inshore Marine Plan Area (Ref. 20.22). Seascape Character Assessment for the East Inshore Marine Plan Area (Ref. 20.23).
ECC	Essex Landscape Character Assessment (Ref. 20.24). Landscape Character Assessment of the Essex Coast (Ref. 20.25). Public Right of Way (PRoW) Interactive Map (Ref. 20.26). The St Peter's Way route leaflet (Ref. 20.27). Bradwell Cockle Spit route leaflet (Ref. 20.28).
MDC	Braintree, Brentwood, Chelmsford, Maldon and Uttlesford Landscape Character Assessments. (Ref. 20.29).
CBC	Colchester Borough Landscape Character Assessment (Ref. 20.30).
Ordnance Survey.	1:25,000 scale mapping: • Explorer 176 – Blackwater Estuary; and • Explorer 184 – Colchester (or digital mapping). NextMap25 Digital Terrain Model (DTM) and Digital Surface Model (DSM) data.

Source	Data
Environment Agency	1m LiDAR DTM and DSM data.
Esri	Aerial Photography, as available through ArcGIS.
Long Distance Walkers Association.	Long distance routes (Ref. 20.31).
Sustrans	National Cycle Network (GIS dataset).
National Trust.	National Trust land (GIS dataset).
RSPB	RSPB reserves (GIS dataset).

Zone of theoretical visibility

20.4.7 A series of preliminary ZTVs have been generated to inform this scoping report and initial viewpoint selection for the main development site. The parameters applied to the preliminary ZTVs, including DTM variations, are described in **Table 20.8**. As parameters for the main development site are refined and become fixed, the ZTVs will be updated.

20.4.8 The ZTVs for the main development site 25km and 10km study areas (**Figures 20.1** and **20.2**) illustrate the maximum theoretical visibility, taking into account topography, principal woodlands and settlements, which have been included in the model with the heights obtained from Nextmap 25 data. The model does not take into account any localised features such as small copses, hedgerows or individual trees and therefore still gives an exaggerated impression of the extent of visibility. The actual extent of visibility on the ground will be less than that suggested by this plan.

20.4.9 The detailed ZTV for the 2km residential visual amenity assessment study area utilises LiDAR data with an accuracy of 1m. Whilst this data picks up a greater level of detail, it may still omit localised feature such as walls, small hedgerows or small individual trees and the actual extent of visibility on the ground will remain less than suggested by the plan (see **Figure 20.4**).

Table 20.8: Preliminary ZTV parameters

ZTV Distance	DTM Data	Parameters
25km	NextMap25.	Ancillary buildings and plant facilities15-25m. Cooling system buildings 6-20m. Hybrid cooling towers 60m. Reactor buildings 65m. Turbine halls 50m.
10km	NextMap25.	
2km	LiDAR DTM/ DSM.	

20.5 Baseline Information

Current baseline

Main development site

Landscape baseline

Immediate landscape context

20.5.1 The main development site comprises flat and low-lying landscape (see **Figure 20.5**). Land use is predominantly arable. There are scattered trees, a few hedgerows and small parcels of woodland, particularly in the western parts of the main development site. The landscape is generally open with long views extending across the Dengie Peninsula and the Blackwater Estuary to Mersea Island and beyond. The exception to this is within the south-western part of the main development site (south and west of the diagonally orientated, linear mixed plantation woodland and south of the existing Bradwell power station) which is notably less open with a greater number of trees, hedgerows and small woodlands and copses. There are also more roads and settlement with some smaller field sizes in this area.

20.5.2 The former Royal Air Force (RAF) Bradwell Bay Airfield within the main development site has a subtle and localised influence on the landscape character. Remnants of this disused WWII airfield include perimeter farm tracks and linear areas of concrete hard standing that previously formed the airfield runways. Several dome-shaped former aircraft hangar buildings remain in this area together with a former control tower building.

20.5.3 Other localised features include a small number of scattered farms or residential properties. Water features include the Weymarks River, a network of field drainage ditches, two irrigation reservoirs (located in the southern part of the main development site) and the Borrow Dyke which is a linear water feature stretching along the northern boundary of the main development site, adjacent to, and landward of the flood defence embankment. A line of electricity transmission pylons crosses the landscape between the existing Bradwell power station and passes

close to one of the larger areas of woodland within the main development site, at Curds Grove. The pylons continue south and east of Bradwell-on-Sea.

20.5.4 The southern boundary of the main development site is marked by East End Road, following the line of a roman road, that continues in a straight north-east direction as far as the Bradwell Shell Bank Nature Reserve car park. East End Road extends further east as a farm track and footpath, terminating just beyond the eastern corner of the main development site boundary, at the chapel of St Peter-on-the-Wall, which is a Grade I listed building and visitor attraction. The chapel together with the Bradwell Bird Observatory at Linnet's Cottage just to the south, and the Othona Community Settlement and Coastal Park to the north of the chapel lie outwith the main development site boundary, which continues north to Sales Point. On East End Road, outwith the main development site, are the Eastland Meadows Country Park caravan site, St Cedd's Café and The Cricketer's public house near the south western corner of the main development site.

20.5.5 The village of Bradwell-on-Sea is located approximately 300 metres (m) further to the south-west of the main development site and includes two related areas of settlement at East End and Down Hall. The main part of the village has an enclosed and historic character focused on the Conservation Area and Church of St Thomas, Bradwell and Bradwell Lodge. East End is a 1970s housing estate, slightly separated from the village beyond the cemetery to the east. There is a further cluster of properties around the Down Hall Residential Care Home to the north of the main village and close to the main development site. The Bradwell Bay War Memorial dates from the late 20th Century and is located on the roadside, on the southern edge of the former airfield, with a poultry farm located further to the north of this at Down Hall Farm. The views from within this south-western part of the main development site are often curtailed by vegetation and rarely extend beyond one or two field boundaries giving this area a less open and slightly more developed character.

20.5.6 The existing Bradwell A power station is located adjacent to the northern boundary of the main development site and is currently in the Care and Maintenance phase of decommissioning, and has been subject to extensive programme of plant and equipment removal (including of the reactor systems and the demolition of most of the ancillary buildings including the turbine hall) since its closure in 2002, whilst the associated substation lies within the boundary. The existing Bradwell A power station appears as a simple rectilinear form with pale grey cladding that appears prominently as an industrial feature, clearly visible from across much of the main development site and the Blackwater Estuary as far north as Mersea Island, Tollesbury Marina and marshes in the west, and Point Clear in the north-east. Some of the woodland in this area is related to the existing Bradwell power station and both feature in *The Landscape of Power*, a book written about landscape architecture by Dame Sylvia Crowe in 1958 (Ref. 20.32). Notably, clear views of the existing Bradwell power station from the south and south-west are restricted by intervening layers of vegetation. Further to the west is the small settlement of Bradwell Waterside and marina, located on the coast at the terminus of the B1021. This settlement includes a mixture of building styles, the Green Man public house,

a caravan site and buildings associated with the marina. Inland views from this area tend to be curtailed by buildings and vegetation along roads and field boundaries.

20.5.7 The northern and north-eastern coastal boundaries of the main development site include the flood defence embankment and associated footpath which form part of the Bradwell Cockle Spit Wildside Walk and the proposed route of the ECP. The landward toe of the coastal defence embankment and the associated Borrow Dyke mark the northern extents of the arable farmland and areas to the north of this comprises the seascapes of the Blackwater Estuary, including Bradwell beach and areas of estuarine marsh and mudflats.

National character areas

20.5.8 The main development site lies within National Character Area (NCA) 81 Greater Thames Estuary, which covers 837km^2 of coastal landscape to the east of London.

20.5.9 The published profile for NCA 81 lists 13 key characteristics of this landscape. Those considered to be of most relevance to the main development site include:

> *"Predominantly flat, low-lying coastal landscape where extensive open spaces are dominated by the sky, and the pervasive presence of water and numerous coastal estuaries extend the maritime influence far inland;*
>
> *Geological contrast and variety along the coastline provided by Sheppey, a long, low island rising from a stretch of very flat marsh along the Swale Estuary in Kent with low, steep clay cliffs facing towards Essex, and Mersea Island in the Blackwater Estuary in Essex;*
>
> *Open grazing pastures patterned by a network of ancient and modern reed-fringed drainage ditches and dykes, numerous creeks and few hedges or fences, with tree cover a rarity;*
>
> *Traditional unimproved wet pasture grazed with sheep and cattle combined with extensive drained and ploughed arable land protected from floods by sea walls, with some areas of more mixed agriculture on higher ground;*
>
> *Strong feelings of remoteness and wilderness persist on extensive salt marshes, mudflats and reclaimed farmed marshland, which support internationally important plants, invertebrates and populations of breeding and overwintering birds, notably overwintering Brent geese; and*
>
> *Some of the least settled parts of the English coast with numerous small villages and hamlets on higher ground and marsh edges reflecting medieval patterns and the coastal economy".*

20.5.10 The geographical location and extent of this NCA and other NCAs are shown in **Figure 20.6**.

Marine character areas

20.5.11 The relevant Marine Character Area (MCA) is MCA 19 Essex and South Suffolk Estuaries and Coastal Waters as defined in the Seascape Character Assessment for the South East Inshore Marine Plan Area (see **Figure 20.7**).

20.5.12 MCA 19 covers the shallow coastal waters of the Essex Coast from Southend-on-Sea in the south to Felixstowe on the Suffolk coast, including the estuaries of the Rivers Orwell and Stour and the Essex estuaries of the Rivers Colne, Blackwater and Crouch.

20.5.13 The overall character of the MCA is cited as being

> *"characterised by an intricate pattern of estuaries, rivers, branching tributaries, shallow creeks, extensive mudflats, low-lying islands and tidal salt marshes. Coastal habitats support large numbers of wetland birds, rare plant and invertebrate species and diverse marine wildlife, evidenced by the majority of the area being internationally and nationally designated coastline. The shallow coastal waters are popular for recreation including boating and sailing. The area includes the busy port of Harwich, and coastal towns and villages, although much of the area is characterised by strong feelings of remoteness and wilderness on the extensive salt marshes, mudflats and reclaimed farmed marshland. Despite being on the Greater Thames estuary, it contains some of the least settled parts of the English coast, with small villages and hamlets on higher ground and marsh edges."*

20.5.14 Amongst its key characteristics, the Seascape Character Assessment states "*Onshore, Bradwell nuclear power station is a feature in views*."

20.5.15 The MCAs identified in the South East Inshore Marine Plan Area do not currently provide sufficient detail to form the basis of the assessment of effects on seascape character. Consequently, consideration of seascape character at a more detailed level will be required to inform the LVIA.

County level landscape character

20.5.16 At a county level, the Essex Landscape Character Assessment defines the landscape within the main development site and surrounding area as the Dengie and Foulness Coast (LCA F3). The key characteristics of this landscape are as follows:

> "*Large scale, flat landscape;*
>
> *Sense of openness/space. Wide views;*
>
> *Vast tidal mudflats and sands, and extensive fringing saltmarshes, rich in wildlife;*

Mainly arable farmland of the reclaimed marshlands, intersected by ditches and dykes;

Absence of woodland, only a few hedgerows;

Isolated farms and barns, with small villages restricted to the fringes;

Bradwell Nuclear Power Station is a significant landmark; and

Remote tranquil character.".

20.5.17 The Essex Landscape Character Assessment is a larger, broad-scale assessment which provides context (i.e. it 'sets the scene'). The county level assessment provides an intervening level of detail between the NCAs and the local authority assessments which refine these larger character areas into more discrete areas.

20.5.18 In addition, the Landscape Character Assessment of the Essex Coast defines the character of the coastline in the vicinity of the main development site. The majority of the main development site lies within the Dengie Coastlands landscape character area. The Landscape Character Assessment of the Essex Coast does not list key characteristics, but the description of the Dengie Coastlands can be summarised as:

- marked at the northern end by the pylons extending from the existing Bradwell A power station;
- access for vehicles is limited;
- marshland furthest inland is the oldest;
- more recent 'innings' immediately behind the existing coastal defences (referred to as the sea wall in the landscape character assessment), with no settlement and public access generally restricted to along the existing coastal defences;
- Bradwell A power station dominates its rural setting; and
- long views from the existing coastal defences over the marshes and to the Tendring coastline.

20.5.19 The remaining south western part of the main development site lies within the Tillingham Ancient Farmlands landscape character area. The description of the Tillingham Ancient Farmlands can be summarised as:

- a low ridge backing the extensive Dengie levels and marshes to the east;
- flat or gently rolling landscape of medium-sized arable fields;
- divided by elm-dominated hedgerows in a discernible rectangular pattern;

- scattered farmsteads mark the break of slope and a line of villages marks the top of the ridge; and
- Bradwell A Power Station and its associated pylons are dominant over the north of the character area.

Local landscape character areas

20.5.20 Local landscape character areas (LCAs) are described in the Braintree, Brentwood, Chelmsford, Maldon and Uttlesford Landscape Character Assessments.

20.5.21 The majority of the main development site (with the exception of the western spur to the west of the existing Bradwell power station access road and the proposed zone for marine infrastructure) lies within LCA D7 Bradwell Drained Estuarine Marsh. Key characteristics of this LCA are as follows:

> "*Flat, low-lying land immediately behind sea wall defences;*
>
> *Mostly arable farmland on former reclaimed marsh intersected by linear ditches and dykes;*
>
> *Absence of trees except around farmsteads;*
>
> *Sense of huge sky, sound of birds, tranquillity, and panoramic views across the marshland and out to sea; and*
>
> *Isolated farms; restricted access provided by a very few lanes; absence of settlements.*".

20.5.22 The following extract from the extant assessment provides a succinct summary which is considered to accurately describe the landscape character of the main development site area;

> "*This windswept landscape of big sky and shifting colours displays varying textures - from the rough textured salt marsh at low tide through to the smoother grazing marsh/grassland and the extensive expanses of arable fields. Disused or derelict buildings mixed with small isolated settlements amid large-scale open arable farmland give this remote promontory of big sky and sea and shifting colours an atmosphere and a character that seems forgotten and lost in time. The sense of tranquillity is very strong*.".

20.5.23 LCA C2 Blackwater Estuarine Marsh/Mudflats is located immediately to the north of the LCA D7 and covers the intertidal zone along the Blackwater Estuary. It is the host LCA for marine infrastructure works related to the main development site. The key characteristics of this landscape are as follows:

> "*Intricate patchwork of predominantly tidal mudflats and sands lining the northern and southern slopes of the Blackwater channel/estuary;*

Inter-tidal landscape which is periodically covered by the constant washing of sea water;

Sense of remoteness and tranquillity;

Character greatly influenced by the changing colours of the sea and sky;

Important habitats for wildlife (including Brent Geese) and biodiversity;

Open landscape with extensive views of estuary and coast; and

Limited public access.".

20.5.24 To the west of LCA D7 lies LCA E2 Tillingham and Latchingdon Coastal Farmland which covers the majority of inland farmland between Maldon and Bradwell. The western spur of the main development site falls within this LCA, the key characteristics of which are as follows:

"*Gently undulating arable farmland behind the coastal marshland, locally quite steep;*

Heavy clay soils and lighter sandy loamy soils where sand and gravel deposits overlie clay;

Distinctive long hedgerow boundaries running on parallel axes are a common feature, thought to be the result of ancient planned enclosure;

Dutch elm disease has made elm loss noticeable in hedgerows;

Right-angled bends in lanes reflect ancient field pattern; and

Settlement pattern follows underlying soils - sand and gravel formations on a ridge between Bradwell and Burnham - elsewhere settlement on slopes in clay areas.".

20.5.25 Other LCAs close to the main development site are LCA C3 Dengie Flats Estuarine Marsh/Mudflats which includes St. Peter's Flats to the east of LCA D7 and LCA D8 Dengie Drained Estuarine Marsh located to the south-east of the LCA D7 and forms a narrow strip just inland from the Dengie Flats Estuarine Marsh and Mudflats LCA (C3), broadening to the south to include an extensive area of marshes on the northern side of the River Crouch.

20.5.26 The location and extent of all LCAs within 10km of the main development site are illustrated in **Figure 20.6**. This includes LCAs as defined in the Colchester Borough Landscape Character Assessment which covers Mersea Island and landscape to the north of the River Blackwater.

Designated landscapes

20.5.27 Two AONBs lie within 25km of the main development site as follows:

- Dedham Vale AONB which covers approximately 90km^2 of land and is located approximately 22km to the north of the main development site; and
- Suffolk Coast and Heaths AONB which was extended in July 2020. The southern fringes of the AONB lie approximately 24km to the north-east of the main development site.

20.5.28 The two AONBs and the level to which they coincide with the Preliminary ZTV is illustrated in **Figure 20.1**.

20.5.29 A further AONB, Kent Downs AONB, is located approximately 50km to the south of the main development site but is located well beyond the proposed study area and likely visibility of the Project.

Visual baseline

20.5.30 Many of the factors that influence the visual baseline have been discussed in the landscape baseline description provided and primarily relate to the low-lying topography of the Dengie Peninsula and surrounding river and coastal landscapes from which wide, panoramic views are available. Within these low-lying areas are pockets of landscape, such as that towards the south-western corner of the main development site, where a higher incidence of woodland serves to frame, filter and foreshorten views. Moving inland from the coastal fringes, variations in topography and a greater concentration of woodlands combine to restrict visibility towards the Dengie Peninsula and the main development site.

20.5.31 The distribution of settlements in which a high proportion of residential visual receptors are located is illustrated on Ordnance Survey mapping on **Figures 20.1** and **20.2**. The Dengie Peninsula is sparsely settled with the closest settlements to the main development site being the villages of Bradwell-on-Sea and Bradwell Waterside to the west and south-west respectively and the small town of West Mersea located to the north of the River Blackwater at the western end of Mersea Island. Major settlements are located at distances in excess of 10km from the main development site and include Maldon to the west, Colchester to the north and Clacton-on-Sea to the north-east at distances of between 10km to 20km. Between 20km and 30km from the main development site lie the towns and cities of Southend-on-Sea, Chelmsford and Braintree.

20.5.32 Recreational visual receptors are widely distributed across the study area. There are no National Trails within 25km of the main development site. However, the proposed route of the ECP is likely to follow the eastern and northern boundaries of the main development site, utilising existing public footpaths along the coastal defences. With regard to Sustrans National Cycle Routes (NCRs), these are concentrated within the northern half of the 25km study area and include sections of NCR 1, NCR 13, NCR 16 and NCR 51 as well as Regional Cycle Route (RCR) 50. The closest section of NCR to the main development site is NCR 1 as it passes through Maldon as shown on **Figure 20.8**.

20.5.33 One regional promoted long-distance walking route is present with 10km of the main development site (St Peter's Way), the route of which is shown in **Figure 20.8**. Other recreational destinations include nature reserves (Old Hall Marshes, Tollesbury Wick Marshes, Abbotts Hall Farm, Ray Island and Colne Point within 10km of the main development site) which are frequently associated with the saltmarsh landscapes along the coast. A visitor centre at Abberton Reservoir to the south of Colchester is a popular destination whilst the coastal resorts and coastline in between the coastal conurbations offer beach access (including the pleasure pier at Clacton).

20.5.34 A review of Ordnance Survey Explorer maps indicates that the distribution of PRoWs has a generally moderate density across the study area, as shown on **Figure 20.9**. Cudmore Grove Country Park on Mersea Island is the closest Country Park to the main development site whilst others present within 25km are High Woods and Blackwater Rail Trail within 20km of the main development site and Danbury, Holland Haven and Marsh Farm at distances of between 20km and 30km from the main development site.

Off-site Power Station Facilities

20.5.35 Detail of the landscape and visual baseline for any proposed off-site Power Station Facilities will be identified once a preferred site has been identified for the facilities, following further project design refinement and consultation.

Off-site associated development: project-provided accommodation

20.5.36 Detail of the landscape and visual baseline for the off-site project-provided accommodation will be identified once the preferred site(s) has been identified for the facilities, following further project design refinement and consultation.

Off-site associated development: highways improvements

Landscape baseline

Immediate landscape context

20.5.37 The early years option Route A and the outbound option of Route B would utilise the same existing roads both inbound and outbound. These roads run across a relatively flat and low-lying landscape (see **Figure 20.10**), which is largely agricultural. The A130 is a dual carriageway located in cutting in the vicinity of Route A and with semi-mature vegetation along the route providing screening. The A132 Burnham Road is located to the north of South Woodham Ferrers and is a single carriageway road with occasional widening at junctions and frequently lined by tall hedgerows set back from the edge of the carriageway. To the east of South Woodham Ferrers, the B1012 Lower Burnham Road becomes narrower with lower hedgerows along the road and occasional areas of woodland, and it runs along slightly elevated land above the lower lying marshes of the River Crouch. Route A would then turn north along the B1010 Fambridge Road until reaching the Fambridge Road/ Latchingdon Road/ Cold Norton Road junction, becoming

narrower and with hedgerows becoming more intermittent. HGVs would then route via the villages of Latchingdon, Mayland and Steeple to the main development site, with the roads becoming narrower and more winding, with characteristic right-angled bends.

20.5.38 The early years option Route B would also utilise existing roads. This route would cross the Danbury ridge before dropping down onto the lower lying landform south of Maldon. The inbound vehicles would approach the main development site via the elevated A12 Junction 18. The route then utilises the A414 through Danbury, which is single carriageway and lined with intermittent hedgerows and tree belts. It passes several areas of settlement, including Woodham Mortimer, to the A414/B1018 junction at Maldon. HGVs would then route along the B1018 to the south of Maldon, which is a narrower and more open road, lined with low hedgerows, to the B1010 Fambridge Road as far as the Fambridge Road/ Latchingdon Road/ Cold Norton Road junction. HGVs would then join the same route via Latchingdon, Mayland and Steeple to the main development site as Route A.

20.5.39 The Strategic Route would follow the same route to the main development site as early years option Route A, with the exception of the Strategic Route options and search areas.

20.5.40 Strategic Route options would potentially provide bypasses of both Latchingdon and Mayland. The western bypass would connect Lower Burnham Road to Burnham Road to reduce traffic through Latchingdon, and would run through rectilinear fields with low, intermittent hedgerows as well as staying below the ridgeline to the south of Latchingdon. The second bypass to connect to the Strategic Route involves creating a connection from Green Lane to Maldon Road to avoid traffic passing through Mayland, and would potentially run through smaller scale rectilinear fields with some woodland as well as also staying below the ridgeline to the south of Latchingdon. East of this new connection the route would then link back into the eastern part of Strategic Route, to the west of Steeple. Within the Strategic Route, a combination of highway interventions would be proposed for each of the identified search areas. Please note this list and combination of interventions is not exhaustive and will be subject to further development and refinement as a result of ongoing design development, environmental information and consultation.

National character areas

20.5.41 The majority of both of the early years options, as well as the Strategic Route (including search areas), lie within NCA 111 Northern Thames Basin (see **Figure 20.11**). The NCA covers 2510km^2 and extends from Hertfordshire in the west to the Essex coast in the east.

20.5.42 The published profile for NCA 111 lists key characteristics of this landscape. Those considered to be of most relevance to the main development site include:

> *"The landform is varied with a wide plateau divided by river valleys. The prominent hills and ridges of the 'Bagshot Hills' are notable to the northwest and extensive tracts of flat land are found in the south.*

Characteristic of the area is a layer of thick clay producing heavy, acidic soils, resulting in retention of considerable areas of ancient woodland.

A diverse landscape with a series of broad valleys containing the major rivers Ver, Colne and Lea, and slightly steeper valleys of the rivers Stour, Colne and Roman. Numerous springs rise at the base of the Bagshot Beds and several reservoirs are dotted throughout the area.

The pattern of woodlands is varied across the area and includes considerable ancient semi-natural woodland. Hertfordshire is heavily wooded in some areas as are parts of Essex, while other areas within Essex are more open in character. Significant areas of wood pasture and pollarded veteran trees are also present.

The field pattern is very varied across the basin reflecting historical activity. Informal patterns of 18th-century or earlier enclosure reflect medieval colonisation of the heaths. Regular planned enclosures dating from the Romano-British period are a subtle but nationally important feature on the flat land to the south-east of the area. In the Essex heathlands 18th- and 19th-century enclosure of heathlands and commons followed by extensive 20th-century field enlargement is dominant.

Mixed farming, with arable land predominating in the Hertfordshire plateaux, parts of the London Clay lowlands and Essex heathlands. Grasslands are characteristic of the river valleys throughout. Horticulture and market gardening are found on the light, sandy soils of former heaths in Essex, particularly around Colchester, along with orchards, meadow pasture and leys following numerous narrow rivers and streams.

The medieval pattern of small villages and dispersed farming settlement remains central to the character of parts of Hertfordshire and Essex. Market towns have expanded over time as have the London suburbs and commuter settlements, with the creation of new settlements such as the pioneering garden city at Welwyn and the planned town at Basildon.

Brick-built dwellings are characteristic from the late 17th century onwards. Prior to this dwellings and farm buildings tended to be timber built with weatherboarding, now mainly painted white but traditionally black or tarred, and whitewashed plaster walls.".

20.5.43 The remainder of the highway improvements lie within NCA 81 as described in relation to the baseline for the main development site.

Marine character areas

20.5.44 From approximately Latchingdon eastwards both of the early years options, as well as the Strategic Route (including search areas), would be located within 2km of the River Blackwater. The relevant Marine Character Area is MCA 19 Essex and South

Suffolk Estuaries and Coastal Waters, as described in relation to the baseline for the main development site.

County level landscape character

20.5.45 The eastern end of both of the early years options, as well as the Strategic Route (including search areas), lies within the Dengie and Foulness Coast (LCA F3), as described in relation to the main development site.

20.5.46 West of LCA F3, the routes lie within the South Essex Farmlands (LCA E1). The key characteristics of this landscape are as follows:

- Gently undulating landform, locally strongly rolling.
- Rectilinear field pattern with tall thick hedgerow boundaries.
- Occasional small woods and copses.
- Sense of enclosure.
- Striking large open water expanse of Hanningfield Reservoir surrounded by dense tree belts is a distinctive feature in the west.
- Pylons are a frequent presence.

20.5.47 The western end of the early years option A and the Strategic Route (including search areas), run along the northern boundary of and are occasionally located just within Crouch & Roach Farmland (LCA F2). The key characteristics of this landscape are as follows:

- Long narrow Crouch and Roach river estuaries with bands of flat low-lying marshlands.
- Rolling or gently undulating arable farmland between the estuaries. Regular fields of variable size and thick or intermittent hedgerow boundaries.
- Frequent long views across the farmland to the estuaries from higher ground.
- Strongly right-angled pattern of lanes.
- Small villages, a scattering of hamlets, farmsteads, and newer suburban properties are concentrated along the lanes on higher ground.

20.5.48 The western end of the early years option B inbound lies within Danbury Hills (LCA D3). The key characteristics of this landscape are as follows:

- Distinctive landform of a very large gently domed hill, and a broad connecting ridge eroded into small rounded hills in the south east.
- Dense woodland on Danbury Hill, fairly open arable farmland to the east.

- Historic parklands, grassy commons, pockets of heathland and orchards diversify character.
- Long views across the Chelmer Valley from high ground.

20.5.49 The Essex Landscape Character Assessment is a larger, broad-scale assessment which provides context (i.e. it 'sets the scene'). The county level assessment provides an intervening level of detail between the NCAs and the local authority assessments which refine these larger character areas into more discrete areas.

Local landscape character areas

20.5.50 The majority of both of the early years options, as well as the Strategic Route (including search areas), lies within LCA E2 Tillingham and Latchingdon Coastal Farmland as described in relation to the main development site.

20.5.51 West of LCA E2, the routes lie within LCA D9 Fambridge Drained Estuarine Marsh, which covers the area between South Woodham Ferrers and North Fambridge. The key characteristics of this landscape are as follows:

- Low-lying flat drained marsh hinterland north of River Crouch that become gently rolling further inland.
- Predominantly open, arable fields with a regular, rectilinear field pattern.
- Steeply rising land above Creeksea and North Fambridge.
- Extensive grazing marsh.
- Sense of isolation and openness near the existing coastal defences.

20.5.52 The western end of the early years option A and the Strategic Route (including search areas), lies within LCA F12 East Hanningfield Wooded Farmland to the south east of Chelmsford. The key characteristics of this landscape are as follows:

- Gently rolling or undulating wooded farmland overlooking the Crouch River channel to the south.
- Predominantly large arable fields delineated with very mature treed field boundaries and ditches.
- Evidence of field boundary loss.
- Pockets of pasture and pony paddocks.
- Network of quiet narrow lanes.
- Generally dispersed settlement pattern.
- Sense of tranquillity away from major road corridors.

- Fords where streams and narrow lanes meet.
- Views to wooded horizons and across the Crouch River channel.

20.5.53 The western end of the years option B inbound lies within two further landscape character areas, LCA F5 Little Baddow and Danbury Wooded Farmland and LCA F6 Woodham Wooded Farmland. The key characteristics of LCA F5 are as follows:

- Wooded hill and ridge housing the linear settlements of Little Baddow and Danbury.
- Sense of enclosure provided by large areas of dense deciduous and mixed woodland.
- Intricate landscape pattern consisting of commons, pasture, heathland and woodland habitats.
- Arable farmland fringing the outer edges of patches of woodland.
- Series of narrow lanes winding down the hillsides and facilitation views into and across the Chelmer/Blackwater valley to the north and east.
- Views to wooded horizons within adjacent wooded farmland to the south.
- Predominantly linear settlement pattern.

20.5.54 The key characteristics of LCA F6 are as follows:

- Sands and gravels over London Clay.
- Broad wooded east-west ridge descending from Danbury.
- Distinctive small rounded hills visible where ridge has eroded in south-east.
- Open landscape of arable farmland framed by woodland and hedgerows on the lower ground.
- Enclosed to semi-enclosed commons, small irregular fields and pasture on the wooded ridge.

Designated landscapes

20.5.55 There are no designated landscapes that will fall within the proposed study area for the identified highway improvement works.

Visual baseline

20.5.56 Many of the factors that influence the visual baseline have been discussed in the landscape baseline description provided and primarily relate to the low-lying topography of the Dengie Peninsula from which wide, panoramic views are

available. Within these low-lying areas are pockets of landscape, such as around Mayland and Maylandsea, where a higher incidence of woodland serves to filter and foreshorten views. Moving inland from the coastal fringes, variations in topography and a greater concentration of hedgerows and woodlands combine to reduce visibility.

20.5.57 The Ordnance Survey mapping on **Figure 20.12** illustrates the distribution of settlements. A high proportion of residential visual receptors are located in these settlements. The Dengie Peninsula is sparsely settled, but the highway improvements to the west would pass by villages such as Latchingdon, Mayland and Steeple, as well as major settlements such as Maldon to the north, North Fambridge and South Woodham Ferrers to the south and Chelmsford to the west.

20.5.58 Recreational visual receptors are widely distributed across the potential study areas. There are no National Trails within 2km of the proposed highway improvements. With regard to NCRs, these are concentrated towards the western end of Route B within the northern half of the 25km study area and includes a section of NCR 1 as shown on **Figure 20.12**.

20.5.59 One regional promoted long-distance walking route is present with 2km of the proposed highway improvements (St Peter's Way), the route of which is shown on **Figure 20.12**. Other recreational destinations include country parks, Registered Common Land and nature reserves closer to the coast.

20.5.60 A review of Ordnance Survey Explorer maps indicates that the distribution of PRoWs has a generally moderate density across the potential study areas, with slightly higher concentrations to the north west around Danbury.

Off-site associated development: park and ride sites

Landscape baseline

Immediate landscape context

20.5.61 The search area for a proposed park and ride facility at Chelmsford is located in the vicinity of junction 18 of the A12. The A12 is a dual carriageway in cutting at this location, connected to the A414 to Danbury to the east and the A1060 to Chelmsford to the west. The search area is located on slightly elevated ground above the valley of the Chelmer and Blackwater navigation to the north and Sandon Brook to the south east (see **Figure 20.13**). Land use within the search area is predominantly large-scale arable farmland with a high concentration of settlement present, including an existing park and ride facility to the north west of the A12 junction. Danbury is located to the east of the search area, with the historic Danbury Park falling into the eastern part of the search area. The western edge of the search area extends as far as the edge of Chelmsford.

20.5.62 The search area at Maldon is located to the west of the town, with the A414 along the eastern and southern edges of the search area and the more minor London Road running through the centre. **Figure 20.13** shows the location of the search

area on the higher ground between Danbury and Maldon, with the valley of the River Chelmer to the north and the low-lying drained marshes to the south-east. Land use within the search area is predominantly large-scale arable farmland with intermittent hedgerows and small woodland blocks. There are a number of lakes and reservoirs within the search area, as well as scattered isolated properties, including Maldon Hall in the east.

20.5.63 The search area at South Woodham Ferrers stretches from the north eastern edge of Runwell and the junction of the A130 with the A132 north eastwards to the north-west edge of South Woodham Ferrers. The A130 is dual carriageway and in cutting, whilst the A132 is single carriageway and at grade. Both are lined with vegetation. As shown on **Figure 20.13**, the search area is located above the valley of the River Crouch but straddles the valley of Fenn Creek. There is scattered settlement within the search area, predominantly located around the edges and including small villages, ribbon development along roads and isolated properties. Road access to the middle of the search area is also limited.

National character areas

20.5.64 The search areas for the park and ride sites are all located within NCA 111 as described in relation to the highway improvements. The extent of these NCAs is shown on **Figure 20.14**.

Marine character areas

20.5.65 The study areas for the park and ride facility search areas would not extend to include any marine character areas.

County level landscape character

20.5.66 The park and ride facility search area at Chelmsford is located at the meeting of three separate landscape character areas at the county level. These include the Blackwater/Brain/Lower Chelmer Valleys (LCA C6), in the north of the search area, the key characteristics of which are:

- Shallow valleys.
- Predominantly arable farmland with well hedged medium to large fields.
- The Brain and the Upper Blackwater Valleys are narrow with undulating valleysides.
- The Lower Chelmer, and the Blackwater near Maldon, have wide flat valley floors, and gentle valleysides.
- Extensive linear poplar and willow plantations are a distinctive feature.

20.5.67 The east of the search area lies within Danbury Hills (LCA D3), as described in relation to the highway improvements. The west of the search area lies within Chelmsford and Environs (LCA G2), the key characteristics of which are:

- Historic town with extensive residential estate development spreading over a gently sloping valleyside landform.
- Wide riverside corridors of green space except in the town centre.
- Fringe of mixed farmland with variable size hedgerowed fields, with few woods or copses.
- Large villages of Writtle and Galleywood physically separated from the town, but with much development of an urban character.

20.5.68 The park and ride facility search area at Maldon is located at the boundary of two separate landscape character areas at the county level. These include the Blackwater/Brain/Lower Chelmer Valleys (LCA C6) to the north, as described in relation to the Chelmsford search areas, and Danbury Hills (LCA D3) to the south, as described in relation to the highway improvements.

20.5.69 The park and ride facility search area at South Woodham Ferrers lies within the South Essex Farmlands (LCA E1), as described in relation to the baseline for the highway improvements.

20.5.70 The Essex Landscape Character Assessment is a larger, broad-scale assessment which provides context (i.e. it 'sets the scene'). The county level assessment provides an intervening level of detail between the NCAs and the local authority assessments which refine these larger character areas into more discrete areas. However, in Rochford District where there is no District scale landscape character assessment, it may be necessary to use the Essex Landscape Character Assessment as the landscape character baseline for some parts of the study area.

Local landscape character areas

20.5.71 The Chelmsford search area lies across two separate landscape character areas. The north-west half of the search area lies within LCA A7 Lower Chelmer River Valley. This character area is found along the River Chelmer between Chelmsford and Maldon. The key characteristics are as follows:

- Shallow valley.
- Predominantly arable farmland on the valley slopes.
- The Lower Chelmer where it meets the River Blackwater has gentle valley sides.
- Overall strong sense of place and tranquillity away from Maldon and the A12 and the railway line.

20.5.72 The south-east of the Chelmsford search area lies within LCA F5 Little Baddow and Danbury Wooded Farmland, as described in relation to the highway improvements.

20.5.73 The Maldon search area lies within the same two landscape character areas as the Chelmsford search area, with the north of the search area within LCA A7 and the south in LCA F6.

20.5.74 The South Woodham Ferrers search area lies predominantly within LCA F12 East Hanningfield Wooded Farmland, as described in relation to the highway improvements. The southern edge of the search area lies within LCA D9 Fambridge Drained Estuarine Marsh, which is also described in relation to the highway improvements. The south western part of the search area lies within LCA F11 South Hanningfield Wooded Farmland, the key characteristics of which are as follows:

- Gently rolling or undulating wooded farmland overlooking the Crouch River channel to the south.
- Predominantly large arable fields delineated with very mature treed field boundaries and ditches.
- Evidence of field boundary loss.
- Pockets of pasture and pony paddocks.
- Network of quiet narrow lanes.
- Generally dispersed settlement pattern.
- Sense of tranquillity away from major road corridors.
- Fords where streams and narrow lanes meet.
- Views to wooded horizons and across the Crouch River channel.

Designated landscapes

20.5.75 There are no designated landscapes that will fall within the proposed study areas for the potential park and ride sites.

Visual baseline

20.5.76 Many of the factors that influence the visual baseline have been discussed in the landscape baseline description provided and primarily relate to the contrast between the higher ground on which the search areas are generally located and the lower lying river valleys and drained marshes. Vegetation cover is generally variable, with fields often large and divided by intermittent hedgerows.

20.5.77 The distribution of settlements in which a high proportion of residential visual receptors are located is illustrated on the Ordnance Survey mapping on **Figure 20.15**. The search areas for the park and ride facilities are located in close proximity

to some of the larger settlements in the vicinity, including Chelmsford, Danbury, Maldon, Wickford and South Woodham Ferrers. The search areas are generally located in areas that are influenced by built development rather than the more remote areas of the Dengie Peninsula.

20.5.78 Recreational visual receptors are distributed across the potential study areas. There are no National Trails within 2km of the proposed search areas. NCR 1 passes through the north of both the Chelmsford and Maldon search areas as shown on **Figure 20.15**. The Centenary Circle regional promoted recreational route passes through the west of the Chelmsford search area and the Saffron Trail passes through the north of the Chelmsford search area and runs north to south through the centre of the South Woodham Ferrers search area. There are no further nationally or regionally promoted routes through the search areas.

20.5.79 Other recreational destinations include country parks such as Danbury Country Park, large areas of common land around Danbury, country parks and nature reserves along the western edge of South Woodham Ferrers and the Royal Horticultural Society's Hyde Hall Garden within the north of the South Woodham Ferrers search area.

20.5.80 A review of Ordnance Survey Explorer maps indicates that the distribution of PRoWs has a generally moderate density across the potential study areas, as shown on **Figure 20.15**.

Off-site associated development: freight management facilities

Landscape baseline

Immediate landscape context

20.5.81 The search area at Latchingdon wraps around the village but is predominantly located to the east and west. As shown on **Figure 20.13**, it is predominantly located on the lower lying land north of a localised ridgeline. The landscape is generally arable farmland with a rectilinear field pattern, although there are some more organic field boundaries in the eastern search area. Road access through the search areas is generally limited to the B1018, with occasional minor roads orientated broadly east-west or north-south. Settlement is generally found in the form of ribbon development along roads or isolated farms. Vegetation cover is limited, particularly in the eastern search area.

20.5.82 The search area at South Woodham Ferrers stretches from the north eastern edge of Runwell and the junction of the A130 with the A132 north eastwards to the north-west edge of South Woodham Ferrers. The A130 is dual carriageway and in cutting, whilst the A132 is single carriageway and at grade. Both are lined with vegetation. As shown on **Figure 20.13**, the search area is located above the valley of the River Crouch but straddles the valley of Fenn Creek. There is scattered settlement within the search area, predominantly located around the edges and including small villages, ribbon development along roads and isolated properties. Road access to the middle of the search area is also limited.

National character areas

20.5.83 The search areas for the freight management facilities are all located within NCA 111 as described in relation to the highway improvements. The extent of these NCAs is shown on **Figure 20.14**.

Marine character areas

20.5.84 The eastern part of the search area for a freight management facility at Latchingdon would be located within 2km of the River Blackwater. The relevant Marine Character Area is MCA 19 Essex and South Suffolk Estuaries and Coastal Waters, as described in relation to the baseline for the main development site.

County level landscape character

20.5.85 The search areas for the freight management facility lie predominantly within the South Essex Farmland (LCA E1), as described in relation to the highway improvements. The north eastern edge of the search area at Latchingdon lies within the Dengie and Foulness Coast (LCA F3), as described in relation to the main development site.

20.5.86 The Essex Landscape Character Assessment is a larger, broad-scale assessment which provides context (i.e. it 'sets the scene'). The county level assessment provides an intervening level of detail between the NCAs and the local authority assessments which refine these larger character areas into more discrete areas. However, in Rochford District where there is no District scale landscape character assessment, it may be necessary to use the Essex Landscape Character Assessment as the landscape character baseline for some parts of the study area.

Local landscape character areas

20.5.87 The South Woodham Ferrers search area lies predominantly within LCA F12 East Hanningfield Wooded Farmland, as described in relation to the highway improvements. The southern edge of the search area lies within LCA D9 Fambridge Drained Estuarine Marsh, which is also described in relation to the highway improvements. The south western part of the search area lies within LCA F11 South Hanningfield Wooded Farmland, as described in relation to the South Woodham Ferrers park and ride facility search area.

20.5.88 The Latchingdon search area is located predominantly within LCA E2 Tillingham and Latchingdon Coastal Farmland as described in relation to the main development site. The western edge of the search area extends slightly into LCA D9 Fambridge Drained Estuarine Marsh, as described in relation to the highway improvements and into LCA F12 East Hanningfield Wooded Farmland, as described in relation to the highway improvements.

Designated landscapes

20.5.89 There are no designated landscapes that will fall within the proposed study areas for the potential freight management facilities.

Visual baseline

20.5.90 Many of the factors that influence the visual baseline have been discussed in the landscape baseline description provided. For the South Woodham Ferrers search area this primarily relates to the contrast between the higher ground on which the search area is located and the lower lying river valleys and drained marshes. For the Latchingdon search area this primarily relates to the contrast between the ridge line from the south of Latchingdon to Tillingham and the low-lying topography of the Dengie Peninsula from which wide, panoramic views are available. Vegetation cover is generally limited with the exception of in the vicinity of settlements.

20.5.91 The distribution of settlements in which a high proportion of residential visual receptors are located is illustrated on the Ordnance Survey mapping on **Figure 20.15**. The South Woodham Ferrers search area is located in close proximity to larger settlements of Wickford and South Woodham Ferrers, in an area that is influenced by built development rather than the more remote areas of the Dengie Peninsula. The Dengie Peninsula is sparsely settled, but the Latchingdon search area is located between a string of small settlements at Cold Norton, Latchingdon, Mayland and Althorne.

20.5.92 Recreational visual receptors are distributed across the potential study areas. There are no National Trails or NCRs within 2km of the park and ride search areas. The Saffron Trail regional promoted long-distance walking route passes along the eastern boundary of the South Woodham Ferrers search area and St Peter's Way runs to the north of the Latchingdon search area, as shown on **Figure 20.15**. There are no further nationally or regionally promoted routes through the search areas.

20.5.93 Other recreational destinations include country parks and nature reserves along the western edge of South Woodham Ferrers and the Royal Horticultural Society's Hyde Hall Garden to the north of the South Woodham Ferrers search area.

20.5.94 A review of Ordnance Survey Explorer maps indicates that the distribution of PRoWs is generally limited across the potential study areas, as shown on **Figure 20.15**.

Future baseline

20.5.95 Landscape change is an ongoing and inevitable process and would continue across the study areas irrespective of whether the Project proceeds. Change can arise through natural processes (for example, the maturity of woodlands) and natural systems (for example, river erosion) or, as is often the case, as a result of human activity, land use, or degree of management and potential climate change.

Bradwell A power station

20.5.96 The existing Bradwell A power station (refer to **Chapter 3: The Project**) has been subject to an extensive programme of plant and equipment removal (including of the reactor systems and the demolition of most of the ancillary buildings including the turbine hall) since its closure in 2002. The reactor buildings have been clad with special weatherproofing to create 'Safe-stores' and the site entered into the 'Care and Maintenance' stage at the end of 2018. This stage is anticipated to extend until 2083.

England coast path (ECP)

20.5.97 The route of the ECP from Burnham-on-Crouch to Maldon is proposed along the eastern and northern main development site boundary and would result in the upgrade of the coastal footpath from a local PRoW to a National Trail.

20.5.98 The proposals for the route of the ECP along this stretch have been published and the report submitted to the Secretary of State for Environment, Food and Rural Affairs, but are yet to be determined. The timescale associated with the opening of this section of the ECP is unknown.

Housing and employment allocations

20.5.99 Reference to the MDC Local Development Plan indicates strategic growth within the district would be delivered through sustainable extensions to Maldon (South Maldon Garden Suburb), Heybridge (North Heybridge Garden Suburb) and Burnham-on-Crouch (north and west of the settlement). A target of 310 homes per annum is set in the local plan and timescales associated with delivery of 5,000 new dwellings in these areas is programmed up until 2028 to 2029.

20.5.100 Within the CCC Local Development Plan a target of 855 homes per annum is set, providing a minimum of 18,515 new homes in the period 2013-2036. Strategic growth across Chelmsford would be delivered through use of previously developed land in Chelmsford Urban Area; sustainable urban extensions around Chelmsford and South Woodham Ferrers; and development around Key Service Settlements outside the Green Belt.

Other future changes

20.5.101 The published profile report for NCA 81 Greater Thames Estuary reports on a number of drivers of change which may also alter the existing baseline landscape and visual within the LVIA study area and the most relevant of these drivers are listed as follows:

- Climate Change:

  i. "*Sea level rise is likely to result in significant losses of salt marsh and other habitats (including sand dunes, coastal vegetated shingle and mudflats)*

through coastal squeeze, with increased pressure on coastal defence structures;

ii. *"A substantial alteration of estuary morphology may occur due to changes in sedimentary processes, with extensive mudflats likely to become sandier, affecting composition of bird species, changes in community composition of estuarine habitats.*

iii. *Increased sedimentation and barrier breaches would result in the loss of saline lagoons. Increased saline intrusion would potentially result in a significant alteration to, and the loss of, other species and habitats, including a reduction in quality of coastal arable farmland.*

iv. *Likely impacts of climate change on grazing marsh habitat include the loss of species due to saline intrusion, drying out in summer, and unpredictable inundation due to wetter winters and more frequent storm events.*

v. *A change in the arable landscape may also occur, with the appearance of species and crops adapted to new climatic conditions and a longer growing season potentially leading to double cropping*.".

- "*Tourism and formal recreation-related uses of the Estuary, such as boating, water and jet skiing, new marinas and increasing visitor pressure, may reduce the feeling of remoteness and wilderness in some areas*.".

- *"New industrial complexes and their ancillary structures including roads, the Thames Gateway and associated developments all form growing pressures on the landscape. Such developments are particularly visible within the flat landscape of the Estuary.".*

- *"Essex Wildlife Trust carried out the largest managed coastal realignment project in Europe in 2002 at Abbots Hall Farm on the Blackwater Estuary to create 80 ha of new coastal habitat including salt marsh, grazing marsh and mudflats.".*

- *"Tree cover is limited to farmsteads and villages on higher ground, and although character was thought to have remained stable between 1999 and 2003, there was notable decline in woodland management agreements during this period.".*

20.5.102 In addition, the published profile report for NCA 111 Northern Thames Basin also includes a number of further drivers of change and the most relevant of these drivers are listed as follows:

- Climate change:

i. *"The Northern Thames Basin is among the warmest and driest parts of the UK. A number of characteristic specialist species, more typical of continental climates, survive here on the edge of their European range.*

ii. *With predictions of increased temperatures, it is projected that species will advance their range northwards therefore the range and types of species found will change over time.*

iii. *To facilitate the migration of species, better connectivity between habitats is required to prevent their extinction through loss of appropriate habitats and an inability to move to other areas.*

iv. *Agricultural land is also at risk from soil erosion and nutrient loss as the soil becomes more susceptible to wind erosion in the predicted hotter and drier periods and water erosion in the wetter, colder periods. Increasing the size and connectivity of surrounding habitats, such as grasslands, will help support new species and improve biodiversity as well as reduce the affects* [sic] *of soil erosion. Also pollinating insects will benefit from the increase in semi-natural habitats and these in turn will benefit the local agricultural landscape. Predicted longer growing seasons and earlier onsets of spring will present an opportunity for introducing growth of new drought tolerant species.".*

- "*Water availability will be a concern, with the potential loss of specific drought intolerant species, as a result of reduced soil water moisture and rising temperatures." "Pressure for continued urban expansion and regeneration including industrial development, offers opportunities to improve well-being conditions for local communities such as, improving greenspace quality and provision, but will also put pressure on water availability and habitat fragmentation. Future mitigation needs to ensure these factors are considered when developments occur*.".

- *"The affects* [sic] *of agriculture practices on water quality, abstraction and surrounding habitats and wildlife will continue to be a challenge. This can be negated through continued support from agri-environmental schemes, which will enable landowners to continue their involvement in creating a diverse and productive environment.*

- *Fragmented habitats could be improved by buffering and putting in place measures to create a network of connected habitats to allow species to disperse and become more healthy and resilient to the impacts of climate change. Gapping up of patchy hedgerows is one method that could be used and improvements in urban planting in gardens and public parks could also help support biodiversity for example, planting nectar-rich species.".*

- *"The increased pressure for infrastructure development around London is going to continue to grow and create difficulties in preserving the London green belt. Care must be taken so that important habitats, geological, archaeological features and recreational greenspace is not destroyed in the process and the character of the area adversely affected.".*

Summary

20.5.103 With the exception of the proposed ECP, the LVIA will be carried out against the current baseline. Long-term changes as a result of climate change are unpredictable and the decommissioning of the existing Bradwell power station will not be fully realised until around 2083. The introduction of additional visual receptors within the housing allocations at Maldon, Heybridge and Burnham-on-Crouch will be assessed as part of the overall visual assessment for these settlements.

Planned further surveys and studies

20.5.104 Further survey work that will be required as part of the LVIA is set out in **Table 20.9**.

Table 20.9: Planned further surveys and studies

Further Surveys and Studies for Landscape and Visual Amenity	Proposed Date
Site visit with stakeholders to agree final list of viewpoint locations.	October 2020.
Viewpoint photography (day and night-time) for the main development site. To be undertaken concurrently with LVIA observation and site surveying.	Summer 2020 (June-September). Winter 2020 – 2021 (December to March).
Detailed seascape character assessment. To be undertaken concurrently with LVIA observation and site surveying.	Winter to Summer 2021 (January to June).
Residential Visual Amenity Assessment (residential properties within 2km of the main development site).	Winter 2020 – 2021 (December to March).
Identification of and viewpoint photography (day and night-time) for off-site associated developments and off-site Power Station Facilities. To be undertaken concurrently with LVIA observation and site surveying.	Throughout 2021.

Viewpoint selection

20.5.105 Initial viewpoint (VP) selection in relation to the main development site has been informed by ZTV analysis and desk-based research on access and recreation, tourism including popular vantage points and destinations, and distribution of population. The selection is set out in **Table 20.10** and illustrated in **Figures 20.1** to

20.4. Where viewpoint locations have been agreed with relevant stakeholders, this is noted in the table. Locations for further viewpoints as requested by stakeholders are currently under discussion.

20.5.106 Additional viewpoints in relation to the off-site associated developments will be identified and agreed with relevant stakeholders once preferred sites have been identified.

20.5.107 Viewpoints will be used to inform the assessment of visual effects within the LVIA, with each viewpoint potentially representing a range of different receptors and receptor groups.

Table 20.10: Initial viewpoint selection

VP Ref	Viewpoint Location	Approximate Grid reference	Rationale
VP1	RAF Bradwell Bay War Memorial near Downhall Farm.	600259, 207596	Specific Viewpoint – representing the view experienced by visitors to the RAF Bradwell Bay War Memorial. Location agreed with stakeholders.
VP2	East End Road between East End and Bradwell-on-Sea.	600696, 207010	Representative of the views available to residents in the closest communities to the main development site – Bradwell-on-Sea and East End. Location agreed with stakeholders.
VP3	PRoW 241_2 to the rear of residential properties on northern edge of East End.	600862, 207190	Representative of the views available to residents in and around the community of East End. Location agreed with stakeholders.
VP4	East End Road east of caravan park.	601827, 207591	Representative of the views available to visitors to the Eastland Meadows Holiday Park. Location agreed with stakeholders.
VP5	PRoW 241_5 to the west of the chapel of St Peter-on-the-Wall.	602599, 207946	Representative of the views available to recreational receptors travelling between the parking area and the Chapel of St. Peter-on-the-Wall. Location agreed with stakeholders.
VP6	Chapel of St Peter-on-the-Wall.	603095, 208177	Representative of the views available to visitors (including pilgrims) to the Chapel of St Peter-on-the-Wall. Location in discussion with stakeholders.

VP Ref	Viewpoint Location	Approximate Grid reference	Rationale
VP7	PRoW 241_15 north of Othona Community.	603026, 208881	Representative of the views available to recreational receptors using the local PRoW network and proposed ECP. Location agreed with stakeholders.
VP8	Western end of Waterside Road, Bradwell Waterside.	599454, 207897	Representative of the views available to recreational and residential receptors on the northern edge of Bradwell Waterside. Location agreed with stakeholders.
VP9	PROW 241_7 to the west of Bradwell Marina.	598932, 207105	Representative of the views available to recreational receptors using the local PRoW network and proposed ECP. Location agreed with stakeholders.
VP10	PRoW 263_30 at Tollesbury Wick Marshes.	597186, 210520	Representative of the views available to recreational receptors using the local PRoW network, approved ECP and visiting Tollesbury Wick Marshes Nature Reserve to the north west of the main development site. Location in discussion with stakeholders.
VP11	PRoW 154_26 boardwalk south of Coast Road, West Mersea.	600457, 212476	Representative of the views available to residential receptors in West Mersea and recreational receptors using the local PRoW network and coastline to the north of the main development site. Location agreed with stakeholders.
VP12	Coast adjacent to beach huts, West Mersea.	602091, 212369	Representative of the views available to residential receptors in West Mersea and recreational receptors using the beach/coastline to the north of the main development site. Location agreed with stakeholders.

VP Ref	Viewpoint Location	Approximate Grid reference	Rationale
VP13	Coast adjacent to caravan park south of East Mersea.	605230, 213581	Representative of the views available to recreational receptors using the beach and coastline to the north-east of the main development site. Location agreed with stakeholders.
VP14	Coast opposite The Stone Inn, Ramsey Island.	595189, 206131	Representative of the views available to recreational receptors using the coastline and proposed ECP and residential receptors overlooking St Lawrence Bay to the west of the main development site. Location agreed with stakeholders.
VP15	Church of St Lawrence.	596716, 204367	Representative of the views available to visitors to the Church of St Lawrence to the south-west of the main development site. Location agreed with stakeholders.
VP16	St Peters Way at Tillingham.	599405, 203897	Representative of the views available to recreational receptors using the St Peters Way to the east of Tillingham to the south of the main development site. Location agreed with stakeholders.
VP17	St Peters Way south of Bradwell-on-Sea.	601060, 204744	Representative of the views available to recreational receptors using the St Peters Way to the south of the main development site. Location agreed with stakeholders.
VP18	PROW 262_36 at Tillingham Marshes.	603155, 203633	Representative of the views available to recreational receptors using the local PRoW network and proposed ECP to the south of the main development site. Location agreed with stakeholders.

VP Ref	Viewpoint Location	Approximate Grid reference	Rationale
VP19	Permissive route within Abbotts Farm Nature Reserve.	596298, 213958	Representative of the views available to recreational receptors visiting the Abbotts Farm Nature Reserve to the north-west of the main development site. Location agreed with stakeholders.
VP20	PRoW 245_7 to the east of Goldhanger.	590735, 208799	Representative of the views available to residents in and around the community of Goldhanger to the west of the main development site. Location agreed with stakeholders.
VP21	Coast adjacent to Point Clear Bay.	608776, 215311	Representative of the views available to recreational receptors visiting Point Clear Bay to the north east of the main development site. Location agreed with stakeholders.
VP22	PRoW 259_1 at Southminster.	595525, 200057	Representative of the views available to residents in and around the community of Southminster to the south-west of the main development site. Location agreed with stakeholders.
VP23	PRoW 259_23 at Shell Bank.	603311, 197591	Representative of the views available to recreational receptors using the local PRoW network and proposed ECP to the south of the main development site. Location agreed with stakeholders.
VP24	St Peters Way at Maylandsea.	591386, 202321	Representative of the views available to recreational receptors using the St Peters Way to the east of Maylandsea to the south -west of the main development site. Location agreed with stakeholders.

VP Ref	Viewpoint Location	Approximate Grid reference	Rationale
VP25	Visitors Centre at Abberton Reservoir Nature Reservoir.	596373, 217794	Representative of the views available to recreational receptors visiting the Abberton Reservoir Nature Reservoir to the north-west of the main development site. Location agreed with stakeholders.
VP26	PRoW 242_15 at Burnham-on-Crouch.	595722, 195926	Representative of the views available to residents in and around the community of Burnham-on-Crouch to the south-west of the main development site. Location agreed with stakeholders.
VP27	PRoW 296_39 at Heybridge Basin.	587242, 206816	Representative of the views available to recreational receptors using a local PRoW or approved ECP close to Heybridge Basin to the west of the main development site. Location agreed with stakeholders.
VP28	Winstree Marathon promoted route at Tiptree **OR** Alternative location on NCR1 along Grange Road	589539, 215152	Representative of the views available to recreational receptors using a local PRoW and promoted route close to the southern edge of Tiptree to the north west of the main development site. **OR** Representative of the views available to recreational receptors using a Sustrans route on higher ground to the north-west of Tiptree to the north-west of the main development site. Location to be refined.
VP29	PRoW 253_22 at Maldon.	586319, 205230	Representative of the views available to recreational receptors using a local PRoW and National Trust land (Northey Island and Site of the Battle

VP Ref	Viewpoint Location	Approximate Grid reference	Rationale
			of Maldon) and residential receptors on the southern edge of Maldon to the west of the main development site. Location agreed with stakeholders.
VP30	NCR1 close to Great Totham.	586338, 210948	Representative of the views available to recreational receptors using NCR1 to the north-west of the main development site. Location agreed with stakeholders.
VP31	Cheshunt Field/Gosbeck. Archaeological Park, Colchester.	596767, 222874	Representative of the views available to recreational receptors visiting a visitor attraction of the southern edge of Chelmsford to the north of the main development site. Location agreed with stakeholders.
VP32	Martello Tower on the coastline at Jaywick.	613598, 212695	Representative of the views available to recreational receptors visiting the coastline at Jaywick to the east of the main development site. Location agreed with stakeholders.
VP33	ECP at Potton Creek, north of Great Wakering.	595378, 189073	Representative of the views available to recreational receptors using the ECP to the south of the main development site. Location agreed with stakeholders.
VP34	NCR34 east of Elmstead Market.	608214, 224528	Representative of the views available to recreational receptors using NCR34 to the north-east of the main development site. Location agreed with stakeholders.
VP35	NCR1 north of Danbury.	580234, 207673	Representative of the views available to recreational receptors using NCR1 to the west of the main development site. Location agreed with stakeholders.

VP Ref	Viewpoint Location	Approximate Grid reference	Rationale
VP36	A137 on the southern edge of the Dedham Vale AONB.	607322, 230758	Representative of the views available to vehicular receptors using a main transport route on the southern edge of the AONB to the north-east of the main development site. Location under discussion with stakeholders.
VP37	River Blackwater off Osea Island	591960, 205577	Representative of the views available to users of recreational vessels. Exact location to be determined based on data for marine routes through maritime traffic surveys Location to be refined.
VP38	River Blackwater off Bradwell A	600244, 210125	Representative of the views available to users of recreational vessels. Exact location to be determined based on data for marine routes through maritime traffic surveys. Location to be refined.
VP39	Blackwater Estuary	606883, 211048	Representative of the views available to users of recreational vessels. Exact location to be determined based on data for marine routes through maritime traffic surveys. Location to be refined.
VP40	Offshore, south of Brightlingsea	615378, 209891	Representative of the views available to users of recreational vessels. Exact location to be determined based on data for marine routes through maritime traffic surveys. Location to be refined.

20.6 Proposed Approach to the Assessment

20.6.1 The LVIA will identify, predict, and evaluate the likely significant landscape and visual effects that may result from the Project. This assessment will address the effects of the Project.

20.6.2 The landscape (including both seascape and townscape effects as required) and visual effect (and whether it is significant) is determined by an assessment of the nature or 'sensitivity' of each receptor or group of receptors and the nature of the effect or 'magnitude of change' that would result from the Project in whole or part. The assessment of sensitivity will take account of the value and susceptibility of the receptor to the Project and the magnitude of change will also be described in terms of its scale, duration and geographical extent. The resulting level of effect will be described in terms of whether it is significant or not. The assessment will also consider the cumulative effects resulting from the development within the main development site, off-site associated development and off-site Power Station Facilities in combination and as a result of other proposed, unbuilt development at planning application stage. Unbuilt development that is already consented will form part of the future baseline for the LVIA.

20.6.3 The time period for the assessment will cover phases related to the construction of the Project, its subsequent operation and the physical implementation of the landscape mitigation strategy which will be delivered prior to and following the main elements of the construction works, as well as the removal and reinstatement phase for temporary associated development (where applicable).

20.6.4 The assessment approach is structured as follows:

- General Methodology;
- Assessment Criteria and process;
- Cumulative Landscape and Visual Assessment;
- Other specialist assessments:
  - Assessment of Landscape Elements, Residential Visual Amenity Assessment and Night-time Lighting Assessment; and
  - Production of ZTVs and Visualisations.

General methodology

20.6.5 GLVIA3 states: "*Landscape and Visual Impact Assessment is a tool used to identify and assess the significance of and the effects of change resulting from development on both the landscape as an environmental resource in its own right and people's views and visual amenity*" (Para. 1.1). Paragraphs 2.20-2.22 of the same guidance indicate that the two components (assessment of landscape effects and assessment of visual effects) are "…*related but very different considerations*…".

20.6.6 For the LVIA, the full baseline study will include the planning policy context, the scope of the assessment and the key receptors. It includes the following key activities:

- An updated desk study of relevant current national and local planning policy, in respect of landscape and visual matters, for the main development site and surrounding areas, as well as the provision of more detail for off-site associated development;
- Ongoing agreement of the study area extents with relevant landscape and visual consultees, as further detail of the proposals becomes available;
- An updated desk study of nationally and locally designated landscapes for the main development site and surrounding areas, as well as in more detail for off-site associated development;
- An updated desk study of existing landscape character assessments and capacity and sensitivity studies for the main development site and surrounding areas, as well as the provision of more detail for off-site associated development;
- A desk study of historic landscape character assessments and other information sources required to gain an understanding of the contribution of heritage assets to the present-day landscape;
- Collation and evaluation of other indicators of local landscape value such as references in landscape character studies or parish plans, tourist information, local walking and cycling guides, references in art and literature;
- The identification of valued character types, landscape elements and features which may be affected by the Project, including rare landscape types;
- Exchanging information with other consultants working on other assessment topics for the Project as required to inform the assessment e.g. ensuring consistency in identification of site features with terrestrial ecology chapter;
- Further draft ZTV studies to assist in identifying and refining potential viewpoints and indicate the potential visibility of the Project, and therefore scope of receptors likely to be affected. The methodology used in the preparation of ZTV studies is described in the following sections;
- The identification of, and agreement upon, through consultation, the scope of assessment for cumulative effects and future baseline receptors;
- The identification of, and agreement upon, through consultation, the final number and location of representative and specific viewpoints within the study areas;
- The identification of the range of other visual receptors (for example people travelling along routes, or within open access land, settlements and residential

properties, as well as recreational and other users of coastal waters) within the study area;

- Site visits to become more familiar with the site and surrounding landscape; verify documented baseline; to identify viewpoints and receptors; and to take baseline photography. Photography will be undertaken during the winter, as agreed with key consultees, to demonstrate a worst-case scenario; and

- Input to the Project design process. The design and assessment stages are necessarily iterative, with stages overlapping in parts. Details of any mitigation measures incorporated within the proposals to help reduce identified potential landscape and visual effects will be set out within the LVIA.

20.6.7 The information gathered during the baseline assessment will be drawn together and summarised in the baseline section of the LVIA, and reasoned judgements will be made as to which receptors are likely to be significantly affected, based on the baseline assessment work. Only these receptors will then be taken forward for the detailed assessment of effects.

20.6.8 Landscape (or seascape or townscape) and visual effects are assessed separately for the construction, operation and where relevant, removal and reinstatement, phases. For all phases the assessment will include further desk and site-based work, covering the following key activities:

- The preparation of a ZTV based on the finalised construction phasing or design of the main development site and proposed off-site associated developments, where relevant;

- An assessment of the sensitivity of receptors relating to the Project;

- An assessment of the magnitude and significance of effects upon the landscape character, designated and recreational landscape and the existing visual environment arising from the Project;

- An informed professional judgement as to whether each identified effect is positive, neutral or adverse;

- A clear description of the effects identified, with supporting information setting out the rationale for judgements;

- Identification of which effects are judged to be significant based on the significance thresholds set out within the landscape and visual assessment; and

- The production of visualisations from a selection of the agreed viewpoints showing the anticipated view of the Project.

20.6.9 The design and assessment stages are necessarily iterative, with stages overlapping in parts. Details of any mitigation measures incorporated within the

design to help reduce identified potential landscape (or seascape or townscape) and visual effects will be set out within the LVIA as appropriate.

20.6.10 There are a number of considerations which are relevant to the methodology. These are reviewed in the following section. These considerations are followed by the methodology in terms of assessment criteria and the process of assessment.

Landscape, seascape and townscape character considerations

20.6.11 The European Landscape Convention, 2000 (Ref. 20.33) provides the following definition:

> *"Landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors.".*

20.6.12 It notes in Article 2 that landscape includes "*natural, rural, urban and peri-urban areas. It includes land, inland water and marine areas*".

20.6.13 An Approach to Landscape Character Assessment defines landscape character as:

> *"a distinct and recognisable pattern of elements, or characteristics, in the landscape that make one landscape different from another, rather than better or worse.".*

20.6.14 The susceptibility of landscape character areas or types (as well as seascape or townscape character areas or types) to accommodate change is judged based on both the attributes of the receiving environment and the characteristics of the Project as discussed under 'susceptibility' within the following section on assessment criteria and process. Thus, the key characteristics of the landscape/seascape character areas or types are considered, along with scale, openness, topography; the absence of, or presence, nature and patterns of development, settlement, landcover, the contribution of heritage assets and historic landscape elements and patterns, and land uses in forming the character. The condition of the receiving landscape, i.e. the intactness of the existing character will also be relevant in determining susceptibility. The likelihood of material effects on the landscape (and seascape or townscape) character areas or types can be judged based on the scale and layout of the proposal and how this relates to the characteristics of the receiving landscape.

20.6.15 The introduction of any development into a landscape adds a new feature which can affect the 'sense of place' in its near vicinity, but with distance, the existing characteristics begin to reassert themselves.

20.6.16 The baseline is informed by desk study of published landscape character assessments and field survey. It is specifically noted within An Approach to Landscape Character Assessment that:

> *"Our landscapes have evolved over time and they will continue to evolve – change is a constant but outcomes vary. The management of change is*

essential to ensure that we achieve sustainable outcomes – social, environmental and economic. Decision makers need to understand the baseline and the implications of their decisions for that baseline.".

20.6.17 At page 51 it describes the function of Key Characteristics in landscape assessment, as follows:

"Key characteristics are those combinations of elements which help to give an area its distinctive sense of place. If these characteristics change, or are lost, there would be significant consequences for the current character of the landscape. Key characteristics are particularly important in the development of planning and management policies. They are important for monitoring change and can provide a useful reference point against which landscape change can be assessed. They can be used as indicators to inform thinking about whether and how the landscape is changing and whether, or not, particular policies – for example - are effective and having the desired effect on landscape character.".

20.6.18 It follows that in order to assess whether landscape (or seascape or townscape) character is significantly affected by a development, it should be determined how each of the key characteristics would be affected. The judgement of magnitude will therefore reflect the degree to which the key characteristics and elements which form those characteristics will be altered by the Project.

Landscape value - considerations

20.6.19 Paragraph 5.19 of GLVIA3 states that "*A review of existing landscape designations is usually the starting point in understanding landscape value, but the value attached to undesignated landscapes also needs to be carefully considered and individual elements of the landscape- such as trees, buildings or hedgerows -may also have value. All need to be considered where relevant*.".

20.6.20 Paragraph 5.20 of GLVIA3 indicates information which might indicate landscape value, including:

- Information about areas recognised by statute such as National Parks and AONBs.
- Information about Heritage Coasts, where relevant.
- Local planning documents for local landscape designations.
- Information on features such as Conservation Areas, listed buildings, historic or cultural sites.
- Art and literature, identifying value attached to particular areas or views.
- Material on landscapes of local or community interest, such as local green spaces, village greens or allotments.

20.6.21 An assessment of landscape value will be made based on the following factors outlined in Box 5.1 of GLVIA3: landscape quality (condition); scenic quality; rarity; representativeness; conservation interest; recreational value; perceptual aspects; and associations.

20.6.22 In addition to the list from paragraph 5.20 of GLVIA3, consideration will be given to any evidence that indicates whether the landscape or seascape or townscape) has particular value to people that would suggest that it is of greater than Community value.

Viewpoints and visual receptors - considerations

20.6.23 A wide variety of visual receptors can reasonably be anticipated to be affected by the Project. Within the baseline assessment, the ZTV study and site visits will be used to determine which visual receptors are likely to be significantly affected and therefore merit detailed assessment. In line with guidance (GLVIA3); both representative and specific viewpoints may be identified to inform the assessment. In general, the majority of viewpoints will be representative – representing the visual receptors at the distance and direction in which they are located and of the type(s) that would be present at that location. The representative viewpoints are generally selected in locations where significant effects would be anticipated; though some may be selected outside of that zone – either to demonstrate the reduction of effects with distance; or to specifically ensure the representation of a particularly sensitive receptor.

20.6.24 The types of visual receptors likely to be included with the assessment are:

- Users of walking routes or accessible landscapes including PRoW, National and Regional Trails and other long distance routes, Common Land, Open Access Land, permissive paths, land held in trust (for example, Woodland Trust, National Trust) offering free public access, and other regularly used, permitted walking routes.
- Visitors to and residents of settlements.
- Visitors to specific valued viewpoints.
- Visitors to attractions or heritage assets for which landscape and views contribute to the experience.
- Users of roads or identified scenic routes.

20.6.25 Typical examples of visual receptor sensitivity are listed in **Table 20.11**.

Table 20.11: Visual Receptor Sensitivity – Typical Examples

	High	Medium	Low
National or International.	1	4	8
Local or District.	2	5	8
Community	3	6	9
Limited		7	10

1) Visitors to valued viewpoints or routes which people might visit purely to experience the view, for example, promoted or well-known viewpoints, routes from which views that form part of the special qualities of a designated landscape can be well appreciated; key designed views; panoramic viewpoints marked on maps.
2) People in locations where they are likely to pause to appreciate the view, such as from local waypoints such as benches; or at key views to/from local landmarks. Visitors to local attractions, heritage assets or public parks where views are an important contributor to the experience, or key views into or out of Conservation Areas.
3) People in the streets around their home, or using PRoW, navigable waterways (both on and offshore) or accessible open space (public parks, open access land).
4) Users of promoted scenic rail routes.
5) Users of promoted scenic local road routes.
6) Users of cycle routes, local roads and railways.
7) Outdoor workers (including farmers and fishermen).
8) Users of A-roads which are nationally or locally promoted scenic routes.
9) Users of sports facilities such as cricket grounds and golf courses.
10) Users of Motorways and A-roads; shoppers at retail parks, people at their (indoor) places of work.

20.6.26 Visual receptors will be grouped for assessment into areas which include all of the routes, public spaces and homes within that area. Groups are selected as follows:

- based around settlements in order to describe effects on that community – for example, a settlement and routes radiating from that settlement; or
- an area of open countryside encompassing a number of routes, accessible spaces and individual dwellings; or
- an area of accessible landscape and the routes within and around it, for example a country park; and
- such that effects within a single visual receptor group are similar enough to be readily described and assessed.

20.6.27 With the exception of specific viewpoints, each route, settlement or location will encompass a range of possible views, which might vary from no view of the

development to very clear, close views. Therefore, effects are described in such a way as to identify where views towards the development elements are likely to arise and what the scale, duration and extent of those views are likely to be. In some cases, this will be further informed by a nearby viewpoint and in others it will be informed with reference to the ZTV, aerial photography and site visits. Each of these individual effects are then considered together in order to reach a judgement of the effects on the visual receptors along that route, or in that place.

20.6.28 The representative viewpoints will be used as 'samples' on which to base judgements of the scale of effects on visual receptors. The viewpoints represent multiple visual receptors, and duration and extent will be judged when assessing impacts on the visual receptors.

20.6.29 For specific viewpoints (key and sometimes promoted viewpoints within the landscape), duration and extent will be assessed, with extent reflecting the extent to which the development affects the valued qualities of the view from the specific viewpoint.

Assessment criteria and process

20.6.30 The assessment criteria include consideration of value and susceptibility in determining receptor sensitivity; and consideration of the scale, extent and duration of the effect in determining magnitude. These criteria are outlined following, including how these criteria will be applied and combined to form judgements of sensitivity, magnitude and significance.

20.6.31 The key terms used within this assessment are:

- Susceptibility and value – which contribute to sensitivity of the receptor;
- Scale, duration and extent - which contribute to the magnitude of effect; and
- Significance.

20.6.32 The precise wording and definitions of assessment criteria is currently under discussion with LVIA consultees and may be further amended to reflect these discussions.

Sensitivity

Susceptibility

20.6.33 The criteria used in the landscape and visual assessments for determining the susceptibility aspect of the sensitivity of receptors are set out in **Table 20.12.**

20.6.34 Susceptibility indicates the ability of a landscape or visual receptor to accommodate change "*without undue consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies*." (GLVIA3, para. 5.40)

Table 20.12: Susceptibility of landscape and seascape and visual receptors

Susceptibility	Description
High	Undue consequences are likely to arise from the Project.
Medium	Undue consequences may arise from the Project.
Low	Undue consequences are unlikely to arise from the Project.

20.6.35 Susceptibility of landscape and seascape character areas or types is influenced by their characteristics and is frequently considered (though often recorded as 'sensitivity' rather than susceptibility) within documented landscape and seascape character assessments and capacity studies.

20.6.36 The susceptibility of designated landscapes is influenced by the nature of the special qualities and purposes of designation and/or the valued elements, qualities or characteristics, indicating the degree to which these may be unduly affected by the proposals.

20.6.37 Susceptibility of accessible or recreational landscapes and seascapes is influenced by the nature of the landscape involved; the likely activities and expectations of people within that landscape and the degree to which those activities and expectations may be unduly affected by the development proposed.

20.6.38 Susceptibility of visual receptors is primarily a function of the expectations and occupation or activity of the receptors.

Landscape value

20.6.39 Landscape value is the relative value that is attached to different landscapes (or seascape or townscape) by society and is measured as set out in **Table 20.13**.

Table 20.13: Landscape value

Landscape Value	Description
National or International.	Designated landscapes which are nationally or internationally designated for their landscape value.
Local or District.	Locally or regionally designated landscapes; also, areas which documentary evidence and/or site observation indicates as being more valued than the surrounding area.
Community	'Everyday' landscape which is appreciated by the local community but has little or no wider recognition of its value.
Limited	Despoiled or degraded landscape with little or no evidence of being valued by the community.

20.6.40 Areas of landscape (or seascape or townscape) of greater than 'community' value may be considered to be 'valued landscapes' in the context of NPPF paragraph 170.

20.6.41 For visual receptors, susceptibility and value are closely linked – the most valued views are also likely to be those where viewer's expectations will be highest. Visual receptor value relates to the value of the view, e.g. a National Trail is nationally valued for access, not necessarily for the available views. It is therefore not possible to separate out visual receptor value from susceptibility. Typical examples of visual receptor sensitivity are listed in **Table 20.11**.

Sensitivity

20.6.42 Sensitivity will be assessed by combining the considerations of susceptibility and value. The differences in **Table 20.14** reflect a slightly greater emphasis on value in considering landscape (or seascape or townscape) receptors, and a greater emphasis on susceptibility in considering visual receptors.

Table 20.14: Assessment of sensitivity of receptors for landscape and visual assessments

Landscape and Seascape Sensitivity.				
		Susceptibility		
		High	**Medium**	**Low**
Value	**National or International.**	High	High-Medium.	Medium
	Local or District.	High-Medium.	Medium	Medium-Low.
	Community	Medium	Medium-Low.	Low
	Limited	Low	Low-Negligible	Negligible
Visual Receptor Sensitivity.				
		Susceptibility		
		High	**Medium**	**Low**
Value	**National or International.**	High	High-Medium.	Medium
	Local or District.	High-Medium.	High-Medium.	Medium
	Community	High-Medium.	Medium	Medium-Low.
	Limited	Medium	Medium-Low.	Low

Magnitude of effect

20.6.43 The magnitude of effect will be informed by combining the scale, duration and extent of an effect. The criteria for the assessment of magnitude are set out in the following sections.

Scale

20.6.44 The scale of effect will be assessed for all landscape or seascape and visual receptors and identifies the degree of change that would arise from each element of the Project as shown in **Table 20.15**. Reference to post development is intended to cover the introduction of all elements of the Project, during construction, operation and, where relevant, removal and reinstatement.

Table 20.15: Scale of effect

Scale	Description
Large	Total or major alteration to key elements, features, qualities or characteristics, such that post development the baseline will be fundamentally changed.
Medium	Partial alteration to key elements, features, qualities or characteristics, such that post development the baseline will be noticeably changed.
Small	Minor alteration to key elements, features, qualities or characteristics, such that post development the baseline will be largely unchanged despite discernible differences.
Negligible	Very minor alteration to key elements, features, qualities or characteristics, such that post development the baseline will be fundamentally unchanged with barely perceptible differences.

Duration

20.6.45 Duration of effect will be assessed for all landscape or seascape and visual receptors and will recognise the time period over which the change to the receptor as a result of the development would arise as shown in **Table 20.16**.

Table 20.16: Duration of effect

Duration	Description
Permanent	The change is expected to be permanent and there is no intention for it to be reversed or occurring for a period longer than 25 years.
Long-term.	The change is expected to be in place for 10-25 years and will be reversed, fully mitigated or no longer occurring beyond that timeframe.
Medium-term.	The change is expected to be in place for 2-10 years and will be reversed, fully mitigated or no longer occurring beyond that timeframe.
Short-term.	The change is expected to be in place for 0-2 years and will be reversed, fully mitigated or no longer occurring beyond that timeframe.

20.6.46 Most effects associated with the main development site and any off-site associated developments and off-site Power Station Facilities that will be retained beyond the construction stage of the main development site will be long-term or permanent. Where off-site associated developments are not intended to be retained and would be reinstated to current land uses after operation, there would be no permanent effects. In both circumstances, medium or short-term effects may be identified where mitigation planting is proposed or local factors will result in a reduced duration of effect (for example, where maturing woodland will screen views in future).

Extent

20.6.47 The extent of effects will be assessed for all receptors and reflects the geographic area over which the effects will be felt as shown in **Table 20.17**.

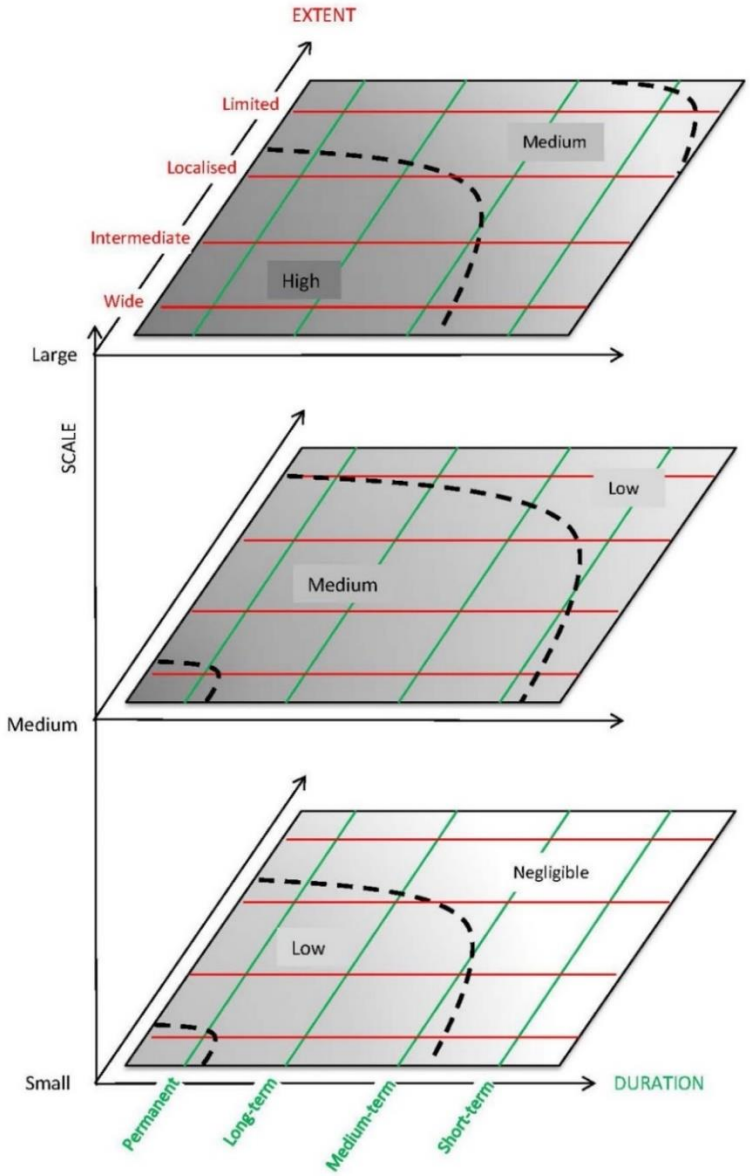
Table 20.17: Extent of effect

Extent	Description
Wide	Beyond 4km, or more than half of receptor area.
Intermediate	Up to approx. 2-4km, or around half of receptor area.
Localised	Site and surroundings up to 2km, or part of receptor area (up to approximately 25%).
Limited	Site, or part of site, or small part of a receptor area (< approximately 10%).

Magnitude

20.6.48 **Plate 20.1** illustrates the judgement process for determining the magnitude of effects.

Plate 20.1: Magnitude of effect



20.6.49 As can be seen from **Plate 20.1**, scale (shown as the layers of the diagram) is the primary factor in determining magnitude; most of each layer indicates that magnitude is typically be judged to be the same as scale, but may be higher if the effect is more widespread and longer term, or lower if it is constrained in geographic extent or timescale.

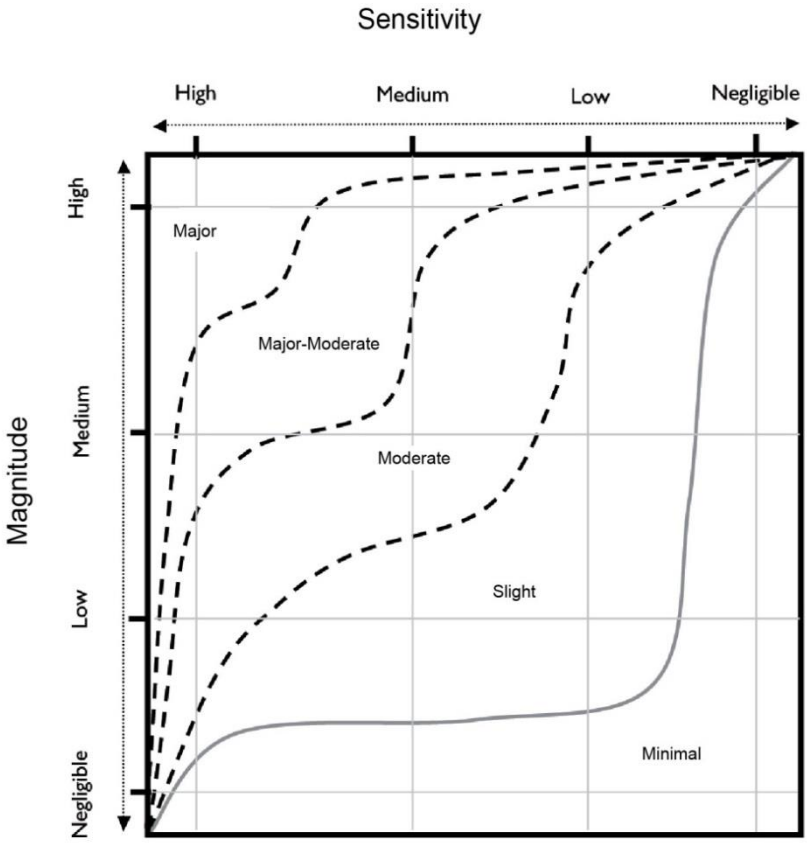
20.6.50 Where the scale of effect is judged to be negligible, the magnitude of effect is also assumed to be negligible, and no further judgement is required.

Significance of effects

20.6.51 The definitions of the significance of effect for the landscape and visual assessments are shown in **Plate 20.2.**

20.6.52 Significance indicates the importance or gravity of the effect. The process of forming a judgement as to the degree of significance of the effect is based upon the assessments of magnitude of effects and sensitivity of the receptor to come to a professional judgement of how important this effect is.

Plate 20.2: Significance



20.6.53 The significance ratings indicate a ‘sliding scale’ of the relative importance of the effect, with major being the most important and minimal being the least.

20.6.54 Following the classification of an effect, a clear statement will be made as to whether the effect is 'significant' or 'not significant'. As a general rule, major-moderate or major effects are considered to be significant and effects of moderate significance or less are *“of lesser concern”* (GLVIA3, para 3.35) and not significant. However, professional judgement will also be applied, where appropriate. It should also be noted that whilst an effect may be significant, that does not necessarily mean that such an impact would be unacceptable or should necessarily be regarded as an *“undue consequence”* (GLVIA3, para 5.40).

20.6.55 Where intermediate ratings are given, for example, “moderate-slight”, this indicates an effect that is both less than moderate and more than slight, rather than one which varies across the range. In such cases, the higher rating will always be given first.

This does not mean that the impact is closer to that higher rating, but it is done to facilitate the identification of the more significant or worst-case effects.

Cumulative LVIA

20.6.56 The approach taken in the EIA to cumulative effects is set out in **Chapter 5: The EIA Process and Methods**. Specific issues relevant to the consideration of LVIA and cumulative effects are set out in the following paragraphs.

In-combination effects

20.6.57 Potential effects from inter-relationships, as understood at this stage, are likely to require consideration of:

- effects of noise, light fugitive dust and vibration on landscape character, and visual receptors;
- effects on heritage assets resulting from changes to views and landscape character; and
- effects on biodiversity resulting from the retention or loss of vegetation and proposals for mitigation as part of the operation phase or construction phase landscape strategy.

Cumulative effects

20.6.58 Cumulative effects will be assessed on the same groups of landscape, seascape and visual receptors as the assessment of the main development site, the off-site associated development sites and the off-site Power Station Facilities. Landscape and visual receptors that are considered to receive effects of low-negligible or negligible magnitude (both localised and overall) from the Project will not be included in the assessment, as an effect of such low magnitude manifestly adds nothing or very little regardless of the effects of other proposals. If significant cumulative effects were to arise on those receptors, they would be as a result of other developments and as such are not relevant for consideration as part of this assessment.

20.6.59 Where potential cumulative schemes are located within existing built-up areas, replace existing similar development or would be separated from the elements of the Project by intervening landform, built form or vegetation, these will not be considered as part of the assessment of cumulative effects.

Cumulative study area

20.6.60 The Cumulative LVIA will follow the process set out in **Chapter 5** and will utilise a study area of 25km from the boundary of each element of the Project for major infrastructure projects (i.e. those going through the DCO process), 5km from the boundary of the Project for major developments (i.e. those requiring EIA) and 1km from the boundary of the Project for smaller scale development. These distances

are derived from the overall study area for the main development site, the extent of likely significant effects for the main development site and the maximum extent of likely significant effects for the off-site associated development sites. Sites within the Cumulative Study Area which are considered likely to contribute to a significant cumulative effect in 'addition' or in 'combination' with the Project will be included in the assessment. Beyond this, any other development in combination with the Project would be unlikely to give rise to any significant effects on landscape or visual receptors due to the distance reducing the perceived scale and massing of the proposed built elements and associated operational elements.

Other specialist assessments

20.6.61 Other specialist assessments are likely to be required as part of the LVIA and an outline of these assessments is provided in this section as follows:

- Residential Visual Amenity Assessment (only required where the Project could affect living conditions or residential amenity); and
- Night-time Assessment (only required where the Project includes lighting).

Residential visual amenity assessment (RVAA)

20.6.62 Residential amenity is a planning matter that involves consideration of a wide number of effects (such as noise and dust) and benefits, of which residential visual amenity is just one component. Residential visual amenity relates to private viewpoints, mainly from residential properties and are frequently dealt with mainly through 'residential visual amenity assessments' which are separate to landscape and visual assessment. The RVAA will be limited to the consideration of visual effects on residential amenity and the methodology accords with the advice in GLVIA 3 and the Landscape Institute's *Residential Visual Amenity Assessment: Technical Guidance Note*.

20.6.63 The Landscape Institute's Technical Guidance Note 02/19 identifies a Residential Visual Amenity Threshold where visual effects would be *"of such nature and / or magnitude that it potentially affects 'living conditions' or Residential Amenity"*. The guidance note further indicates that *"It is not uncommon for significant adverse effects on views and visual amenity to be experienced by people at their place of residence as a result of introducing a new development into the landscape. In itself this does not necessarily cause particular planning concern. However, there are situations where the effect on the outlook / visual amenity of a residential property is so great that it is not generally considered to be in the public interest to permit such conditions to occur where they did not exist before."*

20.6.64 GLVIA3 confirms at paragraph 6.17 that the assessment of effects on residential property is *"separate from LVIA"* and subject to *"specific requirements"*.

20.6.65 For this reason, the effects on the closest residential properties are assessed separately to the viewpoints, specifically in order to identify whether the effects would result in unacceptable harm to residential amenity. The assessment of effects

on residential properties is limited to where, in theory, due to their close proximity, large proportions of their views could potentially be occupied by the Project. Residential properties within 2km of the site boundary for the main development site will be considered (see **Figure 20.3**).

20.6.66 Residential properties within the proposed 2km study area will be identified through fieldwork. For those properties in close proximity to the site where visibility is indicated by the ZTV study (**Figure 20.4**) a site visit will be undertaken and the properties assessed from the nearest publicly accessible location. Distance and direction will be given from the nearest part of the development to the nearest wall of the house and will be accurate to the nearest 10m.

20.6.67 Each property identified as requiring further assessment will be assessed through site reconnaissance and via a review of aerial photography, so that the orientation of windows and gardens towards the development element and the degree of screening from intervening buildings and vegetation can be taken into account, along with the extent and nature of fenestration, in forming a judgement as to whether the visual amenity will be affected to the degree that the Residential Amenity Threshold will be surpassed.

20.6.68 Visualisations will be prepared where they are judged to be required to aid the assessment, at locations to be agreed with LVIA consultees once residential properties for assessment have been shortlisted.

20.6.69 Within the assessment, the following terms will be utilised:

- Partial - for windows this indicates views seen between or over obstructions such that the view is partially screened. Within gardens this indicates where development will be visible from some parts of the properties' gardens, but not others.
- Direct views - views which would be seen looking directly out of the window.
- Oblique views - indicates views seen to one side, but still likely to be visible.
- Very oblique views - indicates it would be necessary to open the window and look out or stand unnaturally close to the window are not recorded as visible.
- The arc of view will be given (to the nearest degree) as the theoretical maximum arc of view which might be occupied by the Project with the full arc of the development seen and no local screening.

20.6.70 The assessment will allow for the seasonal changes of vegetation and will be based the ‘worst case’ when deciduous trees are not in leaf.

20.6.71 Other factors affecting residential amenity such as noise and shadow flicker will not be considered as part of this assessment and will be dealt with elsewhere in the ES, including in the assessment of in-combination effects.

Night-time assessment

20.6.72 Night-time assessment of lighting on landscape and visual receptors is an emerging area, and there is no specific guidance on which to base the assessment.

20.6.73 The approach and methodology of this assessment will follow the same structured approach as the main LVIA. The only difference is that it will be conducted during periods of dawn to dusk and it will assess the baseline night-time environment against artificial lighting proposed for the Project. Importantly, the night-time assessment will not be a technical lighting impact assessment based on quantitative measurement of light levels, rather the assessment will rely on professional judgement of what the human eye can reasonably perceive.

20.6.74 The assessment terminology will also follow that presented in the main LVIA methodology, with the exception of the approach to assessing and describing the sensitivity of receptors as follows.

Sensitivity of landscape character at night

20.6.75 For Landscape Character Types (LCTs), susceptibility will be judged based on the degree to which the character of the landscape is characterised by darkness, informed by satellite mapping of light distribution and site observations. Value will be judged as presented within the assessment of effects during the day, unless specific factors suggest otherwise, for example the identification of a Dark Sky Discovery Site which would increase value; or where factors that contribute to value in the daytime are irrelevant at night (which may reduce value at night).

Sensitivity of visual receptors at night

20.6.76 For visual receptors the assessment will take account of the importance attached to views at night. Generally, the value attached to night-time views is considered to be low, unless there is a particular feature that can be best, or only, appreciated in the hours of darkness. This may include views of stars and the night sky that are only, or best available in particularly dark areas, or views to well-known landmarks that are illuminated at night.

20.6.77 The susceptibility of visual receptors also differs at night, reflecting the different activities people undertake in the hours of darkness. For example, drivers using roads at night tend to be more focused on the road and the area illuminated by their headlights and roadside lighting than during the day and may have their attention drawn by oncoming headlights, road markings/cat's eyes, or signage, resulting in lower susceptibility. By contrast, people taking part in activities requiring darkness, such as star gazing, would be of higher susceptibility.

20.6.78 The sensitivity of visual receptors at night will be assessed using the following criteria, based on the considerations of value and susceptibility outlined previously:

- National value and high susceptibility – visitors to Dark Sky Parks or Dark Sky Reserves as recognised by the International Dark Sky Association.

- Local value and high susceptibility – visitors to Dark Sky Discovery Sites, public observatories or places often visited by Astronomical Societies and Groups.
- Community value and high susceptibility – people engaged in night-time activity such as bat watching, residents of notably dark areas (i.e. rural locations with no street lighting) in the streets around their homes and footpaths where dark skies are integral to the amenity.
- National (or Local) value and medium susceptibility – visitors to nationally important or well-known local landmarks that are illuminated at night.
- Community value and medium susceptibility – residents in urban areas or semi-urban/rural areas, users of cycle routes and footpaths where street lighting/illumination is characteristic.
- Community value and low susceptibility – drivers using local unlit roads, sailors or fishermen and train passengers.
- Limited value and low susceptibility – users of A roads, illuminated minor roads and people at their place of work.

Scope

20.6.79 The extent of the study area for the assessment of night-time effects will replicate that used for the assessment of daytime effects for the main development site, the off-site associated development sites and the off-site Power Station Facilities. The assessment will consider the impact of lighting on landscape character, visual receptors and landscape designations.

20.6.80 A selection of viewpoints will be used to aid the assessment of night-time effects. This will be selected from viewpoints agreed for the main LVIA but will only locations that are used or accessible at night will be utilised e.g. unlit public footpaths in remote areas will not be used as night-time assessment locations.

Production of ZTVs and visualisations

20.6.81 The ZTVs are used to inform the field study assessment work, providing additional detail and accuracy to observations made on site. Photomontages will also be produced in order to assist readers of the assessment in visualising the proposals but are not used in reaching judgements of effect. The preparation of the ZTVs (and visualisations) will be informed by the Landscape Institute's Technical Guidance Note 06/19 'Visual Representation of Development Proposals' (September 2019) and Scottish Natural Heritage 'Visual Representation of Wind Farms Best Practice Guidance' (both the 2006 and 2017 (Ref. 20.34 and 20.35) editions).

20.6.82 The following points should be borne in mind in respect of the ZTV study:

- Areas shown as having potential visibility may have visibility of the development obscured by local features such as trees, hedgerows, embankments or buildings.

20.6.83 In addition to the main visualisations, illustrative views are used as appropriate to illustrate particular points made within the assessment. These are not prepared to the same standard as they simply depict existing views, character or features rather than forming the basis for visualisations.

Methodology for production of ZTVs

20.6.84 ZTV studies are prepared using the ESRI ArcGIS Viewshed routine. This creates a raster image that indicates the visibility (or not) of the points modelled. The ZTV study that is designed to include visual barriers from settlements and woodlands. If notable deviations from these assumed heights are noted during site visits, for example young or felled areas of woodland, or recent changes to built form, the features concerned will be adjusted within the model or the adoption of a digital surface model will be used to obtain actual heights for these barriers.

20.6.85 Details of the data used in the ZTV will be presented on each of the ZTV drawings.

20.6.86 The model is also designed to take into account both the curvature of the earth and light refraction, informed by the Scottish Natural Heritage guidance. All ZTV studies are undertaken with observer heights of 2m.

20.6.87 The ZTV analysis begins at 1m from the observation feature and will work outwards in a grid of the set resolution until it reaches the end of the terrain map for the site, which will vary in relation to the different study areas for the main development site, off-site associated development and off-site Power Station Facilities.

20.6.88 All large scale ZTVs will have a base and overlay of the 1:50,000 Ordnance Survey Raster mapping or better. The ZTV will be reproduced at a suitable scale on an A1 or A3 template to encompass the study area(s).

Ground model accuracy

20.6.89 Depending on the project element and level of detail required, different height datasets may be used. **Table 20.18** lists the different data products and their specifications:

Table 20.18: Data products and their specifications

Product	Distance Between Points	Vertical RMSE Error
LiDAR	50cm – 2m	up to +/- 5cm.
Photogrammetrically Derived Heights.	2m – 5m	up to +/- 1.5m.
Ordnance Survey 'OS terrain 5'.	5m	up to +/- 2.5m.
NextMap25 DTM.	25m	+/- 2.06m.
Ordnance Survey 'OS terrain 50'.	50m	+/- 4m.

20.6.90 Site-specific topographical survey data may also be used where available.

20.6.91 Cumulative ZTV plots based on the intervisibility of the Project and other relevant consented and application developments within the 25km radius LVIA Study Area will also be produced where necessary.

Methodology for production of visualisations

20.6.92 Verified or verifiable photomontages are produced in seven stages. Photowires are produced using the same overall approach, but only require some of the steps outlined below.

- Photography is undertaken using a full frame digital SLR camera and 50mm lens. A tripod is used to take overlapping photographs which are joined together using an industry standard application to create a single panoramic image for each viewpoint. These are then saved at a fixed height and resolution to enable correct sizing when reproduced in the final images. The photographer also notes the GPS location of the viewpoint and takes bearings to visible landmarks whilst at the viewpoint.

- Creation of a ground model and 3D mesh to illustrate that model. This is created using Light Detection and Ranging (LiDAR) point data (or occasionally other terrain datasets where required, such as site-specific topographical data or Photogrammetrically Derived Heights) and ground modelling software.

- The addition of the Project to the 3D model. The main components of the Project are accurately modelled in CAD and are then inserted into the 3D model at the proposed locations and elevations.

- Wireline generation – The viewpoint locations are added within the 3D CAD model with each observer point being inserted at 1.5m above the modelled ground plane. The location of the landmarks identified by the photographer may also be included in the model. The view from the viewpoint is then replicated using virtual cameras to create a series of single frame images, which also

include bearing markers. As with the photographs, these single frame images are joined together using an industry standard application to create a single panoramic image for each viewpoint. These are then saved at a fixed height and resolution to ensure that they are the same size as the photographs.

- Wireline matching – The photographs are matched to the wirelines using a combination of the visible topography, bearing markers and the landmarks that have been included in the 3D model.
- For the photomontage, an industry standard 3D rendering application is used to produce a rendered 3D view of the Project from the viewpoint. The rendering will use materials to match the intended surface finishes of the development and lighting conditions according to the date and time of the viewpoint photograph.
- The rendered development is then added to the photograph in the position identified by the wireline (using an image processing application) to ensure accuracy. The images are then layered to ensure that the development appears in front of and behind the correct elements visible within the photograph. Where vegetation is proposed as part of the development, this is then added to the final photomontage.

20.6.93 In accordance with the guidance provided in Landscape Institute Technical Guidance Note 06/19, visualisations will be prepared to the technical methodology set out in **Table 20.19**. The photowires and photomontages prepared in support of the LVIA will adhere to the Type 4 visualisation specification in all respects except surveyed locational accuracy, which is not generally necessary due to the large number of viewpoints anticipated and the locational accuracy that can be achieved with the use of aerial photography to plot viewpoint locations.

Table 20.19: Technical methodology

Information	Technical Response
Photography	
Method used to establish the camera location.	Aerial photography in ESRI ArcGIS along with GPS reading taken on site.
Likely level of accuracy of location.	Better than 1m.
If lenses other than 50mm have been used, explain why a different lens is appropriate.	N/A
Written description of procedures for image capture and processing.	See paragraph 20.6.90.
Make and type of Panoramic head and equipment used to level head.	Manfrotto Levelling Head 338 and Manfrotto Panoramic Head MH057A5.

Information	Technical Response
If working outside the UK, geographic co-ordinate system (GCS) used.	N/A
3D Model/Visualisation.	
Source of topographic height data and its resolution.	TBC
How have the model and the camera locations been placed in the software?	Georeferenced model supplied by engineers/architects. Camera locations taken from photography viewpoint locations.
Elements in the view used as target points to check the horizontal alignment.	Existing buildings, infrastructure/road alignments, telegraph poles/street lighting/signage, field boundaries, DSM.
Elements in the view used as target points to check the vertical alignment.	Topography, existing buildings.
3D Modelling / Rendering Software.	Civil 3D / AutoCAD / 3DS Max / Rhino / V-Ray.

20.7 Scope of the Assessment

Potential receptors

20.7.1 The principal landscape and visual receptors that have been identified as being subject to potential effects are summarised in **Table 20.20**.

Table 20.20: Receptors subject to potential effects

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Landscape receptors			
Main development site.	Construction and operation.	Landscape elements within the site boundaries.	Likely to be subject to high magnitudes of change. Sensitivity of landscape elements will need to be determined as part of the LVIA.
Main development site.	Construction and operation.	Maldon LCAs entirely or partly located within 10km of the main development site that are at least partly within the preliminary and subsequently refined ZTVs.	Further assessment work required as part of the LVIA to determine sensitivity of the LCAs.
Main development site.	Construction and operation.	Colchester LCAs entirely or partly located within 10km of the main development site that are at least partly within the preliminary and subsequently refined ZTVs.	Further assessment work required as part of the LVIA to determine sensitivity of the LCAs.
Main development site.	Construction and operation.	MCAs (and any localised sub-areas i.e. SCAs) once they have been defined) entirely or partly located within 10km of the main development site and that are at	Further assessment work required as part of the LVIA to determine sensitivity of the MCAs and SCAs.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
		least partly within the preliminary and subsequently refined ZTVs.	
Off-site Power Station Facilities.	Construction and operation.	Landscape elements within the site boundaries.	Likely to be subject to high magnitudes of change. Sensitivity of landscape elements will need to be determined as part of the LVIA.
Off-site Power Station Facilities.	Construction and operation.	Maldon LCAs entirely or partly located within 2km of the off-site Power Station Facilities that are at least partly within the preliminary and subsequently refined ZTVs.	Further assessment work required as part of the LVIA to determine sensitivity of the LCAs.
Off-site Power Station Facilities.	Construction and operation.	Colchester LCAs entirely or partly located within 2km of the off-site Power Station Facilities that are at least partly within the preliminary and subsequently refined ZTVs.	Further assessment work required as part of the LVIA to determine sensitivity of the LCAs.
Off-site Power Station Facilities.	Construction and operation.	MCAs (and any localised sub-areas i.e. SCAs) once they have been defined) entirely or partly located within 2km of the off-site Power Station Facilities and that are at least partly within the preliminary and subsequently refined ZTVs.	Further assessment work required as part of the LVIA to determine sensitivity of the MCAs and SCAs.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Off-site associated development.	Construction, operation and removal and reinstatement (where relevant).	Landscape elements within the site boundaries.	Likely to be subject to high magnitudes of change. Sensitivity of landscape elements will need to be determined as part of the LVIA.
Off-site associated development.	Construction, operation and removal and reinstatement (where relevant).	Maldon LCAs entirely or partly located within 2km (or 5km of the project-provided accommodation if it is remote from the main development site) of the off-site associated developments that are at least partly within the preliminary and subsequently refined ZTVs.	Further assessment work required as part of the LVIA to determine sensitivity of the LCAs.
Off-site associated development.	Construction, operation and removal and reinstatement (where relevant).	Colchester LCAs entirely or partly located within 2km (or 5km of the project-provided accommodation if it is remote from the main development site) of the off-site associated developments that are at least partly within the preliminary and subsequently refined ZTVs.	Further assessment work required as part of the LVIA to determine sensitivity of the LCAs.
Off-site associated development.	Construction, operation and removal and reinstatement (where relevant).	MCAs (and any localised sub-areas i.e. SCAs) once they have been defined) entirely or partly located within 2km (or 5km of the project-provided accommodation if it is remote from the

Element of the Project	Phase	Potential Receptor	Reason for Consideration
		main development site) of the off-site associated developments and that are at least partly within the preliminary and subsequently refined ZTVs.	
Visual receptors			
Main development site.	Construction and operation.	People in their communities: all main settlements within 25km and which lie within the preliminary and subsequently refined ZTVs.	Visual receptors assessed as being of high sensitivity to visual change.
Main development site.	Construction and operation.	People in their communities: all settlements and hamlets within 10km and which lie within the preliminary and subsequently refined ZTVs.	Visual receptors assessed as being of high sensitivity to visual change.
Main development site.	Construction and operation.	People in isolated properties within 2km of the site boundary and which lie within the preliminary and subsequently refined ZTVs.	Visual receptors assessed as being of high sensitivity to visual change.
Main development site.	Construction and operation.	Recreational receptors using NCRs within 25km and which lie within the preliminary ZTV.	Recreational visual receptors assessed as being of high sensitivity to visual change.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Main development site.	Construction and operation.	Recreational receptors using regionally promoted walking trails, RCRs, local PRoWs and open access land within 10km and which lie within the preliminary ZTV.	Recreational visual receptors assessed as being of high sensitivity to visual change.
Main development site.	Construction and operation.	Recreational receptors at visitor and tourist attractions within 25km and which lie within the preliminary and subsequently refined ZTVs including Country Parks, Registered Parks and Gardens open to the public, visitor centres.	Recreational visual receptors assessed as being of high or medium sensitivity to visual change.
Main development site.	Construction and operation.	Recreational receptors at recreational sites within 10km and which lie within the preliminary and subsequently refined ZTVs including sections of beach and coastline, nature reserves where public access is permitted, recreational vessels using the River Blackwater and Blackwater Estuary.	Outdoor recreational visual receptors assessed as being of high or medium sensitivity to visual change.
Main development site.	Construction and operation.	Vehicular receptors using all A classified roads within 25km and which lie within the	Large number of visual receptors and the potential for sequential visual effects.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
		preliminary and subsequently refined ZTVs.	
Main development site.	Construction and operation.	Vehicular receptors using all B and C classified roads within 10km and which lie within the preliminary and subsequently refined ZTVs.	Large number of visual receptors and the potential for sequential visual effects.
Off-site Power Station Facilities.	Construction and operation.	People in their communities: all settlements and hamlets within 2km and which lie within the preliminary and subsequently refined ZTVs.	Visual receptors assessed as being of high sensitivity to visual change.
Off-site Power Station Facilities.	Construction and operation.	Recreational receptors using NCRs, regionally promoted walking trails, RCRs, local PRoWs and open access land within 2km and which lie within the preliminary ZTV.	Recreational visual receptors assessed as being of high sensitivity to visual change.
Off-site Power Station Facilities.	Construction and operation.	Recreational receptors at visitor and tourist attractions within 2km and which lie within the preliminary and subsequently refined ZTVs including Country Parks, Registered Parks and Gardens open to the public, visitor centres, sections of beach and coastline, nature reserves	Recreational visual receptors assessed as being of high or medium sensitivity to visual change.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
		where public access is permitted, recreational vessels using the River Blackwater and Blackwater Estuary.	
Off-site Power Station Facilities.	Construction and operation.	Vehicular receptors using all A, B and C classified roads within 2km (or 5km of the project-provided accommodation if it is remote from the main development site) and which lie within the preliminary and subsequently refined ZTVs.	Large number of visual receptors and the potential for sequential visual effects.
Off-site associated development.	Construction, operation and removal and reinstatement (where relevant).	People in their communities: all settlements and hamlets within 2km (or 5km of the project-provided accommodation if it is remote from the main development site) and which lie within the preliminary and subsequently refined ZTVs.	Visual receptors assessed as being of high sensitivity to visual change.
Off-site associated development.	Construction, operation and removal and reinstatement (where relevant).	Recreational receptors using NCRs, regionally promoted walking trails, RCRs, local PRoWs and open access land within 2km (or 5km of the project-provided accommodation if it is remote from the main development site) and which lie within the preliminary ZTV.	Recreational visual receptors assessed as being of high sensitivity to visual change.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Off-site associated development.	Construction, operation and removal and reinstatement (where relevant).	Recreational receptors at visitor and tourist attractions within 2km (or 5km of the project-provided accommodation if it is remote from the main development site) and which lie within the preliminary and subsequently refined ZTVs including Country Parks, Registered Parks and Gardens open to the public, visitor centres, sections of beach and coastline, nature reserves where public access is permitted, recreational vessels using the River Blackwater and Blackwater Estuary.	Recreational visual receptors assessed as being of high or medium sensitivity to visual change.
Off-site associated development.	Construction, operation and removal and reinstatement (where relevant).	Vehicular receptors using all A, B and C classified roads within 2km (or 5km of the project-provided accommodation if it is remote from the main development site) and which lie within the preliminary and subsequently refined ZTVs.	Large number of visual receptors and the potential for sequential visual effects.

Likely Significant Effects

20.7.2 The effects on landscape and visual amenity which have the potential to be significant and that will be taken forward for assessment in the EIA are summarised in **Tables 20.21** (construction) and **20.22** (operation).

Table 20.21: Likely significant landscape and visual amenity construction effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site.	Land preparation (site clearance, earthworks).	Removal of a high proportion of the landscape elements present under the baseline conditions.	Landscape elements within the main development site boundary.
Main development site.	Construction activity including the presence of large-scale cranes.	Changes to key landscape characteristics and landscape character as a result of construction activity (direct effects).	Host NCA (81 Greater Thames Estuary).
			Host LCAs D7, C2 and E2.
			Host MCA (MCA 19) and any locally defined SCA(s)
Main development site.	Construction activity including the presence of large-scale cranes.	Changes to key landscape characteristics and landscape character as a result of construction activity (indirect effects).	LCAs that are within 10km of the main development site and locally defined SCAs that are at least partly within the preliminary and subsequently refined ZTVs.
Main development site.	Construction activity including the presence of large-scale cranes.	Changes to existing views and residential visual amenity.	People at their place of residence within 2km of the main development site and which lie within the preliminary and subsequently refined ZTVs.

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site.	Construction activity including the presence of large-scale cranes.	Changes to existing views and visual amenity	People in their community (i.e. settlements) and which lie within the preliminary and subsequently refined ZTVs.
Main development site.	Construction activity including the presence of large-scale cranes.	Changes to existing views and visual amenity.	People engaged in outdoor recreation, including tourists and visitors using recreational routes or visiting recreational locations which lie within the preliminary and subsequently refined ZTVs.
Main development site.	Construction activity including the presence of large-scale cranes.	Changes to existing views and visual amenity.	People using sections of the transport network which lie within the preliminary ZTV and subsequently refined ZTVs.
Off-site Power Station Facilities.	Land preparation (site clearance, earthworks).	Removal of some of the landscape elements present under the baseline conditions.	Landscape elements within the off-site Power Station Facilities site boundary.
Off-site Power Station Facilities.	Construction activity including the potential presence of cranes.	Changes to key landscape characteristics and landscape character as a result of construction activity (direct effects).	Host NCAs (81 Greater Thames Estuary or 111 Northern Thames Basin).
			Host LCAs (to be identified when preferred option is identified).

Element of the Project	Activity	Effect	Receptor or Receptor Group
			Host MCA (MCA 19) and any locally defined SCA(s).
Off-site Power Station Facilities.	Construction activity including the potential presence of cranes.	Changes to key landscape characteristics and landscape character as a result of construction activity (indirect effects).	LCAs that are within 2km of the off-site Power Station Facilities and locally defined SCAs that are at least partly within the preliminary and subsequently refined ZTVs.
Off-site Power Station Facilities.	Construction activity including the potential presence of cranes.	Changes to existing views and visual amenity	People in their community (i.e. settlements) and which lie within the preliminary and subsequently refined ZTVs.
Off-site Power Station Facilities.	Construction activity including the potential presence of cranes.	Changes to existing views and visual amenity.	People engaged in outdoor recreation, including tourists and visitors using recreational routes or visiting recreational locations which lie within the preliminary and subsequently refined ZTVs.
Off-site Power Station Facilities.	Construction activity including the potential presence of cranes.	Changes to existing views and visual amenity.	People using sections of the transport network which lie within the preliminary ZTV and subsequently refined ZTVs.

Element of the Project	Activity	Effect	Receptor or Receptor Group
Off-site associated development.	Land preparation (site clearance, earthworks).	Removal of some of the landscape elements present under the baseline conditions.	Landscape elements within the off-site associated development site boundaries.
Off-site associated development.	Construction activity including the potential presence of cranes.	Changes to key landscape characteristics and landscape character as a result of construction activity (direct effects).	Host NCAs (81 Greater Thames Estuary and 111 Northern Thames Basin).
			Host LCAs (to be identified for each off-site associated development when preferred options are identified).
			Host MCA (MCA 19) and any locally defined SCA(s).
Off-site associated development.	Construction activity including the potential presence of cranes.	Changes to key landscape characteristics and landscape character as a result of construction activity (indirect effects).	LCAs that are within 2km of the off-site associated developments (or 5km if the project-provided accommodation is remote from the main development site) and locally defined SCAs that are at least partly within the preliminary and subsequently refined ZTVs.
Off-site associated development.	Construction activity including the potential presence of cranes.	Changes to existing views and visual amenity	People in their community (i.e. settlements) and which lie within the preliminary and subsequently refined ZTVs.

Element of the Project	Activity	Effect	Receptor or Receptor Group
Off-site associated development.	Construction activity including the potential presence of cranes.	Changes to existing views and visual amenity.	People engaged in outdoor recreation, including tourists and visitors using recreational routes or visiting recreational locations which lie within the preliminary and subsequently refined ZTVs.
Off-site associated development.	Construction activity including the potential presence of cranes.	Changes to existing views and visual amenity.	People using sections of the transport network which lie within the preliminary ZTV and subsequently refined ZTVs.

Table 20.22: Likely significant landscape and visual amenity operation effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site.	Implementation of the landscape strategy.	A new framework of landscape elements such as recontoured land, hedgerows and trees would be introduced throughout the main development site.	Landscape elements within the main development site.
Main development site.	Operation of the Bradwell B power station.	Changes to key landscape characteristics and landscape character as a result of the operational development (direct effects).	Host NCA (81 Greater Thames Estuary).
			Host LCAs D7, C2 and E2.

Element of the Project	Activity	Effect	Receptor or Receptor Group
			Host MCA (MCA 19) and any locally defined SCA(s).
Main development site.	Operation of the Bradwell B power station.	Changes to key landscape characteristics and landscape character as a result of the operational development (indirect effects).	LCAs that are within 10km of the main development site and locally defined SCAs that are at least partly within the preliminary and subsequently refined ZTVs.
Main development site.	Operation of the Bradwell B power station.	Changes to existing views and residential visual amenity.	People at their place of residence within 2km of the main development site boundary and which lie within the preliminary and subsequently refined ZTVs.
Main development site.	Operation of the Bradwell B power station.	Changes to existing views and visual amenity.	People in their community (i.e. settlements) and which lie within the preliminary and subsequently refined ZTVs.
Main development site.	Operation of the Bradwell B power station.	Changes to existing views and visual amenity.	People engaged in outdoor recreation, including tourists and visitors using recreational routes or visiting recreational locations which lie within the preliminary and subsequently refined ZTVs.
Main development site.	Operation of the Bradwell B power station.	Changes to existing views and visual amenity.	People using section of the transport network which lie within the preliminary ZTV and subsequently refined ZTVs.

Element of the Project	Activity	Effect	Receptor or Receptor Group
Off-site Power Station Facilities.	Operation of the off-site Power Station Facilities.	A retained or enhanced framework of landscape elements such as recontoured land, hedgerows and trees would be introduced throughout the off-site Power Station Facilities.	Landscape elements within the off-site Power Station Facilities site boundary.
Off-site Power Station Facilities.	Operation of the off-site Power Station Facilities.	Changes to key landscape characteristics and landscape character as a result of the operational development (direct effects).	Host NCAs (81 Greater Thames Estuary and 111 Northern Thames Basin).
			Host LCAs (to be identified when preferred options are identified).
			Host MCA (MCA 19) and any locally defined SCA(s).
Off-site Power Station Facilities.	Operation of the off-site Power Station Facilities.	Changes to key landscape characteristics and landscape character as a result of the operational development (indirect effects).	LCAs that are within 2km of the off-site Power Station Facilities and locally defined SCAs that are at least partly within the preliminary and subsequently refined ZTVs.
Off-site Power Station Facilities.	Operation of the off-site Power Station Facilities.	Changes to existing views and visual amenity	People in their community (i.e. settlements) and which lie within the preliminary and subsequently refined ZTVs.

Element of the Project	Activity	Effect	Receptor or Receptor Group
Off-site Power Station Facilities.	Operation of the off-site Power Station Facilities.	Changes to existing views and visual amenity.	People engaged in outdoor recreation, including tourists and visitors using recreational routes or visiting recreational locations which lie within the preliminary and subsequently refined ZTVs.
Off-site Power Station Facilities.	Operation of the off-site Power Station Facilities.	Changes to existing views and visual amenity.	People using sections of the transport network which lie within the preliminary ZTV and subsequently refined ZTVs.
Off-site associated development.	Operation of the off-site associated development.	A retained or enhanced framework of landscape elements such as recontoured land, hedgerows and trees would be introduced throughout the off-site associated developments.	Landscape elements within the off-site associated development site boundaries.
Off-site associated development.	Operation of the off-site associated development.	Changes to key landscape characteristics and landscape character as a result of the operational development (direct effects).	Host NCAs (81 Greater Thames Estuary and 111 Northern Thames Basin).
			Host LCAs (to be identified for each off-site associated development when preferred options are identified).
			Host MCA (MCA 19) and any locally defined SCA(s).

Element of the Project	Activity	Effect	Receptor or Receptor Group
Off-site associated development.	Operation of the off-site associated development.	Changes to key landscape characteristics and landscape character as a result of the operational development (indirect effects).	LCAs that are within 2km of the off-site associated developments (or 5km if the project-provided accommodation is remote from the main development site) and locally defined SCAs that are at least partly within the preliminary and subsequently refined ZTVs.
Off-site associated development.	Operation of the off-site associated development.	Changes to existing views and visual amenity	People in their community (i.e. settlements) and which lie within the preliminary and subsequently refined ZTVs.
Off-site associated development.	Operation of the off-site associated development.	Changes to existing views and visual amenity.	People engaged in outdoor recreation, including tourists and visitors using recreational routes or visiting recreational locations which lie within the preliminary and subsequently refined ZTVs.
Off-site associated development.	Operation of the off-site associated development.	Changes to existing views and visual amenity.	People using sections of the transport network which lie within the preliminary ZTV and subsequently refined ZTVs.

Effects scoped out of further assessment

20.7.3 The effects scoped out from further assessment are set out in **Table 20.23**.

Table 20.23: Effects scoped out of the assessment

Potential Effect	Justification for Scoping Out
Dedham Vale AONB: Direct or indirect effects on the statutory purpose of the Dedham Vale AONB, its designated special qualities, landscape character and landscape setting.	Whilst the AONB represents a nationally designated landscape of the highest landscape sensitivity, the separation distance between the closest part of the AONB and the main development site is approximately 22km. A review of the ZTV in **Figure 20.1** also shows very limited fragmentary visibility of the Project from within the AONB. As a consequence, the resultant landscape change to the statutory purpose of the Dedham Vale AONB, its designated special qualities, landscape character and landscape setting could not be of a magnitude sufficient to give rise to significant landscape effects. Illustrative viewpoints from within the AONB will be provided as part of the LVIA to demonstrate the lack of potential visibility.
Suffolk Coast and Heaths AONB: Direct or indirect effects on the statutory purpose of the Suffolk Coast and Heaths AONB, its designated special qualities, landscape character and landscape setting.	The Suffolk Coast and Heaths AONB lies approximately 24km from the main development site at its closest point and is outwith the ZTV for the operational period of the main Development. For the reasons described in relation to the Dedham Vale AONB, the landscape change as a result of the Project could not be of a magnitude that would give rise to significant landscape effects.
Indirect effects upon NCAs within the LVIA study area.	NCAs cover extensive areas and consequently it is considered unlikely that the construction and operation of the Project would have the potential to result in significant indirect landscape effects on NCAs. This conclusion is supported by GLVIA3 (Paragraph 5.14), which advises that:

Potential Effect	Justification for Scoping Out
	"*Broad scale assessments at national and regional level can be helpful in setting the landscape context but are unlikely to be helpful on their own as the basis for LVIA – they may be too generalised to be appropriate for the particular purpose*".
Indirect effects upon LCAs and SCAs that lie outwith the preliminary and subsequently refined ZTVs for the main development site and off-site associated developments.	The distribution of LCAs shown on **Figures 20.6, 20.11** and **20.14,** and the separation distances between these and the Project elements indicates that indirect landscape effects are likely to be dependent on the presence of a visual effects pathway, (i.e.) the landscape receptor being located within the preliminary and subsequently refined ZTVs. As a consequence, LCAs and SCAs which lie outwith the ZTVs will not be considered further in the LVIA.
Visual effects on receptors located outside the preliminary and subsequently refined ZTVs.	Visual effects cannot be experienced by visual receptors with no potential views of any component of the Project, (i.e.) those visual receptors located outside the preliminary and subsequently refined ZTVs. As a consequence, visual receptors which lie outwith the ZTVs will not be considered further in the LVIA.

20.8 Potential Mitigation

20.8.1 Potential mitigation measures would comprise, but not necessarily be limited to, the following:

- emerging design principles for the main development site which relate to landscape and visual amenity include:
  - protecting the amenity of local communities including implementing new landscape screening and landform where appropriate;
  - recognising the distinctive visual setting of the Blackwater Estuary and seeking to minimise the visual impact on long distance views from Maldon, Brightlingsea and further afield; minimising the spread of permanent development across the peninsula; giving careful consideration to the composition of larger elements, including the relationship of the new development with the existing Bradwell power station; and integrating design work with early landscape and visual impact assessment;
  - responding to the distinctive landscape character of the Dengie Peninsula using sensitive planting and landform to better integrate the development into the local landscape. This includes ensuring that where new landform and planting is created it responds to, and is integrated with, the specific local character. Post construction planting and landform details will be described in the Restoration Plan; and
  - deliver high quality infrastructure design, achieved by delivering a planned composition that is coherent, clear, and uncluttered; developing a coordinated architectural language for each of the key building groups; and designing to be durable and robust, especially considering the coastal environment.
- consideration of the use of earth bunding in locations where planting is not achievable or would not become sufficiently established during the operational phase of the Project;
- sensitive use of native tree and shrub planting, in keeping with the character of the landscape in the local area, to mitigate for the loss of vegetation during construction and to provide visual screening;
- layout and orientation of buildings to minimise visual effects;
- minimising light spill through good design, consideration of the heights of lighting columns and use of directional lighting, amongst other measures; and
- minimising land take as far as possible.

20.9 Assumptions and Limitations

20.9.1 Assumptions and limitations relating to the information provided at scoping stage are as follows:

- The ZTV has been based upon parameters defined in the Stage 1 Consultation Report and is preliminary at this stage in the assessment process. Further refinement will continue throughout the design and assessment process, including preparing ZTVs for the off-site associated developments.
- The height and frequency of occurrence of any plumes which may be emitted from the cooling towers has not been established with certainty to date. As a consequence of the current uncertainty, plume generation has not been taken into consideration in the preliminary ZTVs.

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21. RECREATION

21.1 Introduction

21.1.1 This chapter sets out the approach which has been applied for determining the scope and content of the recreation assessment. **Chapter 5: The EIA Process and Methods** introduces the overall Environmental Impact Assessment (EIA) process including the methodology for assessing affects and determining significance. The topic specific methodology for determining receptor value, sensitivity and impact magnitude for recreation are provided in **Section 21.6**. This chapter contains:

- a summary of work undertaken to date;
- an explanation of the scope of assessment, including:
  - legislation, policy and guidance that inform the assessment;
  - a description of consultation and engagement so far relevant to recreation;
  - study area for the assessment;
  - sources of data used in scoping;
  - baseline conditions, including current desk studies and surveys;
  - planned further surveys and studies;
- the receptors that are proposed to be assessed and the effects which have the potential to be significant;
- the effects that are proposed can be scoped out of the assessment; and
- potential mitigation.

21.1.2 The chapter should be read in conjunction with the project description provided in **Chapter 3: The Project.** The assessment covers outdoor recreational receptors that include users of recreational routes (including but not limited to public rights of way (PRoW)) and publicly accessible outdoor recreation spaces including users of waterways and the estuarine and marine environments. **Chapter 10**: **Socio-economics** considers the tourism sector, specially holiday parks and other accommodation.

21.1.3 In addition to changes to the physical fabric of the recreational resource as a result of the Project, there may be effects on the amenity value of the recreational resource i.e. the benefits of enjoyment and wellbeing that users gain from a resource in line with its intended function. This may, for example, include the loss of availability of a resource that is convenient to use, or a change in its character or may be affected by a combination of factors such as noise, air quality and visual effects. **Chapter 20: Landscape and Visual Amenity** considers visual receptors such as PRoW

within a 10 kilometre (km) radius of the main development site (see **Table 20.20**) which include those across the Blackwater Estuary. In respect of PRoW to the north of the Blackwater Estuary, any effects would be on recreational amenity via a visual effect pathway only. Where appropriate the landscape and visual impact assessment (LVIA) of visual effects will be drawn upon to inform the recreation assessment.

Work undertaken to date

21.1.4 Work undertaken to date has included a desk study of the sources set out in **Table 21.5** to gain an initial understanding of the recreational receptors within the relevant study areas. Whilst no site-based surveys have been undertaken to date, engagement with consultees (Maldon District Council (MDC), Essex County Council (ECC), Chelmsford City Council (CCC) and Colchester Borough Council (CBC)) has taken place, via a Scoping Workshop in June 2020, to discuss recreation survey techniques and requirements as set out in the Recreation Survey and Monitoring Plan (SMP). The Recreation SMP is provided as **Appendix 21A**.

21.1.5 The description of the Project, including indicative site boundaries, presented in the appended Recreation SMP (see **Appendix 21A**) reflects the Project status at the point that the SMP was issued to consultees to inform the workshops held in June 2020, with subsequent updates to take into account workshop feedback and responses from consultees. As the Project progresses, further iterations of the SMP will be required as proposals are refined, in particular, with respect to the off-site associated development. The technical scope contained in the SMP remains applicable irrespective of any future boundary changes (should this be required), subject to a review of receptors and spatial scope.

21.2 Legislation, Policy and Technical Guidance

21.2.1 This section identifies the relevant legislation, national and local policy and guidance which has informed the scope of the assessment relevant to recreation. Further information on policies relevant to the EIA and their status is set out in **Chapter 2**: **Policy and Regulatory Context**, which should be read in conjunction with this chapter.

21.2.2 The legislation and policy relevant to recreation are detailed in **Table 21.1**.

Table 21.1: Legislation and policy

Relevant Legislation and Policy	Relevance to the Assessment
Legislation	
The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (Ref. 21.1).	Paragraph 2 of Section 5 of the Regulations states that the "*EIA must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development*" on a number of factors including "*population and human health*". The Environmental Statement (ES) will therefore need to include an assessment on recreation to meet the requirements of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.
Planning Act 2008 (Ref. 21.2).	Sections 131 and 132 of the Planning Act 2008 set out requirements on the compulsory acquisition of land or of rights over land including allotments and common or open space, and its replacement or relocation as mitigation. Section 136 of the Planning Act 2008 relates to Public Rights of Way (PRoWs) and states that an order granting development consent may extinguish a public right of way over land only if the Secretary of State is satisfied that: (a) an alternative right of way has been or will be provided, or (b) the provision of an alternative right of way is not required. This legislation is relevant to the assessment of effects on recreational routes and open space. It sets out measures that influence the approach to mitigation of effects.

Relevant Legislation and Policy	Relevance to the Assessment
Marine and Coastal Access Act 2009 (Ref. 21.3).	Part 9 of the Marine and Coastal Access Act 2009 makes provision for and in connection with the establishment of an English coastal walking route and of rights of access to land near the English coast. This legislation of relevance to the proposed England Coast Path, the route of which follows the northern boundary of the Main Site (onshore).
Highways Act 1980 (Ref. 21.4).	Section 119 of the Highways Act 1980 deals with the diversion of footpaths and bridleways whilst section 119ZA details the application process for a public path diversion order.
Countryside and Rights of Way Act 2000 (Ref. 21.5).	The Countryside and Rights of Way Act 2000 (CROW Act) gives a public right of access to land mapped as 'open country' (mountain, moor, heath and down) or registered common land. These areas are known as 'open access land'. Within these areas the public can usually walk, sightsee, bird-watch, climb and run. Much of the coastal margin that is being created as part of the work to implement the England Coast Path is also open access land. The presence of open access land will need to be taken into consideration in the baselines and assessment for recreation.
National Policy	
National Policy Statement for Energy (EN-1) (Ref. 21.6).	Section 5.10 relates to land use including open space which, in the case of EN-1, should be taken to mean all open space of public value, including not just land, but also areas of water such as rivers, canals, lakes and reservoirs (i.e. the River Blackwater). Paragraph 5.10.6 requires that applicants consult the local community on their proposals to build on open space, sports or recreational buildings and land and should consider providing new or additional open space including green infrastructure, sport or recreation facilities, to substitute for any losses as a result of their proposal. In its decision

Relevant Legislation and Policy	Relevance to the Assessment
	making the Infrastructure Planning Commission (IPC) "*should not grant consent for development on existing open space, sports and recreational buildings and land unless an assessment has been undertaken either by the local authority or independently, which has shown the open space or the buildings and land to be surplus to requirements or the IPC determines that the benefits of the project (including need), outweigh the potential loss of such facilities, taking into account any positive proposals made by the applicant to provide new, improved or compensatory land or facilities.*" (paragraph 5.10.14). Paragraphs 5.10.19 to 5.10.24 deal with mitigation. Paragraph 5.10.20 relates to green infrastructure and seeks to "*ensure the connectivity of the green infrastructure network is maintained in the vicinity of the development and that any necessary works are undertaken, where possible, to mitigate any adverse impact and, where appropriate, to improve that network and other areas of open space including appropriate access to new coastal access routes.*". Paragraph 5.10.21 states that any exchange land provided for as part of the mitigation "*should be at least as good in terms of size, usefulness, attractiveness and quality and, where possible, at least as accessible. Alternatively, where Sections 131 and 132 of the Planning Act 2008 apply, replacement land provided under those sections will need to conform to the requirements of those sections.*". Of specific reference to rights of way, paragraph 5.10.24 recognises that these are important recreational facilities and it is expected (by the IPC) that applicants "*take appropriate mitigation measures to address adverse effects on coastal access, National Trails and other rights of way.*". As a consequence, the assessment for the Project will need to demonstrate the inclusion of appropriate mitigation measures to be embedded in the design to ensure the Project meets the requirements of EN-1.

Relevant Legislation and Policy	Relevance to the Assessment
National Policy Statement for Nuclear Power Generation (EN-6) (Ref. 21.7).	Paragraph 3.12.2 recognises that the sites listed in the NPS occupy coastal or estuarine locations in rural areas and that there is therefore the potential for impact on land that has recreational and amenity value. As a result, this Section of EN-6 should also be read in conjunction with Section 5.10 of EN-1 (Land Use including Open Space, Green Infrastructure and Green Belt). In relation to *Nuclear Impact: water quality and resources,* paragraph 3.7.6 addresses mitigation and states that "*In the design of any direct cooling system the locations of the intake and outfall should be sited to avoid or minimise adverse impacts on legitimate commercial and recreational uses of the receiving waters, including their ecology*.". The assessment will need to provide an assessment of the effects on the users of the Blackwater River.
Appraisal of Sustainability: Site Report for Bradwell (Ref. 21.8).	Paragraph 5.55 notes that "*With regard to recreation, there is a potential impact associated with the coastal path which passes the site. It is likely that this path may need to be closed during some phases of power station construction but this effect will be temporary and can readily be mitigated by providing a bypass path around the site.*". The assessment will need to consider the effects on the users of this footpath and the Project will need to demonstrate appropriate measures to be embedded in the design to mitigate any adverse effects.
National Planning Policy Framework (NPPF) (2019) (Ref. 21.9).	Paragraph 97 states "*Existing open space, sports and recreational buildings and land, including playing fields, should not be built on unless:* *a) an assessment has been undertaken which has clearly shown the open space, buildings or land to be surplus to requirements; or* *b) the loss resulting from the proposed development would be replaced by equivalent or better provision in terms of quantity and quality in a suitable location; or*

Relevant Legislation and Policy	Relevance to the Assessment
	c) *the development is for alternative sports and recreational provision, the benefits of which clearly outweigh the loss of the current or former use*.". Paragraph 98 relates specifically to PRoWs and states "*Planning policies and decisions should protect and enhance public rights of way and access, including taking opportunities to provide better facilities for users, for example by adding links to existing rights of way networks including National Trails*.". As a consequence, it is imperative that a suitable baseline and assessment process is undertaken which informs appropriate mitigation measures to be embedded in the design to ensure the Project meets the requirements of the NPPF.
Local Policy	
MDC Local Development Plan (2017) (Ref. 21.10).	Policy N1 relates to green infrastructure and states "*[...] There will be a presumption against any development which may lead to the loss, degradation, fragmentation and / or isolation of existing or proposed green infrastructure.*" The policy requires that all development should (amongst other criteria) "*Maximise opportunities for the restoration, enhancement and connection of the District's green infrastructure network throughout the lifetime of the development, both on-site and for the wider community.*". MDC consider that recreational facilities form part of the green infrastructure network and as a consequence the Project will need to demonstrate that there is no loss, degradation, fragmentation or isolation of existing or proposed green infrastructure and that opportunities to maximise provision of green infrastructure should be explored as part of the design. Policy N3 states "*Proposals for development on open space (including district parks, local parks, children's play areas, cycle ways, bridleways, footpaths and allotments), sports and recreational buildings and land, including playing fields, will not be allowed unless:*

Relevant Legislation and Policy	Relevance to the Assessment
	1) Through an assessment there is clear evidence that the open space, buildings or land are surplus to requirements to meet local needs; or *2) The resulting loss would be replaced by new open space, buildings or land of equivalent or better provision in terms of quantity and quality and in a suitable location accessible by the local community; or* *3) The development is for alternative sports and recreational provision and the need for that provision clearly outweighs the loss of open space, buildings or land.*". The policy continues "*Development that would result in the loss of, or negatively impact upon, any public rights of way or any space / facility contributing towards the integrity of the green infrastructure network, will not normally be supported.*". As a consequence, a suitable baseline and assessment process will need to be undertaken which informs appropriate mitigation measures to be embedded in the design to ensure the Project meets the requirements of Policy N3. Policy T2 lists seven criteria required to create and maintain an accessible environment. Of relevance to recreation, the policy states "*To create and maintain an accessible environment, development proposals should where relevant to the development involved:* *3) Improve accessibility to the countryside and the natural environment and to enhance and protect the provision of Public Rights of Way….*". As a consequence, a suitable baseline and assessment process will need to be undertaken which informs appropriate mitigation measures to be embedded in the design to ensure the Project meets the requirements of Policy T2.

Relevant Legislation and Policy	Relevance to the Assessment
CCC Local Plan (2020) (Ref. 21.11).	Recreation facilities are considered as 'community assets' or 'community facilities' in the Chelmsford Local Plan and protected under Strategic Policy S5, which states that "*Existing community assets will also be protected from inappropriate changes of use or redevelopment*". Policy DM21 provides further detail and policy states (under section 'B') that: "*The change of use of premises or redevelopment of existing open space, sports and recreational buildings and land, including playing fields forming part of an education establishment, will only be permitted where:* *i. an assessment has been undertaken which clearly shows the facility is surplus to requirements; or* *ii. the loss resulting from the proposed development would be replaced by equivalent or better provision in terms of quantity and quality in a suitable location; or* iii. *the development is for alternative provision, the needs of which clearly outweigh the loss.*". As a consequence, a suitable baseline, design and assessment process will need to be undertaken which informs appropriate mitigation measures to ensure the Project meets the requirements of Policies S5 and DM21.

Relevant Legislation and Policy	Relevance to the Assessment
CBC Local Development Framework - Development Policies (2010) (Ref. 21.12).[1]	Coastal areas within Colchester Borough are considered as key assets, including associated tourism and related leisure and cultural facilities, is recognised through Policy DP10 which provides support for the appropriate development of recreational facilities as follows: *Policy DP10: Tourism, Leisure and Culture* *Development for new and extended visitor attractions, leisure and cultural facilities, along with visitor accommodation (including hotels, bed & breakfast accommodation, self-catering accommodation, holiday lodges, static and touring caravans and tenting fields) will be supported in suitable locations.* The supporting text to Policy DP10 (para 4.26) notes that: "*The future development of tourism and related leisure and cultural facilities is a key issue for the Local Authority. In both urban and rural areas, tourism provides jobs, brings in visitors to the area and provides facilities, attractions and environments that enhance the quality of life for local residents."* More widely, the variety of competing interests along the Borough's coastline is recognised in Policy DP23: Coastal Areas which requires a balance to be struck between conservation and socio-economic interests, ensuring that the inherent qualities of the coast, such as Mersea Island, are not compromised by development:

[1] CBC is in the process of reviewing its Local Plan and a submission draft was issued for examination in 2017, with consultation on proposed main modifications planned in October 2020. The environmental aspect chapters will refer to emerging policy where relevant and greater weight will be applied depending on the extent to which the policies have moved towards adoption.

Relevant Legislation and Policy	Relevance to the Assessment
	Policy DP23: Coastal Areas *Within the Coastal Protection Belt and along the undeveloped coast an integrated approach to coastal management will be promoted and, development will only be supported where it can be demonstrated that it:* *(i) Requires a coastal location and is located within the developed area of the coast;* *(ii) Will not be significantly detrimental to conserving important nature conservation, historic environment assets, maritime uses and the landscape character of the coast;* *(iii) Will deliver or sustain social and economic benefits considered important to the wellbeing of the coastal communities; and* *(iv) Provides opportunities and scope for adaptation to climate change.* *In exceptional circumstances, development may be permitted where it is proven that the proposal provides an over-whelming public or community benefit that outweighs all other material considerations. In such instances applications must demonstrate that the site is the only available option and be acceptable in terms of its other planning merits. Proposals for all development and change of use on both the landward and seaward sides of Coast Road, West Mersea, will be expected to enhance the existing traditional maritime character of the West Mersea Waterside Area of Special Character, and its role as a major yachting, fishing and boating centre. Proposals which result in the development of existing undeveloped areas of foreshore will be refused.* In light of the above, a suitable baseline, design and assessment process will need to be undertaken which informs appropriate mitigation measures to ensure the Project is sensitive to the interests of Policies DP10 and DP23.

Technical guidance

21.2.3 There is no standard methodology or prescriptive technical guidance for assessing the significance of effects of a development with respect to recreation resources. The Design Manual for Roads and Bridges Sustainability and Environment Appraisal (specifically document LA 112 Population and human health (Ref. 21.13)) has been reviewed, in particular with respect to the methodology relating to environmental value (sensitivity). However, it should be noted that in terms of recreation, LA 112 relates only to walkers, cyclists and horse riders, and not to other aspects of recreation such as publicly available open spaces and offshore recreation, both of which will also require consideration for the Project. As a consequence, a bespoke approach to the required assessment is described which reflects professional experience and methodologies which have been applied for other major infrastructure projects, as well as being informed by the relevant sections of LA 112 Population and human health.

21.3 Consultation and Engagement

21.3.1 This chapter has been informed by engagement and discussion with various stakeholders. **Table 21.2** details technical engagement to date which has occurred outside of formal statutory consultation. **Table 21.3** provides a summary of consultee comments arising from Stage One Consultation, along with a response to identify how matters are dealt with in this report.

Table 21.2: Technical engagement

Consultee	Points of Discussion
MDC CCC ECC CBC	Discussions with consultees were held on 24 June 2020 via a Scoping Workshop to discuss the Recreation SMP. Amendments have been made to the SMP to reflect the discussion and comments made by consultees in relation to: • The Essex Coast Recreational Disturbance Avoidance Mitigation Strategy (Ref. 21.14) prepared in accordance with Habitat Regulations and its baseline which already includes visitor surveys around coastal habitats. • Extant Green Infrastructure Strategy documents that may provide a valuable source of information on the current and future baseline. • The inclusion of the Maldon Harbour Improvement Commissioners as the statutory harbour authority for the Port of Maldon and the Marine Management Organisation (MMO) as the marine planning authority in relation to the stakeholders associated with the offshore study area.

Consultee	Points of Discussion
	• Consideration that may be given to third party smart data that could be available and which may provide some insight into usage variations across previous seasons. • Engagement that may need to include ramblers, local running groups and parish councils to help establish use trends near the main development site.

Table 21.3: Stage One Consultation comments

Theme	Summary of Consultee Comments and Considerations	How This is Accounted for
Stakeholder engagement.	The MMO encourage engagement with local sailing clubs, marinas and the Royal Yachting Association to understand the impacts to recreation.	It is the intention to consult with user groups of the River Blackwater as set out in **Table 21.6** with further detail provided in the Recreation SMP, which is included as **Appendix 21A** to this chapter. The recreation assessment team will also liaise with the navigation assessment team to share baseline data with regards to users of the Blackwater Estuary.
Assessment Scope.	With regard to the proposed temporary diversion of the England Coast Path (ECP), Natural England would like to see details for how long this diversion would be and if consideration to the use of the path for recreational purposes by the workforce has been taken into account. Additional usage would need to be assessed as part of the Habitats Regulations Assessment (HRA) for the Project.	Further work with regard to a diversion to the ECP and the associated duration of this diversion is ongoing and further consultation will be held with Natural England as the Project design progresses. Any screening and assessment under the Habitat Regulations 2017 (Ref. 21.15) will be undertaken by the biodiversity assessment teams. The recreation assessment team will work closely with these teams to ensure that proposals in relation to recreation provision are consistent with the requirements of the Habitats Regulations.

Theme	Summary of Consultee Comments and Considerations	How This is Accounted for
Project-provided accommodation.	The Royal Society for the Protection of Birds (RSPB) commented upon the requirement for a strategy to be in place to avoid additional recreational or other disturbance to ecological interests as a result of the increase in construction and permanent workforce and the provision of accommodation close to the main development site. The RSPB note that year-round surveys of existing recreational use of the area will be essential in order to establish a clear baseline against which to assess impacts arising from the development.	Planned surveys include the provision of automatic user counts to cover a 12-month period as set out in **Table 21.6** and the Recreation SMP (**Appendix 21A**). The recreation assessment team will work closely with the ornithology and ecology assessment teams to ensure that proposals in relation to recreation provision are consistent with the requirements of the Habitats Regulations. In developing appropriate environmental measures, the assessment teams will be cognisant of the Essex Coast Recreation, Disturbance and Avoidance Mitigation Strategy (RAMS).
Mitigation	CBC noted that the *"potential indirect adverse landscape effect and direct adverse visual impact of the proposed Bradwell B power station on Mersea Island and the Blackwater estuary would be significant and permanent"* and that in order to *"compensate for the anticipated residual significant impacts on Mersea Island and other receptors, CBC recommends that a suitable enhancement fund is set up to provide compensatory structural landscape enhancements, as part of a package of ecological, amenity and tourism benefits."*	The landscape and visual impacts associated with the Project, along with mitigation measures, are being considered as part of the LVIA which will take into account likely visual effects on recreation and tourism interests across the study area. This includes areas of significant recreation and tourism activity such as Mersea Island.

21.4 Data Gathering Methodology

Study area

21.4.1 This section presents the study areas which are considered to be appropriate for the recreation assessment. As the design and consultation processes progress, the geographical scope of study areas may change and, as a result, data collection and collation requirements will be reviewed and updated as necessary to ensure that the baseline data to be used for the assessment of effects is robust.

Main development site

21.4.2 Three study areas have been defined (as shown on **Figure 21.1**) for the main development site as follows:

- An onshore core study area which encompasses all land within the boundary of the main development site. This area extends to the south beyond the main development site boundary towards Tillingham and west beyond Bradwell Waterside to encompass land areas within which there may be recreational and amenity assets that could be directly affected or which may have a physical or functional connection with assets within the study area. This study area is shown on **Figure 21.1**. The extent to which the study area extends to cover the coastal margin will be refined following the field surveys to ensure that the intertidal areas that are readily accessible to the public are included within the study area.

- An offshore 'search area' within which patterns of offshore use would be established and receptors who may have the potential to be affected by the Project would be identified. This offshore 'search area' is illustrated in **Figure 21.2** and includes the River Blackwater reach from Maldon to Sales Point and the River Colne from Wivenhoe to Colne Point. It should be noted that the offshore 'search area' falls within the bounding study area for the Navigation assessment, which extends to 12 nautical miles offshore (see **Chapter 19: Navigation**).

- In addition to the onshore and offshore study areas, a third study area will be included which aligns spatially with the visual assessment study area. Any recreational receptors within this wider study area which are evaluated under in the LVIA as potentially sustaining significant visual effects will be included in the recreation assessment and therefore considered in terms of effects on recreational amenity. Baseline data for these receptors will be collated as part of the Visual Impact Assessment.

Off-site Power Station Facilities and off-site associated development

21.4.3 The study areas for the off-site Power Station Facilities and off-site associated development are described in **Table 21.4.**

Table 21.4: Off-site Power Station Facilities and off-site associated development study areas

Site	Study Area	Rationale
Project-provided accommodation.	To be determined on an individual site basis once the location and spatial extent of each off-site associated development and off-site Power Station Facility is defined.	The study area will need to encompass all recreational routes and spaces that may be directly (i.e. physically) affected as well as those which may be functionally linked to the development area.
Off-site highways works.		
Park and ride facilities.		
Freight management facilities.		
Off-site Power Station Facilities.		

Sources of data used in scoping

Desk based

21.4.4 The EIA scoping exercise has been undertaken with reference to **Chapter 3: The Project**. The principal desk-based data sources which have been used to inform the identification of potentially significant effects are identified in **Table 21.5**.

Table 21.5: Desk-based data sources

Source	Data
ECC.	• Interactive Map of PRoW (Ref. 21.16). • The St Peter's Way route leaflet (Ref. 21.17). • Bradwell Cockle Spit route leaflet (Ref. 21.18).
Natural England.	• Geographical Information System (GIS) datasets for: ▸ Doorstep Greens; ▸ Millennium Greens; ▸ Country Parks; ▸ Registered Common Land;

Source	Data
	▸ Countryside and Rights of Way Act 2000 - Access Land; and ▸ Countryside and Rights of Way Act, Section 15 Land. • England Coast Path Burnham-on-Crouch to Maldon - Natural England's Report to the Secretary of State (Ref. 21.19).
Ordnance Survey (OS).	• OS Explorer Map (1:25,000) 176 Blackwater Estuary (Ref. 21.20). • OS Explorer Map (1:25,000) 184 Colchester (Ref. 21.21). • OS Greenspace data (Ref. 21.22).
Sustrans.	National Cycle Network (Ref. 21.23).
Event websites.	Onshore (including but not limited to): • Saltmarsh Ultra Marathon (Ref. 21.24). • Big East Triathlon (Ref. 21.25). • Tour of the Dengie Cycle (Ref. 21.26). Offshore (including but not limited to): • Maldon Town Regatta (Ref. 21.27). • Mersea Week (Ref. 21.28).
The Royal Yachting Association and the Cruising Association.	'Sharing the Wind', Recreational Boating in the Offshore Wind Farm Strategic Areas, Identification of recreational boating interests in the Thames Estuary, Greater Wash and North West (Liverpool Bay) (Ref. 21.29).
CCC	Identification of sport and recreation and wider green infrastructure assets: • The Chelmsford Infrastructure Delivery Plan (Ref. 21.30). • Green Infrastructure Strategic Plan (Ref. 21.31).

Source	Data
MDC	Identification of sport and recreation and wider green infrastructure assets: • Maldon Infrastructure Delivery Plan Update (Ref. 21.32). • The Maldon Green Infrastructure Strategy (Ref. 21.33).
CBC	• Identification of sport and recreation and wider green infrastructure assets. • Colchester Borough Green Infrastructure Strategy (Ref. 21.34).

21.4.5 Reference will also be made in the assessment to **Chapter 19: Navigation** and the baseline data collection that will be undertaken in relation to recreation marine navigation.

Survey data

21.4.6 No field surveys have been undertaken to date in relation to recreation. The survey of overwintering birds conducted between October 2019 and March 2020 includes observations regarding the effect of recreational activities (for example, dog walking) on birds which has included recording of when and how birds have been disturbed by such activities in the vicinity of the main development site.

21.5 Baseline Information

Current baseline

Main development site

Onshore recreational resources

21.5.1 Onshore recreational assets within the main development site and its study area are illustrated in **Figure 21.1** and comprise the following:

Public rights of way

21.5.2 A number of local PRoWs are located within the study area, as shown on **Figure 21.1**. Seven sections of PRoWs are located within or adjacent to the main development site, as follows:

- PRoW 241_15, a footpath which follows the coastline along the northern edge of the main development site;
- PRoW 241_1, a footpath which connects PRoW 241_15 and the minor road south of Downhall Beach Estate;
- PRoW 241_17 a footpath which connects the northern edge of Bradwell Waterside with PRoW 241_1;
- PRoW 241_4, a footpath which follows a route between the northern edge of Bradwell Waterside and the eastern end of Trusses Road;
- PRoW 241_2, a footpath connecting East End Road with a trackway east of Downhall Farm;
- PRoW 241_3, a footpath connecting the road south of Downhall Lodge with PRoW 241_2; and
- PRoW 241_5, a footpath following a route east from East End Road to meet PRoW 241_15 along the coast at the chapel of St Peter-on-the-Wall.

Promoted routes

21.5.3 The main development site study area contains a number of promoted walking routes as follows:

- St Peter's Way, a 72.4km walk which extends from Chipping Ongar to the chapel of St Peter-on-the-Wall just beyond the south-eastern corner of the study area. The route is clearly signposted and waymarked in both directions; and
- Bradwell Cockle Spit Wildside Walk a locally promoted 10km walk which makes use of local PRoWs within and adjacent to the main development site.

Greenspaces and recreation grounds

21.5.4 OS mapped Greenspaces are shown on **Figure 21.1** and include allotments on the northern side of Woodyards, (north of Bradwell-on-Sea), a playing field and neighbouring play space at Bradwell-on-Sea.

21.5.5 The Maldon District Local Development Plan 9 Proposals Map indicates the presence of a triangular area of land to the north of Trusses Road which is referenced RG05: Bradwell Recreation Ground.

Nature reserves

21.5.6 Bradwell Shell Bank Nature Reserve lies within the study area. Public access is restricted to the footpath (PRoW 241_15 and PRoW 241_16) whilst parking is available at the eastern end of East End Road. The Bradwell Bird Observatory is located at Linnets Cottage on the edge of the reserve to the south-east of the chapel of St Peter-on-the-Wall.

Coastal access

21.5.7 A length of beach follows the coastline along the northern and eastern boundaries of the study area and is available for beach-based recreation (including, for example, swimming, dog-walking and picnicking).

Other public recreational routes, places and events

21.5.8 Ordnance Survey 1:25,000 scale mapping identifies an 'other route with public access' which follows Weymarks Road to the south of Downhall Farm. This route is not marked on ECC's PRoW Interactive Map and the exact nature of the rights on this route will need to be ascertained via consultation with Essex highways authority.

21.5.9 The chapel of St Peter-on-the-Wall lies within the main development site study area. The Bradwell Pilgrimage and Gathering has taken place for nearly 100 years and includes people from across Essex (and beyond) for a day of pilgrimage, worship and activities at the chapel of St Peter-on-the-Wall on the first Sunday of July.

21.5.10 The Dengie Peninsula also hosts a number of annual sporting events some of which pass through the onshore main development site study area as follows:

- Saltmarsh Ultra Marathon: An 83km running and walking event which follows the coastal path including the sections from Burnham-on-Crouch to St. Peters Chapel, Bradwell (21.8km), St. Peters Chapel to Bradwell Waterside (5.3km) and Bradwell Waterside to St. Lawrence (6.9km);
- Big East Triathlon: The swim section of this event takes place in Bradwell Creek between Bradwell Waterside Marina and Pewet Island. The subsequent cycle starts and finishes at Bradwell Waterside whilst the final run follows the route of the Bradwell Cockle Spit Wildside Walk; and
- Tour of the Dengie Cycle: This 43km Fun Ride or 82km Cycle Sportive ride both start and finish at Bradwell Waterside Marina.

Offshore recreational resources

21.5.11 The River Blackwater to the north of the main development site and the Blackwater Estuary to the east are a major sailing centre on the English east coast and there are a number of marinas and sailing or yachting clubs present along the edge of the offshore search area as shown in **Figure 21.2**. Bradwell Marina, for example, is located immediately to the west of the main development site. The river and estuary are host to a large number of sailing events and races including (but not limited to) Mersea Week, the Maldon Town Regatta and Mersea Regatta. Whilst there are no formal fishing facilities, sea fishing charters are run from Bradwell Marina and the coast is used for informal angling (for example immediately south of the existing power station site, Ref. 21.35) (see **Chapter 19: Navigation**).

21.5.12 The RYA's 'Sharing the Wind' report indicates multiple recreational sailing routes passing by the main development site and zone for marine infrastructure, some of which are classed as 'Heavy Recreational Use'. The Royal Yachting Association

(RYA) has classed the Blackwater Estuary and coastal waters extending offshore as a racing area and general sailing area.

Off-site associated development: off-site highways works

Onshore recreation resources

Public Rights of Way

21.5.13 Ordnance Survey 1:25,000 scale mapping indicates that there are several PRoWs potentially affected along the early years route options (see **Figure 3.3**) and preferred) Strategic Route and route options (see **Figure 3.4**). Crossing points and those PRoWs which lie adjacent to the routes are detailed in **Table 6.6** of **Chapter 6: Transport**. The precise nature of the interaction between the Strategic Route and PRoW has yet to be determined.

Promoted Routes

21.5.14 St Peter's Way long distance path runs along the Maldon Road to the west and east of and through the village of Steeple for approximately 2km, part of the Strategic Route. The nature of the effects of this interaction have yet to be determined.

Greenspaces and recreation grounds

21.5.15 Inspection of OS mapping, OS Greenspace mapping and Multi Agency Geographic Information for the Countryside (MAGIC) (Ref. 21.36) shows that various greenspaces and recreation grounds are present alongside, and in the immediate vicinity of, the Strategic Route and route options. These will have to be surveyed on a case-by-case basis in order to determine potential effects.

Coastal access

21.5.16 Access to the coast will not be affected directly by any of the Strategic Route proposals, unless temporary road closures are planned or traffic congestion issues arise.

Other public recreational routes, places and events

21.5.17 Some regular recreational events are likely to interact with the Strategic Route and early years options, notably along the Maldon Road from Latchingdon to Bradwell Waterside, which is the route for the following events:

- Big East Triathlon: The cycle ride starts and finishes at Bradwell Waterside, using the Maldon Road through Latchingdon, Mayland and Steeple and
- Tour of the Dengie Cycle: This 43km Fun Ride or 82km Cycle Sportive ride both start and finish at Bradwell Waterside Marina.

Offshore recreational resources

21.5.18 It is not anticipated that any offshore recreational resources will be affected by the Strategic Route and route options or by the early years options.

Off-site associated development: park and ride facilities

Onshore recreation resources

Public rights of way

21.5.19 OS 1:50,000 scale mapping indicates that there are various PRoW within the areas of search for park and ride facilities at South Woodham Ferrers, Chelmsford and Maldon (see **Figure 3.5**). Any potential effects are dependent upon the precise location and scale of the site(s).

Promoted routes

21.5.20 Sections of promoted routes within the areas of search are present at all three locations as follows: South Woodham Ferrers (Saffron Trail Long Distance Path), Chelmsford (Saffron Trail Long Distance Path, Centenary Circle, Admiral McHardy Way and National Cycle Network Route 1), and Maldon (National Cycle Network Route 1).

Greenspaces and recreation grounds

21.5.21 Inspection of OS mapping and OS Greenspace mapping shows that there are recreation grounds to north of the A130 Battlesbridge Junction at Rettendon Place (playing fields and All Saints Church), and immediately to the west of the A130 at Runwell Hospital, as well as Hyde Hall Royal Horticultural Society (RHS) Garden (Creephedge Lane).

21.5.22 Maldon Cemetery is situated to the south of London Road, west of the A414 bypass.

Nature reserves

21.5.23 Inspection of OS mapping shows that there do not appear to be any nature reserves within the three areas of search.

Coastal access

21.5.24 The areas of search do not impinge upon coastal access.

Other public recreational routes, places and events

21.5.25 The likelihood of the areas of search impinging upon other public recreational routes, places and events is currently uncertain and will be researched separately.

Offshore recreational resources

21.5.26 The areas of search do not impinge upon any offshore recreational resources.

Off-site associated development: freight management facilities

Onshore recreation resources

Public rights of way

21.5.27 OS 1:25,000 scale mapping indicates that there are various PRoW within the areas of search (**Figure 3.6**), in particular to the southwest of Latchingdon and in the A130 Battlesbridge Junction areas of search.

Promoted routes

21.5.28 OS 1:50,000 scale mapping indicates that there no promoted routes within the areas of search.

Greenspaces and recreation grounds

21.5.29 Inspection of OS Greenspace mapping and MAGIC shows that there are greenspaces or recreation grounds only to the south-west of Latchingdon (King George's Field recreation ground and Jacks Centre bowling green), to the north of the A130 Battlesbridge Junction at Rettendon Place (playing fields and All Saints Church), and immediately to the west of the A130 at Runwell Hospital, as well as Hyde Hall RHS Garden (Creephedge Lane).

Nature reserves

21.5.30 Inspection of OS mapping, OS Greenspace mapping and MAGIC shows that there do not appear to be any nature reserves within the areas of search.

Coastal access

21.5.31 The areas of search do not impinge upon coastal access.

Other public recreational routes, places and events

21.5.32 The likelihood of the areas of search impinging upon other public recreational routes, places and events is currently uncertain and will be researched separately.

Offshore recreational resources

21.5.33 The areas of search do not impinge upon any offshore recreational resources.

Off-site Power Station Facilities

21.5.34 Recreational receptors with the potential to be affected by the construction or operation of the Mobile Emergency Equipment Garage (MEEG), Alternative

Emergency Control Centre (AECC), or Environmental Survey Laboratory (ESL) will be identified once the location of these facilities has been established.

Future baseline

21.5.35 By the time the Project commences construction it is anticipated that the determination of the proposed route of the England Coast Path from Burnham-on-Crouch to Maldon and the corresponding upgrade of the coastal footpath from a local PRoW to a National Trail will have occurred. It is anticipated that the England Coast Path will become a high value recreational resource, falling under the remit of Natural England.

21.5.36 The proposals for the route of the England Coast Path along this stretch have been published and the report was submitted to the Secretary of State for Environment, Food and Rural Affairs in July 2017 (Ref. 21.37), but the proposals are yet to be determined. The timescale for the opening of this section of the England Coast Path is unknown. The proposed route is shown in **Figure 21.1**.

21.5.37 The associated Coastal Margin is the land alongside the trail within which there will usually be a right of access (Ref. 21.38). The proposal report indicates that for sections of the England Coast Path which may pass through or near to the main development site, the landward side of the Coastal Margin will be the landward edge of the top of the existing flood defence embankment.

Planned further surveys and studies

21.5.38 Additional survey work which is required to inform the recreation assessment is set out in **Table 21.6**. The Recreation SMP is included as an Appendix to this chapter (see **Appendix 21A**) and provides further detail with regard to the objective of each survey listed in **Table 21.6**, the study area that each survey will cover, the methods proposed and the output of each survey.

21.5.39 The requirements with respect to the locations and spatial extents of the off-site associated development and off-site Power Station Facilities are currently being considered but will fall within the spatial parameters set out in **Chapter 3: The Project**. The methodologies, survey extents, geographical coverage and study areas for off-site associated development and off-site Power Station Facilities will be confirmed once Project requirements with respect to site location, spatial area and design layout are known with sufficient certainty to enable baseline research to be undertaken.

Table 21.6: Planned further surveys and studies

Further Surveys and Studies for the Recreation Assessment	Proposed Date
Field Surveys (project-wide) to: • verify by direct observation the existence of countryside access resources which have been identified from desk-based study; • identify additional resources which may not be apparent from desk-based study; • assess the current condition and context of the resources; and • make general observations about current usage taking into account observations from the overwintering birds survey which has been conducted over the period October 2019-March 2020.	Q3 2020.
Visitor and user surveys for routes affected by the main development site. The number and location survey stations will be determined once the field surveys described above have been completed.	Period of highest probable usage (i.e. Easter weekend 2021).
Automatic User Counts (main development site). To be installed at a suitable point(s) along the proposed England Coast Path. The optimum location for the installation of the automatic counter will be informed by field survey.	Twelve-month period commencing 2020.
Consultation with user groups of the River Blackwater (main development site). Consultation to understand patterns of usage or events etc. Contact will be made via letter or email with the boat or yachting clubs and marinas shown in **Figure 21.2** which have been derived from a review of mapping, aerial photography, and internet searches at the EIA scoping stage. Further clubs and marinas may be added following consultation.	Ongoing Q3 and Q4 2020.
Inspection of the Definitive Rights of Way Map held by ECC to include all elements of the Project.	Q3 2020.

21.5.40 Given the potential for Covid-19 related measures to have altered usual patterns of recreation, the recreation assessment team will also investigate the possibility of supplementing the baseline with data that may be commercially available. Whilst such data would pertain to only a subsection of users, it may provide a longer time-series that could inform any changes to patterns of usage before and after Covid-19 related restrictions were introduced. Similarly, consideration will also be given to any data that may be available from non-commercial organisations such as walking or rambling groups, running groups and parish councils.

21.5.41 The Essex Coast Recreation, Disturbance and Avoidance Mitigation Strategy (RAMS) is also likely to provide valuable survey data that can be used in the recreation baseline.

21.6 Proposed Approach to the Assessment

Assessment methodology

21.6.1 There is no standard methodology for assessing the significance of effects of a development on recreation, so a bespoke approach has been adopted, drawing on professional experience and methodologies established in relation to other infrastructure projects. It is anticipated that the final details of this methodology will be discussed with stakeholders through future engagement.

Assessment of effects and determining significance

21.6.2 The general approach to assessment of effects and determining significance that will be used for the EIA is provided in **Section 5.4** of **Chapter 5: The EIA Process and Methods**. However, this section sets out how the approach has been applied to recreation and where it has been adapted to deal with the specific requirements of this environmental aspect.

21.6.3 The likely effects of the Project on the recreation resource (and whether these are significant) will be determined through consideration of the sensitivity of each potentially affected receptor and the magnitude of change to that receptor's recreational amenity that may arise as a result of the construction and operation of the Project.

21.6.4 Whilst the generic guidance for the assessment of sensitivity set out in **Table 5.3** makes allowance for the categorisation of some receptors as being of 'Very Low' sensitivity, this category is not used in the recreation assessment. To be categorised as being of Very Low sensitivity, recreational users would need to be engaged in activities that could be undertaken in a very wide range of locations (and thus be of very low susceptibility to displacement) and which are not influenced by the users' surroundings (and hence be of very low susceptibility to effects on their recreational amenity via visual or aural pathways. Such receptors are considered outside the scope of this assessment. The sensitivity of receptors is therefore categorised as either 'High', 'Medium' or 'Low' using the criteria shown in **Table 21.7**.

Table 21.7: Sensitivity to change for recreation

Sensitivity	Criteria
High	Users identified as having a high priority (for example, users of regional parks, nationally or regionally promoted long distance footpaths, trails or cycle routes and those taking part in nationally or regionally promoted events for water craft) or who are highly dependent on the recreation resources which the affected resource or facility has to offer because there are no alternative comparable resources available.
Medium	Users identified as having a medium priority (for example users of metropolitan and district parks, locally promoted long distance footpaths, trails and, or cycle routes and those taking part in locally promoted events for water craft) or who are largely dependent on the recreation resources which the affected resource or facility has to offer because there are few alternative comparable resources available.
Low	Users identified as having a low priority (for example users of local parks and small open spaces, users of sections of the local PRoW network that do not form part of a promoted route and users of water craft not involved in promoted events) or who are not particularly dependent on the recreation resources which the affected resource or facility has to offer because there are numerous alternative comparable resources available.

21.6.5 The magnitude of change to recreation will be determined based upon an assessment of the predicted deviation from baseline conditions which may arise as a result of the Project. The magnitude of change that may be experienced by receptors is categorised as either ‘High’, ‘Medium’, ‘Low’ or ‘Very Low’ using the criteria shown in **Table 21.8**.

Table 21.8: Magnitude of change for recreation

Magnitude of Change	Criteria
High	Proposals would cause a substantial change to existing patterns and levels of use of recreation resources.
Medium	Proposals would cause a moderate change to existing patterns and levels of use of recreation resources.
Low	Proposals would cause a slight change to existing patterns and levels of use of recreation resources.
Very Low.	No discernible changes in expected levels or patterns of use are expected.

21.6.6 The significance of potential effects is determined though reference to the sensitivity of affected receptors, the magnitude of change experienced by those receptors, the nature of the effect and the nature of the affected resource. A matrix based on that shown **Chapter 5: The EIA Process and Methods** is used to guide the determination by combining the sensitivity and magnitude of change for each receptor. The table, however, is an aid to assessment and the process of significance evaluation involves the application of professional judgement.

21.7 Scope of the Assessment

Potential receptors

21.7.1 The principal recreation receptors that have been identified as being potentially subject to effects are summarised in **Table 21.9**. This table will be subject to modification as the level of Project design maturity available to inform the recreation assessment increases. Receptors which may be affected by off-site Power Station Facilities will be identified within the areas of search.

Table 21.9: Receptors subject to potential effects

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Project-wide.	Construction and operation.	Walkers (together with cyclists and horse riders where bridleways, restricted byways or byways	Local routes present within the main development site and off-site associated development.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
		open to all traffic are present) using local PRoWs (including long-distance or promoted routes and local users).	Promoted routes present within and adjacent to the main development site and off-site associated development sites, as well as those more distant such as those on the northern banks of the Blackwater Estuary.
Main development site.	Construction and operation.	Walkers travelling along the proposed England Coast Path and associated coastal margin.	Recreational receptor of the highest sensitivity present (under future baseline conditions) within the main development site.
Main development site.	Construction and operation.	Recreational sailors using the River Blackwater and Blackwater Estuary including those participating in regattas and races.	Off-shore recreational resource adjacent to the main development site within which Marine Infrastructure would be constructed and operate.
Main development site.	Construction and operation.	Bird watchers and visitors to the Bradwell Shell Bank Nature Reserve.	Located within and adjacent to the main development site study area.
Main development site.	Construction and operation.	Beach visitors (including dog-walkers, anglers and swimmers).	Located adjacent to the main development site and within which Marine Infrastructure would operate.
Project-wide.	Construction and operation.	Users of greenspaces and recreational grounds.	Present within the main development site and within the off-site associated development search areas.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Main development site.	Construction and operation.	Visitors and pilgrims at the chapel of St Peter-on-the-Wall.	Located adjacent to the main development site study area.
Main development site and off-site highway works.	Construction and operation.	Sporting event participants (Saltmarsh Ultra Marathon, Big East Triathlon and Tour of the Dengie Cycle).	Event routes present within and adjacent to the main development site study area and within the off-site highway works.

Likely significant effects

21.7.2 The effects on recreation which have the potential to be significant and that will be taken forward for assessment in the ES are summarised in **Tables 21.10** and **Table 21.11**.

Table 21.10: Likely significant recreation construction effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Project-wide.	Land take and overall construction activity across the main development site. Land take and overall construction and operation of the off-site associated development sites.	Potential severance of local and promoted routes due to permanent or temporary closures to accommodate land take. May also include disruption to annual sporting events such as the Saltmarsh Ultra Marathon, Big East Triathlon and Tour of the Dengie Cycle. The amenity value (i.e. the benefits of enjoyment and wellbeing that users gain from a resource in line with its intended function) that receptors using the retained and diverted sections of local and promoted footpaths give to this recreational resource may be affected by a combination of factors such as noise, air quality and visual effects.	Walkers, cyclists and horse riders (where applicable) using local PRoWs (including long-distance or promoted routes and local users) and sporting event participants.

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site.	Marine Infrastructure.	Potential severance of the proposed England Coast Path (National Trail) during construction, when and where access is required for marine off-loading. The amenity value that receptors using the retained and diverted sections of the England Coast Path give to this recreational resource may be affected by a combination of factors such as noise, air quality and visual effects.	Walkers travelling along the proposed England Coast Path and associated coastal margin.
Main development site.	Marine Infrastructure.	Potential for disruption to sailing events and recreational users in vessels on the River Blackwater during the construction and use of marine infrastructure. The amenity value that receptors using the waters give to this recreational resource may be affected by a combination of factors such as noise, air quality and visual effects.	Recreational sailors using the River Blackwater and Blackwater Estuary.

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site.	Overall construction activity across the main development site.	The amenity value that receptors visiting the nature reserve give to this recreational resource may be affected by a combination of factors such as noise, air quality and visual effects.	Bird watchers and visitors to the Bradwell Shell Bank Nature Reserve.
Main development site.	Marine Infrastructure.	Potential to be affected through closures, diversions or other interference with currently used access resources. The amenity value that receptors using the foreshore give to this recreational resource may be affected by a combination of factors such as noise, air quality and visual effects.	Beach visitors (including dog-walkers and swimmers).
Main development site and off-site associated development.	Land take and overall construction activity across the main development site and off-site associated development.	Closures of greenspaces and recreational grounds. The recreational amenity value that receptors using green spaces and recreational grounds give to these resources may be affected by a combination of factors such as noise, air quality and visual effects.	Users of greenspaces and recreational grounds.

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site.	Overall construction activity across the main development site.	The recreational amenity value that receptors visiting, or pilgrimaging give to this recreational resource may be affected by a combination of factors such as noise, air quality and visual effects.	Visitors and pilgrims at St Peter-on-the-Wall chapel.
Main development site.	Overall construction activity across the main development site.	The recreational amenity value that receptors travelling along or using other recreational resources beyond the Main Site study area may be affected by a change to their visual amenity.	Other recreational receptors within the visual assessment study area (for example users of the England Coast Path on Mersea Island and bird watchers in these locations).
Main development site and project-provided accommodation.	Use of recreational resources by construction workforce.	Resources potentially not available to other users. Changes to the perceptual qualities or attractiveness of resources due to increased levels of use.	Users of local PRoWs (including long-distance or promoted routes and local users) and users of local greenspaces and recreation grounds.

Table 21.11: Likely significant recreation operation effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site.	Land take and presence of operational development.	Potential severance of routes and disruption to networks of routes due to permanent closure to accommodate land take. Well-functioning alternative routes will need to be provided. The amenity value that receptors using the local and promoted footpaths give to this recreational resource may be affected by a combination of factors such as noise, air quality and visual effects.	Walkers using local PRoWs (including long-distance or promoted routes and local users) and sporting event participants.
Main development site.	Marine Infrastructure.	Dependant on long-term presence (or otherwise) of marine infrastructure. Current proposals indicate a marine transport facility would be permanently retained for occasional use (once every 5-years or less on average) to bring large components to site by sea. As a consequence, there may be low frequency, short-term disruption to walkers using the England Coast Path from the presence and occasional use of a marine transport facility.	Walkers travelling along the proposed England Coast Path and associated coastal margin.

Element of the Project	Activity	Effect	Receptor or Receptor Group
		The amenity value that receptors using the National Trail give to this recreational resource may be affected by a combination of factors such as noise, air quality and visual effects.	
Main development site.	Marine Infrastructure.	Dependant on long-term presence (or otherwise) of marine infrastructure. Current proposals indicate a marine transport facility would be permanently retained for occasional use (once every 5 years or less on average) to bring large components to site by sea. As a consequence, there may be low frequency, short-term disruption to users of the River Blackwater from the presence and occasional use of a marine transport facility. The amenity value that receptors using the waters give to this recreational resource may be affected by a combination of factors such as noise, air quality and visual effects.	Recreational sailors using the River Blackwater and Blackwater Estuary.

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site.	Presence of operational development.	The amenity value that receptors visiting the nature reserve give to this recreational resource may be affected by a combination of factors such as noise, air quality and visual effects.	Bird watchers and visitors to the Bradwell Shell Bank Nature Reserve.
Main development site.	Marine Infrastructure.	Dependant on long-term presence (or otherwise) of marine infrastructure. Current proposals indicate a marine transport facility would be permanently retained for occasional use (once every 5 years or less on average) to bring large components to site by sea. As a consequence, there may be low frequency, short-term disruption to recreational users of the foreshore from the presence and occasional use of a marine transport facility. The amenity value that receptors using the foreshore give to this recreational resource may be affected by a combination of factors such as noise, air quality and visual effects.	Beach visitors (including dog-walkers and swimmers).

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site.	Land take and presence of operational development.	Potential permanent loss of greenspaces or recreation grounds. The recreational amenity value that receptors using green spaces and recreational grounds give to these resources may be affected by a combination of factors such as noise, air quality and visual effects.	Users of greenspaces and recreational grounds.
Main development site.	Overall construction activity across the main development site.	The recreational amenity value that receptors visiting, or pilgrimaging give to this recreational resource may be affected by a combination of factors such as noise, air quality and visual effects.	Visitors and pilgrims at the chapel of St Peter-on-the-Wall.
Main development site.	Presence of operational development.	The recreational amenity value that receptors travelling along or using other recreational resources beyond the main development Site study area may be affected by a change to their visual amenity.	Other recreational receptors within the visual assessment study area (for example users of the England Coast Path on Mersea Island).

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site.	Use of recreational resources by operational workforce.	Resources potentially not available to other users. Changes to the perceptual qualities or attractiveness of resources due to increased levels of use.	Users of local PRoWs (including long-distance or promoted routes and local users) and users of local greenspaces and recreation grounds.
Legacy components of the off-site associated development (including potential permanent housing).	Land take and presence of operational development.	Potential severance of routes and disruption to networks of routes due to permanent closure to accommodate land take. Well-functioning alternative routes will need to be provided. Potential permanent loss of greenspaces or recreation grounds.	Users of local PRoWs (including long-distance or promoted routes and local users) and users of local greenspaces and recreation grounds.

21.7.3 There are no recreation effects that are to be scoped out of the assessment. The potential effects on ecology (ornithology) receptors which result from recreational disturbance will be considered in **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**.

21.8 Potential Mitigation

21.8.1 Any mitigation measures that may be required to be incorporated into the project to avoid or mitigate effects on recreation will be informed by the following principles:

- where path closures are necessary for safety and security reasons, diversions will be agreed with key stakeholders (PRoW or Countryside Officers and Natural England);
- where temporary or permanent closures are required, proposals will need to ensure that a well-functioning alternative route is provided. Opportunities to retain temporary diversions as additional recreational routes to increase connectivity across the Dengie Peninsula and deliver local long-term gain in terms of recreational resource will be explored as part of ongoing design and masterplanning;
- where the temporary closure of a greenspace or recreation ground is necessary, the duration of closures should be kept to a minimum;
- where the permanent closure of a greenspace or recreation ground is necessary, the provision of an alternative resource that is equally advantageous to the recreational amenity of users will be explored as soon as it is practicable to do so and any such provision will be consulted on with key stakeholders (PRoW or Countryside Officers);
- recreational amenity effects may be mitigated through the Code of Construction Practice to minimise noise levels and direct construction activity away from the retained and diverted sections of the England Coast Path (where feasible) and site design; and
- disruption within sections of the River Blackwater may be unavoidable and clear communication with the relevant sailing clubs and marinas will be required to ensure public safety with access potentially prohibited within particular sections of the waterway.

21.9 Assumptions and Limitations

21.9.1 The recreational receptors, resources and potential effects set out in this chapter have been identified on the basis of desk-based study only and may be subject to revision in the light of additional information obtained from field surveys and stakeholder engagement.

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22. HISTORIC ENVIRONMENT: TERRESTRIAL AND MARINE

22.1 Introduction

22.1.1 This chapter sets out the approach for determining the scope of the assessment for historic environment. **Chapter 5: The EIA Process and Methods** introduces the overall Environmental Impact Assessment (EIA) process including the methodology for assessing affects and determining significance. The topic specific methodology for determining receptor value, sensitivity and impact magnitude for the historic environment are provided in **Section 22.6**. The chapter contains:

- a summary of work undertaken to date;
- an explanation of the scope of assessment, including:
  - legislation, policy and guidance that inform the assessment;
  - a description of consultation and engagement so far relevant to historic environment;
  - study area for the assessment;
  - sources of data used in scoping;
  - baseline conditions, including current desk studies and surveys;
  - planned further surveys and studies;
- the receptors that are proposed to be assessed and the effects which have the potential to be significant;
- the effects that are proposed can be scoped out of the assessment; and
- potential mitigation.

22.1.2 The chapter should be read in conjunction with the project description provided in **Chapter 3: The Project.**

Work undertaken to date

22.1.3 This chapter sets out the proposed scope and methodology for the terrestrial and marine historic environment assessment of the Project. These issues have been informed by an outline description of the environmental baseline conditions, along with a preliminary view of the key issues likely to be associated with the Project.

22.1.4 The description of the Project, including indicative site boundaries, presented in the Survey and Monitoring Plan (SMP) (see **Appendix 22A**) reflects the Project status at the point that the SMP was issued to consultees to inform workshops held in June 2020, with subsequent updates to take into account workshop feedback and

responses from consultees. As the Project progresses, further iterations of the SMP will be required as proposals are refined, in particular, with respect to off-site associated development. The technical scope contained in the SMP remains applicable irrespective of any future boundary changes (should this be required), subject to a review of receptors and spatial scope.

22.1.5 To date desk studies have focused on assessing the historic environment of the main development site (Ref. 22.1, Ref. 22.2 and Ref. 22.3). Previous monitoring of geotechnical investigations (Ref. 22.4 and Ref. 22.5) across large parts of the main development site has allowed geoarchaeological analysis of buried deposits and the production of a deposit model (Ref. 22.6), which will continue to inform the refinement of archaeological potentials, particularly for the prehistoric periods.

22.2 Legislation, Policy and Technical Guidance

22.2.1 This section identifies the relevant legislation, national and local policy and guidance which has informed the scope of the assessment relevant to historic environment. Further information on policies relevant to the EIA and their status is set out in **Chapter 2: Policy and Regulatory Context**, which should be read in conjunction with this chapter.

22.2.2 The legislation and policy relevant to historic environment are detailed in **Table 22.1**.

Table 22.1: Legislation and policy

Relevant Legislation and Policy	Relevance to the Assessment
Legislation	
United Nations Educational, Scientific and Cultural Organization Convention on the Protection of the Underwater Cultural Heritage (Ref. 22.7).	The United Nations Educational, Scientific and Cultural Organization (UNESCO) Convention on the Protection of the Underwater Cultural Heritage 2001 is intended to enable states to better protect their submerged cultural heritage. The Convention: • sets out basic principles for the protection of underwater cultural heritage; • provides a detailed cooperation system for the member states; and • provides widely recognized practical rules for the treatment and research of underwater cultural heritage. The Convention consists of a main text and an annex, which set out the "*Rules for activities directed at underwater cultural heritage*". The main principles of the Convention are: • Obligation to preserve underwater cultural heritage – member states should preserve underwater cultural heritage and take action accordingly. This does not mean that ratifying states would necessarily have to undertake archaeological excavations; they only have to take measures according to their capabilities. The Convention encourages scientific research and public access. • In situ preservation as first option – the in-situ preservation of underwater cultural heritage (i.e. in its original location on the seafloor) should be considered as the first option before allowing or engaging

Relevant Legislation and Policy	Relevance to the Assessment
	in any further activities. The recovery of objects may, however, be authorized for the purpose of making a significant contribution to the protection or knowledge of underwater cultural heritage. • No commercial exploitation – the Convention stipulates that underwater cultural heritage should not be commercially exploited for trade or speculation, and that it should not be irretrievably dispersed. This requirement is in conformity with the moral principles that already apply to cultural heritage on land. It is not to be understood as preventing archaeological research or tourist access. • Training and information sharing – member states shall cooperate and exchange information, promote training in underwater archaeology and promote public awareness regarding the value and importance of underwater cultural heritage. The 2001 Convention neither regulates the ownership of wrecks nor does it change existing maritime zones. In the Cultural White Paper (2016) (Ref. 22.8), the UK Government undertook to review its position on the ratification of the Convention. This review has been deferred (Ref. 22.9) due to other new and more immediate priorities. However, there remains a commitment to review the Government's position on the ratification of the Convention when priorities and resources permit (Ref. 22.9). The Government has already adopted the principles set out in the annex to the Convention as best practice in the management of underwater cultural heritage (for example, through the Marine and Coastal Access Act 2009 (Ref. 22.10)).

Relevant Legislation and Policy	Relevance to the Assessment
Ancient Monuments and Archaeological Areas Act 1979 (Ref. 22.11).	The Ancient Monuments and Archaeological Areas Act sets out that sites considered to be of national importance are required to be compiled in a Schedule of Monuments. These sites are accorded statutory protection. Scheduled Monument Consent is required before any works are carried out which would have the effect of demolishing, destroying, damaging, removing, repairing, altering, adding to, flooding or covering up a Scheduled Ancient Monument. Scheduled monument protection is offered not only to the known structures and remains of a site but also to the soil under and around them to protect any archaeological interest. This Act also provided for the designation of Areas of Archaeological Interest in which statutory provisions for access to construction sites for carrying out archaeological works apply.
Planning (Listed Buildings and Conservation Areas) Act 1990 (Ref. 22.12).	The Act covers the registration of listed buildings (buildings that are seen to be of special architectural or historic interest) and the designation of Conservation Areas (areas of special architectural or historic interest the character or appearance of which it is desirable to preserve or enhance). A listed building may not be demolished, altered or extended in any manner which would affect its character as a building of special architectural or historic interest without listed building consent being granted. The Act sets out at Section 66 a duty of local planning authorities (LPAs) to give great weight to the desirability of preserving a listed building and its setting in planning decisions. The Act sets out, at Section 72, a duty of LPAs to consider the desirability of preserving the character of a conservation area in planning decisions, and it gives LPAs the ability to control demolition and other works in conservation areas which would not normally require planning permission. The Section 66 and Section 72 duties are superseded in applications under the Planning Act 2008 by equivalent provisions in the Infrastructure Decisions (Designations) Regulations 2010.

Relevant Legislation and Policy	Relevance to the Assessment
Infrastructure Decisions (Designations) Regulations 2010 (Ref. 22.13).	These regulations require decision-makers to have regard to the desirability of preserving a scheduled monument or its setting; listed buildings, any features which contribute to their special interest and their settings and to have regard for the desirability of preserving the character and appearance of conservation areas.
Treasure Act 1996 (Ref. 22.14).	This Act defines what constitutes "*treasure*". Any find of "*treasure*" must be reported to the local Coroner.
Treasure (Designation) Order 2002 (Ref. 22.15).	This Order amends the statutory definition of *"treasure"*.
The Hedgerow Regulations 1997 (Ref. 22.16).	These regulations set out criteria to be used to determine the importance of hedgerows and protect important hedges from removal. Selection criteria include heritage-based considerations.
The Protection of Military Remains Act 1986 (Ref. 22.17).	This Act sets out specific protections for aircraft which have crashed or vessels which have sunk or been stranded while in military service. It sets out a general prohibition on any disturbance or removal of such remains without a licence granted by the Secretary of State (SoS).
The Protection of Wrecks Act 1973 (Ref. 22.18).	The Protection of Wrecks Act 1973 (Section 1) is designed to protect the site of a vessel lying wrecked on or in the sea bed on account of the historical, archaeological or artistic importance of the vessel, or of any objects contained or formerly contained in it which may be lying on the sea bed in or near the wreck. It secures protection of wreck sites in territorial waters (below high-water mark) from interference by unauthorised persons.

Relevant Legislation and Policy	Relevance to the Assessment
Burial Act 1857 (Ref. 22.19).	It is generally an offence to remove human remains from a place of burial without a licence from the SoS.
National Policy	
National Policy Statement for Energy (EN-1) (Ref. 22.20).	NPS EN-1 requires change to the significance of heritage assets to be considered in developing an understanding of the potential effects of the proposed development. NPS EN-1 notes that setting contributes to an asset's significance and sets outs policies regarding change to the setting of heritage assets. Paragraphs 5.8.8 and 5.8.9 requires that "…*the applicant should provide a description of the significance of the heritage assets affected by the proposed development and the contribution of their setting to that significance*...", referencing the requirements to have consulted the Historic Environment Record (HER), and where appropriate to carry out desk-based assessment and further field evaluation. Paragraph 5.8.10 states that "*The applicant should ensure that the extent of the impact of the proposed development on the significance of any heritage assets affected can be adequately understood from the application and supporting Documents*.". Paragraph 5.8.9: "*Where proposed development will affect the setting of a heritage asset, representative visualisations may be necessary to explain the impact*.". Paragraphs 5.8.14-15 outline a presumption in favour of the conservation of designated heritage assets, and notes "*Where the application will lead to substantial harm to or total loss of significance of a designated heritage asset the IPC should refuse consent unless… loss of significance is necessary in order to deliver substantial public benefits that outweigh that loss or harm.*". Paragraph 5.8.16 notes that not all elements of a conservation area necessarily contribute positively to significance and requires that the contribution of elements which may be affected be considered.

Relevant Legislation and Policy	Relevance to the Assessment
	Paragraph 5.8.20 states that the developer should be required to record and advance understanding of the significance of the heritage asset before it is lost.
National Planning Statement for Nuclear Power Generation (EN-6) (Ref. 22.21).	NPS EN-6 (Volume I) identifies policy for siting nuclear generation and specific nuclear impacts. The historic environment is not identified as a nuclear impact and therefore this document does not contain policies which specifically relate to the historic environment. NPS EN-6 (Volume II) includes the results of an appraisal of sustainability of the Bradwell site, which sets out the principal environmental constraints considered in selecting the site as an appropriate location for new nuclear development. These include heritage assets at: • Othona Roman Fort and Chapel of St Peter-on-the-Wall; and • West Mersea Conservation Area.
UK Marine Policy Statement (Ref. 22.22).	The Marine Policy Statement, published in March 2011, was prepared and adopted under the Marine and Coastal Access Act 2009. The Marine Policy Statement provides the context for marine plans, which will provide detailed policy and spatial guidance and ensure that individual decisions within a plan area make the appropriate contribution to UK, national and area specific policy objectives.
National Planning Policy Framework (NPPF) (Ref. 22.23).	Section 16 of the NPPF relates to the Historic Environment and is consistent with the policies of EN-1. Paragraph 185 outlines the requirement of a positive strategy for the conservation and enjoyment of the historic environment, including heritage assets (both designated and non-designated) most at risk. Heritage assets should be conserved in a manner appropriate to their significance. Paragraph 189 states the requirement to describe the significance of heritage assets (and their setting) and any archaeological interest that may be impacted by the proposal.

Relevant Legislation and Policy	Relevance to the Assessment
	Paragraph 190 requires LPAs to assess the significance of heritage assets (and their setting) that may be affected, to avoid or minimise any conflict between the heritage asset's conservation and any aspect of the proposal. Paragraph 192 outlines that great weight will be given to the conservation of designated heritage assets "…*irrespective of whether any potential harm amounts to substantial harm, total loss or less than substantial harm to its significance*.". Paragraph 194 states that any harm, or loss of significance of a designated heritage asset from development within its setting will require clear and convincing justification. Paragraph 195 states "*Where a proposed development will lead to substantial harm to (or total loss of significance of) a designated heritage asset, local planning authorities should refuse consent, unless it can be demonstrated that the substantial harm or total loss is necessary to achieve substantial public benefits that outweigh that harm or loss, or all of the following apply:* *(a) the nature of the heritage asset prevents all reasonable uses of the site; and* *(b) no viable use of the heritage asset itself can be found in the medium term through appropriate marketing that will enable its conservation; and* *(c) conservation by grant-funding or some form of not for profit, charitable or public ownership is demonstrably not possible; and* *(d) the harm or loss is outweighed by the benefit of bringing the site back into use*.". There are four designated heritage assets within the main development site. Paragraph 196 states "*Where development will lead to less than substantial harm to the significance of the designated asset, the harm should be weighed against the public benefit of the proposal*.". The main development site lies within the setting of numerous designated heritage assets. Assets will be scoped into further assessment, where harm to their significance is possible.

Relevant Legislation and Policy	Relevance to the Assessment
	Paragraph 197 states "*The effect of a proposal on the significance of a non-designated heritage asset should be taken into account in determining the application*.". Paragraph 199 "*The developer will be required to record and advance understanding of the significance of any heritage assets to be lost and to make this evidence publicly accessible*.". Paragraph 200 indicates that proposals which preserve those elements of the setting that make a positive contribution to an asset's significance should be treated favourably.
Draft South East Inshore Marine Plan (2020 (Ref. 22.24).	A draft South East Inshore Marine Plan is undergoing formal consultation. Policy SE-HER-1 relevant to heritage assets states: "*Proposals that demonstrate they will conserve and enhance elements contributing to the significance of heritage assets will be supported. Proposals unable to conserve and enhance elements contributing to the significance of heritage assets will only be supported if they demonstrate that they will, in order of preference:* *a) avoid* *b) minimise* *c) mitigate harm to those elements contributing to the significance of heritage assets* *d) if it is not possible to mitigate, then public benefits for proceeding with the proposal must outweigh the harm to the significance of heritage assets*.".

Relevant Legislation and Policy	Relevance to the Assessment
Local Policy	
Maldon District Council (MDC) Local Development Plan (2017) (Ref. 22.25).	Policy S1, sustainable development states, "*When considering development proposals the Council will take a positive approach that reflects the presumption in favour of sustainable development contained in the NPPF and will apply the following key principles in policy and decision making: ...* *10) Conserve and enhance the historic environment by identifying the importance of local heritage, and providing protection to heritage assets in accordance with their significance…*". Policy D1, Design Quality and Built Environment states, "*All development must:* *1) Respect and enhance the character and local context and make a positive contribution in terms of:* *e) Historic environment particularly in relation to designated and non-designated heritage assets;…*". Policy D3 Conservation and Heritage Assets provides for the protection of built heritage assets and archaeological remains. The policy states: "*Heritage Assets* *Development proposals that affect a heritage asset (whether designated or non-designated) and / or its setting will be required to:* *1) Preserve or enhance its special character, appearance, setting – including its streetscape and landscape value - and any features and fabric of architectural or historic interest;* *2) Be supported by a Heritage Statement which describes the asset's significance in sufficient detail to understand the potential impact of the proposal upon the significance of the heritage asset through the proposed work to it and / of its setting."* *"Where a proposed development would lead to substantial harm to or total loss of significance of a designated heritage asset, it will be refused unless it can be demonstrated that the substantial harm or*

Relevant Legislation and Policy	Relevance to the Assessment
	loss is necessary to achieve substantial public benefits that outweigh that harm or loss, or all of the following apply: the nature of the heritage asset prevents all reasonable use of the site; no viable use of the heritage asset itself can be found in the medium term through appropriate marketing that will enable its conservation; conservation by grand-funding or some form of charitable or public ownership is demonstrably not possible; and the harm or loss is outweighed by the benefit of bringing the site back into use.". Enabling Development *"Enabling development which would otherwise conflict with policies in this plan, but which secures the conservation of a heritage assets, will only be allowed where the benefits of the proposal outweigh the dis-benefits of the departure from the policies in this Plan.".* Archaeology *"Where development might affect geological deposits, archaeology or standing archaeology, an assessment from an appropriate specialist source should be carried out. This assessment must include consultation of the Historic Environment Record. The assessment should be carried out during an early stage of the planning process to identify the likely impact on known or potential heritage assets and assess their significance. The assessment will also provide the basis for potential mitigation strategies, including excavation, in situ preservation, and recording.".*
Chelmsford City Council (CCC) Local Plan (2020) (Ref. 22.26).	Policy S1, Spatial Principles "*The Council will require all new development to accord with the following Spatial Principles where relevant:* • *Respect the character and appearance of landscapes and the built environment, and preserve or enhance the historic environment and biodiversity.".*

Relevant Legislation and Policy	Relevance to the Assessment
	Policy S3, Conserving and Enhancing the Historic Environment states: "*The Council will conserve and where appropriate enhance the historic environment recognising the positive contribution it makes to the character and distinctiveness of Chelmsford through the diversity and quality of heritage assets. This includes wider social, cultural, economic and environmental benefits.* *The Council will designate and keep under review Conservation Areas in order to preserve or enhance their special architectural or historic interest with an emphasis on retaining and where appropriate improving the buildings and/or features that make a positive contribution to their character or appearance.* *The Council will conserve or enhance the significance (including any contribution made by its setting) of Listed Buildings, Scheduled Monuments and Registered Parks and Gardens with an emphasis on preserving and where appropriate enriching the social, cultural, economic and environmental benefits that these heritage assets provide.* *The Council will seek the protection, conservation, and where appropriate and important to their significance, re-use and/or enhancement of historic places and sites on the Heritage at Risk Register and the local buildings at risk register.* *When assessing applications for development, the Council will place great weight on the preservation or enhancement of designated heritage assets and their setting. The Council will encourage applicants to put heritage assets to viable and appropriate use, to secure their future preservation and where appropriate enhancement, as appropriate to their significance. Policy DM13 sets out how the Council will consider proposals affecting the different types of designated heritage assets and their significance.* *The Council will seek to conserve and where appropriate enhance the significance of non-designated heritage assets and their settings, which includes buildings, structures, features, gardens of local interest and protected lanes. Policy DM14 sets out the Council's approach to the protection and retention of these assets. Chelmsford contains a number of sites of archaeological importance. As set*

Relevant Legislation and Policy	Relevance to the Assessment
	out in Policy DM15, the Council will seek the preservation and where appropriate enhancement of sites and their setting of archaeological interest.". Policy S9, Infrastructure Requirements *"Infrastructure necessary to support new development must seek to preserve or enhance the historic environment and mitigate any adverse impacts on nearby heritage assets and their settings*.". Policy DM13 – Designated Heritage Assets *"A) The impact of any development proposal on the significance of a designated heritage asset or its setting, and the level of any harm, will be considered against any public benefits arising from the proposed development. Where there is substantial harm or total loss of significance of the designated heritage asset, consent will be refused unless it can be demonstrated that the substantial harm or loss is necessary to achieve substantial public benefits that outweigh that harm or loss; or all of the following apply:* *i. the nature of the heritage asset prevents all reasonable uses of the site; and* *ii. use of the asset is not viable in itself in the medium term, or not demonstrably possible in terms of grant funding; and* *iii. the harm or loss is outweighed by bringing the site back into use.* *Where there is less than substantial harm to the heritage asset this will be weighed against the public benefits of the development proposal, including securing the optimum viable use of the heritage asset.* *The Council will take account of the desirability of sustaining and enhancing the significance of heritage assets and the positive contribution that conservation of heritage assets can make to sustainable communities, local character and distinctiveness.* *B) Listed Buildings* *In addition to Part A) the Council will preserve Listed Buildings and will permit proposals where:*

Relevant Legislation and Policy	Relevance to the Assessment
	i. any extension/alteration would not adversely affect its significance as a building of special architectural or historic interest, both internally and externally; and *ii. development within the setting of a listed building would not adversely affect the significance of the listed building, including views to and from the building, landscape or townscape character, land use and historic associations; and* *iii. any change of use would preserve its significance as a building of special architectural or historic interest and ensure its continued use.* *C) Conservation Areas* *In addition to Part A) development will be permitted in Conservation Areas where:* *i. the siting, design and scale would preserve or enhance the character or appearance of the area; and* *ii. building materials and finishes are appropriate to the local context; and* *iii. features which contribute to the character of the area are retained; and* *iv. iv. important views are preserved.* *Development involving demolition or substantial demolition will only be granted if it can be demonstrated that:* *v. the structure to be demolished makes no contribution to the special character or appearance of the area; or* *vi. it can be demonstrated that the structure is beyond repair or incapable of beneficial use; or 214 Chelmsford Local Plan Chelmsford Local Plan - Full Council Version May 2020* *vii. the substantial public benefit would outweigh the harm; or viii. it can be demonstrated that the removal of the structure would lead to the enhancement of the Conservation Area.* *D) Registered Parks and Gardens*

Relevant Legislation and Policy	Relevance to the Assessment
	Development proposals should protect Registered Parks and Gardens and their settings. Harm should be assessed in accordance with the tests within Part A) of this policy. *E) Scheduled Monuments* *Development proposals should protect Scheduled Monuments and their settings. Harm should be assessed in accordance with the tests within Part A) of this policy."* Policy DM15 – Archaeology "*Planning permission will be granted for development affecting archaeological sites providing it protects, enhances or preserves sites of archaeological interest and their settings. Applications shall have assessed the site in consultation with the Historic Environment Record and taken account of the archaeological importance of those remains, the need for the development, the likely extent of any harm, and the likelihood of the proposal successfully preserving the archaeological interest of the site by record*."
Colchester Borough Council (CBC) Development Policies (2014) (Ref. 22.27)	Policy DP14: Historic Environment Assets The policy states, "*Development will not be permitted that will adversely affect a listed building, a conservation area, historic park or garden or important archaeological remains. Development affecting the historic environment should seek to preserve or enhance the heritage asset and any features of specific historic, archaeological, architectural or artistic interest."* Conservation of the historic environment will be ensured by "*(iii) Preserving or enhancing Listed Buildings, Scheduled Monuments, Historic Parks and Gardens, including their respective settings, and other features which contribute to the heritage of the Borough*;" And *"Heritage Statements and/or Archaeological Evaluations will be required for proposals related to or impacting on the setting of heritage assets and/or known or possible archaeological sites, so that*

Relevant Legislation and Policy	Relevance to the Assessment
	sufficient information is provided to assess the impacts of development on historic environment assets together with any proposed mitigation measures."
Colchester Borough Council Emerging Local Plan (2017) (Ref. 22.28)	Policy DM16: Historic Environment The policy states that: "*Development that will lead to substantial harm to or total loss of significance of a listed building, conservation area, historic park or garden or important archaeological remains (including development that adversely affects the setting of heritage assets) will only be permitted in exceptional circumstances where the harm or loss is necessary to achieve substantial public benefits that outweigh the harm or loss. Where development will lead to less than substantial harm this harm should be weighed against the public benefits of the proposal.* *Development affecting the historic environment should seek to conserve and enhance the significance of the heritage asset and any features of specific historic, archaeological, architectural or artistic interest. In all cases there will be an expectation that any new development will enhance the historic environment or better reveal the significance of the heritage asset, in the first instance, unless there are no identifiable opportunities available."* Conservation of the historic environment will be ensured by *"(iii) Preserving and enhancing Listed Buildings, Scheduled Monuments, Historic Parks and Gardens, including their respective settings, and other features, which contribute to the heritage of the Borough*;" And *"Heritage Statements and/or Archaeological Evaluations will be required for proposals related to or impacting on the setting of heritage assets and/or known or possible archaeological sites, and where there is potential for encountering archaeological sites so that sufficient information is provided to assess the significance of the heritage assets and to assess the impacts of development on historic assets together with any proposed mitigation measures."*

Technical guidance

22.2.3 Technical guidance that has been used to define the assessment is set out in **Table 22.2**.

Table 22.2: Relevant technical guidance

Guidance Reference	Implications
Planning Practice Guidance (Ref. 22.29).	This guidance explains requirements of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (Ref 22.30).
Planning Practice Guidance: Historic Environment (2019) (Ref. 22.31).	This guidance provides advice on the conservation and enhancement of the historic environment.
Good Practice Advice in Planning Note 2 (GPA 2): Managing Significance in decision-taking in the Historic Environment (2015) (Ref. 22.32).	This document provides guidance and information to assist local authorities, planning and other consultants, owners, applicants and other interested parties in implementing historic environment policy and ensuring compliance with NPPF fundamentals. It is important to understand the nature, extent and level of significance of an asset, and the contribution of its setting to its significance, in order to understand the impact of the proposals on that significance and for decisions to be made in line with legal requirements, objectives of the development plan and the policy requirements of the NPPF.
Good Practice Advice in Planning Note 3 (GPA 3): The Setting of Heritage Assets (2017) (Ref. 22.33).	Sets out guidance on managing change within the settings of heritage assets. The document sets out five steps to follow to ensure an appropriate level of assessment is achieved.

Guidance Reference	Implications
Conservation Principles, Policies and Guidance (2008) (Ref. 22.34).	Sets out principles for the assessment of heritage significance and its management.
Conservation Principles for the Sustainable Management of the Historic Environment - consultation draft (2017) (Ref. 22.35).	A draft version of the revised conservation principles for the sustainable management of the historic environment.
Statements of Heritage Significance: Analysing Significance in Heritage Assets (2019) (Ref. 22.36).	This Historic England advice note covers the NPPF requirement for applicants for heritage and other consents to describe heritage significance to help local planning authorities to make decisions on the impact of proposals for change to heritage assets.
Advice Note 10 Listed Buildings and Curtilage (2018) (Ref. 22.37).	Provides worked examples to assist understanding of how to define the curtilage of a listed building.
Advice Note 2: Making Changes to Heritage Assets (2016) (Ref. 22.38).	Provides guidance on the application of NPPF policies to alterations to heritage assets.
Research and Archaeology: Framework for the East of England (2000, 2011 and draft updates 2018-19) (Ref. 22.39, Ref. 22.40 and Ref. 22.41).	The resource assessment was aimed at better understanding the current state of knowledge and understanding within the region. This includes period-based summaries. The research agenda and strategy identifies gaps in knowledge and research topics and presents a range of research issues which could usefully be addressed within the region. Where available, these summaries will be consulted during the production of the ES and in formulating the mitigation strategies.
Greater Thames Research Framework (2010) (Ref. 22.42).	This framework outlines the current state of knowledge and understanding within the Great Thames region, and research objectives applicable to Essex and the Project.

Guidance Reference	Implications
Chartered Institute for Archaeologists (CIfA) Standard and guidance for archaeological desk-based assessment (2017) (Ref. 22.43).	Sets out standards for the production of archaeological desk-based assessments.
CIfA Standard and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment (2014) (Ref. 22.44).	Sets out standards for the provision of consultancy advice in the historic environment.
CIfA Standard and guidance for archaeological field evaluation (2014) (Ref. 22.45).	Sets out standards for archaeological evaluation.
CIfA Standard and guidance for archaeological geophysical survey (2014) (Ref. 22.46).	Sets out standards for archaeological geophysical survey.
CIfA Standard and guidance for the archaeological investigation and recording of standing buildings or structures (2019) (Ref. 22.47).	Sets out standards for archaeological investigation and recording of standing buildings or structures.
Guidelines for the use of Geophysics in Archaeology (2016) (Ref. 22.48).	Sets out standards for archaeological geophysical survey.
Standards for Field Archaeology in the East of England (Ref. 22.49).	Provides guidance to standards for field archaeology.

Guidance Reference	Implications
Environmental Archaeology (2011) (Ref. 22.50).	Provides guidance for good practice in environmental archaeology and practical advice on the applications and methods of environmental archaeology within archaeological projects.
Deposit Modelling and Archaeology (2020) (Ref. 22.51).	Provides guidance on the development and application of deposit models to characterise deep sequences of deposits, which may have archaeological interest.
Geoarchaeology (2011) (Ref. 22.52).	Provides guidance on the range of geoarchaeological techniques available to understand site formation processes and landscape-scale changes over time.
Historic Environment Guidance Note for the Offshore Renewable Energy Sector (2007) (Ref. 22.53).	Generic guidance on the survey, appraisal and monitoring of the historic marine and coastal environment.
Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector 2011 (Ref. 22.54).	Provides best practice options in relation to the integration of archaeology with offshore development led geotechnical investigations.
Marine Geophysics Data Acquisition, Processing and Interpretation (2013) (Ref. 22.55).	Guidelines on the applicability of geophysical techniques for maritime archaeology and provides basic information for and characterisation of wreck sites and submerged prehistoric landscapes.
Guidance for the Assessment of Cumulative Impacts on the Historic Environment from offshore Renewable Energy (2008) (Ref. 22.56).	Guidance on the assessment of cumulative impacts on the historic coastal and marine environment.

Guidance Reference	Implications
Code of Practice for Seabed Developers (1998) (Ref. 22.57).	The Joint Nautical Archaeology Policy Committee Code sets out recommended procedures for consultation and co-operation between seabed developers and archaeologists. It seeks to ensure seabed developers acknowledge the potential scientific value of archaeological evidence on, or concealed within, the seabed and make every effort to report, promptly, unexpected discoveries encountered.
People and the Sea: A Maritime Archaeological Research Agenda for England (2013) (Ref. 22.58).	People and the Sea: A Maritime Archaeological Research Agenda for England is a resource assessment, research agenda and research framework for England's maritime and marine historic environment. It provides a coherent overview of previous research into England's maritime, marine and coastal archaeology, enabling long-term strategic planning, informing policy and providing a statement of agreed future research priorities.

22.3 Consultation and Engagement

22.3.1 This chapter has been informed by engagement and discussion with various stakeholders. **Table 22.3** details technical engagement to date which has occurred outside of formal statutory consultation. **Table 22.4** provides a summary of consultee comments arising from Stage One Consultation, along with a response to identify how the matters are dealt with in this report.

Table 22.3: Technical engagement

Consultee	Points of Discussion
Historic England.	Discussions with Historic England took place via an initial consultation meeting on 17 December 2019 and via a Cultural Landscape scoping workshop on 26 June 2020, to understand key historic environment issues and constraints; to explore measures for addressing key issues; and to outline appropriate engagement approach. Historic England advice would focus on heritage assets of the highest significance but may include comment on Grade II listed buildings and conservation areas in general. For these latter designations, Historic England would generally defer to the LPA conservation officer. The Regional Science Advisor should be consulted for advice on scientific dating, particularly for marine sediments. Ground investigation works (in advance of the Development Consent Order (DCO) submission) should be subject to geoarchaeological monitoring. The applicant has confirmed that this has been and will be undertaken. Historic England would liaise with Essex County Council (ECC) regarding heritage assets in the tidal zone and would take an interest in any heritage assets offshore regardless of designation. The following potential receptors were highlighted in the initial consultation meeting as key concerns: • Chapel of St Peter-on-the-Wall: there is a need to maintain the open aspect of the approach to this asset which forms a key part of its part of its setting and contributes to its significance. • The entire Dengie Peninsula is considered to be an area of considerable archaeological interest, and areas of farmland reclaimed from coastal marshland are considered to be particularly important.

Consultee	Points of Discussion
	• Dengie has field systems which are of a distinctive form and which, it has been argued, may have Roman or pre-Roman origins. • There is a scheduled hillfort at Asheldham (SM 1014142) which may be affected by proposed transport routes.
ECC Place Services.	ECC Place Services provide specialist archaeological advice to MDC and CCC. Discussions with ECC took place on 10 January 2020 to discuss the archaeological requirements to support the GI planning application and consider the archaeological context of the permanent and construction plot plans more generally. ECC identified the basic model for archaeological potential set out in the GI heritage statement, with near surface remains of permanent settlement and agricultural activity on higher ground, particularly along East End Road, seasonal or industrial activity (for example, salt making) in the former wetland margins, tending into a more deeply buried sequence of alluvial, estuarine and peat deposits within the reclaimed marshland at the north and east of the site. There would be a degree of modern disturbance arising from the use of the airfield and the construction of Bradwell nuclear power station in the 1950s, but it was anticipated that this disturbance would be localised and of limited extent. During these discussions, ECC identified potential issues arising from the potential to place landscaped soil mounds close to the Chapel of St Peter-on-the-Wall. ECC also requested information about scoping heritage assets within the wider area. Wood confirmed that setting issues and effects on the marine historic environment would be considered at the scoping stage. Development of the study area is discussed further at **Section 22.4**. Discussions with ECC subsequently took place via a Cultural Landscape Scoping Workshop on 26 June 2020 to understand key historic environment issues and constraints; to explore measures for addressing key issues; and to outline an appropriate engagement approach.

Consultee	Points of Discussion
MDC	Discussions with MDC took place via the Cultural Landscape scoping workshop on 26 June 2020 referred to above. MDC have compiled an assessment of potential impacts on built heritage assets within Maldon District, focusing on listed and non-designated structures and conservation areas (Ref 22.59). This sets out initial comments about potential effects on built heritage assets within Maldon District. Key concerns focus on: • Chapel of St Peter-on-the-Wall; • Grade II listed buildings at East Hall Farm; • Local List buildings within the site, including the former RAF Watch Office and blister hangars and Peartree Cottages; • The Bradwell-on-Sea Conservation Area; and • Other listed and non-designated historic buildings within the vicinity of the main development site and associated developments.
CBC	Discussions with CBC took place via the Cultural Landscape scoping workshop on 26 June 2020 referred to above. Key concerns for CBC were identified as effects on the West Mersea Conservation Area. The CBC archaeologist also raised concerns over the visibility of the Project in views from the churches of St John the Baptist, Layer de la Haye and St Nicholas, Little Wigborough.
CCC	Discussions with CCC took place via the Cultural Landscape scoping workshop on 26 June 2020 referred to above. Key concerns for CCC were identified as effects arising from the proposed park and ride sites and transport corridors, particularly where these passed through Danbury, and for heritage assets which might be affected by change in their setting, most notably those with extensive views in which elements of the off-site associated development may be discernible, particularly Danbury Park and the Chelmer and Blackwater Navigation Conservation Area.

Table 22.4: Stage One Consultation comments

Theme	Summary of Consultee Comments and Considerations	How this is Accounted For
Project-provided accommodation.	Historic England comments note that assessment should consider: • The duration of the operational period and the potential retention of these sites after construction is complete. • The influence of the location and design of accommodation on direct and indirect effects which may arise. • The influence of the design, height, layout, lighting on any effects. • that where development would result in major adverse effects then mitigation or alternative location for harmful elements of the scheme should be sought. • That results of the aassessment of impacts should be fed into the decision making for the design and layout of the project-provided accommodation. MDC have not made specific comments on the project-provided accommodation design with regards to the historic environment except where their Built Heritage Impact Assessment identifies potential effects arising from this element of the Project.	Further planned surveys outlined in the SMP (see **Appendix 22A**) include setting assessment for project-provided accommodation, which will consider full temporal scope of development proposals. Sensitivity of heritage receptors and potential effects to heritage significance will be considered throughout the design of the Project. The assessment will have regard to the comments set out in the MDC Built Heritage Impact Assessment comments.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted For
Assessment methodology.	Historic England consider the impacts on the historic environment will be significant and are concerned about the potential harm to significance. Key points regarding approach to assessment are: • Further consultation on assessment and mitigation of impacts • Viewpoints and photomontages production, with early engagement on viewpoint location • Integration with Landscape and Visual Impact chapter • Cumulative effects on heritage assets • Clear, non-technical narrative assessment using qualitive and expert judgement • Follow guidance in Historic England GPA3 The Setting of Heritage Assets. Historic England, ECC, MDC, CBC and CCC have not made specific comments on methodology other than to recommend the use of Historic England guidance GPA3 in considering the potential effects arising through change to setting. CBC recognises that the main impact and potential harm within the borough will be through the indirect and visual impacts on the setting of heritage assets and the wider historic landscape.	Assessment methodology outlined in **Section 22.6** will take account of all points made by Historic England. Methodology outlined in GPA3 will be followed. Viewpoints and photomontages will be produced in consultation with key stakeholders. The assessment will have regard to the comments set out in the MDC Built Heritage Impact Assessment.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted For
Assessment scope.	Historic England recognise the potential for and significance of heritage assets within the marine and intertidal zone. As such, Historic England consider it important to undertake a full coastal process assessment to determine positive and negative impacts on heritage assets and whether these impacts would result in harm. It is also considered likely that these assets will need to be physically assessed for their condition, prior to undertaking any assessment work, in order to provide a baseline for further analysis. Assessments should be undertaken by specialists and reported in an accessible manner. Additional keys points provided by Historical England regarding assessment scope are: • Adverse effects upon the historic environment need to be explicitly set out and set against the negative elements of the scheme so that the determining authority can effectively weigh the adverse effects against the public benefit. • Request for further discussion and details of the assessment and mitigation strategies for the designated heritage assets. MDC have requested that the scope of assessment has regard to their Built Heritage impact assessment and considers any additional heritage assets that	Approach to assessment is given in the SMP (see **Appendix 22A**), which includes details of the methodology and scope of surveys. A review of full coastal process assessment will be carried out to enable assessment of effects on heritage assets through changes to coastal processes. Intertidal walkovers will be carried out as part of planned further archaeological surveys. The assessment scope will have regard to the comments set out in the MDC Built Heritage Impact Assessment. The study areas for the park and ride sites have been reviewed and it is considered that 1km reflects the potential spatial extent of adverse effects that would arise from these elements of the project and would provide a robust evidence base for assessment. The 2km study area for the marine desk-based assessment (DBA), buffered around the zone for marine infrastructure, has been defined to capture heritage assets that may be subject to effects from the Project, including indirect effects arising from changes to coastal processes.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted For
	may be identified as potentially subject to adverse effects during the course of the assessment. CCC request that the heritage assessment should identify all heritage assets likely to be impacted upon by the proposals, to include all designated and non-designated heritage assets within 0.5 kilometres (km) of the highway routes and 2km of the park and ride facilities, and to include the impact on other assets potentially affected in the wider area where longer views are important. This work should be in accordance with GPA3 and include recommendations for mitigating any adverse impacts. CBC state that the direct effects study area will need to extend sufficiently to capture these archaeological remains and scheduled fish weirs in the intertidal zone around the borough. They also require an assessment of impact to the views from the West Mersea Conservation Area with the use of photomontages.	
Off-site associated development.	CCC have commented on the park and ride facilities and freight management facilities' search areas: The Danbury search area includes many designated and non-designated heritage assets, including the	Sensitivity of heritage receptors and potential effects to heritage significance will be considered at the optioneering and design stage for the off-site associated developments.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted For
	Sandon and Danbury Conservation Areas, the Chelmer and Blackwater Navigation Conservation Area, Danbury Park Registered Park and Garden. The landscape setting of these assets is important to a number of sites, including the views to and from Danbury Hill, St Johns Church and Danbury Park. The South Woodham Ferrers search area includes a number of historic farmsteads, including grade II listed buildings at Ilgars, Shaws, Winters, Pounds and the settlement of Woodham Ferrers, which includes a Grade I listed church and seven Grade II buildings and has views over the search area. South Woodham Ferrers Town Council (SWFTC) have raised concerns about the possible location of a park and ride facility on the A132/B1012 route where there are two Grade II listed buildings - Shaw Farm and Tabrums. SWFTC strongly advise other sites are considered. Search Area 3a and the freight management facilities' search area includes a large area around the turnpike, with many designated and non-designated heritage assets. The Church of All Saints (Grade I listed) is a prominent landmark in the area and its setting is quite extensive. The area also has a number of historic farmhouses and farm buildings,	Regard will be given to CCC's comments in ongoing Project design and in developing the detailed scope of assessment The assessment scope will have regard to the comments set out in the MDC Built Heritage Impact Assessment.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted For
	including Rettendon Place (non-designated heritage asset house and grade II listed granary), High House (grade II), Bear Hall (grade II) and Poplars Farm (grade II). The World War Two (WWII) GHQ defence line also passes north-south through the area, which includes a large number of pillboxes. To the south is the estuarine village of Battlesbridge (seven Grade II buildings, Conservation Area and several non-designated heritage assets). MDC have requested that the scope of assessment has regard to their Built Heritage impact assessment and considers any additional heritage assets that may be identified as potentially subject to adverse effects during the course of the assessment.	
Baseline	Historic England identify the rural estuarine character of this landscape and the importance of the relationship between the historic settlements, the monasteries, the landscape, and a local rural economy dominated by the marshes and the estuaries. Some key sensitive receptors likely to be affected by the Project have been identified: • Scheduled Saxon Shore fort and Anglo-Saxon monastery at Bradwell-on-Sea (1013834) thought to have been constructed in the third century to	Sensitivity of heritage receptors and potential effects to heritage significance will be considered at the design stage of the Project. This includes those heritage assets identified by Historic England. Approach to establishing a detailed baseline and assessment of effects are detailed within the SMP (see **Appendix 22A**).

Theme	Summary of Consultee Comments and Considerations	How this is Accounted For
	defend against invading Saxons, and the grade I listed Chapel of St Peter-on-the-Wall within the fort. This is one of the oldest churches in Britain, probably built c. 654 AD. These assets and the landscape context is of the highest significance. • Four scheduled fish weirs (Sales Point- 1019103, West Mersea 1019104, Pewet Island 1019105, Northern end of The Nass- 1019581) • Five scheduled decoy ponds in the marshes of the Blackwater estuary (Gore decoy 1019149, Decoy pond 700 metres (m) north-east of Marsh House Farm 1013835, Square decoy pond 260m south of Pennyhole Fleet Old Hall Marshes 1016863, the Decoy pond 500m south of Waldegraves Farm 1019036, and Decoy pond immediately north of Pennyhole Fleet Old Hall LEN: 1021086). • Four conservation areas (Bradwell on Sea, Tillingham, and then Tollesbury and West Mersea on the northern side of the estuary (also highlighted by CBC). • Historic settlement of Bradwell-on-Sea and listed buildings within, which include grade II* 16th century Bradwell Lodge. • Tillingham Conservation Area which surrounds the 12th century church.	

Theme	Summary of Consultee Comments and Considerations	How this is Accounted For
	• The grade I church of St Peter and St Paul in West Mersea, and three grade II* churches, a significant number of grade II* and grade II secular buildings likely to be affected by the development. CBC also refer to the sensitivity of archaeological remains and scheduled fish weirs within the intertidal zone around the Colchester borough.	
Mitigation	Historic England highlight the following concerns: • relative footprint, mass and height of the Project; • visibility of the Project from significant heritage assets and historic landscapes; • temporal scope of effects on historic environment during construction and operation phases; and • use of traditional mitigation such as planting and bunding which have potential to be harmful. Historic England recommend early discussions with stakeholders regarding mitigation measures. Where mitigation is not possible through design, enhancement of off-site heritage assets should be considered.	Sensitivity of heritage receptors and potential effects to heritage significance will considered at the optioneering and design stage of the Project. Mitigation measures will be embedded within the design process and full consideration will be given to the appropriateness and effectiveness of mitigation options to ensure they do not introduce harm to significance in of themselves.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted For
Stakeholder engagement.	A number of consultees commented on stakeholder engagement, key points raised include: • engagement and discussion on baseline studies; • results of an early assessment of impacts on assets within marine and intertidal zones should feed into decision making and be discussed with stakeholders; and • need to provide information on where construction aggregates will be sourced and if new marine mineral dredging areas will be needed.	To date, the scope of works in relation to this historic environment has been informed by feedback from consultation opportunities listed in **Table 22.3**. The SMP (see **Appendix 22A**) has been prepared to present relevant baseline characterisation details for agreement with consultees, which will be reviewed and refined as the Project progresses and consultation with key stakeholders.
Transport strategy.	Historic England recognises that the Transport Strategy is an important part of the Project proposal. Key points for consideration are: • Location and design of any off-site infrastructure, road or rail network improvements would need to take into account their impact upon designated or non-designated heritage assets and the impact upon their significance through a development within their setting. • Design, layout, lighting and the degree to which these assets may become permanent or have a life beyond the lifetime of the project (i.e. park and ride	Sensitivity of heritage receptors and potential effects to heritage significance will considered at the optioneering and design stage of the Transport Strategy. Appropriate mitigation options will be considered and implemented to reduce the level of harm, where possible.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted For
	or freight interchange locations) would need to be considered. • If these parts of the Project would result in major adverse effects then mitigation or alternative locations for harmful elements of the scheme should be sought. • The assessment of impacts would need to be undertaken early in the development process and the results fed into the decision making for the design and layout of the improvements. • CCC note that the access route along the A414 through Danbury would pass through the Conservation Area, adjacent to listed buildings and Danbury Park, and that noise, visual intrusion and vibration from greater numbers of HGVs would potentially affect heritage assets. • The route along the A132 may have potential to impact on designated heritage assets depending on the nature of off-site highways works sought.	

22.4 Data Gathering Methodology

Study area

22.4.1 This section presents study areas for historic environment. As the design and consultation processes progress and the Project is refined, the exact geographical scope of study areas may continue to evolve to accommodate any changes. If the study areas change, data collection requirements will also be reviewed and updated.

Main development site

22.4.2 The study area for the terrestrial historic environment assessment will extend 1km onshore and offshore beyond the main development site boundary. The area beyond the site boundary will be considered to establish the archaeological and historical context and inform the assessment of the potential for previously unrecorded buried archaeological remains to be present. The study area for the main development site is shown in **Figure 22.1** and **Figure 22.2**.

22.4.3 A second, wider study area of 12km radius from the main development site will be used for identifying heritage assets which may be subject to adverse effects arising through change to setting (see **Figure 22.3**). This study area was determined with reference to the topography and landscape of the area around the site, considering the scale and massing of the Project, and the prominence that it would have in views from heritage assets which draw significance from designed or extensive views towards the site. Heritage assets within this zone will be selected to be taken forward for assessment with reference to the Zone of Theoretical Visibility (ZTV) of the Project and to the specific nature of those assets and their settings. This identification of heritage assets for assessment will focus on those heritage assets which draw significance from distant views in which the Project would be visible.

22.4.4 The study area for the marine historic environment assessment will extend 2km offshore beyond the zone for marine infrastructure boundary to establish the archaeological and historical context and inform the assessment of the potential for previously unrecorded buried archaeological remains to be present. This study area is shown in **Figure 22.4**.

Off-site Power Station Facilities

22.4.5 Where off-site Power Station Facilities are proposed, a study area extending 1km beyond the redline boundary will be used to identify receptors of indirect effects. HER data from the study area will be used to inform an understanding of the potential presence and significance of archaeological remains within the site.

Off-site associated development

22.4.6 The study areas for the off-site associated development are described in **Table 22.5.**

Table 22.5: Off-site associated development study areas

Site	Study Area	Rationale
Off-site highways works.	A 1km buffer from the redline boundary for offline routes, and 500m from online routes will be used to identify potential receptors of indirect effects and to gather HER data which could inform an understanding of potential direct effects.	Proportionate to the scale of development for establishing archaeological and historical context and assessment potential for undesignated buried archaeological remains, and for identifying heritage assets which may be subject to indirect effects.
Park and ride facilities.	A 1km buffer from the redline boundary will be used to identify potential receptors of indirect effects and to gather HER data which could inform an understanding of potential direct effects.	Proportionate to the scale of development for establishing archaeological and historical context and assessment potential for undesignated buried archaeological remains, and for identifying designated heritage assets which may be subject to indirect effects.
Freight management facilities.	A 1km buffer from the redline boundary will be used to identify potential receptors of indirect effects and to gather HER data which could inform an understanding of potential direct effects.	Proportionate to the scale of development for establishing archaeological and historical context and assessment potential for undesignated buried archaeological remains, and for identifying designated heritage assets which may be subject to indirect effects.
Project-provided accommodation.	A 1km buffer from the redline boundary will be used to identify potential receptors of indirect effects and to gather HER data which could inform an understanding of potential direct effects.	Proportionate to the scale of development for establishing archaeological and historical context and assessment potential for undesignated buried archaeological remains, and for identifying designated heritage assets which may be subject to indirect effects.

Sources of data used in scoping

Desk based

22.4.7 The EIA scoping exercise has been undertaken with reference to **Chapter 3: The Project**, supported by a number of data sources. The principal desk-based data sources used to inform this chapter for potential effects comprise of the following in **Table 22.6**.

Table 22.6: Principal desk-based data sources

Source	Data
National Heritage List for England (NHLE).	Designated heritage asset information within the UK.
Essex Historic Environment Record (EHER).	GIS-based records of a wide range of buildings, monuments, find spots, places, and landscapes of archaeological, architectural, artistic or historic interest. Aerial photography.
British Geological Survey (BGS).	Geological mapping and borehole data (Ref. 22.60).
National Library of Scotland.	Historic Ordnance Survey mapping (Ref. 22.61).
Historic England Archive.	Aerial photography, records of heritage assets, surveys and thematic studies.
MDC	Local Lists of Heritage Assets (Ref. 22.62) and Conservation Area Appraisals and Assessments (Ref. 22.63).
CCC	Register of buildings of local value (Ref. 22.64).
CBC	Register of buildings of local value.
National Archives and Essex Record Office.	Documentary, cartographic and photographic records, including aerial photographs.
Defence of Britain Archive.	Field and documentary evidence of 20th century militarised landscape.

Source	Data
Airfield Research Group Archive.	Documentary, cartographic and photographic records, together with research publications relating to airfields.
Recent desk and field studies (including those listed in paragraphs 22.4.8 and 22.4.9).	Archaeological and historical information.
Environment Agency LiDAR data.	Digital Terrain Model, where coverage is available.
Other readily available secondary sources.	For example: local history books and journal articles, thematic studies. Archaeological and historical information.

Survey data

22.4.8 Work undertaken to date comprises:

- Wessex Archaeology Archaeological Assessment in 2009, covering the boundary of the development site considered in EN-6 Assessment of Sustainability;
- geoarchaeological deposit model based on an initial phase of ground investigation works partially carried out across the main development site in 2018;
- archaeological monitoring of ground investigation works within the main development site; and
- Heritage Statement for GI works, which establishes an archaeological and historical baseline and associated impacts of intrusive ground investigation works within the main development site.

22.4.9 Relevant thematic, regional and local contextual studies:

- Blackwater Estuary Fish Trap Monitoring Survey (Ref. 22.65), comprising a series of surveys of the early medieval timber-built fish traps within the Blackwater Estuary, which considers issues of erosion, research and management in and of the inter-tidal zone;
- The Hullbridge Survey (Ref. 22.66) provides an introductory stratigraphic and environmental framework for the major estuaries of the Essex coast, detailing period-based summaries of heritage sites;

- An overview of the historic environment of the rural coast Maldon District together with key issues which affect its conservation and management (Ref. 22.67);
- The Essex Historic Grazing Marsh Project (Ref. 22.68) provides an assessment of the historic environment in the distinctive and sensitive grazing marshes of the Essex coast;
- Early Planned Landscapes in South-East Essex (Ref. 22.69) which examines the origins and nature of the "*planned landscapes*" which cover much of southern Essex;
- Managing the Essex Pleistocene Project (Ref. 22.70) investigates the potential for the survival, nature and significance of Palaeolithic archaeology and Pleistocene faunal or floral remains within Essex;
- Defence of Britain Archive (Ref. 22.71) provides field and documentary evidence of the 20th century militarised landscape within the UK, including Essex;
- An overview of the Bradwell Bay airfield and its changing condition provided by the WWII project (Ref. 22.72);
- Survey of WWII Defences in the district of Maldon (Ref. 22.73): and
- An introductory guide to 20th century defences in Britain (Ref. 22.74).

22.5 Baseline Information

Current baseline

Main development site

Designated heritage assets

22.5.1 There are no scheduled monuments, world heritage sites, registered park and gardens, registered battlefields, protected wreck sites or protected military sites within the main development site.

22.5.2 There are four Grade II listed buildings within the main development site, at East Hall Farm, comprising the farmhouse and the associated stable ranges, byres and barns to the west. These are listed in **Table 22.7**.

Table 22.7: Designated heritage assets within the main development site

List Entry	Grade	Name
1110940	II	Easthall Farmhouse.
1110941	II	Barn approximately 15m west of Easthall Farmhouse.
1308791	II	Byres and stable ranges approximately 25m south-west of Easthall Farmhouse.
1337399	II	Byres and stable ranges approximately 25m south-west of Easthall Farmhouse.

22.5.3 Within the 1km study area there are three scheduled monuments, 43 listed buildings and a conservation area, which are listed in **Table 22B.2** in **Appendix 22B**. The majority of listed buildings comprise farm buildings and cottages. Features of particular note that wwill be considered in more detail for the EIA comprise:

- The scheduled Saxon Shore Fort and Anglo-Saxon monastery at Bradwell-on-Sea (SM 1013834). Built on the western wall of the fort is the Grade I Chapel of St Peter-on-the-Wall (LB 1110942). These assets are approximately 200m south-east of the main development site.
- The Bradwell-on-Sea Conservation Area, which is centred on the historic core of the village around the Grade II* listed Church of St Thomas (LB 1308856). In addition to the parish church, the conservation area contains the Grade II* listed Bradwell Lodge (LB 1337401) and numerous Grade II listed buildings comprising mainly houses and cottages, with a former schoolhouse (LB 1391238), village lock-up (LB 1337396) and occasional agricultural and workshop buildings. These assets are located to the south-west of the main development site.
- Grade II listed buildings at Bradwell Waterside to the west of the Site Boundary, comprising Truscott (LB 1147242), Trusses (LB 1337405), The Old Cottage (LB 1147234), Timbercot (LB 1146663), The Post Office and Post Office House LB 1110977) and Down Westwick (LB 1110958).
- Grade II listed buildings along East End Road to the south of the site, including Cricketer's Cottage (LB 1110938), three listed buildings at Munkins Farm (Munkins Farmhouse LB 1110939; Munkins Cottage LB 1337397; and Barn approximately 25 metres south west of Munkins Farmhouse LB 1337398) and Linnet's Cottage (LB 1146868).

22.5.4 Within the 12km study area, there are numerous designated heritage assets. While the majority of these heritage assets have settings that would not be sensitive to change caused by the construction and operation of the Project, there are some

which may be more sensitive to these changes. These can primarily be expected to be heritage assets which have designed or fortuitous views towards the main development site and locality. Individual heritage assets will be identified in consultation with Historic England and the relevant LPA Conservation Officers, with reference to the ZTV of the Project and an understanding of the present significance and setting of these assets. Notable examples of these assets include:

- The West Mersea Conservation Area, which is located on the opposite side of the Blackwater Estuary, approximately 3km north of the main development site. It is focused on the marina and moorings along the mudflats on the north side of the estuary and there are clear views southwards across the estuary.
- The scheduled Tudor blockhouse 300m south of Mersea Stone (SM 1013832), approximately 7km north-east of the main development site was built to defend the approach to the River Colne and is likely to have views towards the main development site which contribute to significance.
- The Grade I listed Layer Marney Tower (LB 1223988), approximately 11.5km north of the Project, is an early-16th century monumental gatehouse for a palatial residence that was never completed. It faces south with commanding views of the Blackwater Estuary over the creeks at Salcott Creek and Tollesbury Fleet. The visibility of the main development site within these views may give rise to change that affects significance.
- The scheduled Martello towers at Point Clear (Martello tower A and associated battery, Stone Point: SM 1017052; also listed Grade II as LB 1309070; approximately 8.5km north-east of the Project) and Jaywick (Martello tower C, St Osyth Beach, Clacton-on-Sea SM 1018954, also listed Grade II as LB 1165569; approximately 11km north by north-east of the site) were built to defend the approaches to the rivers Blackwater and Colne, and are likely to have views towards the site which contribute to their significance.

Locally listed buildings

22.5.5 There are four heritage assets identified in the draft Local List for Bradwell-on-Sea, which are located within the main development site. These are described in **Table 22.8**.

Table 22.8: Draft local list heritage assets within the main development site

Name	HER monument number	Description
Bradwell Bay WWII Airfield Control Tower.	Collectively recorded as MEX41854 Bradwell Bay WWII Airfield.	This Control Tower oversaw operations at Bradwell Bay airfield during WWII and was later converted to a residence. The roof-top observatory has been rebuilt but the basic form of the building has been preserved.
Bradwell Bay WWII Airfield Station HQ.	Collectively recorded as MEX41854 Bradwell Bay WWII Airfield.	The Station HQ survives to the rear (south) of the Control Tower. It is a long single-storey building which appears to have been repurposed as a workshop.
Bradwell Bay WWII Airfield Four Blister Hangars.	Collectively recorded as MEX41854 Bradwell Bay WWII Airfield.	During WWII there were twelve Blister hangers dispersed across the airfield, of which only four survive. They are each approximately 90 feet in span x 60 feet in length. Three of the hangars have a corrugated asbestos roof, while the fourth has a corrugated iron roof.
Pear Tree Cottage, Weymarks Road.	Not identified within the HER.	A pair of late-Georgian cottages built to house agricultural workers at Weymarks Farm. It was converted into a single dwelling in the 20th century. The building is one and a half storeys high with a clay-tiled gambrel roof. The roof sweeps down in 'cat-slide' form at the back over rear lean-tos.

22.5.6 There are a further 12 heritage assets within the study area identified in the draft Local List for Bradwell-on-Sea, including a mix of late 18th, 19th and early 20th century houses, public houses, a school, village hall, fire boxes installed during WWII by the RAF and a village water pump, originally constructed around 1880 but rebuilt in the 1970s.

Non-designated heritage assets

22.5.7 There are 57 HER records located within the main development site, and a further five HER records within the zone for marine infrastructure. These represent a range of record types including small finds (for example, pot sherds and fired clay of Iron Age date MEX1035603), a small number of cut features (ditches and gullies) dating to the Iron Age or Roman and post-medieval period, cropmark remains of ditches and gullies of unknown, but likely prehistoric, date (MEX1040061, MEX7251); and the remains of Red Hills, which comprise mounds of industrial waste including

briquetage, coarse ceramic vessels associated with processing and transport of salt of probable Iron Age or Roman date (for example MEX7142, MEX7144). Remains relating to the former use of the main development site as a WWII airfield (MEX41854) are also present, including a control tower, Station HQ and four blister hangers identified as local list buildings as well as elements of the runway and perimeter tracks and ruinous remains of the former Battle Headquarters. Further elements of the former airfield may survive as below-ground archaeological remains

22.5.8 Within the main development site 1km study area there are 135 HER records.

Prehistoric

22.5.9 The main development site lies on the east coast of Essex, which is dominated by river terrace sequences from earlier river systems. A geoarchaeological deposit model highlights the presence of deep, undisturbed alluvial sequences of varying ages below large areas of the main development site. Some of these deposits are known to contain evidence of early prehistoric exploitation of the marshland, as well as paleoenvironmental remains that can be used to reconstruct the past landscape and environment.

22.5.10 Within the main development site there is differential potential for remains of Palaeolithic date, which have the potential to provide a greater understanding of the past landscape and human activity within it, contributing to a wider understanding of the Essex Coast. Whilst the low-level East Essex Gravels underlying the southern edges and western parts of the main development site are considered to have moderate Palaeolithic potential, according to the Essex HER, the recent geoarchaeological deposit model suggests that the Asheldham Gravels observed within the main development site are of limited archaeological potential of themselves but may have formed areas of higher ground that were exploited in later periods. Where there is potential for Palaeolithic material within the Bradwell Channel Deposits and Bradwell Gravels in the east of the site, these are unlikely to be in situ and would be of low archaeological interest due to the effects of erosion. The early Mesolithic land surface formed by these pre-Holocene deposits has been mapped. Palaeosols have been identified on the pre-Holocene land surface developed between 6,000 and 125,000 years ago during a period of stable terrestrial conditions and are of archaeological interest.

22.5.11 Generally, the elevated deposits in the west are of low prehistoric potential both archaeologically and palaeoenvironmentally due to weathering and mechanical destruction. Whilst in the north and east, there is a moderate prehistoric archaeological potential with the possibility of Mesolithic to Bronze Age human activity in evidence.

22.5.12 During the Neolithic period the coastal marshes and inter-tidal mud flats would have predominated at the main development site and marine infrastructure area. Buried Neolithic land surfaces occur at points along the Blackwater Estuary, including along the northern coastal edge of the main development site and the zone for marine infrastructure. Material recovered from this land surface suggested the presence of

an early Neolithic occupation site nearby. Prehistoric small finds within the main development site and study area have included a number of struck flints and a burnt flint scatter which indicate activity in the immediate landscape. It is uncertain where the limits of Prehistoric activity extended to within the present-day marine environment, but it is likely that further evidence of prehistoric occupation and coastal exploitation will be present within the main development site and zone for marine infrastructure.

Iron age and roman

22.5.13 Evidence for Iron Age exploitation of the coastal marshes comprises mounds of industrial waste as a result of salt making activities, known as red hills. Three red hills are identified within the main development site. The line of the red hills at Bradwell are thought to denote the edge of the landward marsh during this period.

22.5.14 Other Iron Age evidence within the study area includes pottery, a ditch or gully, and a wooden structure with associated land surface within the northern coastal edge of the main development site and marine infrastructure area.

22.5.15 Cropmarks identified within the main development site have a morphology indicative of later prehistoric or Romano-British enclosures. These features appear to be of a type which is relatively frequent in Essex and understanding these features would present an important opportunity to better understand the nature of the past use of the site and the relationship of these features to the historic landscape.

22.5.16 Within the main development site evidence for Roman activity comprises small finds including beads, coins and pottery in addition to building material. It is likely that the marshes continued to be exploited during this period with the shoreline (indicated by the line of red hills) likely to represent the limit of the marshland.

22.5.17 The Saxon Shore fort (SM 1013834) is dated to the late-3rd century. Associated features within the wider area include evidence of a barrack block in the north-west corner of the fort which is likely to extend into the main development site at its south-eastern edge. The presence and character of the marine infrastructure during this period is presently unknown.

Early medieval and medieval

22.5.18 Whilst there are no HER records relating to the early medieval period identified within the main development site, the current field systems within parts of the main development site are thought to have originated in the early medieval period.

22.5.19 Within the wider landscape, evidence of this period includes the site of the Saxon shore fort, which was reused as a monastery within the early-medieval period with the construction of the Chapel of St Peter-on-the-Wall (LB 1110942). The wider coastal areas continued to be exploited during this period with the marshes used for pasturage and evidence identified for fish traps in the wider Blackwater Estuary, including the Coastal Fish Weir 440m north-west of Pewet Island (SM 1019105) and the Saxon coastal fish weir at Sales Point (SM 1019103) of which both are

scheduled. An early medieval burial (MEX1040218) was recorded within the zone for marine infrastructure, where skeletal remains of an adult male were recovered within a shallow grave.

22.5.20 The medieval period is represented within the existing baseline by findspots, only one of which is found within the main development site, and surviving timber-framed buildings and the parish Church of St Thomas (LB 1308856) within the surrounding study area. It appears likely that the basic settlement geography of the study area reflects the late-medieval pattern of settlement, but this relationship is not clearly established.

Post-medieval

22.5.21 The post-medieval period is represented in the study area by evidence for agricultural activity. The current field systems that can be seen within the site are thought to have developed through a process of infilling between long roughly east-west oriented "resource linkage routes" originating in prehistory, rather than necessarily reflecting a preserved prehistoric field system (Ref. 22.75). Land use and settlement patterns appear to have been relatively stable, with the exception of the reclamation of the marshland in the eastern parts of the main development site. An Estate map of 1714 produced by William Cole shows the area consisting of large fields, some of which may have retained their medieval appearance, with some enclosure by agreement. By the 1820s the Tithe maps show a degree of Parliamentary enclosure which was still in place by the 1880s when the first edition Ordnance Survey mapping was produced. A degree of change to the field patterns has occurred since, mainly through the loss of many internal boundaries to create large arable fields. The lower lying fields were historically used for pastoral farming with higher land being arable.

22.5.22 There are a range of agricultural buildings, some of which are listed, for example the Grade II listed Easthall Farmhouse (LB 1110940) in the south of the main development site. An 18th century, or earlier, a duck decoy pond (MEX1038439) is also present at East Hall Farm.

22.5.23 Surviving post-medieval remains within the main development site are possible and are likely to be features or deposits relating to agriculture and land management, such as field boundary ditches. However, modern use of the main development site as an airfield will have impacted these.

Modern

22.5.24 The main development site remained agricultural land with isolated farmsteads at East Hall, Weymarks and Weymark and East Wick, until the early 20th century. It was used as an airfield during WWII (MEX41854) and the marshes were used as a bombing range. The former satellite field servicing the Dengie ranges from 1936 was identified as a suitable location for an airfield in 1940, and the airfield was opened in November 1941. It was active as a wartime base, being the home of several squadrons, primarily flying offensive missions over occupied Europe. The airfield was equipped with three runways, two of which were extended during the

war. In total there were over 300 buildings and other structures at the site including blister hangars and the marshes were used as a bombing range. Many of these buildings and related structures are visible on aerial photography captured between 1945 and 1953, many of which have since disappeared. The majority of the airfield and 11 pillboxes are located within the main development site boundary. The line of a WWII boom originally passed from a seawall at Bradwell across the Blackwater estuary, through the proposed marine infrastructure area, to Shinglehead Point. Survival of the wooden posts which formed the boom is uncertain. Within the main development site, some airfield structures including four blister hangars, the control tower and Station Head Quarters survive, together with below ground remains of further structures, including former dispersal pens. The airfield was closed in 1946 and part of the airfield was subsumed by the existing Bradwell power station, which opened in 1962 and is in the Care and Maintenance phase of decommissioning. Roads within the parish were upgraded to support the extra traffic associated with the existing Bradwell power station.

22.5.25 In addition to surviving elements of the airfield, modern coastal infrastructure, such as sea walls, wooden and brick structures, are likely to be present along the coastal edge of the main development site and marine infrastructure area

Off-site Power Station Facilities

22.5.26 Establishing a detailed historic environment baseline for the off-site Power Station Facilities will form part of planned further surveys. The location of these facilities is not yet known, and baseline studies as set out above will establish the historic background and potential presence and significance of archaeological remains.

Off-site associated development: project-provided accommodation

22.5.27 Establishing a detailed historic environment baseline for the project-provided accommodation will form part of planned further surveys. Some project-provided accommodation is expected to be within close proximity to the main development site, with additional smaller worker accommodation sites located elsewhere on the Dengie Peninsula (as described in **Chapter 3: The Project**). Until further refinement of the project-provided accommodation within the design process, it can be assumed that the accommodation will be located within a similar historic landscape as detailed in the baseline for the main development site, within this section of the report.

Associated development: park and ride facilities

22.5.28 The distribution of designated heritage assets in relation to the proposed park and ride facilities is shown in **Figure 22.5.** A detailed baseline for this development will form part of planned further surveys.

22.5.29 The park and ride search areas are located on the higher ground inland of Dengie. Whilst the landscape remains characterised by the historic dispersed settlement pattern, there is more extensive modern settlement around the towns of Maldon, Chelmsford and South Woodham Ferrers. Within this landscape are numerous

designated heritage assets, dating to the prehistoric, Roman, medieval and post-medieval periods (including Grade II Danbury Park RPG 1000739, Grade I Church of St Mary, Woodham Ferrers LB 1236909, Grade II* Church of St Andrew at Sandon LB 1235849 and Church of All Saints at Rettendon LB 1235573, the Chelmer and Blackwater Conservation Area, the scheduled medieval leper hospital of St Giles SM 1020915, The Grade II listed ruins of Woodham Walter Hall 1337371 (also SM 1021442) and numerous other listed buildings, most notably the Grade I listed Beeleigh Abbey LB 1257150), as well as non-designated heritage assets of all periods. There may be some areas of higher palaeoloenvironmental potential, particularly on the gravels around Chelmsford and in pockets within Dengie, although the majority of the identified areas of search are located on areas identified as having lower potential for survival of remains of geoarchaeological interest. Undated non-designated cropmarks and earthworks, which represent buried archaeological remains, are present within these search areas and their immediate vicinity.

Off-site associated development: freight management facilities

22.5.30 The general distribution of designated heritage assets in relation to the proposed freight management search area is shown in **Figure 22.6.** A detailed baseline for freight management facilities will form part of planned further surveys.

22.5.31 The freight management facilities are located within a varied landscape, from the higher ground of inland Essex to the rural estuarine Dengie peninsula. This landscape is characterised by dispersed settlement pattern with areas of more extensive modern settlements around historic towns and village cores. Within this landscape are numerous designated heritage assets, dating to the prehistoric, Roman, medieval and post-medieval periods (including the Grade I listed Church of St Mary, Woodham Ferrers LB 1236909, Grade II* Church of All Saints at Rettendon LB 1235573 and numerous Grade II listed buildings), as well as non-designated heritage of all periods. There may be some areas of higher potential geoarchaeological interest.

Off-site associated development: off-site highways works

22.5.32 The distribution of designated heritage assets in relation to the proposed off-site highways works is shown in **Figures 22.7** and **22.8**. A detailed baseline for off-site highway works will form part of planned further surveys.

22.5.33 The proposed highway routes cross a varied landscape, from the higher ground inland to the lower-lying and more rural estuarine Dengie peninsula, where there is a dispersed settlement pattern of farmsteads and villages within historic field systems, which likely reflects a late-medieval pattern of settlement and agricultural practice. The field systems of Dengie are distinctive in scale and form often believed to have a pre-medieval origin, though this has not been firmly established. The character of historic settlement is reflected in the survival of numerous historic buildings, many of which are listed or locally listed. These historic buildings are often

found in small clusters, representing surviving historic settlement cores (some being designated as conservation areas), or are isolated farm or homesteads.

22.5.34 Non-designated heritage assets of all periods are present along the route options. Across the majority of the area the geology is London clay which generally will have a low potential for remains of geoarchaeological significance, though there may be some areas of higher potential, particularly to the east closer to the main development site. The routes frequently cross or pass close to areas of undated non-designated cropmarks and earthworks, which represent buried archaeological remains. These include linear features, rectangular or square enclosures, ring ditches and pit features. Remains of deserted medieval settlements are also known in the vicinity of Snoreham Hall and former St Michael's Church. Surviving elements of the modern military landscape are also likely to be present, including pill boxes and other defensive features.

Future baseline

22.5.35 The existing baseline is based on information from the EHER acquired in December 2019. This data is drawn from a variety of sources, which have variable precision and accuracy. It is constantly updated to include new survey results and may not include the results of more recent archaeological investigations that have occurred. It should also be noted that both national and local records of the historic environment relate to known heritage sites and archaeological finds. This information may therefore change prior to the Project construction phase, which might highlight an increased potential for buried archaeological remains.

Planned further surveys and studies

22.5.36 Additional work which is required to inform the Historic Environment Assessment is set out in **Table 22.9**.

Table 22.9: Planned further surveys and studies

Further Surveys and Studies for Historic Environment	Proposed Date
Detailed terrestrial desk-based assessment of the main development site.	2020
Detailed terrestrial desk-based assessment of off-site associated development and off-site Power Station Facilities.	2021
Detailed marine desk-based assessment	Q4 2020.
Geophysical survey of main development site.	Commencing Q3 2020.

Further Surveys and Studies for Historic Environment	Proposed Date
Geophysical survey of off-site associated development sites and off-site Power Station Facilities (scope to be confirmed following site location and Project design refinement).	TBC
Geoarchaeological monitoring of ground investigation works on main development site.	2021
Review of offshore and intertidal geophysical survey.	2021
Geoarchaeological monitoring of offshore GI works.	2021
Completion of archaeological trial trenching in Load Test Area, within the main development site.	2020-2021.
Strip, map and recording in Load Test Area, within the main development site.	2020-2021.
Site walkovers of main development site and site visits to offsite heritage assets to inform the assessment of effects arising from change to setting.	September 2020.
Site visits to historic buildings within the main development site.	August 2020.
Walkovers of the off-site associated development sites, together with off-site Power Station Facilities and site visits to offsite heritage assets to inform the assessment of effects arising from change to setting.	TBC
Representative viewpoints for the Landscape and Visual Assessment (LVIA) assessment will be used to inform the settings assessment where appropriate.	Q3-Q4 for main development site. TBC for off-site associated development.
Cross-referencing with the LVIA and other workstreams (including noise) where appropriate to ensure an integrated approach to assessment.	Ongoing throughout the EIA process.

22.6 Proposed Approach to the Assessment

22.6.1 The assessment will be completed in accordance with the guidance listed identified in **Table 22.2**.

Assessment of effects and determining significance

22.6.2 The general approach to assessment of effects and determining significance that will be used for the EIA is provided in **Section 5.4** of **Chapter 5: The EIA Process and Methods**. However, this section sets out how the approach has been applied to historic environment and where it has been adapted to deal with the specific requirements of historic environment.

22.6.3 EN-1 requires change to the significance of heritage assets to be considered in developing an understanding of the potential effects of the Project.

22.6.4 The significance of a heritage asset is a product of the value which it holds to this and future generations as a result of its historic, archaeological, architectural or artistic interests, and these provide the basis for considering the significance of each heritage asset (including the contribution of its setting to those interests). These interests are set out in EN-1 (paragraph 5.8.2) and are discussed in more detail in Conservation Principles and GPA2:

- archaeological: the potential of a heritage asset to hold evidence about the past which can be retrieved through specialist investigation;
- historical: which can be through association with past events or people, or where a heritage asset is illustrative of a particular asset type, theme or period; and
- architectural and artistic: values which derive from a contemporary appreciation of a heritage asset's aesthetics.

22.6.5 EN-1 notes that setting contributes to an asset's significance and sets outs policies regarding change to the setting of heritage assets but does not offer an explicit definition. Setting is defined in both the NPPF and by Historic England in GPA 3 as:

> "*…the surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance, or may be neutral.*"

22.6.6 For the purposes of assessing the significance of effects, heritage significance is assigned to one of four classes, with reference to the heritage interests described above and relying on professional judgement as informed by policy and guidance. The hierarchy given in **Table 22.10** reflects the EN-1 distinction between designated and non-designated heritage assets. EN-1 distinguishes between designated assets of the highest heritage significance (i.e. Scheduled Monuments, protected wreck sites, battlefields, Grade I and II* listed buildings, Grade I and II* registered parks and gardens, and World Heritage Sites) and other designated heritage assets. This further distinction is relevant to planning policy but has less influence on the establishment of the significance of an effect in EIA terms.

Table 22.10: Establishing the sensitivity of receptors

Sensitivity	Criteria	Receptor type
High	Assets of national importance, which have significance for an outstanding level of archaeological, architectural, historic and/or artistic interest. It is possible that low-moderate impacts upon these assets or their settings could lead to significant effects.	Designated heritage assets.
Medium	The sensitivity of these assets will largely be dependent upon their current setting and their character. Asset has significance for a high level of archaeological, architectural, historic and/or artistic interest. It is possible that moderate-high impacts upon these assets or their settings could lead to significant effects.	Non-designated sites and monuments of regional importance.
Low	Assets of local interest, which have significance for elements of archaeological architectural, historic or artistic interest. Although these assets must be considered, and mitigation may be required, it is considered that significant effects would only exist if the assets were to be predominantly or totally destroyed as a result of the Project.	Non-designated assets of local importance.
Very low.	Due to its nature of form, condition and survival, cannot be considered as an asset in its own right.	Non-extant HER record.

22.6.7 Magnitude of change is a measure of the extent to which the significance of an asset would be disturbed or lost.

22.6.8 In respect of buried archaeological remains with no visible above ground remains, this would normally arise from direct disturbance or removal of archaeological material which would result in the loss of archaeological interest, but elements of architectural and historic interest can also be affected. Similarly, direct loss, damage or alteration of a structure would primarily affect architectural interest, although

historic and archaeological interests may also be affected. The effects of change in the setting of a heritage asset depends on the contribution of that setting to the significance of the asset, and assessments must be, by their nature, specific to the individual assets being considered.

22.6.9 Magnitude of change of an impact is based on a number of factors:

- the permanence of the impact (temporary, permanent or reversible);
- physical changes caused by the impact (both positive and negative);
- the extent of the heritage asset or its setting that would be affected (for example, the whole or a very small part) and the contribution of that part to significance;
- the nature of the heritage asset that would be affected; and
- the overall impact of changes on the values and significance of the heritage asset (including the contribution of its setting).

22.6.10 In this context, the effects of change in the setting of a heritage asset may depend on individual aspects of that setting, and assessments must be, by their nature, specific to the individual assets being considered.

22.6.11 Impacts on receptors are assigned to one of four classes of magnitude, defined in **Table 22.11**. Impacts can be adverse or beneficial and it is recognised that EN-1 (paragraph 5.8.13) looks to developers to make, where possible, a positive contribution to the historic environment as part of its design response.

Table 22.11: Establishing the magnitude of change

Magnitude	Criteria (Adverse)	Criteria (Beneficial)
High	Loss of significance approaching or of an order of magnitude that would result from irreversible total or substantial demolition or disturbance of a heritage asset or from the disassociation of an asset from its setting.	Sympathetic restoration of an at-risk or otherwise degraded heritage asset and, or its setting and bringing into sustainable use with robust long-term management secured.
Medium	Loss of significance arising from partial disturbance or inappropriate alteration of asset which will adversely affect its importance. Change to the key characteristics of an asset's setting, which gives rise to lasting	Appropriate stabilisation and/or enhancement of a heritage asset and, or its setting that better reveal the significance of the asset or contribute to a long-term sustainable use or management regime.

Magnitude	Criteria (Adverse)	Criteria (Beneficial)
	harm to the significance of the asset, but which still allows its archaeological, architectural or historic interest to be appreciated.	
Low	Minor loss to or alteration of an asset which leaves its current significance largely intact. Minor and, or short-term changes to setting which do not affect the key characteristics and in which the historical context remains substantially intact.	Minor enhancements to a heritage asset and, or its setting that that better reveal its significance or contribute to sustainable use and management.
Very Low.	Minor alteration of an asset or its setting which presents only very limited change to significance.	Minor alteration of an asset which does not affect its significance in any discernible way. Minor and, or short term or reversible change to setting which does not affect the significance of the asset.

22.6.12 The matrix in **Table 22.12** has been prepared to guide the assessment of whether effects on the historic environment for the purposes of EIA are to be considered significant or not. The classification of the effect is judged on the relationship of the magnitude of impact to the assessed heritage significance of the resource. As a general rule, major and moderate effects are considered to be significant and minor and negligible effects are considered to be not significant. However, professional judgement is also applied where appropriate.

Table 22.12: Significance assessment matrix

	Magnitude of Change			
Receptor heritage significance	**High**	**Medium**	**Low**	**Very Low**
High	Significant	Significant	Significant	Not Significant.
Medium	Significant	Significant	Not Significant.	Not Significant.
Low	Significant	Not Significant	Not Significant.	Not Significant.
Very Low	Not Significant.	Not Significant.	Not Significant.	Not Significant.

22.6.13 All assessments will be presented as narrative discussions, setting out the significance of the relevant heritage asset(s), and where appropriate contribution of their settings to significance, providing a description of the anticipated change and setting out the magnitude of impact in line with the definitions set out in **Tables 22.10**, **22.11** and **22.12.**

22.6.14 EN-1 further distinguishes between 'harm' and 'substantial harm' and sets out how development that gives rise to harm should be considered within the planning process. For the purposes of this assessment, adverse impact of low or medium magnitude to a designated heritage asset or non-designated heritage assets of equivalent heritage significance would normally be considered to comprise harm, while a high magnitude of impact would normally comprise substantial harm. Special consideration, however, needs to be given to the particular context in which the assessment is taking place. Comments on the magnitude of any harm accruing to designated heritage assets or non-designated heritage assets of equivalent heritage significance will be made in the narrative assessment.

22.7 Scope of the Assessment

Potential receptors

22.7.1 The principal historic environment receptors that have been identified as being potentially subject to effects are summarised in **Table 22.13**.

Table 22.13: Receptors subject to potential effects

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Project-wide.	Construction phase.	Designated heritage assets. For example, scheduled Saxon Shore Fort and Anglo-Saxon monastery at Bradwell-on-Sea (SM 1013834) and the Grade I Chapel of St Peter-on-the-Wall (LB 1110942).	Designated heritage assets located within the development site and surrounding landscape. Direct change arising from, damage or alteration could give rise to harm to significance of designated heritage assets. Change to setting arising from visibility of, or noise associated with, the construction activities could result in harm to the significance of designated heritage assets. Any effect is likely to be temporary, limited to the duration of construction activities.
Project-wide.	Construction phase.	Non-designated buried heritage assets. For example, prehistoric and palaeoenvironmental remains evidencing occupation and coastal exploitation.	Intrusive construction activities would give rise to disturbance of deposits with archaeological interest. Variable potential for paleoenvironmental and archaeological remains of all periods within the main development site, off-site associated development sites and off-site Power Station Facilities.

Element of the Project	Phase	Potential Receptor	Reason for Consideration
Project-wide.	Construction phase.	Non-designated built heritage assets. For example, Bradwell Bay WWII Airfield Control Tower, Station HQ and blister hangers.	Non-designated built heritage assets located within the main development site, off-site associated development sites, off-site Power Station Facilities and surrounding landscape. Construction activities may give rise to loss or alteration of buildings with heritage significance, which would be permanent. Change to setting arising from visibility of, or noise associated with, the construction activities could result in harm to the significance of designated heritage assets. Perceptual change arising from construction activities would be temporary, but the duration would depend on the nature of the effect and may be medium-term where it persists through the construction period.
Project-wide.	Operational phase.	Heritage assets. For example, the medieval and post-medieval landscape character.	Heritage assets located within the development site and surrounding landscape. Change to setting arising from visibility of, or noise associated with, the operational development could result in harm to the significance of heritage assets and would be considered permanent.

Likely significant effects

22.7.2 The effects on historic environment which have the potential to be significant and that will be taken forward for assessment are summarised in **Table 22.14** and **Table 22.15**.

Table 22.14: Likely significant historic environment construction effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site.	Site preparation (excavation), elements of which may be carried out as part of separate early works applications.	Permanent disturbance of paleoenvironmental and archaeological remains.	Non-designated heritage assets. For example, Bradwell Bay WWII Airfield Control Tower, Station HQ and blister hangers.
Zone for marine infrastructure.	Site preparation (excavation) associated with marine infrastructure, elements of which may be carried out as part of separate early works applications.	Permanent disturbance of paleoenvironmental and archaeological remains.	Non-designated heritage assets. For example, early medieval coastal exploitation remains, such as fishing weirs, or burials.
Main development site.	Site preparation (excavation), elements of which may be carried out as part of separate early works applications.	Disturbance of historic landscape elements.	Historic landscape character, both terrestrial and marine.
Main development site and zone for marine infrastructure.	All construction phases, elements of which may be carried out as part of separate early works applications.	Potential for change to setting caused during construction activities.	Heritage assets within the site boundary (Grade II listed buildings at East Hall Farm).

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site and zone for marine infrastructure.	All construction phases, elements of which may be carried out as part of separate early works applications.	Potential for change to setting caused during construction activities.	Identified heritage assets within the study area and extended study area. For example, scheduled Saxon Shore Fort and Anglo-Saxon monastery at Bradwell-on-Sea (SM 1013834) and the Grade I Chapel of St Peter-on-the-Wall (LB 1110942).
Main development site.	All construction phases, elements of which may be carried out as part of separate early works applications.	Potential for impacts arising from change to coastal processes during construction.	Heritage assets within the marine and intertidal zone including Coastal fish weir 440m north-west of Pewet Island (SM 1019105) and Saxon coastal fish weir at Sales Point (SM 1019103).
All off-site associated development sites, off-site Power Station Facilities.	Site preparation (excavation), elements.	Permanent disturbance of paleoenvironmental and archaeological remains.	Non-designated heritage assets.
All off-site associated development sites, off-site Power Station Facilities.	Site preparation (excavation), elements.	Disturbance of historic landscape elements.	Historic landscape character.
All off-site associated development sites,	All construction phases.	Potential for change to setting caused during construction activities.	Heritage assets within the respective study areas, which will be identified

Element of the Project	Activity	Effect	Receptor or Receptor Group
off-site Power Station Facilities.			following refinement of Project design proposals.
All elements of the Project.	All construction phases.	Potential for in-combination cumulative effects during construction activities.	Historic landscape character. Designated and non-designated heritage assets.

Table 22.15: Likely significant historic environment operational effects

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site.	Operational phase – all buildings and above ground infrastructure.	Perceptual change to historic landscape.	Historic landscape character, both terrestrial and marine.
Main development site.	Operational phase – all buildings and above ground infrastructure.	Potential for change to setting caused during operation of the Project.	Heritage assets (Grade II listed buildings at East Hall Farm, scheduled Saxon Shore Fort and Anglo-Saxon monastery at Bradwell-on-Sea (SM 1013834) and the Grade I Chapel of St Peter-on-the-Wall (LB 1110942).
Main development site.	Operational Phase – change to coastal processes arising from development in the marine and intertidal zones.	Potential for erosion or burial of archaeological remains by changes patterns of erosion and deposition.	Marine and intertidal archaeological heritage assets.

Element of the Project	Activity	Effect	Receptor or Receptor Group
Main development site.	Operational phase – all buildings and above ground infrastructure.	Potential for change to setting caused during operation of the Project.	Identified heritage assets within the study area and extended study area.
Main development site.	Operational phase – all buildings and above ground infrastructure.	Potential for impacts arising from change to coastal processes during operation of the Project.	Heritage assets within the marine and intertidal zone including Coastal fish weir 440m north-west of Pewet Island (SM 1019105) and Saxon coastal fish weir at Sales Point (SM 1019103).
Off-site associated development sites.	Operational phase – all buildings and above ground infrastructure.	Perceptual change to historic landscape.	Historic landscape character.
Off-site Power Station Facilities.	Operational phase – all buildings and above ground infrastructure and vehicle movements	Potential for change to setting caused during operation of the Project.	Heritage assets within the respective study areas, which will be identified following refinement of design proposals.
All retained elements of the Project.	Operational phase – all buildings and above ground infrastructure.	Potential for in-combination cumulative effects during operation of the Project.	Historic landscape character. Designated and non-designated heritage assets.
All retained elements of the Project.	Operational phase – all buildings and above ground infrastructure.	Potential for cumulative effects during operation of the Project.	Historic landscape character. Designated and non-designated heritage assets.

Effects scoped out of further assessment

22.7.3 The effects scoped out from further assessment in are presented in **Table 22.16.**

Table 22.16: Effects scoped out of the assessment

Potential Effect	Justification for Scoping Out
Adverse direct effects on heritage assets outwith the site boundary.	No direct disturbance, damage or alteration would arise to heritage assets outwith the proposed boundaries of the main site or off-site associated development sites. However, a review of heritage assets within the study area is required to establish the archaeological and historical context and inform the assessment of the potential for previously unrecorded buried archaeological remains to be present within the site boundary.
Adverse effects arising from construction or operation phases of the main development site through change to setting of heritage assets outwith the extended study area.	Perceptibility of the Project in the setting of heritage assets located outwith the extended study area would be too limited for discernible adverse effects to arise.
Adverse effects arising from construction or operation phases of off-site associated development and off-site Power Station Facilities through change to setting of heritage assets outwith the respective study area.	Perceptibility of the Project in the setting of heritage assets located outwith the study areas of respective off-site associated development sites would be too limited for discernible adverse effects to arise.

22.8 Potential Mitigation

22.8.1 Potential mitigation would comprise, but not necessarily be limited to, the following design measures:

- Selection of the main development site has been carried out with regard to the potential for adverse effects on heritage assets, as part of the NPS Appraisal of Sustainability. Site selection of the off-site associated development sites will have regard to the potential for adverse effects on heritage assets within and in proximity of the Project.
- Any significant effects on the settings of heritage assets will be mitigated as far as reasonably practicable through design, landscape planting or screening.

- Additional measures for buried archaeological remains and paleoenvironmental deposits, mitigation will entail an agreed programme of archaeological recording and dissemination to mitigate any significant adverse effects during construction. This would usually reduce the magnitude of any adverse residual effect but would not usually result in a beneficial effect.
- Any loss of built heritage assets or historic landscape elements would be mitigated through an appropriate level of survey and recording where avoidance or sensitive adaptation is not feasible.
- Loss or disturbance of historic landscape elements arising from temporary works would be mitigated, as far as possible, through sensitive design restoration and enhancements provided through the permanent masterplan.
- Where significant effects on the settings of heritage assets would not be feasible, enhancements to the asset or its setting may be considered to offset the overall effect.

22.9 Assumptions and Limitations

22.9.1 The assessment of the effects on heritage assets will assume a worst-case scenario, for example, visual change will be considered under winter conditions, i.e. no leaf cover on deciduous trees and shrubs.

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23. BIODIVERSITY: TERRESTRIAL AND FRESHWATER ECOLOGY AND ORNITHOLOGY

23.1 Introduction

23.1.1 This chapter sets out the approach for determining the scope, and content of the assessment for biodiversity (including terrestrial and freshwater ecology, and ornithology). It presents the proposed scope of the biodiversity assessment for the main development site, off-site Power Station Facilities and off-site associated development and it contains:

- a summary of work undertaken to date;
- an explanation of the scope of assessment, including:
  - legislation, policy and guidance that inform the assessment;
  - a description of consultation and engagement to date which is relevant to biodiversity;
  - study area for the assessment;
  - sources of data used in scoping;
  - baseline conditions, including current desk studies and surveys;
  - planned further surveys and studies;
- the receptors (ecological features) that are proposed to be assessed and the effects which have the potential to be significant;
- the effects that are proposed can be scoped out of the assessment; and
- potential mitigation.

23.1.2 The chapter should be read in conjunction with the project description provided in **Chapter 3: The Project.**

23.1.3 In addition to the biodiversity chapter, other environmental aspects including **Chapter 6: Transport, Chapter 7: Noise and Vibration, Chapter 8: Air Quality, Chapter 15: Water Environment, Chapter 17: Coastal Geomorphology and Hydrodynamics, Chapter 18: Marine Water Quality and Sediments, Chapter 21: Recreation, Chapter 24: Marine Ecology and Fisheries** and the Habitat Regulations Assessment (HRA) will be used to support and inform the biodiversity terrestrial and freshwater ecology and ornithology assessment for the Environmental Statement (ES).

23.1.4 An example of this inter-disciplinary approach is the avian noise assessment (including ambient/background noise level monitoring and modelling analysis) which will be conducted in tandem with the overwintering bird surveys.

23.1.5 The HRA is running in parallel to the ornithology assessment for the Environmental Impact Assessment (EIA) and although it is a separate standalone assessment process, the HRA encompasses the same European Sites detailed within this chapter and addresses the relevant terrestrial and freshwater ecology and ornithological qualifying features.

23.1.6 The HRA process is ongoing and an Evidence Plan (EP) is being developed, which is a voluntary step to support the Development Consent Order (DCO) application process and constitutes a non-legally binding agreement between the applicant and the relevant Statutory Nature Conservation Bodies (SNCBs) and competent authorities on the information that needs to be provided in order to produce a robust and appropriate HRA. As detailed within the Planning Inspectorate's Advice Note Ten (Ref. 23.1) the EP will form the basis of the No Significant Effect Report (NSER) if there are no likely significant effects anticipated on any European Site, or the HRA Report if any likely significant effects are identified.

23.1.7 The HRA EP has identified a number of potential likely significant effects and included within the HRA EP are three separate ornithological species-specific mock impact assessments which are being undertaken for dark-bellied brent goose, red throated diver and little tern and ringed plover. The assessments will encompass the Project specific effects based on literature review of species autecology, information concerning species distribution, species-specific responses to disturbance and construction effects (including marine vessel and recreational disturbance) obtained from disturbance monitoring programmes, as well as impact assessments and recommendations for appropriate and effective mitigation measures.

23.1.8 All relevant evidence and data collated for the HRA will be used where appropriate within the terrestrial and freshwater ecology and ornithology assessment for the EIA and any EIA data relevant to European Sites and their qualifying features will form part of the HRA EP and final HRA report.

Work undertaken to date

23.1.9 Biodiversity survey work carried out on the main development site and adjacent areas has included:

- an Extended Phase 1 habitat survey of the main development site and adjacent areas (note the description of the Project, including indicative site boundaries, presented in the Phase 1 habitat survey report **Appendix 23D** reflects the Project status at the point in time that the report was completed);
- an Ecological Appraisal (including HRA) of proposed ground investigation works in 2017 (Ref. 23.2) and in 2020 (Ref. 23.3);

- a suite of survey work covering a variety of terrestrial ecology and ornithological taxa from 2007 to 2009 (Ref. 23.4 - 23.15);
- bat survey work to inform ongoing estate management tasks, 2015-17 (Ref 23.16-23.18);
- walkover survey in winter 2019-20 to search for signs of badger activity;
- preliminary high-level assessment of the potential for the study area to support roosting bats, undertaken in winter 2019; and
- intertidal, nearshore and terrestrial bird surveys undertaken October 2019 – March 2020 (note the description of the project, including indicative site boundaries, presented in the Overwintering Bird Report 2019 - 2020 (**Appendix 23E**) reflects the Project status at the point in time that the report was completed).

23.1.10 Additionally, *ad hoc* records of species were made during supervision of ground investigation works undertaken in 2017 and 2018.

23.1.11 As a complete baseline of terrestrial ecology, freshwater ecology and ornithology surveys has not yet been completed the data available is treated as indicative of the habitats and species likely to occupy the area rather than providing a precise inventory of current presence. Nevertheless, the data from these sources are considered to provide a suitable basis for the identification of relevant ecological features within, and in areas adjacent to, the main development site.

23.1.12 This chapter considers the potential for effects on the following biodiversity features:

- statutory designated sites for nature conservation, namely Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR) and Local Nature Reserves (LNR);
- non-statutory designated sites for nature conservation, namely Local Wildlife Sites (LWS);
- legally protected species (including Wildlife and Countryside Act 1981 (WCA) Schedule 1 birds, badgers, bats, great crested newt, reptiles, otter and water vole); and
- notable habitats, species and species assemblages, such as those habitats and species listed via Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006) as being of principal importance for the purpose of conserving biodiversity in England.

23.2 Legislation, Policy and Technical Guidance

23.2.1 This section identifies the relevant legislation, national and local policy and guidance which has informed the scope of the assessment relevant to biodiversity. Further information on policies relevant to the EIA and their status is set out in **Chapter 2: Policy and Regulatory Context**, which should be read in conjunction with this chapter.

23.2.2 The legislation and policies relevant to biodiversity are detailed in **Table 23.1**.

Table 23.1: Legislation and policy

Relevant Legislation and Policy	Relevance to the Assessment
Legislation	
Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) (Ref. 23.19).	Defines the species, habitats and type of sites that receive legal protection at European level and describes the protection that is afforded.
Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (the Birds Directive) (Ref. 23.20).	Defines the species, habitats and type of sites that receive legal protection at European level, and describes the protection that is afforded, specifically with respect to birds.
Convention on Wetlands of International Importance especially as Waterfowl Habitat 1971 (the Ramsar Convention) (Ref. 23.21).	Provides protection for wetland sites of international importance. In the UK, development of these sites will be allowed only in the rarest circumstances. Any lost wetlands interest must be replaced.
Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy (Water Framework Directive) (Ref. 23.22).	Establishes a legislative framework for the protection of surface waters (including rivers, lakes, transitional waters and coastal waters) and groundwater.
The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref. 23.23).	Transposes the Water Framework Directive (WFD) in England and Wales.

Relevant Legislation and Policy	Relevance to the Assessment
The Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations) (Ref. 23.24).	Transposes the Habitats Directive and elements of the Birds Directive in England, Wales and, to a limited extent, Scotland and Northern Ireland.
Wildlife and Countryside Act 1981 (as amended) (WCA) (Ref. 23.25).	Defines the species, habitats and type of sites that receive legal protection at National level and describes the protection that is afforded.
Countryside and Rights of Way Act 2000 (CRoW Act) (Ref. 23.26).	Requires government departments to have regard for biodiversity in carrying out its functions, and to take positive steps to further the conservation of listed species and habitats. Places a statutory duty on Local Authorities to further the conservation and enhancement of SSSIs in exercising their decision-making functions.
Natural Environment and Rural Communities Act 2006 (NERC Act) (Ref. 23.27).	Section 40 places a duty on public authorities to have regard to the purpose of conserving biodiversity in exercising their normal functions, such as decision-making. Conserving biodiversity can include restoring or enhancing a population or habitat. Section 41 requires the Secretary of State to publish and maintain a list of habitats and species that are of principal importance for the purpose of conserving biodiversity in England. The Habitats of Principal Importance (HPI) and Species of Principal Importance (SPI) lists comprise those habitats and species that were formerly listed as UK Biodiversity Action Plan (UKBAP) Priority Habitats and Species.
The Hedgerows Regulations 1997 (Ref. 23.28).	Protects important hedgerows in the countryside from destruction or damage, by controlling their removal through a system of notification.

Relevant Legislation and Policy	Relevance to the Assessment
Eels Regulations 2009 (Ref. 23.29).	Requires that measures be put in place to ensure that no obstruction is created that prevents the passage of European eels or, where this is unavoidable, alternative habitat and connectivity is provided.
Protection of Badgers Act 1992 (Ref. 23.30).	Consolidates and strengthens previous legislation protecting badgers (including Badgers Act 1973; Badgers Act 1991; and Badgers (Further Protection) Act 1991).
National Policy	
National Policy Statement for Energy (EN-1) (Ref. 23.31).	Assessment of effects on biodiversity (Paragraphs 5.3.3 – 5.3.7): Effects on internationally, nationally and locally designated sites of ecological conservation importance, on protected species and on habitats and other species of principal importance for biodiversity conservation should be accounted for. The assessment and scheme design shall take account of opportunities to conserve and enhance biodiversity. The Project should aim to avoid significant harm to biodiversity conservation interests, and where significant harm cannot be avoided, appropriate compensation measures should be sought. Designated sites (Paragraphs 5.3.8 – 5.3.10): The assessment should attach appropriate weight to designated sites of international, national and local importance, protected species, habitats and species of principal importance for the conservation of biodiversity and to biodiversity within the wider environment. Potential Special Protection Areas (pSPA) are to be considered in the same way as if they had already been classified. Ramsar sites receive the same protection.

Relevant Legislation and Policy	Relevance to the Assessment
	Development consent would not normally be granted where the proposed development is likely to have an adverse effect on a SSSI. An exception should only be made where the benefits (including need) for development at this SSSI clearly outweigh the impacts on the SSSI and on the national network of SSSIs. Regional and local sites (Paragraph 5.3.13): • Effects on sites of regional and local biodiversity, including local nature reserves and locally designated sites. Ancient Woodland and Veteran Trees (Paragraph 5.3.14): • Effects on ancient woodland and veteran trees. Biodiversity within developments (Paragraph 5.3.15): • Maximising opportunities for biodiversity enhancement. Habitats and species (Paragraphs 5.3.16 – 5.3.17): • Effects on species that receive statutory protection or are of principal importance for the conservation of biodiversity. Mitigation (Paragraphs 5.3.18 – 5.3.20): • Incorporating appropriate mitigation measures as an integral part of the Project, also ensuring that: ▸ during construction, activities are confined to the minimum areas required for the works;

Relevant Legislation and Policy	Relevance to the Assessment
	▸ during construction and operation best practice is followed to ensure that risk of disturbance or damage to species or habitats is minimised, including as a consequence of transport and access arrangements; ▸ habitats are, where practicable, restored after construction works; and ▸ opportunities are taken to enhance existing habitats and, where practicable, create new habitats of value within landscaping proposals.
National Policy Statement for Nuclear Power Generation (EN-6) (Ref. 23.32).	Effects on biodiversity, including the effects on the groundwater regime and its effects on terrestrial or coastal habitats, and other common implications for biodiversity arising from: water discharge, abstraction and quality issues; habitat and species loss; fragmentation or coastal squeeze; disturbance events (noise, light and visual); and air quality'. Baseline studies on nationally and internationally important habitats and species that may be affected as a result of a development should be undertaken to inform the assessment of the cumulative ecological effects. Other possible mitigation options include: variations to building layout to avoid ecologically sensitive areas and on-site measures to protect habitats and species and to avoid or minimise pollution and the disturbance of wildlife.
National Planning Policy Framework (2019) (Ref. 23.33).	Section 15 (paragraph 170), states that: "*Planning policies and decisions should contribute to and enhance the natural and local environment by: protecting and enhancing … sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan)…"* and "*minimising impacts on and providing net gains for biodiversity,*

Relevant Legislation and Policy	Relevance to the Assessment
	including by establishing coherent ecological networks that are more resilient to current and future pressures…" Paragraph 175 states that *"When determining planning applications, local planning authorities should apply the following principles:* *a) if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;* *b) development on land within or outside a Site of Special Scientific Interest, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of Sites of Special Scientific Interest;* *c) development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists; and* *d) development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to incorporate biodiversity improvements in and around developments should be encouraged, especially where this can secure measurable net gains for biodiversity.".*

Relevant Legislation and Policy	Relevance to the Assessment
Local Policy	
Maldon District Council (MDC) Local Development Plan (2017) (Ref. 23.34).	Policy N1 Green Infrastructure Network: "*A strategic multi-functional network of green infrastructure will be identified, managed and where possible, enhanced. Open spaces and areas of significant biodiversity or historic interest will be protected. Development which results in the creation, restoration, enhancement, expansion and interconnection of these sites will be encouraged.* *There will be a presumption against any development which may lead to the loss, degradation, fragmentation or isolation of existing or proposed green infrastructure.* *Where there is no adverse impact or the adverse impact can be mitigated without loss in value, development proposals which promote the use and enjoyment of the natural environment will be encouraged.* *To preserve and enhance a multi-functional green infrastructure network, including green infrastructure identified in this Plan and any other new green infrastructure, all development should:* *1) Maximise opportunities for the restoration, enhancement and connection of the District's green infrastructure network throughout the lifetime of the development, both on-site and for the wider community;* *2) Maximise opportunities to integrate green infrastructure with other types of land uses or design measures to maximise the collective social, economic and environmental benefits;*

Relevant Legislation and Policy	Relevance to the Assessment
	3) Seek to meet local standards and address any deficiencies as identified in the Maldon District Green Infrastructure Study and future strategies adopted by the Council; and *4) Where appropriate, be accompanied by a viable, long-term management plan to the Council's satisfaction.* *The requirement for new green infrastructure associated with developments will be subject to the legal tests (currently set out in Regulation 122 of the Community Infrastructure Levy Regulations 2010) and subject to the proviso that no obligation or policy burden shall threaten the viability of the development.*". Policy N2 Natural Environment, Geodiversity and Biodiversity: "*Development proposals which help to improve the condition of existing international, national or local designations will be encouraged.* *All development should seek to deliver net biodiversity and geodiversity gain where possible. Any development which could have an adverse effect on sites with designated features, priority habitats or protected or priority species, either individually or cumulatively, will require an assessment as required by the relevant legislation or national planning guidance.* *Where any potential adverse effects to the conservation value or biodiversity value of designated sites are identified, the proposal will not normally be permitted.* *In exceptional circumstances where the loss of designated sites is demonstrated to be unavoidable, developers will be required to provide 'like for like' replacement, relocation or compensation towards the loss of habitats and be able to demonstrate that such measures are at least of an equal value to the loss on a site*

Relevant Legislation and Policy	Relevance to the Assessment
	by site basis. Any compensatory habitat created should be ecologically functional in advance of the loss. *If any protected species or priority habitats or species or significant local wildlife are found on site, or their habitat may be affected by the proposed development, the proposal must make provision to mitigate any negative biodiversity impacts it may create.* *Where the creation or relocation of habitat is required as part of the mitigation measures, the Council will have to be satisfied that:* *1) There is no net loss of habitats in terms of quantity, quality and connectivity to the local ecological network; and* *2) Any new or replacement habitat is delivered as close as possible to the development site in order to maintain a viable population locally and to avoid incremental and accumulative impact on local ecology.* *Wherever possible, all development proposals should incorporate ecologically sensitive design and features. Where appropriate, development proposals near any watercourses or water bodies should provide a sufficient buffer which will be beneficial from the perspective of minimising the encroachment of development, providing ecological enhancements, and preventing pollution.*".
Chelmsford City Council (CCC) Local Plan (2020) (Ref. 23.35).	Policy NE1 Ecology and Biodiversity states: "*A) Internationally Designated Sites* *Developments that are likely to have an adverse impact (either individually or in* *combination with other developments) on European Designated Sites must satisfy the requirements of the Habitats Regulations, determining site specific impacts and avoiding or mitigating against impacts where identified.*

Relevant Legislation and Policy	Relevance to the Assessment
	B) Nationally Designated Sites *Development proposals within or outside a SSSI, likely to have an adverse effect on a SSSI (either individually or in combination with other developments), will not be permitted unless, on an exceptional basis, the benefits of the development clearly outweigh both the adverse impacts on the features of the site and any adverse impacts on the wider network of SSSIs.* *C) Locally Designated Sites* *Development likely to adversely affect locally designated sites, their features or their function as part of the ecological network, will only be permitted where the need and benefits of the development clearly outweigh the loss and the coherence of the local ecological network is maintained.* *D) Biodiversity and Geodiversity in Development* *All development proposals should:* *i. Conserve and enhance the network of habitats, species and sites (both statutory and non-statutory, including priority habitats and species) of international, national and local importance commensurate with their status and give appropriate weight to their importance; and* *ii. Avoid negative impacts on biodiversity and geodiversity, mitigate unavoidable impacts and as a last resort compensate for residual impacts; and* iii. *Deliver a net gain in biodiversity where possible, by creating, restoring and enhancing habitats and enhancing them for the benefit of species.".*

Relevant Legislation and Policy	Relevance to the Assessment
Colchester Borough Council Local Development Plan (2008, policies updated in 2014) (Ref 23.36)[1].	Policy ENV1: Environment *"The Borough Council will conserve and enhance Colchester's natural and historic environment, countryside and coastline. The Council will safeguard the Borough's biodiversity, geology, history and archaeology through the protection and enhancement of sites of international, national, regional and local importance. In particular, developments that have an adverse impact on Natura 2000 sites or the Dedham Vale Area of Outstanding Natural Beauty will not be supported.* *Within the Coastal Protection Belt development will not be permitted that would adversely affect the open and rural character of the undeveloped coastline, and its historic features, sites of nature conservation importance and wildlife habitats.* *The network of strategic green links between the rural hinterland, river corridors, and key green spaces and areas of accessible open space that contribute to the green infrastructure across the Borough will be protected and enhanced.* *Development will be supported at appropriate locations to improve public access, visual amenity and rehabilitate the natural environment. Development will need to minimise and mitigate adverse impacts on river, coastal and ground water quality.* *The Council will seek to direct development away from land at risk of fluvial or coastal flooding in accordance with PPS25, including areas where the risk of flooding is likely to increase as a result of climate change.* *Unallocated greenfield land outside of settlement boundaries (to be defined/reviewed in the Site Allocations DPD) will be protected and where possible*

[1] Colchester Borough Council is in the process of reviewing its Local Plan and a submission draft was issued for examination in 2017, with consultation on proposed main modifications planned in October 2020. The environmental aspect chapters will refer to emerging policy where relevant and greater weight will be applied depending on the extent to which the policies have moved towards adoption.

Relevant Legislation and Policy	Relevance to the Assessment
	enhanced, in accordance with the Landscape Character Assessment. Within such areas development will be strictly controlled to conserve the environmental assets and open character of the Borough. *Where new development needs, or is compatible with, a rural location, it should demonstrably:* *i. be in accord with national, regional and local policies for development within rural areas, including those for European and nationally designated areas; and* *ii. be appropriate in terms of its scale, siting, and design; and* *iii. protect, conserve or enhance landscape and townscape character, including maintaining settlement separation; and* *iv. protect, conserve or enhance the interests of natural and historic assets; and* *v. apply a sequential approach to land at risk of fluvial or coastal flooding in line with the guidance of PPS25; and vi. protect habitats and species and conserve and enhance the biodiversity of the Borough; and* *vii. provide for any necessary mitigating or compensatory measures.”.*

Technical guidance

23.2.3 Technical guidance that has been used to define the assessment scope and methods is set out in **Table 23.2**.

Table 23.2: Relevant technical guidance

Guidance Reference	Implications
Guidelines for Preliminary Ecological Appraisal (2017) (Ref. 23.37).	Sets out the industry standard approach to undertaking Preliminary Ecological Appraisals.
Guidelines for Ecological Impact Assessment in the UK and Ireland: terrestrial, freshwater, coastal and marine version 1.1 (2018) (Ref. 23.38).	Sets out the industry standard approach to Ecological Impact Assessment.
Guidelines for baseline ecological assessment (1995) (Ref. 23.39).	Outlines the best practice approach for describing and evaluating ecological baseline for the purposes of environmental assessment.
Handbook for Phase 1 habitat survey: A technique for environmental audit (2010) (Ref. 23.40).	Describes standard methods for carrying out Phase 1 habitat surveys.
National Vegetation Classification - users' handbook (2012) (Ref. 23.41).	Details standard approach to sampling and describing vegetation in the field, in line with National Vegetation Classification (NVC) methods.
Farm Environment Plan (FEP) Manual; Higher Level Stewardship, Third Edition. 2010 (2010) (Ref. 23.42).	Provides guidance on assessing the value of ditch habitats.
A manual for the survey and evaluation of the aquatic plant and invertebrate assemblages of	Provides guidance on assessing both the botanical and invertebrate value of ditch habitats.

Guidance Reference	Implications
grazing marsh ditch systems, Version 6 (2013) (Ref. 23.43).	
A guide to monitoring the ecological quality of ponds and canals using PSYM (2002) (Ref. 23.44).	Provides details of the PSYM method of assessing pond quality.
Surveying terrestrial and freshwater invertebrates for conservation evaluation. (2007) (Ref. 23.45).	Sets out common standards for surveying terrestrial and freshwater invertebrates.
Guidelines for Electric Fishing Best Practice. R&D Technical Report W2-054/TR (2002) (Ref. 23.46).	Provides guidance on best practice in electric fishing.
Surveying for Badgers: Good Practice Guidelines. Version 1. 2018. (2018) (Ref. 23.47).	Provides standard methods for the collection of badger activity data to assess usage of a site.
Territorial marking with faeces in Badgers (*Meles meles*): a comparison of boundary and hinterland latrine use (1993) (Ref. 23.48).	Outlines methods for establishing the territory size and location of badger clans.
The use of marked bait in studies of the territorial organisation of the European Badger (*Meles meles*) (2000) (Ref. 23.49).	Describes standardised methods for using bait marking techniques to establish badger territories.

Guidance Reference	Implications
Bat surveys for professional ecologists: Good practice guidelines. 3rd Edition (2016) (Ref. 23.50).	Provides standard methods for the collection of bat survey data for the purpose of informing an impact assessment.
BS 8596:2015: Surveying for bats in trees and woodland (2015) (Ref. 23.51).	British Standards setting out guidance on surveying for bats in trees and woodland, including for the purpose of assessing impacts from woodland loss for development.
Bat roosts in trees: a guide to identification and assessment for tree-care and ecology professionals (2018) (Ref. 23.52).	Outlines methods for effectively surveying trees for the purpose of identifying bat roosts.
Bird monitoring methods: a manual of techniques for key UK species (2001) (Ref. 23.53).	Provides details on the methods for the collection of bird survey data, suitable for the purpose of informing an impact assessment.
Waterbird disturbance mitigation toolkit informing estuarine planning & construction projects (2013) (Ref. 23.54).	Provides guidance on the identification of construction-related disturbance issues affecting waterbirds.
A Review of disturbance distances in selected bird species: A report from Natural Research (Projects) Ltd to Scottish Natural Heritage (2007) (Ref. 23.55)	Provides guidance on disturbance distances for bird species.
Common Birds Census instructions (1983) (Ref. 23.56).	Outlines standard Common Bird Census methods for assessing breeding bird populations.

Guidance Reference	Implications
Diurnal studies do not predict nocturnal habitat choice and site selection of European Golden Plovers *Pluvialis apricaria* and Northern Lapwings *Vanellus vanellus* (2005) (Ref. 23.57).	Sets out the requirement for nocturnal survey work to supplement diurnal survey work in assessing use of a site by some bird species.
Barn owl *Tyto alba* survey methodology and techniques for use in Ecological Assessment: developing best practice in survey and reporting (2011) (Ref. 23.58).	Provides details on the methods for the collection of barn owl survey data that is suitable to inform an impact assessment.
Evaluating the suitability of habitat for the great crested newt (*Triturus cristatus*) (2000) (Ref. 23.59).	Outlines a Habitat Suitability Index (HSI) for assessing the suitability of pond habitats to support great crested newt.
ARG Advice Note 5: Great Crested Newt Habitat Suitability Index (2010) (Ref. 23.60).	Provides further guidance on applying the HSI method in the field.
Great Crested Newt Mitigation Guidelines (2001) (Ref. 23.61).	Describes industry standard methods for surveying for great crested newts for the purposes of impact assessments.
Analytical and methodological development for improved surveillance of the great crested newt. Defra Project WC1067 (2014) (Ref. 23.62).	Sets out the sampling method by which great crested newt presence or likely absence may be established using environmental DNA (eDNA).

Guidance Reference	Implications
Reptile survey: an introduction to planning, conducting, and interpreting surveys for snake and lizard conservation. (1999) (Ref. 23.63).	Provides accepted industry standard methods for the collection of reptile survey data that is suitable to inform an impact assessment.
Monitoring the otter (*Lutra lutra*). Conserving Natura 2000. Rivers Monitoring Series No 10 (2003) (Ref. 23.64).	Describes industry standard methods for carrying out surveys for otters and assessing their use of a site.
Water Vole Conservation Handbook. 3rd Edition. (2011) (Ref. 23.65).	Provides widely accepted methods for the collection of survey data to assess water vole use of a site.
The Water Vole Mitigation Handbook (2016) (Ref. 23.66).	Provides further guidance on the application of standard survey methods for the purposes of informing impact assessments and mitigation design for development purposes.
Hedgerow Survey Handbook: A standard procedure for local surveys in the UK (2007) (Ref. 23.67).	Describes the approach that should be followed to assess hedgerows against hedgerow regulation assessment criteria.

23.3 Consultation and Engagement

23.3.1 This chapter has been informed by engagement and discussion with various stakeholders. **Table 23.3** details technical engagement to date which has occurred outside of formal statutory consultation. **Table 23.4** provides a summary of consultee comments arising from Stage One Consultation, along with a response to identify how the matter is dealt within this report.

Table 23.3: Technical engagement

Consultee	Biodiversity Points of Discussion
Environment Agency. Essex County Council (ECC). Essex Wildlife Trust (EWT). MDC Royal Society for the Protection of Birds (RSPB).	An Introduction and Kick-off Meeting held on 14 October 2019 discussed effects of water cooling on the marine environment specifically mentioning fisheries. Parties discussed whether the 2019-20 overwintering bird survey window was too narrow, and it was proposed to cover this issue in more detail at the HRA Evidence Plan meeting in December 2019 and at the Survey and Monitoring Plan (SMP) meeting (November 2019). It was confirmed that in addition to the overwintering period, surveys would also cover passage and breeding season over a two-year period. The applicant welcomed feedback on overwintering bird survey methodology and amended the approach to address the points raised.
ECC EWT Historic England. MDC Marine Management. Organisation (MMO). Natural England. RSPB	At the masterplanning workshop 1, held on 16 October 2019, a commitment to inclusion of the Biodiversity Net Gain principles was highlighted and the applicant was requested to identify interruption of any ecological networks. RSPB confirmed the lack of trees in the landscape restoration and noted relative beneficial impact on SPAs for ecology and biodiversity. For example, brent geese by siting the permanent power station development further west.
MMO Natural England.	At the Introduction and Kick-off meeting with the MMO and Natural England on 6 November 2019, participants discussed whether the 2019 to 2020 overwintering bird survey window was too narrow. It was proposed to cover this issue in more detail at the HRA Evidence Plan meeting (December 2019) and at the SMP meeting (November 2019). It also was confirmed that in addition to the overwintering period, surveys would also cover

Consultee	Biodiversity Points of Discussion
	passage and breeding season over a two-year period, as recommended. Natural England raised the need to consider public access in terms of bird disturbance and any additional disturbance associated with construction workers in the area and the need to consider the condition of SSSIs where there may be SSSIs that are currently in unfavourable condition, it was emphasised that the Project must not constrain the capacity of those sites to achieve favourable condition. Natural England also highlighted that the list of key receptors needs careful interpretation in a local context and that any mitigation strategy should follow the 'avoid, mitigate, compensate' framework and it would be helpful to see more evidence at this stage to demonstrate how the applicant intends to ensure this. Natural England welcome the inclusion of Net Gain principles but would like to see evidence that any Net Gain effort will be carefully audited to ensure it produces beneficial outcomes.
ECC EWT MDC MMO Natural England. RSPB	A teleconference to discuss the bird survey scope took place on 19 November 2019 to agree the scope of the Overwintering Bird Survey and Monitoring Plan. The key outcome of the meeting was the increase in survey effort for intertidal, nearshore and terrestrial bird survey to four visits per observation point or transect per month. Further clarification was provided in terms of an additional SMP for passage and breeding birds, and survey covering two years.
Environment Agency. ECC MMO Natural England.	At the transport shortlist workshop on 28 November 2019, commitment to Biodiversity Net Gain was raised as a key issue and a commitment to inclusion of the Biodiversity Net Gain principles was made by the applicant. Focus is required on marine infrastructure locations so as not to impact upon surrounding sensitive habitats.

Consultee	Biodiversity Points of Discussion
Environment Agency. ECC EWT MDC CCC Natural England. RSPB	A teleconference to discuss the Biodiversity SMP (see **Appendix 23A**[2]) took place on 02 April 2020. The key aim of the meeting was to detail and agree the scope of the main development site biodiversity (terrestrial and freshwater ecology and ornithology) survey methodology and programme. Follow discussions a number of revisions and clarifications were made to the original SMP which was reissued and accepted by all consultees
Environment Agency. ECC MDC CCC CBC Natural England.	A Terrestrial Biodiversity Workshop took place on 23 June 2020 to agree the proposed approach (remote sensing) to undertaking a Phase 1 habitat survey to assist with the optioneering and site selection processes for off-site associated developments as detailed in the Phase 1 Habitat Survey and Monitoring Plan – off-site Associated Developments (see **Appendix 23B**). The proposed approach was accepted in principle with clarifications provided post-meeting.
Natural England.	A teleconference took place on 29 August 2020 to discuss the scope of the 2020/21 surveys for protected species and to begin outline discussions around licensing actions.

[2] The description of the Project, including indicative site boundaries, presented in the appended Survey and Monitoring Plan (SMP) (**Appendices 23A** and **23B**) reflects the Project status at the point that the SMP was issued to consultees to inform workshops held in June 2020, with subsequent updates to take into account workshop feedback and responses from consultees. As the Project progresses, further iterations of the SMP will be required as proposals are refined, in particular, with respect to associated development. The technical scope contained in the SMP remains applicable irrespective of any future boundary changes (should this be required), subject to a review of receptors and spatial scope.

Table 23.4: Stage One Consultation comments

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
Project-provided accommodation	A number of consultees (Natural England, EWT and the RSPB) commented on the proposed project-provided accommodation (directly or indirectly). The key point raised was: • The potential for temporarily housed workers to cause recreational disturbance to designated features of the Special Protection Areas and Sites of Special Scientific Interest present in the area. It was identified that a robust baseline (including consideration of baseline levels of disturbance) is necessary to allow an assessment of this effect.	Detailed consideration of recreational disturbance is not provided within this chapter, however the issue is highlighted for inclusion in later phases of the EIA and HRA process and the commitment to undertaking appropriate field survey activity is provided (see **Section 23.7**). This field survey will record both the number and distribution of birds currently associated with the designated sites in the local area, as well as the types and levels of disturbance currently occurring. In addition to the scope of this chapter, other environmental aspects including **Chapter 21: Recreation**, **Chapter 24: Marine Ecology and Fisheries** and the HRA will be used to support and inform the recreational disturbance assessment for the ES. Further information on the baseline will be made available within the Preliminary Environmental Information (PEI) for Stage 2 Consultation, as well as information on how the design of the infrastructure has responded to the issue of disturbance of waterbirds using habitats associated with designated sites. This will be further updated and described in detail within the ES and the HRA Report to support the DCO application.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
Assessment methodology and scope.	Natural England, the Environment Agency, MMO, EWT and the RSPB commented on the assessment methodology. Key points raised include: • The need to consider the full range of designated sites, legally protected species and notable habitats and species within a comprehensive assessment that is across an appropriate geographic extent. • The need to consider functionally linked land when considering the designated sites present in the area. This includes consideration of disturbance within functionally linked land. • The need to ensure that an appropriate definition of "temporary" effect is adopted. • The need to consider the effects of hydrological changes on ecological features • The need to ensure that any changes to designations (for example, through the adoption of the 2001 and 2016 UK SPA	The potential effects on ecological features are considered within this chapter (see **Section 23.7**). At this stage of the Project, it is not possible to provide a detailed assessment as the masterplanning and Project design processes are ongoing, and the baseline is incomplete. Further information will be made available within the PEI for Stage 2 Consultation, and by the time of the DCO application these elements will all have been considered and documented. The field survey programme that is currently ongoing, will provide the necessary baseline information to understand the use of habitats both inside and outside of the footprint of the Project as well as establishing the location and extent of functionally linked land (see **Appendix 23A**). Future technical engagement, alongside the evolution and detailing of project design information, will provide the basis for refining the understanding of both the temporal and spatial nature of likely significant effects. The approach to maintaining bio-security will be detailed at the time of DCO application. However, these measures will be discussed during technical engagements and introduced in outline within the PEI. The mitigation hierarchy, as described within planning policy (see **Table 23.1**) will be adhered to with information

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
	reviews) are accounted for in the assessment. • The need to demonstrate adoption of the mitigation hierarchy. • The need to consider bio-security within the assessment.	provided at the time of DCO application to describe the evolution of the project design.
Associated development.	The Environment Agency and Natural England commented on the off-site associated development; key points raised include: • A requirement for greater levels of information on off-site associated development. • The need to consider the associated development as part of the Project, as opposed to stand alone elements. • Encouragement of adopting locations and designs where biodiversity effects could be	Information on project design is provided in **Chapter 3: The Project** and the likely significant effects on ecological features are considered in outline in **Section 23.7**. Further information and assessment of off-site associated development will be provided within the PEI for Stage 2 Consultation, and at the time of the DCO application.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
	avoided or minimised and where enhancements could be achieved.	
Baseline and assessment scope.	A number of consultees (Natural England, EWT and the RSPB) commented on the baseline and assessment scope and key points raised include: • The need to consider all aspects of designated sites. • Ensure that current activities, unrelated to the Project, to improve and protect designated sites (such as measures to lessen the effects of recreational disturbance) are understood and accounted for. • Ensure that functionally linked land is considered appropriately. • Ensure a comprehensive baseline is established that describes current levels of bird disturbance in inter-tidal areas and on functionally linked land.	The baseline information available to inform this scoping report chapter and to inform the scope of the assessment is described in **Section 23.5** (see **Tables 23.7 and 23.8** for details)**.** Further baseline information is being gathered (see **Table 23.10**) and will be available to inform the EIA. The data to be gathered will include both updates to the desk study, to ensure the most relevant data is available to inform the assessment, and results of the extensive field programme being undertaken to establish a robust baseline on both the main development site and the areas within which off-site associated development may be proposed. This exercise will provide the necessary information on designated sites (including any updates to designation status adopted or planned, and current management measures) on which to base an assessment. The assessment will also be informed by field survey that will record the current land use by designated features and the level of disturbance they currently face, and their behavioural responses to it.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
Mitigation	Natural England and the EWT commented on the environmental measures; key points raised include: • A welcoming of a Net Gain approach, and encouragement to look at developing a plan of an appropriate scale and location to ensure a positive legacy. • Specific species including dark bellied brent geese and water voles should have comprehensive mitigation strategies devised that consider the length of time over which effects may be realised, recognising that "temporary" effects may be up to 10 years in duration.	Potential mitigation measures are described in **Section 23.8.** Further detail will be provided as the project design evolves and is reported on in the PEI to support Stage 2 Consultation and the ES for the DCO application. The approach to mitigation, compensation and enhancement will be developed as the Project design evolves. The approach will respond to particular effects that may be realised in different design scenarios, as well as identifying the presence of enhancement opportunities both within and adjacent to the various project elements.

23.4 Data Gathering Methodology

Study area

23.4.1 As the design and consultation processes progress and the Project is refined, the exact geographical scope of study areas may continue to evolve to accommodate any changes. If the study areas change, data collection will also be reviewed and updated.

Main development site

23.4.2 The study area encompasses the area over which all desk-based and field data will be gathered to inform the assessment of effects. Due to the presence of multiple ecological features and many potential effects, the level and type of data collection varies across the study area.

23.4.3 The extent of the desk study and field survey areas applied to date (see **Table 23.5 and Figures 23.1, 23.2** and **23.3**) have been determined based on best practice guidance and a high level overview of the types of ecological features known or likely to be present, and the potential effects that could occur. The study area has been defined on a precautionary basis to ensure that, as a minimum, the Zone of Influence (ZoI) relevant to all ecological features will be covered during baseline data collection activities.

23.4.4 The "study area", therefore, comprises:

- the main development site;
- the desk study areas for statutory and non-statutory designated sites;
- the desk study area for legally protected and notable ecological features; and
- the field survey areas.

Table 23.5: The study area, comprising desk study and field survey areas

Ecological Feature	Study Area	Rationale
Desk study areas (see **Figure 23.1**)		
International statutory designated sites with ornithological qualifying features.	The main development site and a 20km radius plus sites that fall within species specific foraging ranges.	20km is standard best practice for terrestrial sites with ornithological interest, encompasses daily foraging ranges of site qualifying features. For mobile marine bird species standard best practice relates to the qualifying interest features species specific foraging ranges.
International statutory designated sites with bat-related qualifying features.	The main development site and a 10km radius.	Standard guidance states that statutory designated sites relevant to bats within 10km require consideration.
National statutory designated sites with bat-related qualifying features.	The main development site and a 10km radius.	Standard guidance states that statutory designated sites relevant to bats within 10km require consideration.
Statutory designated sites (international and national).	The main development site and a 2km radius.	Standard guidance states that the minimum desk study radius should be 1km. This has been increased due to the scale of the Project and the potential for effects to occur on designated features over a greater distance from the main development site boundary.
Non-statutory designated sites.	The main development site and a 2km radius.	Standard guidance states that the minimum desk study radius should be 1km. This has been increased due to the scale of the Project and the potential for effects to occur on designated features over a greater distance from the main development site boundary.

Ecological Feature	Study Area	Rationale
Priority habitats and ancient woodland.	The main development site and a 2km radius.	Standard guidance states that the minimum desk study radius should be 1km. This has been increased due to the scale of the Project and the potential for effects to occur on ecological features over a greater distance from the main development site boundary.
Bats and aquatic mammals (otter and water vole).	The main development site and a 5km radius.	Standard guidance states that the minimum desk study radius for bats should be 2km. This has been increased due to the scale of the Project, and the mobile nature of bat species, with the 5km study area designed to incorporate the core roost sustenance zones for all bat species expected to use on-site habitats. Standard guidance states that the minimum desk study radius for water vole should be 2km, but that this should be increased to at least 5km for larger scale developments. A similar radius has been adopted for otter, which is a similarly mobile species.
Legally protected and notable species (excluding bats and aquatic mammals).	The main development site and a 2km radius.	Standard guidance states that the minimum desk study radius should be 1km. This has been increased due to the scale of the Project and to provide greater context for the baseline ecological assessment, particularly with regards to identifying species that might occur on the main development site itself.
Water bodies not separated from the main development site by major barriers to great crested newt movement (for	The main development site and a 500m radius.	The study area must, as a minimum, include the area directly affected by the Project (i.e. the main development site). A 500m buffer has been applied around that to encapsulate the potential breeding habitat of great crested newts that may use terrestrial habitats within the main development site.

Ecological Feature	Study Area	Rationale
example major roads and rivers).		This reflects standard guidance on the typical ranging distance of this species.
Field survey areas (see **Figure 23.2** for non-ornithological study areas and **Figure 23.3** for the ornithology study area)[3]		
Habitat and botanical surveys.	The main development site and a 100m radius.	The ZoI must, as a minimum, include the area directly affected by the Project (i.e. the main development site). A 100m buffer has been applied around that to cover the area most likely to be significantly affected by indirect effects.
Invertebrate surveys (freshwater and terrestrial).	The main development site and a 100m radius.	The ZoI must, as a minimum, include the area directly affected by the Project (i.e. The main development site). A 100m buffer has been applied around that to cover the area most likely to be significantly affected by indirect effects.
Fish surveys.	The main development site and a 100m radius.	The ZoI must, as a minimum, include the area directly affected by the Project (i.e. the main development site). A 100m buffer has been applied around that to cover the area most likely to be significantly affected by indirect effects.
Badger surveys.	The main development site and a 100m radius; plus, additional areas required to map the territories of	The ZoI must, as a minimum, include the area directly affected by the Project (i.e. the main development site). A 100m buffer has been applied around that to cover the area most likely to be significantly affected by indirect effects.

[3] The study area for the field surveys for the main development site will be applied to the off-site associate development sites once they have been identified.

Ecological Feature	Study Area	Rationale
	clans using main setts occurring within the initial survey area.	Where main badger setts occur within the initial survey area, the buffer has been extended to incorporate the territories of those clans in order to establish the size and extent of their range (which will also overlap partly with the main development site).
Bat surveys.	The main development site and a 100-500m radius, depending on initial survey findings.	The ZoI must, as a minimum, include the area directly affected by the Project (i.e. the main development site). A buffer has been applied around that to incorporate potential habitat used by bats that is most likely to be significantly affected by indirect effects. The precise study area used will be reviewed and refined as initial survey results become available, so that the most appropriate ZoI can be identified.
Intertidal and near shore bird surveys.	All intertidal habitat and near shore waters within 500m of the Site extending seaward, 1km from the seawall, plus additional areas of the shoreline that may provide further contextual insight into the distribution and abundance data of wintering and passage birds within the intertidal and near shore habitats.	The 500m buffer has been derived as a precautionary distance, beyond which (and taking account of the nature and scale of the works), the effects of disturbance from works undertaken within main development site area would likely be negligible. This distance has been derived from bird disturbance studies. The study area extends offshore to 1km from the mean high-water mark to include birds using the close, inshore waters (such as brent goose) that might be disturbed by the movements of vessels to and from and around the main development site. The intertidal and near shore survey area is divided in three survey sectors with two observation points per sector.

Ecological Feature	Study Area	Rationale
Terrestrial (non-breeding) bird surveys.	All areas of suitable habitat (primarily farmland) within the Site and within 500m of its boundary, above mean high water springs (MHWS) plus additional terrestrial areas that may provide further contextual insight into the distribution and abundance data of wintering and passage birds in the wider area.	A disturbance distance of up to 400m is outlined for brent geese (a species of high sensitivity to disturbance) in the construction disturbance toolkit. However, given the nature and large scale of the works, a precautionary distance of 500m will continue to be used, within which brent geese (and other key species) could be disturbed by the Project.
Breeding bird surveys.	Main development site plus 200m buffer extended to 500m for breeding bird ditch surveys and barn owl.	The 200m buffer has been derived as a precautionary distance, based on the species likely to be present, professional judgement and the buffer distances provided for breeding birds. This buffer area has been extended to 500m for barn owl and shoreline and freshwater ditch habitats to allow for potential disturbance buffers associated with marsh harrier, ringed plover, bearded tit and pochard.
Great crested newt survey.	The main development site and a 500m radius.	The ZoI must, as a minimum, include the area directly affected by the Project (i.e. the main development site). A 500m buffer has been applied around that to encapsulate the potential breeding habitat of great crested newts that may use terrestrial habitats within the main development site. This reflects standard guidance on the typical ranging distance of this species.

Ecological Feature	Study Area	Rationale
Reptile survey.	The main development site and a 100m radius.	The ZoI must, as a minimum, include the area directly affected by the Project (i.e. the main development site). A 100m buffer has been applied around that to cover the area most likely to be significantly affected by indirect effects.
Aquatic mammal survey (otter and water vole).	The main development site and a 500m radius.	The ZoI must, as a minimum, include the area directly affected by the Project (i.e. the main development site). A buffer has been applied around that to incorporate the potential water vole and otter habitat 500m upstream and downstream of any surveyed water courses. This reflects standard guidance on survey areas for assessing impacts on water vole.

23.4.5 As the design process evolves iteratively, the study area, and its constituent parts, will be regularly reviewed to ensure that its extent remains adequate to enable the assessment of all potentially significant effects of the ecological features identified.

Off-site associated development and off-site Power Station Facilities

23.4.6 Study areas for the off-site associated development and off-site Power Station Facilities will be based upon the principles applied to the main development site (see **Table 23.5**); although specific requirements will be reviewed based on the local circumstances of each identified option.

23.4.7 Once further information on the location and extent of each potential area is understood a suitable suite of surveys can be determined. The extent of these surveys will conform to industry best practice and reflect the location and habitats present.

Sources of data used in scoping

Desk based

23.4.8 The EIA scoping exercise has been undertaken with reference to **Chapter 3: The Project**, supported by a number of data sources. The principal desk-based data sources used to inform this chapter for potential effects comprise those set out in **Table 23.6.**

Table 23.6: Sources of desk-based data used for informing the scope of the biodiversity assessment

Source	Data
Multi Agency Geographic Information for the Countryside (MAGIC) website (Ref. 23.68).	Contextual information relating to designated sites, notable habitats and protected species provided from the desk study area. Locations of statutory designated sites for biodiversity conservation. Locations of HPIs. Indicative locations where European Protected Species Applications have been granted and the date of the applications.
Natural England's designated sites website (Ref. 23.69).	Citations and details relating to statutory designated sites for biodiversity conservation, supplementing the information provided by MAGIC.
Bradwell B preliminary ground investigation: Ecological Appraisal, 2017 (Ref. 23.2).	Provides historical baseline information relevant to part of the study area. Site-sourced habitat survey data. Preliminary assessment of suitability of habitats within part of the main development site to support protected and notable species.
Bradwell B preliminary ground investigation: Ecological Appraisal, 2020 (Ref. 23.3).	Provides baseline information relevant to part of the study area. Habitat survey data collected through remote sensing and analysed using the 2017 field dataset for ground-truthing. Preliminary assessment of suitability of habitats within part of the main development site to support protected and notable species.
Bradwell invertebrate survey report, 2009 (Ref. 23.4).	Provides historical baseline information relevant to part of the study area.

Source	Data
	Invertebrate survey data relating to part of the main development site from 2009.
Eel management plans for the United Kingdom: Anglian River Basin District, 2010 (Ref. 23.70).	Contextual data regarding European eel populations in the wider Anglian region.
Bradwell badger survey report, 2008 (Ref. 23.5).	Provides historical baseline information relevant to part of the study area. Badger survey data relating to part of the main development site from 2008.
Bradwell bat survey report, 2008 (Ref. 23.6).	Provides historical baseline information relevant to part of the study area. Bat survey data relating to part of the main development site from 2008.
Bradwell, Essex: Report on inspection of cottages for bat roosts, 2015 (Ref. 23.16).	Provides historical baseline information relevant to part of the study area. Data from an inspection of three structures within the main development site in 2015, to assess their potential to support roosting bats: 1 & 2 Peartree Cottages, New House and New Bungalow.
The Bungalow, Bradwell. Method Statement: advice for contractors relating to bats, 2017 (Ref. 23.17).	Provides historical baseline information relevant to part of the study area. Data from a bat survey of The Bungalow, within the main development site in 2017.
Peartree Cottages. Method Statement: advice for contractors relating to bats, 2017 (Ref. 23.18).	Provides historical baseline information relevant to part of the study area. Data from a bat survey of 1 & 2 Peartree Cottages, within the main development site, in 2017.

Source	Data
Bradwell interim bird report, 2007 (Ref. 23.7).	Provides historical baseline information relevant to part of the study area. Breeding bird survey data (April-July 2007 inclusive). Intertidal bird survey data (April-July 2007 inclusive).
Bradwell second interim bird report, 2007-08 (Ref. 23.8).	Provides historical baseline information relevant to part of the study area. Intertidal bird survey data (August 2007 to March 2008 inclusive). Non-breeding daytime (walkover) bird survey data (September 2007 to March 2008 inclusive). Non-breeding nocturnal (walkover) bird survey data (December 2007 to March 2008 inclusive).
Bradwell third interim bird report, 2008-09 (Ref. 23.9).	Provides historical baseline information relevant to part of the study area. Intertidal bird survey data (April-May 2008 and September 2008 to March 2009 inclusive). Non-breeding daytime (walkover) bird survey data (April-May 2008 and September 2008 to March 2009 inclusive). Non-breeding nocturnal (walkover) bird survey data (April-May 2008 and October 2008 to March 2009 inclusive).
Bradwell fourth interim bird report, 2008-09 (Ref. 23.10).	Provides historical baseline information relevant to part of the study area. Intertidal bird survey data for Observation Points covering the Dengie Flats: September 2008 to August 2009 (inclusive).
Essex beach-nesting Birds Group 2019 report (Ref. 23.71).	Contextual data relating to the distribution and abundance of breeding little tern and ringed plover in Essex.

Source	Data
HiDef report to Natural England - Digital video aerial surveys of red-throated diver in the Outer Thames Estuary Special Protection Area 2018 (Ref. 23.72).	Contextual data relating to red throated diver and marine wintering bird distribution and abundance survey in the Outer Thames Estuary SPA.
Bradwell confidential barn owl survey report, 2008 (Ref. 23.11).	Provides historical baseline information relevant to part of the study area. Barn owl survey data relating to part of the main development site from 2008.
Bradwell great crested newt survey report, 2008 (Ref. 23.12).	Provides historical baseline information relevant to part of the study area. GCN survey data relating to part of the main development site from 2008.
Bradwell reptile survey report, 2008 (Ref. 23.13).	Provides historical baseline information relevant to part of the study area. Reptile survey data relating to part of the main development site from 2008.
Bradwell otter survey report, 2008 (Ref 23.14).	Provides historical baseline information relevant to part of the study area. Otter survey data relating to part of the main development site from 2008.
Essex otter survey 2007 (Ref. 23.73).	Contextual otter survey data from across the county of Essex, including part of the Dengie Peninsula, in 2007.
Essex otter survey 2009-2010 (Ref. 23.74).	Contextual otter survey data from across the county of Essex, including part of the Dengie Peninsula, in 2009-10.
Bradwell water vole survey report, 2008 (Ref. 23.15).	Provides historical baseline information relevant to part of the study area. Water vole survey data relating to part of the main development site from 2008.

Survey data

23.4.9 Preliminary field survey data that has been used to inform this chapter for potential effects comprise those set out in **Table 23.7**.

Table 23.7: Field-based data collected and used for informing the scope of the biodiversity assessment

Ecological feature	Field Survey Undertaken
Habitats	An extended Phase 1 habitat survey of the main development site was undertaken in May and July 2020. This provides a description of the habitats present within the study area, alongside information about the presence or potential presence of legally protected and notable species (see **Appendix 23D**).
Badgers	December 2019 to February 2020 – walkover survey to search for badger field signs within the study area.
Bats	December 2019 – preliminary high-level assessment of the potential for the study area to support bats.
Birds	October 2019 to February 2020 – intertidal and near shore surveys (distribution and abundance, and disturbance monitoring). October 2019 to February 2020 – terrestrial (non-breeding) transect surveys (diurnal and nocturnal) (see **Appendix 23E**).

23.5 Baseline Information

Current baseline

23.5.1 The following description of ecological features provides a summary of the biodiversity baseline as determined through desk study and field survey completed to date.

Main development site and surroundings

23.5.2 Statutory designated sites identified within the study area are presented in **Tables 23A.1-23A.4 in Appendix 23C**. Those falling within and immediately adjacent to the main development site are presented in **Figure 23.4**.

23.5.3 There are seven SPAs and six Ramsar Sites within a 20km radius of the main development site that are designated primarily for ornithological value. A further five SSSIs and three NNRs occur within a 10km radius, all of which are designated either partially or entirely for ornithological value, particularly for the waterbird assemblage

they support. Of these, the boundaries of the following sites are either immediately adjacent to, or overlap with those of the main development site:

- Blackwater Estuary (Mid-Essex Coast Phase 4) SPA;
- Dengie (Mid-Essex Coast Phase 1) SPA;
- Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar;
- Dengie (Mid-Essex Coast Phase 1) Ramsar;
- Blackwater Estuary SSSI; and
- Dengie SSSI.

23.5.4 Essex Estuaries SAC also overlaps with the main development site by 30.7ha. In addition to ornithological interest, the Ramsar sites, SSSIs and SAC that occur adjacent to or within the development site are also designated for their important coastal habitats and invertebrate fauna.

23.5.5 A single LWS has been identified, 237m from the main development site, as shown in **Figure 23.4**. This is Bradwell Cemetery, designated for unimproved grassland and botanical interest.

23.5.6 There are a number of habitat types that do or may (following further survey) qualify as Habitats of Principal Importance or Essex Biodiversity Action Plan priority habitats (for example, hedgerows, cereal field margins and reedbed).

23.5.7 The dominant habitats occurring within the main development site are (see **Appendix 23D**):

- arable;
- broadleaved woodland;
- coniferous woodland;
- scrub;
- hedgerows;
- coastal grassland;
- semi-improved grassland;
- amenity grassland;
- waterbodies and wetland habitats (including reedbed);
- saltmarsh; and

- hardstanding and buildings.

23.5.8 **Table 23.8** presents a summary of the data that are currently available regarding the status of protected and notable species on the main development site and within the adjacent surrounding areas.

Table 23.8: Summary of protected and notable species' status within the study area

Species or Species Group	Year of Survey	Comments
Invertebrates	2008	A survey of freshwater, terrestrial and saltmarsh habitats on and adjacent to the main development site recorded six SPIs, five Red Data Book and 31 Nationally Scarce invertebrate species. It was concluded that habitats included within statutory designations (for example Dengie SSSI) supported invertebrate assemblages of high biodiversity conservation value. Other habitats within the main development site, but outside of the designated areas, were of lower value but still supported some notable species.
Fish	None	There are two records of European eel occurring within the watercourse network on or adjacent to the main development site. The general trend for the European eel population in the Anglian region, reported as of 2010, was that it appeared to be declining, but that the dataset was generally deficient and may not be reliable.
Badger	2008-09. 2019-20.	Signs of badger activity were widespread and abundant across the survey area, and 10 social groups of badger were identified as using habitats within the main development site in 2009. Badger activity continued to be widespread across the study area in 2019-20; with 11 main setts, 11 annex setts, 10 subsidiary setts and 13 outlier setts recorded.
Bats – roosting.	2008 2015 2017 2019	18 buildings within the main development site were assessed in 2008. One possible bat roost was identified in a large warehouse. Four buildings could not be surveyed. No evidence of roosting was found in the remaining buildings. Building inspections in 2015 concluded that the following three buildings had the potential to support roosting bats:

Species or Species Group	Year of Survey	Comments
		• 1 and 2 Peartree Cottages; • New House; and • a shed adjacent to New Bungalow. Follow up survey work in 2017 confirmed the presence of a single common pipistrelle roosting within Peartree Cottages. The shed adjacent to New Bungalow did not appear to support roosting bats during the survey work. The 2019 high level assessment confirmed that a number of trees and buildings within the survey area retain the potential to support roosting bats.
Bats – foraging and commuting.	2008	Four species or groups were recorded on site, namely common and soprano pipistrelle, serotine and *Myotis* sp. Small numbers were recorded, with the most frequent being common pipistrelle.
Birds	2007-2009.	During the breeding season, the waters offshore of the existing Bradwell power station (Bradwell A) were used on a regular basis by foraging little tern. Pewet Island supported a regionally important breeding colony of gulls, primarily black-headed gull but also Mediterranean gull. The farmland to the east of the existing power station supported numbers of breeding corn bunting (present throughout the year) and yellow wagtail that were important in terms of the county (Essex) populations, and the area also supported high numbers of breeding skylark, reed warbler and turtle dove. During winter, potentially important numbers (in terms of local statutory designated site populations) of brent goose, ringed plover, lapwing, golden plover, redshank, sanderling, turnstone, dunlin and curlew were recorded foraging on intertidal areas between the existing power station and Sales

Species or Species Group	Year of Survey	Comments
		Point and, or roosting on Pewet Island, with lapwing, golden plover and brent goose also recorded foraging on farmland primarily to the east of the existing power station. Potentially important numbers of cormorant, great crested grebe and red-breasted merganser were foraging close, offshore, together with congregations of resting brent goose at high tide. Hen harrier were recorded occasionally (infrequently) hunting over the farmland and intertidal areas. Surveys of the mudflats to the south of Sales Point on the Dengie Flats in 2008-09 revealed that the mudflats were used by important numbers of a wide range of wildfowl and wader species including brent goose, oystercatcher, ringed plover, knot, sanderling, dunlin, curlew, redshank, turnstone and grey plover. Offshore of Sales Point, congregations of red-throated diver and red-breasted merganser were also recorded, as well as commuting little tern in summer.
Birds	2019-2020.	Results from intertidal surveys showed that during October and November 2019, nearly all records of brent geese were of birds feeding on the mudflats and resting on the close, inshore waters at high tide (particularly around Pewet Island). Since December 2019, brent geese have regularly been seen feeding on fields of winter cereal (presumably as their eelgrass food source on the mudflats has been depleted), in particular fields adjacent to the existing power station (both east and west of the area), and in fields adjacent and inland of Sales Point in the east. Flocks of lapwing and golden plover have been recorded foraging in fields of winter cereal, with lapwing widely distributed across the survey area, and golden plover primarily in the east. Foraging curlew (apart from on the mudflats) have been largely confined to a single field of grassland adjacent to Bradwell Waterside. High numbers of waders and wildfowl have been recorded foraging on the mudflats to the south of Pewet Island and south of Sales Point with very low numbers using the intertidal mud and beach adjacent to the existing power station (primarily redshank, oystercatcher, grey plover, curlew, sanderling and turnstone), though the close, inshore waters have occasionally supported larger numbers of brent geese at high tide. In January, very high numbers of cormorant (with some counts exceeding 1,000 birds) were foraging offshore as well as increased numbers of great crested grebe

Species or Species Group	Year of Survey	Comments
		and red-throated diver; though the latter species were generally 1-3km offshore of Sales Point. Pewet Island was used as a high tide roost site by a diverse range of waders and wildfowl, in particular curlew, lapwing, dunlin, redshank and oystercatcher, but also shelduck, golden plover, grey plover and turnstone.
Great crested newt.	2008	Surveys indicate that the species was likely to be absent from the survey area (as of 2008).
Reptiles	2008	Four species of reptile were identified within the main development site: • grass snake – low population; • adder – low population; • slow worm – low population; and • viviparous lizard – good population. Key areas of reptile habitat identified were on the sea wall and within semi-improved grassland to the south of the existing power station (Bradwell A).
Otter	2008 2019	Surveys in 2008 indicated that otter was likely to be absent from the survey area, which was supported by similar negative findings from the Essex Otter Survey 2007. Otters have, however, been recovering across the county and in 2011 the EWT reported sightings of otter from Bradwell. Field signs of otter presence were also confirmed within the main development site as an incidental part of the badger survey work in 2019. This included feeding remains, otter spraint and a potential otter holt.

Species or Species Group	Year of Survey	Comments
Water vole.	2008	Water voles were relatively widespread across the Dengie Peninsula, although much of the habitat within the 2008 survey area was noted to be suboptimal for water vole due to ditches drying out and becoming encroached by scrub; with the notable exception of habitat within the Borrow Dyke. Despite this, almost all ditches supported the species and it was concluded that a low population occupies the survey area. Within the context of Essex county, the Dengie Peninsula was of county value for water voles and the Borrow Dyke provided an important dispersal corridor linking the ditch network on site with that in the wider Essex landscape. The Borrow Dyke was also deemed critical to the survival of the on-site population, given the lower quality and potentially seasonal habitat provided by inland ditches.
Other notable species.	None	The desk study data indicates that the following SPIs occur or have historically occurred locally and these may, therefore, use habitats within the study area: • harvest mouse; • hedgehog; and • brown hare.

Off-site associated development (all elements) and off-site Power Station Facilities

23.5.9 Baseline information for the off-site development elements is limited, as preferred sites have yet to be identified. However, there are a number of internationally and nationally designated sites that do lie within 10km of the off-site associated development and off-site Power Station Facilities search areas shown on **Figure 3.3** to **Figure 3.6**.

23.5.10 These designated sites include the following (excluding those already listed in paragraph 23.6.3):

- Crouch and Roach Estuaries Ramsar site/SPA/SSSI (designated for dark-bellied brent geese, wintering waterbird assemblage and a variety of coastal habitats);
- Thrift Wood, Woodham Ferrers SSSI (cited for woodland and diverse flora, bird community and invertebrate assemblage);
- Danbury Common SSSI (cited for heathland, unimproved grassland and woodland habitats);
- Blake's Wood and Lingwood Common SSSI (cited for woodland and heath habitats);
- Woodham Walter Common SSSI (cited for ancient woodlands, floristic diversity and invertebrate assemblage); and
- Hanningfield Reservoir SSSI (cited for wintering wildfowl including gadwall).

23.5.11 Within 2km of some of the off-site associated development search areas (including highway improvements and park and ride facilities) are two Local Nature Reserves (LNR), namely: Fenn Washland LNR (wetland consisting of coastal grazing marsh, reedbed, marsh and ponds) and Kendal Park LNR (woodland set on River Crouch).

23.5.12 The remainder of the Dengie Peninsula is expected to be relatively uniform (based on incidental observations of field surveyors and examination of satellite imagery) with the inland habitats being dominated by arable fields that are separated by hedgerows or fence lines, with occasional copses. The coastal area is notable due to the extent of mudflats and saltmarsh, with coastal grassland and lengths of borrow dyke being common.

23.5.13 Desk study information for the main development site suggests that legally protected and notable species are present and well distributed (as described in **Table 23.8**); these species and potentially others are expected to be present in the vicinity of one or more of the off-site development elements.

Future baseline

23.5.14 Determining a future baseline draws upon information about the likely future use and management of the Project sites in the absence of development, known

population trends (for species), climate change (see **Chapter 12: Climate Change**) and any other proposed developments (consented or otherwise) that may act cumulatively with the Project to affect ecological features.

23.5.15 It is not possible to conclude that in the absence of the Project, any future baseline is likely to be markedly different from the current baseline. Land use and management is currently anticipated to remain largely unchanged in the absence of development and it is therefore considered appropriate to use the current baseline for the purpose of this assessment.

Planned further surveys and studies

23.5.16 In order to confirm the current baseline and to collect appropriate information to inform an EIA, a comprehensive suite of biodiversity surveys is planned for 2020 and 2021 for the main development site. For off-site development and off-site Power Station Facilities the survey programme is not yet confirmed as individual survey locations have not yet been identified. Each area of off-site associated development and the location of the off-site Power Station Facilities will be subject to a suite of surveys that reflects the types of habitats present on and adjacent to each. A summary of the future survey programme (which focusses on the main development site) is provided in **Table 23.9**, with further detail in **Appendix 23A** and **23B**.

Table 23.9: Planned further surveys and studies

Further Surveys and Studies	Proposed Date
Desktop study	Complete for main development site (see **Appendix 23C**). Timing dependent on design evolution for off-site associated development and off-site Power Station Facilities.
Habitats and botanical surveys	
Extended Phase 1 habitat survey.	Complete for main development site (see **Appendix 23D**). Timing dependent on design evolution for off-site associated development and off-site Power Station Facilities.
National Vegetation Classification (NVC).	June-July 2020. April – July 2021.
Hedgerows Regulations survey.	June-July 2021.
Ditch habitat survey.	June-July 2020.

Further Surveys and Studies	Proposed Date
	June – July 2021.
Predictive System for Multimetrics (PSYM) assessment of ponds.	June-July 2020. June – July 2021.
Invertebrate surveys	
Terrestrial invertebrate survey.	June-September 2020. June-September 2021.
Aquatic macroinvertebrate survey of watercourses.	June-September 2020. June-September 2021.
Fish survey	July-August 2021.
Mammal surveys	
Badger activity survey (study area expanded to at least 1km from site boundary).	December 2019-February 2020. October 2020 – February 2021.
Badger bait marking study.	April 2020. February - April 2021.
Bat roost identification survey: ground level visual assessment of trees.	Ongoing 2020.
Bat roost identification survey: potential roost feature (PRF) inspection of trees.	July-August 2020. September 2020-February 2021.
Bat roost identification survey: external building inspections.	May-September 2020. May-September 2021.
Bat roost identification survey: internal building inspections.	August 2020-February 2021.
Bat roost identification survey: emergence and re-entry surveys.	May-September 2020. May-September 2021.
Bat activity survey: active transects and passive monitoring.	April-October 2020. April-October 2020.
Bat activity survey: woodland sampling.	July-September 2020.

Further Surveys and Studies	Proposed Date
	May 2021.
Otter survey.	April 2020. August-March 2021.
Water vole survey.	April 2020. August-March 2021.
Ornithological surveys	
Bird intertidal or near shore surveys (distribution and abundance).	October 2019-May 2020. July 2020-May 2021. July -September 2021.
Bird intertidal and near shore surveys (disturbance monitoring).	October 2019-May 2020. July 2020-May 2021. July -September 2021.
Bird terrestrial transect surveys (diurnal and nocturnal).	October 2019-March 2020. October 2020-March 2021.
Breeding bird survey.	March-June 2020. March-June 2021.
Ditch breeding bird survey.	April-July 2020. April-July 2021.
Barn Owl survey.	February 2021. April-August 2021.
Ornithological appraisal surveys.	April-August 2021. Off-site associated development and off-site Power Station Facilities (if deemed necessary following Extended Phase 1 Habitat surveys).
Herpetofauna surveys	
Great crested newt habitat suitability assessment.	April-May 2020. April 2021.

Further Surveys and Studies	Proposed Date
Great crested newt environmental DNA (eDNA) sampling.	May-June 2020. April – June 2021.
Great crested newt population assessment survey (if required).	March-June 2021.
Reptile presence or likely absence survey.	March-October 2020. March-October 2021.
Reptile population assessment survey (if required).	March-October 2021.

23.6 Proposed Approach to the Assessment

Assessment methodology

23.6.1 The generic project-wide approach to the assessment methodology is set out in **Chapter 5: The EIA Process and Methods**. However, while this will inform the approach to be used in the Biodiversity assessment, it is necessary to align with the standard industry guidance provided by the Chartered Institute of Ecology and Environmental Management (CIEEM) (2018).

23.6.2 The assessment will be based upon not only the results of the desk study and field surveys, but also relevant published information (for example on the status, distribution, sensitivity to environmental changes and ecology of the features scoped in to the assessment, where this information is available), and professional knowledge of ecological processes and functions.

23.6.3 For each scoped-in ecological feature, effects will be assessed against the predicted future baseline conditions for that feature during construction and operation and, where appropriate the removal and reinstatement of off-site associated development.

23.6.4 Throughout the assessment process, the initial results of the assessment regarding potentially significant effects will be used to inform whether additional baseline data collection is required, together with the identification of environmental measures that should be embedded into the Project to avoid or reduce adverse effects or to deliver enhancements. The results of the assessment will, therefore, reflect the final Project design (i.e. incorporating any environmental measures described).

23.6.5 The spatial extent of the assessment will reflect the area occupied by the ecological feature that is being assessed and, as a minimum, the ZoI of the changes that are likely to affect it.

23.6.6 Where part of a designated site is located within the ecological ZoI relating to a particular biophysical change as a result of the Project, an assessment will be made of the effects on the designated site as a whole. A similar approach will be taken for areas of notable habitat.

23.6.7 For species that occur within the ZoI, the assessment will consider the total area that is used by the affected individuals or the local population of the species (for example, for foraging or as breeding territories).

Assessment of effects and determining significance

Overview

23.6.8 The general approach to assessment of effects and determining significance that will be used for the EIA is provided in **Section 5.4** of **Chapter 5: The EIA Process and Method**. However, this section sets out how the approach has been applied to biodiversity and where it has been adapted to deal with the specific requirements of biodiversity.

23.6.9 CIEEM (2018) defines a significant effect as one "that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general".

23.6.10 When considering potentially significant effects on ecological features, whether these be adverse or beneficial, the following characteristics of environmental change will be taken into account. It should be noted that the definitions of the characteristics of environmental change are based on the descriptions provided in CIEEM (2018). Other chapters in the ES may use some of the same terms albeit with a different definition.

- extent – the spatial or geographical area over which the environmental change may occur;
- magnitude – the size, amount, intensity or volume of the environmental change;
- duration – the length of time over which the environmental change may occur;
- frequency – the number of times the environmental change may occur;
- timing – the periods of the day, year etc. during which an environmental change may occur; and
- reversibility – whether the environmental change can be reversed through restoration actions.

Magnitude of change

23.6.11 Although the characteristics described above are all important in assessing effects by using information about the way in which habitats and species are likely to be

affected, a scale for the magnitude of the environmental change, as a result of the Project, has been described in **Table 23.10** to provide an understanding of the relative change from the baseline position, be they adverse or beneficial changes.

Table 23.10: Guidelines for the assessment of the scale of magnitude

Scale of Change	Criteria and Resultant Effect
High	The change permanently (or over the long-term) affects the conservation status of a habitat or species, reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area. Relative to the wider habitat resource or species population, a large area of habitat or large proportion of the wider species population is affected. For designated sites, integrity is compromised. There may be a change in the level of importance of the ecological feature in the context of the Project.
Medium	The change permanently (or over the long term) affects the conservation status of a habitat or species reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area. Relative to the wider habitat resource or species population, a small-medium area of habitat or small-medium proportion of the wider species population is affected. There may be a change in the level of importance of this ecological feature in the context of the Project.
Low	The quality or extent of designated sites or habitats or the sizes of species' populations, experience some small-scale reduction or increase. These changes are likely to be within the range of natural variability and they are not expected to result in any permanent change in the conservation status of the species or habitat or integrity of the designated site. The change is unlikely to modify the evaluation of the ecological feature in terms of its importance.
Very low.	Although there may be some effects on individuals or parts of a habitat area or designated site, the quality or extent of sites and habitats, or the size of species populations, means that they would experience little or no change. Any changes are also likely to be within the range of natural variability and there would be no short-term or long-term change to conservation status of ecological features (habitats or species) or the integrity of designated sites.
Negligible	A change, the level of which is so low, that it is not discernible on designated sites or habitats or the size of species' populations, or changes that balance each other out over the lifespan of the Project and result in a neutral position.

Determining significance - adverse and beneficial effects

23.6.12 Adverse effects will be assessed as being significant if the favourable conservation status of an ecological feature would be lost as a result of the Project. Beneficial effects are assessed as those where a resulting change from baseline improves the quality of the environment (for example, increases species diversity, increases the extent of a particular habitat etc., or halts or slows down an existing decline). For a beneficial effect to be considered significant, the conservation status would need to positively increase in line with a magnitude of change of "high" as described in **Table 23.10**.

23.6.13 Conservation status is defined as follows (as per CIEEM 2018):

> "*For habitats, conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and typical species within a given geographical area;*
>
> *For species, conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area*".

23.6.14 The decision as to whether the conservation status of an ecological feature would alter will be made using professional judgement, drawing upon the information produced through the desk study, field survey and assessment of how each feature is likely to be affected by the Project.

23.6.15 A similar procedure is used where designated sites may be affected by the Project, except that the focus is on the effects on the integrity of each site; defined as:

> "*The coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified*".

23.6.16 The assessment of effects on integrity will draw upon the assessment of effects on the conservation status of the features for which the site has been designated.

23.6.17 Where these features are not clearly defined, it will be necessary to use professional judgement to identify the interest features or, where possible, obtain additional information about the interest features from the designating body, so that sufficient information on which to base an assessment is available.

23.7 Scope of the Assessment

Potential ecological features

23.7.1 The first stage in determining the scope of the biodiversity assessment is to identify which ecological features identified through the desk study and field surveys are 'important' in the context of the Project. Following guidance from CIEEM, the importance of ecological features is first determined with reference to UK legislation

and policy and then with regard to the extent of habitat or size of population that may be affected.

23.7.2 As the importance of ecological features is determined with regard to the extent of habitat or size of population that may be affected by the Project, each status can differ from that which would be conferred by legislative protection or identification as a conservation notable species. For example, house sparrow is important at a national level because it is a SPI and features on the Birds of Conservation Concern red list. However, a small population that could be affected by a development would be assessed as being of less than national importance due to the large, albeit declining, national population (in excess of 5 million pairs). Similarly, a small length of hedgerow, a HPI, even if deemed to be 'Important' with regard to the Hedgerow Regulations may be considered to be less than of national importance due to the extent of this habitat type across a given county.

23.7.3 Wherever possible, information regarding the extent and population size, population trends and distribution of the ecological features has been used, to inform the categorisation to determine importance at the project level. Where detailed criteria or contextual data are not available, professional judgement has been used to determine importance.

Table 23.11: Importance of the Project for ecological features

Geographic Context of Importance	Example and Description
International or European.	1. European sites including SPAs, SACs, candidate SACs and Sites of Community Importance (SCI). pSPAs, possible SACs (pSACs), Ramsar sites (designated under international convention) and proposed Ramsar sites should also be considered in the same manner in accordance with national planning policy. 2. Areas of habitat or populations of species which meet the published selection criteria based on discussions with Natural England and field data collected to inform the EcIA for designation as a European site or Ramsar site, but which are not themselves currently designated at this level.
National (England).	1. A nationally designated site including SSSIs and NNRs. 2. Areas (and the populations of species which inhabit them) which meet the published selection criteria guidelines for selection of biological SSSIs but which are not themselves designated based on field data collected to inform the EcIA, and in agreement with Natural England. 3. HPI and SPI, Red listed and legally protected species that are not addressed directly in Part 2 of the “Guidelines for

Geographic Context of Importance	Example and Description
	Selection of Biological SSSIs" but can be determined to be of national importance using the principles described in Part 1 of the guidance. 4. Areas of Ancient Woodland, for example, woodland listed within the Ancient Woodland Inventory and ancient and veteran trees.
Regional (East of England).	1. Regularly occurring HPI and populations of SPI, Red listed and legally protected species may be of regional importance in the context of published information on population size and distribution.
County (Essex).	1. LNRs and non-statutory designated sites including LWSs. 2. Areas which based on field data collected to inform the EcIA meet the published selection criteria for those sites listed above (for habitats or species, including those listed in relevant Local Biodiversity Action Plans) but which are not themselves designated.
Local (Maldon District).	1. HPI and SPI, Red listed and legally protected species that based on their extent, population size, quality etc. are determined to be at a lesser level of importance than the geographic contexts above. 2. Common and widespread semi-natural habitats occurring within the study area in proportions greater than may be expected in the local context. 3. Common and widespread native species occurring within the study area in numbers greater than may be expected in the local context.
Negligible	1. Common and widespread semi-natural habitats and species that do not occur in levels elevated above those of the surrounding area. 2. Areas of heavily modified or managed land uses (for example, hard standing used for car parking, as roads etc.).

23.7.4 Where protected species are present and there is the potential for an effect, those species should always be considered as 'important' features. With the exception of such species receiving specific legal protection, or those subject to legal control (for example, invasive species), all ecological features that are determined to be important at negligible level have been scoped out of the assessment at this stage.

Further, ecological features of local importance, where there is a specific technical justification, have been also scoped out at this stage. This is because effects on them would not influence the decision-making about whether or not consent should be granted for the Project (in other words a significant effect in EIA terms could not occur). This approach is consistent with that described by CIEEM.

23.7.5 All legally protected species and ecological features that are of sufficient importance have then been taken through to the next stage of the scoping assessment.

23.7.6 The principal ecological features that have been 'scoped in' at this stage are summarised in **Table 23.12.**

Table 23.12: Ecological features subject to potential effects

Element of the Project	Phase	Potential ecological features	Reason for Consideration
Project-wide.	Construction phase. Operation phase.	International statutory designated nature conservation sites and the qualifying features for which they are designated, including: • Blackwater Estuary (Mid-Essex Coast Phase 4) SPA; • Dengie (Mid-Essex Coast Phase 1) SPA; • Outer Thames Estuary SPA; • Colne Estuary (Mid-Essex Coast Phase 2) SPA; • Abberton Reservoir SPA; • Foulness (Mid-Essex Coast Phase 5) SPA; • Crouch and Roach Estuaries (Mid-Essex Coast Phase 3) SPA; • Blackwater Estuary Ramsar; • Dengie Ramsar; • Colne Estuary Ramsar; • Abberton Reservoir Ramsar; • Foulness Ramsar;	These sites, occurring within the ZoI of the main development site and elements of the off-site associated development and off-site Power Station Facilities, are of international importance. Further sites may be included post fieldwork reporting based on species specific foraging distances outwith the 20km desk-based study search area.

Element of the Project	Phase	Potential ecological features	Reason for Consideration
		• Crouch & Roach Estuaries Ramsar; and • Essex Estuaries SAC. Full details of the qualifying features are provided in **Appendix 23C**. These relate to internationally important bird assemblages, invertebrate communities, and coastal habitats.	
Project-wide.	Construction phase. Operation phase.	National statutory designated nature conservation sites and the features for which they are designated, including: • Blackwater Estuary SSSI; • Dengie SSSI; • Colne Estuary SSSI; • Sandbeach Meadows SSSI; • Abberton Reservoir SSSI; • Crouch and Roach Estuary SSSI; • Thrift Wood, Woodham Ferrers SSSI; • Danbury Common SSSI; • Blake's Wood and Lingwood Common SSSI; • Woodham Walter Common SSSI;	These sites, occurring within the ZoI for the main development site, elements of the off-site associated development and off-site Power Station Facilities, are of national importance.

Element of the Project	Phase	Potential ecological features	Reason for Consideration
		• Hanningfield Reservoir SSSI; • Colne Estuary NNR; • Blackwater Estuary NNR; and • Dengie NNR. Full details of the qualifying features are provided in **Appendix 23C**. These relate to nationally important bird assemblages, invertebrate communities, and coastal habitats.	
Project-wide.	Construction phase. Operation phase.	Non-statutory designated nature conservation sites, including: • Bradwell Cemetery LWS; and • any additional LWS that have not yet been identified.	These sites, occurring within the ZoI, are of county importance. It is expected that additional LWS will be identified within the ZoI for the off-site associated development and off-site Power Station Facilities.
Project-wide.	Construction phase. Operation phase.	HPIs, including: • arable field margins; • hedgerows; • coastal saltmarsh; • ponds; • reedbeds;	In the absence of any further survey data, at this stage it is assumed that HPIs occurring within the ZoI of the main development site, off-site associated development and off-site Power Station Facilities are of national importance.

Element of the Project	Phase	Potential ecological features	Reason for Consideration
		• lowland mixed deciduous woodland; and • any additional HPIs that have not yet been identified.	
Project-wide.	Construction phase. Operation phase.	SPIs and other notable species, including: • brown hare; • harvest mouse; • European eel; • various invertebrate species; • various botanical species; and • various bird species.	In the absence of any further survey data, at this stage it is assumed that SPIs and other notable species occurring within the ZoI of the main development site, off-site associated development and off-site Power Station Facilities are of national importance.
Project-wide.	Construction phase. Operation phase.	Notable invertebrate (terrestrial and aquatic) assemblages.	In the absence of any further survey data, at this stage it is assumed that the invertebrate assemblages occurring within the ZoI of the main development site, off-site associated development and off-site Power Station Facilities are of national importance.
Project-wide.	Construction phase. Operation phase.	Fish communities.	In the absence of any further survey data, at this stage it is assumed that the fish community, occurring within the ZoI of the main development

Element of the Project	Phase	Potential ecological features	Reason for Consideration
			site, off-site associated development and off-site Power Station Facilities are of national importance.
Project-wide.	Construction phase. Operation phase.	Badger	In the absence of any further survey data, at this stage it is assumed that the badger population, known to occur within the ZoI of the main development site is of county importance. Currently there is no information regarding the status of badgers within the vicinity of the off-site associated development or off-site Power Station Facilities. Regardless of the level of importance assigned to badgers, they have been scoped in on the basis of their legal protection.
Project-wide.	Construction phase. Operation phase.	Bats	In the absence of any further survey data at this stage, it is assumed that the bat populations, known to occur within the ZoI of the main development site, off-site associated development and off-site Power Station Facilities, are of county importance. Regardless of the level of importance assigned to bats, they have been scoped in on the basis of their legal protection.
Project-wide.	Construction phase.	Notable bird assemblage.	In the absence of any further survey data at this stage, it is assumed that the bird assemblage,

Element of the Project	Phase	Potential ecological features	Reason for Consideration
	Operation phase.		occurring within the ZoI of the main development site, off-site associated development and off-site Power Station Facilities, is of national importance based on the statutorily designated sites surrounding the Dengie peninsular.
Project-wide.	Construction phase. Operation phase.	Birds listed on Schedule 1 of the WCA (including barn owl).	Regardless of the level of importance assigned to Schedule 1 protected birds, they have been scoped in on the basis of their legal protection.
Project-wide.	Construction phase. Operation phase.	Great crested newt.	There is no evidence to confirm the presence of great crested newt within the ZoI of the main development site, associated development or off-site Power Station Facilities, however, in the absence of up to date field survey data it is assumed that the species is present. Regardless of the level of importance assigned to great crested newt, they have been scoped in on the basis of their legal protection.
Project-wide.	Construction phase. Operation phase.	Reptiles	In the absence of any further survey data at this stage, it is assumed that the reptile populations, known to occur within the ZoI of the main development site, off-site associated development

Element of the Project	Phase	Potential ecological features	Reason for Consideration
			and off-site Power Station Facilities, are of county importance. Regardless of the level of importance assigned to reptiles, they have been scoped in on the basis of their legal protection.
Project-wide.	Construction phase. Operation phase.	Otter	In the absence of any further survey data at this stage, it is assumed that the otter population, known to occur within the ZoI of the main development site, off-site associated development and off-site Power Station Facilities, is of regional importance. Regardless of the level of importance assigned to otters, they have been scoped in on the basis of their legal protection.
Project-wide.	Construction phase. Operation phase.	Water vole.	In the absence of any further survey data at this stage, it is assumed that the water vole population, known to occur within the ZoI of the main development site, off-site associated development and off-site Power Station Facilities, is of regional importance. Regardless of the level of importance assigned to water vole, they have been scoped in on the basis of their legal protection.

Likely significant effects

23.7.7 The effects on biodiversity that have the potential to be significant and that will be taken forward for assessment in the ES are summarised in **Table 23.13**.

Table 23.13: Likely significant biodiversity effects

Element of the Project	Activity	Effect	Ecological feature
Project-wide.	All construction activities.	Pollution caused by construction activities resulting in temporary and permanent degradation of habitats. This includes vehicle emissions, dust, fuel spillages, discharge of wastewater and groundwater contamination. Significant earthworks carried out during the construction phase have the potential to significantly alter the local hydrological regime which could significantly affect any designated sites that are hydraulically linked to the construction area.	Statutory and non-statutory designated nature conservation sites; protected and notable habitats and species and assemblages.
Project-wide.	All construction activities.	Land-take and land-cover change resulting in permanent loss or degradation of habitat.	Statutory designated nature conservation sites occurring within or adjacent to land-take areas; sites that are designated for mobile species that could potentially rely on habitats within or immediately adjacent to the site (including FLL); protected and notable habitats and species and assemblages.
Project-wide.	All construction activities.	Alteration of recharge, groundwater flow and baseflow regime due to changes in topography	Statutory and non-statutory designated nature conservation sites; protected

Element of the Project	Activity	Effect	Ecological feature
		and land use, and construction dewatering (see **Chapter 15: Water Environment**).	and notable habitats and species and assemblages.
Project-wide.	All construction activities.	Visual and noise (including vibration) disturbance. Increases in vehicular movements and the presence of personnel, plant, machinery etc. in locations that were previously subject to minimal anthropogenic activity has the potential to dissuade species from using habitats at the site and in adjacent areas resulting in potentially significant negative effects on the conservation status of species and populations affected.	Statutory designated nature conservation sites occurring within or adjacent land-take areas; sites that are designated for mobile species that could potentially rely on habitats within or immediately adjacent to the site (including FLL); protected and notable habitats and species and assemblages.
Project-wide.	All construction activities.	Habitat change and degradation (including through indirect effects such as increased artificial lighting) and introduction of barrier effects. These activities will reduce habitat availability as well as the continuity of habitats that exist across the landscape. This could negatively affect the conservation status of species populations that require contiguous habitat.	Statutory designated nature conservation sites occurring within or adjacent land-take areas; sites that are designated for mobile species that could potentially rely on habitats within or immediately adjacent to the site (including FLL; protected and notable habitats and species and assemblages.
Project-wide.	All construction activities.	Habitat removal resulting in death or injury of faunal, or destruction or damage to sheltering habitat. Construction work has the potential to result in direct harm to populations of protected	Protected species.

Element of the Project	Activity	Effect	Ecological feature
		species that could be present in construction zones.	
Main development site.	Operational phase, all aspects.	Pollution caused by ongoing activities resulting in degradation of habitats causing an increase to baseline levels of vehicle emissions, dust, fuel spillages and accidental pollution events, and discharge of wastewater. This includes the running of stand-by generators, which are expected to use diesel fuel and consequently emit particulate matter, NO_X and SO_2. The emissions have the potential to result in degradation of habitats through aerial deposition (see **Chapter 8: Air Quality**).	Statutory and non-statutory designated nature conservation sites; protected and notable habitats and species and assemblages.
Project-wide.	Operational phase, all aspects.	Alteration of recharge, groundwater flow and baseflow regime due to changes in topography and land use, including placement of permanent below ground infrastructure (see **Chapter 15: Water Environment**).	Statutory and non-statutory designated nature conservation sites; protected and notable habitats and species and assemblages.
Main development site.	Operational phase, all aspects.	Visual and noise (including vibration) disturbance. The ongoing presence of personnel, plant, machinery and significantly increased levels of artificial lighting in locations that were previously subject to minimal anthropogenic	Statutory designated nature conservation sites occurring within or adjacent land-take areas; sites that are designated for mobile species that could potentially rely on habitats within

Element of the Project	Activity	Effect	Ecological feature
		activity has the potential to dissuade species from using any habitats within the site and in adjacent habitats.	or immediately adjacent to the site; protected and notable habitats and species and assemblages.
Project-wide.	Operational phase, all aspects.	The presence of significant built infrastructure, permanent loss of connecting habitat, and permanent installation of artificial lighting has the potential to cause ongoing fragmentation effects on species and result in isolation of populations.	Statutory designated nature conservation sites occurring within or adjacent land-take areas; sites that are designated for mobile species that could potentially rely on habitats within or immediately adjacent to the site; protected and notable habitats and species and assemblages.
Project-wide.	Operational phase, all aspects.	Ongoing activities resulting in an increase to baseline levels of vehicle movements has the potential to result in deaths of mobile faunal species through road traffic accidents.	Designated nature conservation sites that are designated for mobile species and notable species and assemblages of a mobile nature.

23.7.8 There are no effects that are to be scoped out of the assessment at this stage.

23.8 Potential Mitigation

23.8.1 Potential mitigation would comprise, but not be limited to, the following:

- Creation of mitigation or compensation habitat comprising enhanced mixed arable and grassland farmland: The compensatory land would need to be sufficiently distant from the proposed works as to avoid birds utilising the compensation area (in particular, brent geese) being disturbed by works activities.
- Creation of a mosaic of replacement habitat (including but not limited to wetland and ditches). Such habitat should be functionally linked to the on-site habitats, so that it is suitable for displaced faunal populations (for example, reptiles, water voles and badgers).
- A Restoration Plan will be developed that will define the requirements for land forming and landscaping works for areas of the main development site which are not required during the operational phase. This plan will aim to maximise opportunities for biodiversity conservation, and long-term value will be maintained and enhanced through the implementation of a Habitat Management Plan (HMP).
- As with the main development site, site specific Restoration and Reinstatement Plans will be developed as required for the off-site associated development which will also aim to maximise opportunities for biodiversity conservation where practicable.
- Through delivery of mitigation, compensation and enhancement measures, including habitat creation, the main development site Restoration Plan, and off-site associated development Restoration and Reinstatement Plans and the HMP, the Project will provide an overall Net Gain for biodiversity in the long-term.

23.9 Assumptions and Limitations

23.9.1 As the Project is at an early stage, the assessment of the effects on biodiversity will assume a worst-case scenario, and will be confirmed through review of additional fieldwork results, data sources, and consultation with the relevant stakeholders

23.9.2 It is assumed that mitigation will be undertaken in accordance with best practice and a detailed Code of Construction Practice (CoCP) will be developed to address bespoke measures required to manage the sources and pathways of potential effects to the ecological features identified in this scoping report chapter.

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24. MARINE ECOLOGY AND FISHERIES

24.1 Introduction

24.1.1 This chapter sets out the proposed scope of assessment for marine ecology and fisheries for the main development site and the zone of marine infrastructure. **Chapter 5: The EIA Process and Methods** introduces the overall Environmental Impact Assessment (EIA) process including the methodology for assessing effects and determining significance. Topic specific methodologies for determining receptor value, sensitivity and impact magnitude for marine ecology and fisheries receptors are provided in **Section 24.6.**

24.1.2 This chapter contains:

- a summary of work undertaken to date;
- an explanation of the scope of assessment, including:
  - legislation, policy and guidance that inform the assessment;
  - a description of consultation and engagement so far relevant to marine ecology and fisheries;
  - study area for the assessment;
  - sources of data used in scoping;
  - baseline conditions, including current desk studies and surveys;
  - planned further surveys and studies;
- the receptors that are proposed to be assessed and the effects which have the potential to be significant;
- the effects that are proposed can be scoped out of the assessment; and
- potential mitigation.

24.1.3 The chapter should be read in conjunction with the project description provided in **Chapter 3: The Project.**

24.1.4 Characterisation reports will be produced for each of the marine ecology and fisheries receptor groups and key species and habitats will be identified during the EIA process. A summary of the current understanding of the baseline environment is provided in **Section 24.5**. Marine ecology and fisheries receptor groups subject to site-specific characterisation reports include:

- Plankton (phytoplankton and zooplankton).

- Benthic Ecology.
- Fish Ecology.
- Marine Mammals.
- Commercial and Recreational Fisheries.

Work undertaken to date

24.1.5 Historical desk-based and survey data sources have been used to inform the marine ecology and fisheries assessment. Details of available data sources can be found in **Section 24.4**.

24.1.6 Engagement with statutory consultees and stakeholders to date is listed in **Section 24.3**.

24.2 Legislation, Policy and Technical Guidance

24.2.1 This section identifies and describes the relevant legislation, national and local policy and guidance which has informed the scope of the marine ecology and fisheries assessment. Further information on policies relevant to the EIA and their status is set out in **Chapter 2: Policy and Regulatory Context**, which should be read in conjunction with this chapter.

24.2.2 Legislation and policy relevant to marine ecology and fisheries is detailed in **Table 24.1**.

Table 24.1: Legislation and policy

Relevant Legislation and Policy	Relevance to the Assessment
Legislation	
International: European Commission (EC) Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC). (Ref 24.1).	The Habitats Directive fulfils the obligations of the Bern Convention with the aim of restoring natural habitats and maintaining biodiversity. The Directive ensures the conservation of a wide range of rare, threatened or endemic animal and plant species listed within the Annexes. European member states are required to adopt an ecologically coherent network of protected sites. Special Areas of Conservation (SACs) are designated and used in conjunction with Special Protection Areas (SPAs, Birds Directive) to form a network of European Sites. Relevant qualifying features of designated sites must be assessed to ensure conservation objectives for each protected site are met. The marine ecology EIA (see **Figure 24.1** and **Figure 24.2** for sites in relation to the relevant Project elements) runs parallel to the Habitats Regulations Assessment Report (hereafter HRA Report) to inform Appropriate Assessment. The HRA Report specifically considers likely significant effects on designated features of European Sites. The Habitats Directive was transposed into UK law through the Conservation of Habitats and Species Regulations.
International: EC Directive on the Conservation of Wild Birds (2009/147/EC). (Ref 24.2).	The Birds Directive is the means by which the UK and the European Union (EU) meet the objectives of the Bonn Convention of migratory species and the Bern Convention of conservation of wild species. Vulnerable and rare species listed in Annex I are afforded protection under the Natura network of protected areas through designated SPAs. Migratory species and internationally important

Relevant Legislation and Policy	Relevance to the Assessment
	wetlands are also protected with SPA designations. Relevant qualifying features of designated sites must be assessed to ensure conservation objectives for each relevant site are met. The marine ecology EIA (see **Figure 24.1** and **Figure 24.2** for sites in relation to the relevant Project elements) runs parallel to the HRA Report, which specifically considers likely significant effects on designated features of European Sites. Elements of the Birds Directive were transposed into national law in England and Wales through the Conservation of Habitats and Species Regulations and the Wildlife and Countryside Act.
International: Ramsar Convention on Wetlands of International Importance 1971. (Ref 24.3).	Wetlands of international importance are designated Ramsar sites and are afforded the same level of protection as SPAs under the Birds Directive. Relevant qualifying features of designated sites must be assessed to ensure conservation objectives for each relevant site are met. The marine ecology EIA runs in parallel to the HRA Report, which specifically considers likely significant effects on designated features.
National: The Conservation of Habitats and Species Regulations 2017. (Ref 24.4). Conservation of Offshore Marine Habitats and Species Regulations 2017. (Ref 24.5).	The Habitats Directive was transposed into the UK law through the Conservation of Habitats and Species Regulations 2010, which have been repealed and replaced by the 2017 Regulations. The Conservation of Habitats and Species Regulations 2017 (Habitats Regulations) transpose the EC Habitats Directive and elements of the EU Wild Birds Directive into national law in England and Wales. The Habitats Regulations provide the legislative enforcement for the protection of Natura 2000 sites within the limit of territorial waters (12 nautical miles (nm)) and protect species and habitats listed in Annex I and II of the EC Habitats Directive.

Relevant Legislation and Policy	Relevance to the Assessment
	Beyond the 12nm limit, the EC Habitats Directive and elements of the EU Wild Birds Directive are transposed into national law by the Conservation of Offshore Marine Habitats and Species Regulations 2017. The Regulations make it an offence to deliberately capture, injure, kill or disturb any European Protected Species (EPS) listed in Schedule 2, or to damage or destroy a breeding site or resting place of such an animal. All cetaceans are listed as EPS in Schedule 2.
National: Wildlife and Countryside Act 1981. (Ref 24.6).	The Wildlife and Countryside Act 1981 (as amended) was implemented to meet the obligations of the Bern Convention and Birds Directive and consolidated existing national legislation. The Act makes it an offence to kill, injure or take any species listed under Schedule 5, including all cetaceans, and prohibits intentionally disturbing animals occupying places used for protection or shelter.
International: Water Framework Directive (2000/60EC). (Ref 24.7). National: The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. (Ref 24.8).	The Water Framework Directive (WFD) covers groundwaters, lakes, rivers, transitional waters (estuaries and lagoons) and coastal waters up to 1nm. Water bodies are classified by way of hydromorphological criteria, ecological and physico-chemical assessments and the application of environmental chemical standards for priority substances and specific pollutants. The aim is to achieve Good qualitative and quantitative status of all water bodies. A WFD assessment will run parallel to the EIA. The marine ecology assessment would consider the biological elements to ensure the development is not detrimental to achieving the relevant water body objectives.

Relevant Legislation and Policy	Relevance to the Assessment
International: Marine Strategy Framework Directive (2008/56/EC). (Ref 24.9). National: The Marine Strategy Regulations 2010. (Ref 24.10).	The aim of the Marine Strategy Framework Directive (MSFD) is to achieve or maintain Good Environmental Status (GES) in European seas. Member States are required to develop a marine strategy to achieve GES and establish a network of Marine Protected Areas. Annex I of the Directive outlines 11 high-level descriptors of GES. The UK's Marine Strategy identifies the measures which are required to achieved GES thereby fulfilling the requirements of the MSFD. The Strategy covers coastal waters from mean high water springs to the outer limit of the UK Renewable Energy Zone and areas beyond for which the UK has claim. The Marine Strategy overlaps with WFD coastal waters but does not include transitional waters (for example estuaries). In coastal waters the Marine Strategy only applies to aspects of GES not covered by the WFD. The EIA will consider relevant descriptors of GES pertaining to underwater noise, litter, non-indigenous species, and certain aspects of biodiversity including marine mammals.
International: Convention on Biological Diversity 1992. (Ref 24.11). National: Natural Environment and Rural Communities (NERC) Act 2006. (Ref 24.12).	The Convention on Biological Diversity aims to develop national strategies for the conservation and sustainable use of biological diversity. The UK's first response to the Convention on Biological Diversity was to compile lists of Biodiversity Action Plan (BAP) species and habitats. These lists and subsequent action plans sought to ensure that priority species or habitats are conserved or enhanced. Ensures the conservation and sustainable use of biological diversity. BAP species and habitats lists have been superseded by statutory lists of priority species and habitats under the Natural Environment and Rural Communities (NERC) Act 2006. Relevant species and habitats will be considered in the marine ecology assessment. The species and habitats of conservation

Relevant Legislation and Policy	Relevance to the Assessment
	importance listed under Section 41 of the NERC Act will be fully considered in the decision-making process and measures implemented to avoid, where possible, or mitigate impacts.
International: Convention for the Protection of the Marine Environment of the North East Atlantic (OSPAR) 1992. (Ref 24.13).	Legislative instrument regulating international cooperation on environmental protection in the North-East Atlantic. Relevant species, habitats and ecological processes that are threatened and or declining will be considered in the marine ecology assessment.
International: Common Fisheries Policy 1983, reformed in 2014. (Ref 24.14). National: Marine Management Organisation (MMO) "Blue Book". (Ref 24.15).	Common Fisheries Policy (CFP) regulations extend to conservation, management and exploitation of fisheries resources, aquaculture, and the processing, presentation, and marketing of fisheries products. Fisheries for the majority of commercially exploited finfish and Nephrops are managed through internationally agreed quotas. The EC Directives and Council Regulations relevant for UK marine fisheries are listed and described in detail in the Marine Management Organisation (MMO) "Blue Book". The MMO has responsibility (up to 12nm) for ensuring that UK quotas are not exceeded and for policing (in England, out to the 200nm or the median line). Monitoring and management of quota uptake is for UK (English) registered vessels. Inshore Fisheries and Conservation Authority's (IFCAs) set quotas for key non-quota shellfish species within their districts and policing within 6nm is carried out in partnership between the MMO and the IFCAs. In addition to quotas, there are technical measures to control metrics such as fishing gear construction, minimum sizes and closed seasons or areas. These are set at the EU, national (applies to all UK vessels) and local level (IFCA byelaws). As the UK becomes an independent Coastal State, it is expected that quotas for those species currently under the CFP quota regulations will still be set

Relevant Legislation and Policy	Relevance to the Assessment
	through international negotiations whilst access to waters is also under negotiation. The draft Fisheries Bill includes existing EU commitments to operating within Maximum Sustainable Yield and statutory duties for the development of fishery management plans. The fisheries assessment would assess the relevant resources to ensure the development is not detrimental to achieving the objectives of these legislation and policies.
National: Salmon and Freshwater Fisheries Act 1975. (Ref 24.16).	The Salmon and Freshwater Fisheries Act imposes restrictions on the taking and destroying of fish and prohibits the obstruction to the passage of salmon and trout (including sea trout). Relevant species would be considered in the marine ecology assessment.
National: Sea Fisheries (Shellfish) Act 1967. (Ref 24.17).	Section 1 of the Shellfish Act gives the appropriate Minister the power to make orders for the purpose of establishment or improvement, and for maintenance and regulation of fisheries for shellfish of one or more species specified in that section. A right of several fishery may be granted under Section 1 in respect of the whole area or part thereof. There is a Several Fisheries Order for the Tollesbury and Mersea Native Oyster Fishery Company Limited (Blackwater).
National: Marine and Coastal Access Act 2009. (Ref 24.18).	The Act creates a strategic marine planning system that seeks to promote the efficient, sustainable use and protection of the marine environment, guided by the Marine Policy Statement and a series of Marine Plans (see Draft South East Inshore Marine Plan 2020). The Act seeks to implement a series of marine conservation zones (MCZ) to sit alongside European marine sites (SACs and SPAs), Sites of Special Scientific Interest (SSSIs) and Ramsar sites to form an ecologically coherent network of marine protected areas. The Act requires marine licences for works within the UK marine area at sea (including the

Relevant Legislation and Policy	Relevance to the Assessment
	deposition or removal of any substance or objects from the sea below mean high water). Relevant marine plan(s) and MCZ(s) will be considered in the marine ecology assessment. In conjunction with the EIA an MCZ assessment would be completed.
International: Eel Recovery Plan (Council Regulation No 1100/2007). (Ref 24.19). National: Eel Management Plans 2010. (Ref 24.20).	The European Commission initiated an Eel Recovery Plan to recover the sustainability of eel stocks. Across England, Eel Management Plans are set at the WFD defined River Basin District (RBD) level. Management actions that would ensure the long-term viability of the eel population. Relevant eel management plans and potential effects of the Project would be considered in the marine ecology assessment. In conjunction to the EIA an Eels Regulations Compliance Assessment would be completed.
National Policy	
National Policy Statement for Energy (EN-1). (Ref 24.21).	The Overarching National Policy Statement (NPS) for Energy (NPS EN-1) and the NPS for Nuclear Power Generation (NPS EN-6, Ref. 24.22) set out the Government's energy policy. The sections of relevance to the marine ecology and fisheries EIA are summarised. Section 4.8 *Climate Change*: New energy infrastructure has long operational life cycles and needs to remain operational over the period of multiple decades and in the face of climate change. The marine ecology EIA will determine the influence of climate change including, but not limited to, warming sea temperatures and potential sea level rise to influence ecological receptors. Section 5.3 *Biodiversity and geological conservation*: The Government's biodiversity strategy aims to halt, and if possible, reverse declines in priority

Relevant Legislation and Policy	Relevance to the Assessment
	habitats and species and healthy, functioning ecosystems. Significant harm to biodiversity interests and geological conservation interests should be avoided, through mitigation and consideration of reasonable alternatives. Central to the EIA is the identification of priority species and habitats and throughout the iterative planning process engineering options and mitigation measures will be sought to minimise environmental impacts. Section 5.3 *Mitigation*: Appropriate mitigation measures should be included as an integral part of the Project. Such measures include; minimising areas for construction works, following best practice to avoid risking damage or disturbance to species or habitats including as a consequence of transport access, restore habitat where practicable following construction, and take opportunities to enhance existing habitats and create new habitats of value. Section 5.11 *Noise*: Construction and operational noise has the potential to have negative impacts on wildlife and biodiversity. The impacts of noise should be assessed by the applicant. The EIA will include a detailed noise assessment. Section 5.12 *Socioeconomics:* The EIA should consider "*all relevant socio-economic impacts".* The marine ecology and fisheries EIA will assess potential impacts on commercial fishing interests and runs in parallel with the project wide socio-economics assessment (see **Chapter 10: Socio-economics**).
National Policy Statement for Nuclear Power Generation (EN-6).	The NPS for Nuclear Power Generation (EN-6) set out the Government's nuclear energy policy. The sections of relevance to the marine ecology and fisheries EIA are summarised. Section 3.7.6 Nuclear impact: *Water Quality and Resources: In the design of any direct cooling system the locations of the intake and outfall should be sited to avoid or minimise negative impacts on legitimate commercial and recreational*

Relevant Legislation and Policy	Relevance to the Assessment
	uses of the receiving waters, including their ecology. There should also be specific measures to minimise impact to fish and aquatic biota by entrainment or by excessive heat or biocidal chemicals from discharges to receiving waters. The EIA will consider the potential implications for commercial and recreational (shore-based anglers and harvesters and charter boats) fisheries. The marine ecology and fisheries EIA runs in parallel with the project wide recreation and amenity assessment of the effects on the users of the Blackwater Estuary (see **Chapter 21: Recreation**) and the socio-economics assessment (see **Chapter 10: Socio-economics**). Section 3.9 *Biodiversity and geological conservation:* The nuclear Appraisal of Sustainability identified cooling water abstraction and discharges, habitat and species loss and fragmentation or coastal squeeze, and disturbance events (noise light visual) as potential impacts on biodiversity. Baseline studies are a requirement on important habitats and species to inform assessments and determine the potential for cumulative effects.
Regional Policy[1]	
Draft South East Inshore Marine Plan 2020 (Ref. 24.23).	Strategic approach to planning within the inshore waters between Felixstowe, in Suffolk and near Dover, in Kent. The marine ecology assessment will assess the relevant resources to ensure the development is not detrimental to achieving the objectives of the Plan.

[1] Regional and local fisheries specific legislation and policy would be described in detail in the commercial and recreational fisheries characterisation report.

Relevant Legislation and Policy	Relevance to the Assessment
Essex and South Suffolk Shoreline Management Plan 2 2010 (Ref. 24.24).	Shoreline Management Plans (SMP) are applied to individual sediment cells along the coast for the purpose of managing flood and erosion risk during the short, medium and long-term. They identify the best ways to manage coastal flood and erosion risk to people and the developed, historic and natural environment. Management Unit F (Blackwater Estuary) and G (Dengie Peninsula) are of interest for the Project.
Local policy	
Essex Coast Recreational disturbance Avoidance and Mitigation Strategy (RAMS) (2018 – 2038) (Ref. 24.25).	The Essex coast Recreational disturbance Avoidance and Mitigation Strategy (the "Essex coast RAMS" or the Strategy) aims to deliver the mitigation necessary to avoid significant negative effects from 'in-combination' impacts of residential development that is anticipated across Essex; thus protecting the Habitats (European) sites on the Essex coast from adverse effect on-site integrity.
Maldon District Council (MDC) Local Development Plan (2017) (Ref. 24.26).	The Maldon District Local Development Scheme (LDS) sets out a description of the development plan documents (DPDs) being prepared by the Council and outlines the timetable for their production (see **Chapter 23: Biodiversity – Terrestrial and Freshwater Ecology and Ornithology** for further details of this plan).

Relevant Legislation and Policy	Relevance to the Assessment
The Colchester Borough Local Plan (2008, policies updated in 2014) (Ref. 24.27)[2].	The Colchester Local Development Plan sets out the policy for nature conservation requirements and developments within the Coastal Protection Belt and covers areas of the Colne and Blackwater estuaries where effects from the Project may occur.

[2] Colchester Borough Council is in the process of reviewing its Local Plan and a submission draft was issued for examination in 2017, with consultation on proposed main modifications planned in October 2020. The environmental aspect chapters will refer to emerging policy where relevant and greater weight will be applied depending on the extent to which the policies have moved towards adoption.

Technical guidance

24.2.3 Technical guidance that has been used to define the assessment is set out in **Table 24.2**. The marine ecology and fisheries assessments draw on a range of guidance documents including but not limited to chemical and thermal standards, underwater noise assessment criteria and thresholds and mitigation guidelines, and cooling water infrastructure best practice guidance. Standards and guidelines underpinning assessments will be detailed in the relevant Technical Reports and the Environmental Statement (ES).

Table 24.2: Relevant technical guidance

Guidance Reference	Implications
Chartered Institute of Ecology and Environmental Management (CIEEM) 2018. Guidelines for ecological impact assessment in Britain and Ireland: Terrestrial, Freshwater, Coastal and Marine (Ref. 24.28).	Marine ecology methods apply an Ecological Impact Assessment (EcIA) based approach to assess the potential effects of the Project on marine ecology receptors.
Joint Nature Conservation Committee (JNCC) pressures-activities database (PAD) (Ref. 24.29).	The PAD uses the information present within Natural England's Advice on Operations (AoO) and supplements it with information on activities relevant to Scotland and a range of new activities that occur or may occur in UK waters. Marine ecology receptors will be assessed against relevant (medium-high risk) pressures (see **Section 24.6**).
Marine Evidence based Sensitivity Assessment (MarESA) (Ref. 24.30).	Sensitivity assessments determine the resistance (or tolerance) of a receptor to a pressure and the ability to recover following the cessation of the pressure, termed resilience (see **Section 24.6**). Resistance and resilience descriptors are informed by the MarESA approach for benthic receptors and highly mobile species.
Centre for Environment Fisheries and Aquaculture Science (Cefas) Offshore Wind Farms Guidance Note for Environmental Impact Assessment (2004) (Ref. 24.31).	The methodology for fisheries assessment follows a structured approach primarily based on the guidance document, which provides indications of types of impacts to consider.

Guidance Reference	Implications
JNCC (2010) Statutory Nature Conservation Agency Protocol for Minimising the Risk of Injury to Marine Mammals from Piling Noise (Ref. 24.32).	Outlines measures to minimise potential injury from pile driving during offshore wind farm construction and other industries that use piling.
Merchant and Robinson (2020) Abatement of underwater noise pollution from pile-driving and explosions in UK waters (Ref. 24.33).	Explores the technical feasibility of applying noise abatement measurements to offshore windfarm construction and unexploded ordnance (UXO) detonation. States that it is at the discretion of regulators to determine whether to require noise abatement technologies as a condition of a marine licence. Such decisions are informed by the advice of Statutory Nature Conservation Bodies and scientific advisers.
JNCC (2020). Guidance on noise management in harbour porpoise SACs 2020 (Ref. 24.34).	Harbour porpoise is known to be present within the study area (see **Section 24.5**), therefore any underwater noise assessment will need to take account of the latest guidance on noise management in harbour porpoise SACs.
Popper et al. (2014) Sound Exposure Guidelines for Fishes and Sea Turtles (Ref. 24.35).	Guidelines for underwater noise criteria for fish and other marine animals, defined by the way they detect sound. Appropriate metrics are defined for measurement of the received levels.
National Marine Fisheries Service (NMFS) (2018) technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (Ref. 24.36).	The United States NMFS (part of the National Oceanic and Atmospheric Administration (NOAA) provide acoustic thresholds for the onset of auditory impacts for marine mammals exposed to acute anthropogenic noise.
British Energy Estuarine and Marine Studies (BEEMS) Scientific Advisory Report SAR008 v2. Thermal Standards for Cooling Water from New Build Nuclear Power Stations (Ref. 24.37).	Considers the ecological implications of thermal discharges and thermal tolerances of a range of species to cooling water discharges in relation to existing standards.

24.3 Consultation and Engagement

24.3.1 This chapter has been informed by engagement and discussion with stakeholder organisations and statutory consultees. **Table 24.3** details technical engagement to date which has occurred outside of formal statutory consultation. **Table 24.4** provides a summary of consultee comments arising from Stage One Consultation, along with a response to identify how the relevant matters are dealt with in this report.

Table 24.3: Technical engagement

Consultee	Points of discussion
Natural England. MMO Environment Agency.	Marine Baseline Data Early Survey Design Considerations (27 November 2018). Note that these discussions reflected that direct cooling was still an option at this stage.
Natural England. MMO Environment Agency. Essex Native Oyster Restoration Initiative (Essex University).	Oyster Literature Review and Environmental Tolerances (28 November 2018). Discussions on preliminary data and knowledge reviews of key species and sensitivities and identification of knowledge gaps. Note that these discussions reflected that direct cooling was still an option at this stage.
Natural England. MMO Environment Agency. Essex Native Oyster Restoration Initiative (Essex University). Kent and Essex Inshore Fisheries and Conservation Authority.	Cooling Water Strategy Optioneering and Implications for Marine Studies. (11 June 2019). Sharing preliminary temperature model results and update on benthic survey design. Discussion of oyster studies programme. Comments from Natural England requested an official HRA evidence plan.
Natural England. MMO Environment Agency.	Marine Ecology Survey Plans (03 September 2019). Discussion of marine survey plans and data requirements including benthic (subtidal and intertidal), fish, plankton and marine mammals. Recommended changes to the

Consultee	Points of discussion
	fish and plankton surveys adopted to target a full tidal cycle. Modification to eel survey adopted to encompass day and night sampling. Fish survey protocol shared with the Environment Agency and Natural England with further ongoing discussion on points of detail.
Environment Agency.	Hydrodynamic modelling strategy report reviewed by the Environment Agency. Outlines the high-level approach to the hydrodynamic model setup, calibration and validation (11 November 2019).

Table 24.4: Stage One Consultation comments

Theme	Summary of Consultee Comments and considerations	How this is accounted for
Mitigation	The Environment Agency and the MMO noted that the Project should use studies and surveys to inform designs which avoid adverse effects or incorporate the necessary mitigation measures. The Project should also aim to maximise the contribution to the environment and commit to achieve a net gain in biodiversity. Natural England would value the opportunity to support the Project to develop detailed habitat creation proposals. The Environment Agency and the MMO noted that the document does not present information regarding assessing the risk to biosecurity or implementing mitigation for the potential introduction of invasive non-native species. Natural England advised that surveys and impact studies will need to assess disturbance impacts (both direct and indirect) on designated bird species at all stages of the project and potential impacts on seagrass beds need to be considered.	Avoidance measures and mitigation will be integrated into the iterative planning stages of the Project (**Section 24.8**), further details will be provided in the Preliminary Environmental Information (PEI) and the ES to support the Development Consent Order (DCO) application. Justification of infrastructure design and efficiency of mitigation measures will be provided. Appropriate monitoring will be considered within the PEI and ES and will be informed by characterisation reports and assessment of effects. As described in the Stage One Consultation document the applicant aims for enhancement of the environment above and beyond the environmental mitigation and compensation to offset lost habitat in the development area. These measures are discussed in **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology** and will be developed as the project progresses. The presence of invasive non-native species in the study area (see **Section 24.5**) will be assessed as part of the receptor baseline characterisations and

Theme	Summary of Consultee Comments and considerations	How this is accounted for
		possible activity-impact pathways for invasive non-native species will be assessed in the EIA. Direct and indirect (including food web) effect pathways on identified marine ecological and fisheries receptors will be assessed, including potential in-combination and cumulative effects. Further detail on marine ecological and fisheries assessments will be provided in the PEI for Stage 2 consultation and the ES to support the DCO application.
Baseline	The Environment Agency and Natural England noted that the Project needs to identify the full range of internationally, nationally, and locally designated sites and their relevant features; protected species; and priority habitats and species. Also, that detailed baseline studies of the habitats and species present at the proposed site and detailed surveys of the ecology of linear features need to be supplied. Natural England noted that the Project should not constrain the capacity of designated sites to achieve and maintain favourable condition.	The evidence requirements that underpin the environmental assessments, in particular linked with the assessment of likely significant effects on designated sites and features (under the HRA) is the subject of a continuing HRA Evidence Plan being developed in consultation with stakeholder groups and statutory consultees. The conservation status of designated sites will be accounted for within assessments. A summary table of the ongoing surveys and how the data will be applied is provided in **Section 24.5**. Receptor characterisation reports will be produced that contain full details of surveys methods and evidence base. A robust baseline characterisation

Theme	Summary of Consultee Comments and considerations	How this is accounted for
		will be produced for the EIA, from which assessments will be made.
Assessment Scope	The Environment Agency, Essex Wildlife Trust and Local Councils noted that any effects on the full range of internationally, nationally, and locally designated sites; protected species; and priority habitats and species, supported by ecological surveys need to be described and that conservation advice packages are used in the assessment. Essex Wildlife Trust noted that all receptors likely to be impacted need to be described and assessed. The MMO and Natural England advise that consideration is given to additional sites outside of the study area, in particular to impacts beyond English waters and that an appropriate 'Zone of Influence' (ZoI) can only be determined with a 'cradle to grave' assessment including all aspects of the build. The MMO and Natural England note that no references to bio-security procedures or non-native invasive species mitigation measures have been presented.	The evidence requirements to underpin the environmental assessments is the subject of a continuing HRA Evidence Plan being developed in consultation with stakeholder groups and statutory consultees. The approach to scoping and assessing receptors for assessment purposes is described in **Section 24.6**. ZoI will be identified for each aspect of the Bradwell B power station lifecycle (construction, commissioning and operation), and where necessary transboundary effects will be assessed. The presence of invasive non-native species in the study area (see **Section 24.4**) will be assessed as part of the receptor baseline characterisations and possible activity-impact pathways for invasive non-native species will be assessed in the EIA. Further detail on mitigation measures will be provided in the PEI and ES. Effects on prey species forms and important part of the assessment. Important prey species will be scoped into the assessment due to their ecological value (see **Section 24.7**).

Theme	Summary of Consultee Comments and considerations	How this is accounted for
	Natural England advises that potential impact pathways on prey species to more distant populations of birds must be given full consideration. The Royal Society for the Protection of Birds noted that the Dengie and the Blackwater Estuary SPAs have been identified for boundary review to ensure that the importance of cropped land is recognised appropriately, therefore the Project needs to consider that the main development site may be included in a future possible SPA extension.	The potential for future SPA extension is noted.
Survey and Monitoring	The Environment Agency noted that detailed ecological surveys need to be conducted early to understand the potential adverse effects and how these can be avoided or mitigated. Natural England noted that surveys need to cover the entire period of the annual cycle when the areas in question may be used by the species concerned and baseline surveys must cover at least two successive years. Natural England would like to see a timeline for post-consent and restoration ecological monitoring work.	Detailed ecological surveys within the study area (see **Section 24.4**) have commenced and are ongoing. Surveys target the important times of the year for the key receptors identified and will cover two successive years where appropriate. Receptor characterisation reports will be produced that contain further details of the proposed and ongoing surveys. A robust baseline will be produced for the EIA, from which future assessments will be made. Mitigation and monitoring will be considered in the PEI and ES. Avoidance measures and mitigation will be integrated into the iterative planning and design of the Project (**Section 24.8**) and will be informed by the

Theme	Summary of Consultee Comments and considerations	How this is accounted for
		presence of sensitive features, survey data and characterisation reports. Post-consent monitoring plans are beyond the scope of this EIA Scoping chapter but will be provided as part of the EIA process, as required.
Marine Works.	The Environment Agency noted that the environmental effects of the proposed marine infrastructure in combination with the environmental effects of the consequential vessel movements needs to be considered. The Environment Agency also noted that the potential impacts to Blackwater herring need to be considered from the proposed works and eutrophication of the estuary needs to be considered. Environmental best practices should be used to minimise environmental effects. The Environment Agency and MMO noted that further information on effects of marine infrastructure on the coast (i.e. beach landing facilities (BLFs)) should be provided, including footprints and pilling requirements, and that effects should not be considered temporary from a 'temporary' structure. The MMO also noted that	No effects have been scoped out at this stage, therefore potential direct and indirect (food web) effect pathways on identified marine ecological and fisheries receptors will be assessed, including potential in-combination and cumulative effects. The potential for effects on Blackwater herring populations will form part of the ecological assessments as will the potential for eutrophication. Avoidance measures, mitigation and best practice measures will all be implemented and described in the PEI and ES to minimise environmental effects. **Section 24.7** and **Chapter 17: Coastal Geomorphology and Hydrodynamics** specifically scope in potential effects from BLF construction and operation. The scoped in effects cover a worst-case envelope at this stage but will be refined as the project design develops. The term 'temporary' in the Stage One Consultation document is not intended to imply effects are considered to be temporary but to

Theme	Summary of Consultee Comments and considerations	How this is accounted for
	two BLFs are needed the combined effects must be considered. Essex Wildlife Trust noted that operational protocols of the Bradwell B power station will need to consider and assess the potential impacts on the Native Oyster (Ostrea edulis) and Native Oyster beds.	indicate that the structure will be removed at the end of the construction phase. The combined effects of different infrastructure elements will be assessed in the in-combination assessment. Native oysters and oyster beds will form an important consideration for the EIA for all stages of the Project and will be subject of the MCZ Assessment. Ongoing laboratory and modelling work (see **Section 24.5**) will help inform the potential for effects on oysters within the ZoI of operational impacts.
HRA	The Environment Agency noted that the HRA needs to be prepared in consultation with competent authorities and statutory nature conservation bodies and be consistent with the published guidance, best practice, and recent case law. The Environment Agency noted that the Project needs to identify all internationally designated sites through impact pathways, including those sites designated by other countries subject to transboundary effects and consider all qualifying features of designations and other projects that may act in-combination in the HRA Report. The Environment Agency, the MMO and Essex Wildlife Trust noted that the HRA needs to consider the full range of available mitigation and provide a full	The evidence requirements that underpin environmental assessments, in particular linked with the assessment of likely significant effects on designated sites and features (under the HRA) is the subject of a continuing HRA Evidence Plan being developed in consultation with stakeholder groups, competent authorities and statutory nature conservation bodies. All potential effect pathways on identified sites and features will be assessed, including potential in-combination effects. ZoI will be identified for each aspect of the Bradwell B power station lifecycle (construction, commissioning and operation), and where necessary transboundary effects will be assessed.

Theme	Summary of Consultee Comments and considerations	How this is accounted for
	assessment of alternatives where adverse effects cannot be ruled out. Essex Wildlife Trust and the Royal Society for the Protection of Birds noted that the concept of functional linkage is relevant to the HRA process.	Avoidance measures and mitigation will be integrated into the iterative planning and design of the Project (**Section 24.8**), Justification of infrastructure design and efficiency of mitigation measures will be provided, and alternatives considered. Functional linkage will be considered and outlined in the HRA.
Assessment Methodology.	Natural England and Essex Wildlife Trust noted that they expect to see all impact pathways considered, assessed, and presented along with the data collection methodologies and resultant evidence. The MMO noted that all features and supporting habitats of adjacent designated sites must be considered key and considered against their conservation objectives. Natural England noted that evidence will need to be provided that there will be no permanent loss of habitat and adverse impacts on relevant sites or the integrity of protected species resulting from 'temporary' facilities. Natural England also noted that the impact of water abstraction needs to be fully assessed in terms of sediment transport and hydrodynamics in the area	The evidence requirements that underpin environmental assessments is the subject of a continuing HRA Evidence Plan being developed in consultation with stakeholder groups and statutory consultees. Receptor characterisation reports will be produced that contain further details of the proposed and ongoing surveys. A robust baseline will be produced for the EIA, from which future assessments will be made. All potential direct and indirect effect pathways on identified marine ecological and fisheries receptors will be assessed, including potential in-combination and cumulative effects. Further detail on marine ecological and fisheries assessments will be provided in the PEI and ES.

Theme	Summary of Consultee Comments and considerations	How this is accounted for
	and quantitative assessments for the impacts of the cooling infrastructure upon protected sites and species and ecosystem functioning will need to be provided.	Supporting habitats and functional linkages will be considered with relevance to the HRA. Full assessments including the potential for habitat loss will be considered in both the ES and the HRA in light of the conservation objectives of designated sites. Quantitative assessments of cooling water abstraction will be a key assessment element of the EIA process for the Project. The potential for food web effects and changes in the structure or functioning of the ecosystem will be considered (see **Section 24.6**). Project wide effects on coastal processes and hydrodynamics are considered in **Chapter 17: Coastal Geomorphology and Hydrodynamics.**
Policy and Legislation.	The MMO noted that care is taken to meet the legislative requirements of each assessment as HRA requirements are different to those of an MCZ.	The legislative requirements for the HRA, MCZ assessment and EIA will be set out and assessed individually to meet the requirements, however the evidence input will be common to these individual assessments.

Theme	Summary of Consultee Comments and considerations	How this is accounted for
Permitting	The MMO noted that if any protected species are identified as being affected by the works, a Wildlife Licence may be required. Natural England noted that the relevant permits for species licensing and SSSI consents need to be in place before works commence.	Noted. Consents have been obtained for surveys underway and will be obtained for any future surveys, as necessary.
Cumulative Effects.	Natural England noted that potential impacts must be considered within the context of the development as a whole (including aspects defined as both temporary and permanent), to enable the cumulative effects of the development on the full range of different designated sites (and the functional linkages of their features) in the project area at all stages of the development to be fully assessed. Essex Wildlife Trust noted that the cumulative impacts of increased temperature and biocide pollution will potentially result in a large area of sterility around the outfall.	No effects have been scoped out at this stage, therefore any potential direct and indirect (including food web) effect pathways on identified marine ecological and fisheries receptors will be assessed, including potential in-combination and cumulative effects (see **Section 24.6**). Further detail on marine ecological and fisheries assessments will be provided in the PEI and ES. In-combination effects arising from the Project, including thermal and chemical discharges during the operational phase, will be assessed against all relevant environmental quality standards (see **Section 24.6**).

Theme	Summary of Consultee Comments and considerations	How this is accounted for
Alternatives	Natural England noted that the potential impact of the proposed BLF is intertidal mudflat habitat loss, however there is no mention of saltmarsh habitat loss.	Saltmarsh features within the ZoI above mean high water springs (MHWS) will be assessed in the terrestrial ecology EIA (see **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**). However, the function of saltmarsh habitat as a marine resource (for example as a nursery habitat) will be considered in the marine ecology assessments and any potential effects on this receptor will be assessed, including potential in-combination and cumulative effects. Further detail on marine ecological and fisheries assessments will be provided in the PEI and ES.
Stakeholder Engagement.	Natural England noted that the applicant should embrace the Net Gain commitments, and work to achieve a 10% increase in biodiversity compared to its previous status and show that plans are in place for monitoring the restoration success following on from the development. Essex Wildlife Trust noted that proposals need to be suitably underpinned by environmental evidence and robustly assessed such that any new nuclear development does not adversely affect designated sites or important wildlife populations.	As described in the Stage One Consultation document the applicant aims for enhancement of the environment above and beyond the environmental mitigation and compensation which to offset lost habitat in the development area. These measures are discussed in **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology** and will be developed as the Project progresses. The evidence requirements that underpin the environmental assessments is the subject of a continuing HRA Evidence Plan being developed in

Theme	Summary of Consultee Comments and considerations	How this is accounted for
		consultation with statutory consultees stakeholder groups which Essex Wildlife Trust are part of.
Site Location.	MDC and ECC noted that the Project needs to confirm its commitment to maximise environmental benefits and to achieve biodiversity Net Gain from the development, in line with the emerging Environment Bill 2020.	As described in the Stage One Consultation document, the applicant aims for enhancement of the environment above and beyond the environmental mitigation and compensation which to offset lost habitat in the development area. These measures are discussed in **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology** and will be developed as the Project progresses.

24.4 Data Gathering Methodology

Study area

24.4.1 This section presents the study areas for marine ecology and fisheries receptors. As the design and consultation processes progress and the Project design specifications and associated impacts are refined, the exact geographical scope of study areas may continue to evolve to accommodate any changes. For example, if disposal sites for dredge material are being considered outside the current study area the scope of assessment would be extended as appropriate. Surveys collecting data to characterise the site extend beyond the anticipated scope of impacts arising from the Project, however, should the study area change, data collection requirements would also be reviewed.

24.4.2 The geographical extent of the study area for direct effects on marine ecology receptors is considered as the tidal Blackwater Estuary extending from Maldon, approximately 15 kilometres (km) to the west of the main development site, to the eastern boundary of the Essex estuaries SAC (the MCZ boundary extends just beyond the most easterly extent and would be accounted for). Mersea Island defines the initial northerly extent for direct effects. The potential for effects on mobile receptors, including within the Colne Estuary and further afield is scoped in (see **Section 24.7**). The landward limit is delineated by the MHWS tidal mark.

24.4.3 The study area for commercial and recreational fisheries will be defined following characterisation of the fishery at a local and regional context. The MMO database and Kent and Essex IFCAs will be consulted to allow the most recent catch statistics and fishing activities to inform the study area. Fisheries landings and first sale value will be reported at the relevant International Council for the Exploration of the Sea (ICES) scale and by local ports. Seasonality of catches and catches by gear type will be identified for both fin and shellfish. The Blackwater Estuary is a nursery ground which contains an important shellfishery where private farming and harvesting of wild stock occurs. An existing Several Fisheries Order exists for the Tollesbury and Mersea (Blackwater) area of the estuary.

24.4.4 The Project is situated within the ICES rectangle 32F0 with the ports of Harwich and Felixstowe located within ICES rectangle 32F1 (see **Figure 24.3**).

24.4.5 The study area described is based on preliminary work and expert judgment of the largest-scale potential impacts. Further work is underway to define the spatial extent of these impacts which will inform receptor specific ZoI. The largest-scale (precautionary) potential impacts associated with the main development site, and marine infrastructure zone include:

- underwater noise changes during construction activities (piling, dredging, drilling);
- water quality effects associated with dredging and drilling activities (for example changes in suspended solids at ecologically relevant concentrations);

- water quality effects (chemical discharges) associated with the terrestrial groundworks and sewage treatment discharge during construction; and
- water quality effects (chemical discharges) associated with commissioning discharges; and water quality effects (thermal and saline plumes) associated with the discharge of heated cooling water effluent during the main operation of the Bradwell B power station.

24.4.6 Effects on marine ecological receptors are dependent on the distribution, mobility and ecology of the species being considered relative to the impact. Therefore, assessments would determine the receptor-specific spatial scale.

Sources of data used in scoping

Desk based

24.4.7 The EIA scoping exercise has been undertaken with reference to **Chapter 3: The Project**, supported by available data sources. **Table 24.5** identifies some of the desk-based data sources used to inform scoping and this will be used to inform characterisation reports and subsequent assessments.

Table 24.5: Examples of desk-based data sources

Source	Data
Cefas Distribution and Abundance of Young Fish on the East and South Coast of England (Ref. 24.38).	Relevant population abundances of juvenile fish.
Environment Agency Water Framework Directive catchment data (Ref. 24.39).	WFD assessment data pertaining to the hydromorphological, ecological and physico-chemical status of the relevant water bodies.
Estimates of Cetacean Abundance in European Atlantic Waters in Summer 2016 from the SCANS-III Aerial and Shipboard Surveys (Ref. 24.40).	Relevant population distribution and abundances of marine mammals.
Wildfowl and Wetlands Trust Consulting Distributions of Cetaceans, Seals, Turtles, Sharks and Ocean Sunfish recorded from Aerial Surveys 2001-2008 (Ref. 24.41).	Relevant population distribution and abundances of marine mammals.
Atlas of Cetacean Distribution in North-West European waters (Ref. 24.42).	Relevant population distribution and abundances of marine mammals.

Source	Data
Scientific Advice on Matters Related to the Management of Seal Populations (Ref. 24.43).	Relevant population distribution and abundances of UK seals.
MMO annual sea fisheries landings data (Ref. 24.44).	Relevant fisheries landings statistics.
Coastal Fisheries Review (Ref. 24.45).	Cefas review of the inshore fisheries in England and Wales.
Sea Angling Survey 2017 (Ref. 24.46).	Recreational angling data.
Kent and Essex Inshore Fisheries and Conservation Authority species management plans (Ref. 24.47).	Relevant fish and shellfish (including oyster) distribution and management measures.
Radiological Habits Survey: Bradwell, 2015 (Ref. 24.48).	Identifies the habits and consumption rates of people living, working and pursuing recreational activities in the vicinity of the existing Bradwell nuclear site.
Thames Marine Aggregate Regional Environmental Characterisation (Ref. 24.49).	Biological baseline information.
Natural England conservation advice packages (Ref. 24.50).	Advice on operations and conservation objectives for relevant designated sites.
Characterisation of European Marine Sites: for example, the Essex Estuaries European Marine Site (Ref. 24.51).	Biological baseline information.
Mapping European Seabed Habitats (MESH) (Ref. 24.52) and European Marine Observation and Data Network (EMODNET) (Ref. 24.53).	Biological baseline information.

Survey data

24.4.8 Cross-disciplinary work at Bradwell was carried out under the BEEMS during 2008 to 2009. This involved the collection of preliminary physical data on bathymetry, topography, tidal movements and sediments. A series of marine ecology and fisheries surveys (fisheries, fish, shellfish and benthic invertebrates) were

conducted. These historical datasets will be used as background information to inform receptor specific marine ecology characterisation reports.

24.4.9 **Table 24.6** details the baseline surveys and studies to inform the EIA.

24.5 Baseline Information

24.5.1 The main development site and related marine infrastructure zone on the Blackwater Estuary is an ecologically important site, along with the Crouch, Roach and Colne estuaries, and is protected by international and national nature conservation designations (see **Figure 24.1**).

24.5.2 This section provides a summary of the baseline for each ecological receptor group. Full characterisation reports describing the baseline conditions for the receptor specific study areas at the main development site and in relation to the local and regional context will be produced for each receptor.

Current baseline

Plankton

24.5.3 Estuaries form transitional zones between freshwater and marine environments and are characterised by a large variability in physical and chemical properties affecting spatial and temporal distribution of phytoplankton and zooplankton.

24.5.4 Phytoplankton is an important primary producer and is a food source to herbivorous zooplankton. The annual peak concentrations of chlorophyll *a* are recorded between April and July in the Blackwater Estuary and between June and August in the Colne Estuary (Ref. 24.54). In the Colne, concentrations up to ten times higher than the Blackwater have been reported. Flagellates, largely euglenophytes, dominate the phytoplankton. These communities are considered to be light limited in the turbid estuaries and therefore extensive blooms do not generally occur (Ref. 24.55).

24.5.5 The current WFD catchment data classification for phytoplankton is ‘moderate’, ‘good’ and ‘high’ for Blackwater, Blackwater Outer, and Colne and Essex water bodies respectively. Effects on these parameters will also be assessed in the WFD assessment.

24.5.6 Occasional harmful algal blooms have historically been observed in the Blackwater and Essex water bodies. Harmful Algal Bloom (HAB) surveillance shows that short-term shellfishery closures have been put in place infrequently in the Blackwater (the last was in September 2013) whilst no shellfishery closure has been enforced in the Colne.

24.5.7 Zooplankton provide a key link in estuarine food webs as a food source for benthic invertebrates and fish. The dominant species found in the larger size fraction zooplankton are ctenophores, mysids, chaetognaths, amphipods and isopods, whilst copepods and benthic larvae (polychaetes, bryozoans, gastropods) dominate the smaller size zooplankton (Ref. 24.56).

Benthic ecology

24.5.8 The Blackwater Estuary contains a wide range of intertidal and subtidal benthic habitats and associated marine communities.

24.5.9 Extensive intertidal areas are exposed at low water around Mersea Island, the Colne Estuary, and in the inner Blackwater Estuary around Osea and Northey Islands. As the channel widens east of Ramsey Island, the intertidal areas become narrower before becoming more extensive again east of Sales Point along the Dengie Flat. Various habitat types can be found in the intertidal such as mudflat or sandflats, macrophyte-dominated shores, mussel and eel grass beds. The extensive mudflats and saltmarshes of the estuary provide rich foraging for wintering waterbirds.

24.5.10 Benthic microalgae (microphytobenthos) colonise the extensive mudflat and sandflat habitats and are considered as the major primary producers in the estuary, with diatoms dominating (Ref. 24.51 and Ref. 24.57).

24.5.11 Coastal areas and estuaries are prone to the effects of eutrophication and the occurrence of algal mats, primarily from agricultural nitrogen inputs (Ref. 24.58). Intertidal habitats in the Colne and Blackwater estuaries have had occurrences of opportunistic macroalgae mats of *Ulva* spp. (Ref. 24.51). The Environment Agency monitors macroalgae in the Blackwater Estuary.

24.5.12 The presence of the native oyster *Ostrea edulis* resulted in the designation of the estuary as a MCZ (Ref. 24.59), which also covers the nearby estuaries of the Colne, Crouch and Roach. Oyster beds provide important habitat for other marine wildlife, such as other shellfish species and benthic invertebrates. A 200ha Blackwater Restoration Box for the specific purpose of recovering native oyster beds is managed by the Essex Native Oyster Beds Initiative (ENORI) (see **Figure 24.3**).

24.5.13 Different sections of the Blackwater Estuary contain different patches of subtidal benthic habitats supporting a variety of macroinvertebrate assemblages. The centre and the sublittoral edges of the estuary are characterised by coarser sediments, supporting a mixed benthic community dominated by the slipper limpet *Crepidula fornicata* and the baked bean ascidian *Dendrodoa grossularia* whilst the muddy sediment located towards the mouth of the Blackwater Estuary supports typical infaunal assemblages dominated by polychaetes, bivalves and amphipods (Ref. 24.60). The reef building worm *Sabellaria spinulosa* has been recorded in the area in the Colne and on mixed sediment seabed in the mouth of the Blackwater Estuary (Ref. 24.51) but only as small crust-like aggregations, and not in abundances suggesting the presence of biogenic reefs.

24.5.14 The slipper limpet is an invasive non-native species that competes for food and space with native oysters (*Ostrea edulis*) (Ref. 24.61). The possible presence of other invasive non-native species in the area will be assessed as part of the baseline characterisation.

Fish

24.5.15 Ichthyoplankton is made up of larval fish and fish eggs. The most abundant ichthyoplankton taxa found in the Blackwater Estuary during historic BEEMS surveys were anchovy (*Engraulis encrasicolus)* eggs (see **Table 24.6** for planned surveys including ichthyoplankton and fish surveys). Goby larvae were the most abundant larvae, other ichthyoplankton occurring with relative frequency included eggs and/or larvae of other clupeid species (herring *Clupea harengus*, sprat *Sprattus sprattus* and pilchard *Sardina pilchardus*), solenette *Buglossidium luteum* larvae and weever fish *Trachinus vipera* eggs (BEEMS data, paragraph 24.4.8).

24.5.16 The Blackwater Estuary's shallow, turbid waters provide nursery habitat for a variety of juvenile fish including sprat, herring and European plaice *Pleuronectes platessa* (Ref. 24.62). Intertidal salt marshes are also an important nursery sites for numerous fish species with abundant juvenile individuals of common goby *Pomatoschistus microps*, herring and seabass *Dicentrarchus labrax* (Ref. 24.63).

24.5.17 Thames estuary herring belong to a small localised stock, known and managed as Blackwater herring. Blackwater herring are members of a spring-spawning (between late February and April) coastal population as opposed to the larger offshore stocks in the North Sea which spawn in the autumn (Ref. 24.51).

24.5.18 Juvenile seabass aggregate around warm water produced by cooling water outfalls. Bradwell A ceased operation in 2002 but a seabass nursery area surrounding the decommissioned power station still exists and is protected under a Kent and Essex IFCA byelaw, which prevents fishing between 1 May and 31 October each year (**Figure 24.3**).

24.5.19 The estuary and nearby waters further offshore support a diversity of finfish including Atlantic cod *Gadus morhua*, plaice, seabass and Dover sole *Solea solea* (Ref. 24.51).

24.5.20 Migratory fish species of conservation importance known to occur within the Blackwater Estuary include European eel *Anguilla anguilla* and cucumber smelt *Osmerus eperlanus* (a designated feature of the Medway Estuary MCZ). River lamprey *Lampetra fluviatilis* may also be present, although there is no evidence that the estuary supports a breeding population of this species. Extensive surveys are underway to characterise the fish communities of the Blackwater and Colne estuaries. The results of which will be presented in detail in characterisation reports.

Marine mammals

24.5.21 Marine mammals are known to be present in the study area. The harbour porpoise *Phocoena* is the only cetacean species that is common in the study area (Ref. 24.40 and Ref. 24.42). Grey seals *Halichoerus grypus* are present in the study area and use Goodwin Sands as a haul out site (approximately 50km from the main development site), although this species is not known to breed in the area. Harbour seals *Phoca vitulina* are present in the study area and breed in the Greater Thames Estuary, and have a wide-spread foraging distribution (Ref. 24.64 and Ref. 24.65).

Commercial and recreational fisheries

24.5.22 The mainstays of regional catches (by value) in the Kent and Essex IFCA district are cockles (*Cerastoderma edule*), Dover sole (*Solea solea*), scallops (*Pecten maximus*), seabass (*Dicentrarchus labrax*), plaice (*Pleuronectes platessa*), brown crab (*Cancer pagurus*), whelk (*Buccinum undatum*), cod (*Gadus morhua*), lobster (*Homarus gammarus*), and thornback ray (*Raja clava*) (2006 to 2010 data, Ref. 24.66).

24.5.23 The Blackwater Estuary contains one several order (Ref. 24.67) for mollusc fisheries (The Tollesbury and Mersea Fishery Order 2019) for cultivation of pacific oyster *Magallana (Crassostrea) gigas* and native oyster *Ostrea edulis*, mussels *Mytilus edulis* and quahog *Mercenaria mercenaria* (**Figure 24.3**). The Dengie flats support a commercially fished cockle bed (Ray Sands and Dengie Flats) (Ref. 24.66).

24.5.24 As well as the native oyster restoration box in the Blackwater Estuary (**Figure 24.3**), in order to prevent further decline and to promote recovery of the native oyster, a three-year fishing closure (31 May 2015 to 31 May 2018) was placed on the Blackwater, Crouch, Roach and Colne MCZ under the Kent and Essex IFCA Shellfish Beds Byelaw. This closure remains in place but does not prejudice the existing Several Fishing Order.

24.5.25 The largest inshore fishing fleet between Suffolk and Devon is based in West Mersea, and smaller fleets are also based in the Blackwater, Colne and the Crouch and Roach estuaries (Ref. 24.51).

24.5.26 Recreational fisheries in the study area include shore and boat-based angling for seabass, thornback ray, smooth hound, grey mullet, cod and whiting, and shellfish hand racking or picking (cockles and periwinkles *Littorina littorea*) (Ref. 24.66).

24.5.27 The marine ecology and fisheries EIA will assess effects on the recreational and commercial fishery and runs in parallel with the project wide recreation assessment of the effects on the users of the Blackwater Estuary (see **Chapter 21: Recreation**) and the socio-economics assessment (see **Chapter 10: Socio-economics**).

Future baseline

24.5.28 The current baseline will be established during characterisation studies that are designed to provide appropriate levels of detail for assessments for the duration of the construction and power station commissioning phases. The operational lifetime of the Bradwell B power station means that contemporary baselines are not necessarily appropriate for assessments for the duration of the operational phase. This may result from changes in the contemporary baseline with time, irrespective of the Project.

24.5.29 The future baseline is a theoretical situation that would exist in the absence of the Project. Extrapolation of current baselines to predict future ecological scenarios is challenging and prone to a large degree of uncertainty. This is particularly apparent for the range of receptor groups in the assessment, and in relation to natural

variability, changes in anthropogenic pressures and climate change. The degree of uncertainty rises with projections further into the future. Where reasonable evidence permits, the EIA will consider impacts (qualitatively) in relation to future baselines.

24.5.30 The operational design life of the Project means that some impacts must be considered in relation to long-term climate change. Climate change has the potential to interact with development pressures and influence the future baseline environment. Climate change is, for example, predicted to result in sea temperature rises with relevant ecological implications for the Project. The interaction between thermal discharges and climate related increases in seawater temperature on ecological receptors will be considered. Climate change will also be considered in relation to sea level rise in conjunction with **Chapter 17: Coastal Geomorphology and Hydrodynamics** and water quality issues (**Chapter 18: Marine Water Quality and Sediments**) such as pH, dissolved oxygen, and ammonia partitioning. However, long-term changes in species distribution, species specific adaptation ability, and possible life cycle shifts results in a degree of uncertainty when describing the potential for effects from development impacts under future climate change scenarios.

Planned surveys and studies

24.5.31 **Table 24.6** details the surveys and studies planned to inform the EIA. The purpose of the survey and studies is to characterise the study area, with particular emphasis on the predicted maximum ZoI of the Project thereby providing site specific information for use in baseline characterisation, model parameterisation, and assessment of effects.

Table 24.6: Planned further surveys and studies for marine ecology and fisheries

Survey or Study	Methods	Description	Proposed Date /Duration
MetOcean survey.	Landers, buoys wave riders.	Measurements of currents, tides, suspended sediments, waves and temperature at subtidal and intertidal sites to inform baseline conditions and validate hydrodynamic models.	12 months (deployed October 2019).
Bathymetry and backscatter (interpreted to habitat map).	Multi-beam echosounder.	Data will be interpreted to inform a benthic habitat map of the mid and outer Blackwater estuary to 0m chart datum. Scope agreed through stakeholder consultation.	Survey completed May 2019, interpretation in progress.
Marine water quality.	Water samples surface and near bed.	Niskin sampler or similar. 6 stations to establish water quality conditions.	Every 3 months for 12 months. November 2019 to October 2020.
Marine sediment quality.	Core samples.	To be determined (TBD) once the location of the proposed marine infrastructure has been defined. Sediment samples will provide information on sediment contaminant levels and be used to inform dredge disposal options in consultation with the MMO, where dredging is required.	TBD

Survey or Study	Methods	Description	Proposed Date /Duration
Hydro-dynamic models (thermal-saline and chemical).	GETM and TELEMAC 3D hydrodynamic models	Following Environment Agency modelling guidelines as described in the Bradwell B modelling strategy. Scope agreed through ongoing stakeholder consultation. Validated models will be used to predict the spatial footprint of discharge plumes during construction, commissioning, and operational phases of the Project.	Desk study underway (MetOcean data required for calibration and validation).
Sediment transport models.	Computational models; such as Telemac Sisyphe and Delft 3D.	Models of sediment transport in the study area and potential effects of changes to the physical environment with the addition of structures such as the BLFs and suspended sediment plumes following dredging and or disposal.	Development and calibration and validation ongoing.
Underwater noise propagation.	Cefas noise propagation model.	The noise propagation study will allow models to more accurately predict site-specific sound propagation when determining underwater noise effects on marine receptors.	Sound propagation study conducted in November - December 2019.
Ambient noise monitoring.	Deployed recorders.	Establishment of ambient underwater noise from monitoring data to allow characterisation of baseline noise environment against which effect assessments can be made.	12 months commenced Q1 2020.

Survey or Study	Methods	Description	Proposed Date /Duration
Plankton (phytoplankton, zooplankton, fish eggs and larvae).	Gulf VII plankton sampler with 2 nets plus water samples.	Four sites trawled repeated over the tidal cycle. Total sample numbers to be collected are 88 for phytoplankton, 352 for ichthyoplankton and large zooplankton, and a maximum of 352 for small zooplankton. Scope developed through stakeholder consultation. The surveys will inform plankton characterisation reports against which the assessments will be made.	12 months. Monthly (every two weeks December and March to September). Nov-2019 to Oct-2020.
Marine benthic ecological surveys.	Subtidal grabs and intertidal transects and core samples.	26 subtidal grab sites (triplicate samples) 21 intertidal stations (triplicate samples) over 7 transects. Scope discussed with stakeholders. The surveys coupled with other available data sources (see **Section 24.5**) and the bathymetry and backscatter will inform the benthic characterisation report against which the assessments will be made.	Surveys completed September 2019, interpretation in progress.
Marine fish and epibenthos surveys.	Finfish and bottom trawling gears including beam and otter trawls along with acoustic surveys with calibration tows for pelagic species.	5 sites within the study area are being surveyed for finfish. Sampling includes multiple gears at monthly resolution repeated at different states of the tide. Scope reviewed through stakeholder consultation. Surveys will inform the fish ecology characterisation report.	24 months (monthly surveys) November 2019 to October 2021.

Survey or Study	Methods	Description	Proposed Date /Duration
Glass eel survey	Modified Methot/Isaacs Kidd net (MIK net).	4 sites sampled repeatedly for 4 consecutive days during the day and night to determine presence and abundance of glass eels. Scope discussed with stakeholders. Surveys will inform the fish ecology characterisation report and be used in the Eels Regulations Compliance Assessment.	5 months – February - June 2020 completed. To be repeated in 2021.
Transitional fish classification surveys.	WFD sampling methods for transitional fish.	Sites selected to characterise the fish communities in the upper, mid, and lower sections of the Blackwater and Colne water bodies using a combination of seine netting, beam trawling, otter trawling and fyke netting. Data will inform the WFD transitional fish classification index and the fish ecology characterisation report.	Autumn 2020 and spring and autumn 2021.
Oyster population model.	Integral Projection model (IPM).	An IPM will be developed using the latest available information on oyster ecology and physiology. The IPM will be used to determine the potential for population level effects from the Project on Blackwater native oysters.	Desk study underway. Calibrated with in situ experiments through 2019/2020.
Oyster thermal tolerance experiments.	Laboratory experiments.	Laboratory measurements of metabolic rate, respiration, feeding, immune function and survival at differing temperatures. Results from thermal tolerance experiments will inform modelling of potential effects from thermal discharges.	2019 and 2020.

24.6 Proposed Approach to the Assessment

Assessment methodology

24.6.1 Marine ecology methods apply an EcIA based approach to assess the potential effects of a proposed development on marine ecology and fishery receptors following the CIEEM good practice guidelines.

24.6.2 The term 'marine ecology receptor' primarily applies to species and habitats (defined by applying the European Nature Information System (EUNIS) classification). The EUNIS habitat classification is a comprehensive system covering the terrestrial and marine habitat types of the European land mass and its surrounding seas. It is hierarchical in structure and includes a key with criteria for identification of habitats at the first three levels. Functional traits, diversity indices or species groups may be assessed as receptor proxies, where appropriate.

Assessment of effects and determining significance

24.6.3 The general approach to assessment of effects and determining significance that will be used for the EIA is provided in **Chapter 5: The EIA Process and Methods**. This section sets out how the approach has been applied to marine ecology and fisheries and where it has been adapted from the general methodology to account for specific requirements of these receptor groups including in-combination effects, cumulative effects and food webs.

24.6.4 Marine ecology receptors will be assessed against relevant (medium-high risk) pressures identified in the JNCC PAD (see **Table 24.7**). Relevant pressures are commonly caused by an activity at a level that warrants further consideration. The PAD uses information provided within Natural England's AoO. The Natural England AoO identifies activities capable of affecting qualifying features of designated sites and provides advice on how to fulfil the conservation objectives of the relevant site. For consistency, the list of pressures provided in the EIA will be consistent with those proposed for the HRA and MCZ assessment. It should be noted that the list of pressures may be revised following stakeholder engagement on either the HRA Screening or EIA Scoping processes.

Table 24.7: Relevant PAD pressures for marine ecology receptors

Broad pressure themes*	Pressure description in statutory marine Conservation Advice Packages
Alteration of coastal processes and sediment transport.	Water flow (tidal current) changes, including sediment transport considerations.
	Emergence regime changes, including tidal level change considerations.
	Wave exposure changes.

Broad pressure themes*	Pressure description in statutory marine Conservation Advice Packages
Water quality effects - marine environment. Including: Cooling water discharges, for example thermal and saline plume and chemical plumes.	Temperature increase.
	Salinity increase.
	Salinity decrease.
	Smothering and siltation rate changes (Heavy).
	Smothering and siltation rate changes (Light).
	Transition elements and organo-metals contamination.
	Hydrocarbon and polycyclic aromatic hydrocarbons (PAH) contamination.
	Synthetic compound contamination.
	Introduction of other substances (solid, liquid or gas).
	Nutrient enrichment.
	Organic enrichment.
	De-oxygenation.
	Introduction of microbial pathogens.
	Introduction or spread of invasive non-indigenous species (INIS).
	Changes in suspended solids (water quality).
	Barrier to species movement.
Radiological effects.	Radionuclide contamination†.
Direct habitat loss and indirect habitat fragmentation.	Physical change (to another seabed type).
	Physical change (to another sediment type).
	Habitat structure changes – removal of substratum (extraction).
	Abrasion or disturbance of the substrate on the surface of the seabed.
	Penetration and or disturbance of the substrate below the surface of the seabed, including abrasion.
	Physical loss (to land or freshwater habitat).
	INIS
	Siltation rate changes.
	Electromagnetic changes.

Broad pressure themes*	Pressure description in statutory marine Conservation Advice Packages
Population disturbance effects.	Underwater noise changes.
	Vibration
	Above water noise (effects on birds assessed in **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**, however, would also be considered in marine ecology assessments if applicable).
	Visual disturbance.
Disturbance due to increased recreational pressure.	Visual disturbance.
	Above water noise.
	Underwater noise changes.
Physical interaction between species and project infrastructure. Including: entrainment and or impingement of biota (Impingement and entrainment are considered within the theme of 'Physical interaction between species and project infrastructure' but would be considered in detail individually and in-combination {total entrapment} in the marine ecology assessments).	Barrier to species movement.
	Death or injury by collision.
	Collision above water with static or moving objects not naturally found in the marine environment (for example, boats, machinery, and structures).
	Collision below water with static or moving objects not naturally found in the marine environment (for example, boats, machinery, and structures).
	Removal of non-target species.

** Where the same pressure falls within two or more broad pressure themes, the pressure would be assessed once where most appropriate.*

†Marine Ecology assessments will consider pathways for contamination of existing radionuclides. Sediment quality surveys proposed at the site will determine the baseline radionuclide concentrations and determine the potential for activities associated with the Project to resuspend sediment-bound radionuclides.

Receptor value

24.6.5 Baseline characterisations of the study area will identify key taxa and habitats as important receptors for assessment purposes. Key taxa will be selected for assessment based on socio-economic, conservation or ecological value (see **Table 24.8**). As such, receptor value determines the species and habitats that would be

assessed. Value should also be applied to inform the overall determination of the significance of an ecological effect on a given receptor.

24.6.6 The value of marine ecological receptors is therefore uncoupled from sensitivity. This allows sensitivity assessments to be undertaken for a given impact independently of value. The highest scoring value for ecological, socio-economic and or conservation importance will determine the overall value of a receptor (see **Table 24.8**). Receptors with very low value will not be included as key taxa during baseline characterisations and would therefore be scoped out of further assessment. Species-specific assessments are not feasible for each individual taxa identified in characterisation reports. For example, benthic infauna communities are typically made up of hundreds of species. Very Low and Low value benthic receptors will, however, be considered by applying biological trait-based approaches. This allows assessments of ecological effects to be made at the community level by assessing representative taxa with shared traits.

Table 24.8: Marine ecology and fisheries receptor value

Value	General Description for Assigning Value
High	• High ecological value (other ecosystem features dependent on it). • International conservation value such as designated feature of SAC, SPA or Ramsar sites. • Habitats and Species "*of principle importance for the purpose of conserving biodiversity"* listed in Section 41 (England) of the NERC Act 2006. • National or international socio-economic value.
Medium	• Moderate ecological value (for example abundant or common and or another feature partially depends on it). • National conservation value such as designated features of regional or county importance, such as SSSIs or County Wildlife Sites (CWSs), Conservation Areas. • Moderate national regional socio-economic value.
Low	• Low ecological value (for example not selected as an abundant or common taxa and or limited connection to other ecosystem features). • Regional or local conservation value such as local nature reserves. • Local socio-economic value.
Very Low.	• Receptor nationally abundant but neither common or abundant locally and has no functional dependencies (and common biological traits). • Receptors with no conservation designation. • No immediate socio-economic value.

Impact magnitude

24.6.7 The impact magnitude or magnitude of change primarily considers the spatial extent of the impact, the duration of the impact, and the amount of change relative to baseline conditions. In accordance with EcIA guidelines, additional factors such as frequency, timing and reversibility will be taken into consideration in the assessments, where appropriate, as these factors can contribute towards the sensitivity of a receptor.

24.6.8 The extent of the impact relates to the geographic area exposed to changes. Effects on marine ecological receptors are dependent on the distribution, mobility and ecology of the species being considered relative to the impact. Therefore, assessments will determine the receptor-specific spatial scale. In some instances, assessments will consider the proportion of a reference population exposed to the impact. An established example of this approach is applying marine mammal population density estimates to determine the proportion of the population exposed to activities generating underwater noise.

24.6.9 The predicted amount of change for a given impact is assessed in relation to regulatory thresholds or standardised pressure benchmarks, for example, Environmental Quality Standards (EQS). Wherever possible the amount of change will be quantified and related to the baseline. In the absence of established standards, applied thresholds based on a 'weight of evidence approach' and pressure benchmarks proposed in MarESA will be used to inform the amount of change. Pressure benchmarks provide a basis for assessing the sensitivity of a given receptor to the site-specific impacts relative to recognised standards. However, it should be noted that benchmarks are not universally applicable and site-specific factors which apply within the Project ZoI may require further scrutiny.

24.6.10 Benchmark thresholds are applied to trigger further ecological investigation and do not necessarily infer sensitivity of all receptor groups.

24.6.11 The duration of the impact is considered in relation to pressure benchmarks and construction timelines. Impacts during the construction phase are considered short to medium-term, whilst impacts that occur (or persist) for longer durations are considered long-term. Pressure benchmarks often consider changes over the course of a year, therefore impacts under one year are considered low duration. It should be noted that sensitivity assessments will take into consideration the ecology of the species of concern relative to the duration and frequency of impacts.

24.6.12 Impact magnitude or magnitude of change is assessed on a four-point scale; *Very Low, Low, Medium, High* (**Table 24.9**). Generic descriptions help with assigning magnitude. However, it should be noted that expert judgement will be required when determining the weight of each of the factors involved in the overall assessment of magnitude.

Table 24.9: Marine ecology descriptions of impact magnitude

Impact Magnitude	Generic Description	Spatial Extent[3]	Amount of Change	Duration
High	Large-scale measurable changes, which are typically permanent or long-duration over most of the study area and potentially beyond.	Changes occur across a large proportion of the area of interest and possibly beyond.	Clear, measurable changes beyond natural variation and exceeds site-specific pressure benchmark.	Long-term or even permanent, for example beyond construction phase.
Medium	Medium-scale measurable changes over much of the study area. Impacts are typically medium term but not permanent.	Changes occur across a substantial proportion of area of interest.	Measurable changes beyond natural variation.	Medium-term, temporary impacts, for example during construction phase.
Low	Noticeable but small-scale change over a partial area. Impacts are typically short-term.	A partial spatial area is exposed to changes.	Measurable change within range of natural variation.	Short-term temporary, less than a year.
Very Low.	Very small-scale or barely discernible changes, over a small area. Impacts are short-lived.	A very small extent is exposed to changes.	Change possible but intangible from natural variation.	Very short-term, for example spring-neap cycle or less.

[3] Descriptive terms applied here are highly-receptor specific and depend on the ecology of the receptor of concerned.

Sensitivity

24.6.13 Sensitivity assessments determine the resistance (or tolerance) of a receptor to a pressure and the ability to recover following the cessation of the pressure, termed resilience. Within the context of the marine ecology and fisheries EIA, sensitivity assessments will be completed relative to the site-specific impact magnitude or magnitude of changes predicted during the construction and operational phases of the development.

24.6.14 Sensitivity is assessed on a four-point scale: *Not Sensitive, Low, Medium,* and *High* (**Table 24.10**).

Table 24.10: Guidance for marine ecology sensitivity criteria

Sensitivity	General Description for Assigning Sensitivity
High	Little or no capacity for resistance, limited or prolonged recovery (for example >10 years).
Medium	Low capacity for resistance, low capacity for resilience (for example after 10 years).
Low	Moderate resistance to the pressure, moderate capability for resilience (for example after 5 years).
Not Sensitive.	High capacity for resistance, high capacity of resilience (for example after 1 year).

24.6.15 Resistance and resilience descriptors are informed by the MarESA approach for benthic receptors and highly mobile species.

24.6.16 The resistance of an ecological receptor will be assessed against the predicted impact magnitude or magnitude of change. Resistance is considered using the following criteria, specific thresholds for descriptive terminology will be receptor specific and dependant of the outcome of site characterisation:

- None: A severe decline or reduction in the extent of a habitat and or the density or abundance of a species due to mortality or displacement or any other mechanism.
- Low: A substantial decline in the extent of a habitat and or the density or abundance of a species due to mortality or displacement.
- Medium: A moderate decline in the extent of a habitat and or the density or abundance of a species due to mortality or displacement.

- High: No or very minor changes in the extent of a habitat and/or the density or abundance of a species population. Physiological and behavioural changes in metabolism, feeding rates and foraging effort may occur. In the case of *r*-selected[4] species reductions in reproductive rates may occur, but not at the detriment of the population. Plasticity in feeding behaviours or dietary shifts would prevent behavioural changes resulting in reduce reproductive output in highly mobile (*K*-selected) species, such as marine mammals.

24.6.17 The resilience of a receptor is assessed in terms of its ability to recover once the pressure is removed and the environment returns to pre-impacted conditions. Receptor specific factors are considered in the assessment of resilience, these include, but are not limited to:

- the lifespan and age of maturity of the receptor;
- factors affecting fecundity, reproductive success, and or larval mortality;
- dispersal and recruitment patterns;
- mobility and migration of adults, and;
- population dynamics including natural mortality.

24.6.18 Recovery implies that a species or habitat has returned to pre-impacted habitat conditions or populations levels with structure and functioning maintained. It does not necessarily mean that all the species within the community have returned to pre-impacted levels.

24.6.19 Resilience following pressures causing behavioural avoidance or displacement are based on evidence for the time it takes a receptor to return to an impacted area once the pressure ceases. However, behavioural responses in highly mobile species (fish and marine mammals) can cause considerable population declines due to temporary displacement and are therefore given greater weight in assessing sensitivity (Ref. 24.68). As such, determination of sensitivity is dependent on the interplay between recovery and resilience and would be receptor specific. The assessments will consider the potential indirect food web effects associated with such behavioural responses.

Determination of significance

24.6.20 The aim of the EcIA process is to determine the occurrence of ecological effects and the potential significance of such effects caused by the Project. Determination of significance is derived with reference to the sensitivity of the receptors in relation

[4] *r*-selected species are small short-lived organisms, with rapid reproduction and growth rates that can make use of opportunistic resource availability. In ecological selection theory they differ from *K*-selected species that are at the other end of the spectrum and are typified by larger body size, longer life expectancy and fewer, larger offspring.

to the impact magnitude or magnitude of change and the value of the receptor effected.

24.6.21 A cross tabulation of the impact magnitude or magnitude of change and sensitivity of the receptors provides a guideline for the classification of effects (**Table 24.11**).

Table 24.11: Classification of effects based on sensitivity of receptors and magnitude of impact

Magnitude of change	Sensitivity of Receptor			
	High	Medium	Low	Not Sensitive
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Minor
Low	Moderate	Minor	Minor	Negligible
Very Low	Minor	Minor	Negligible	Negligible

24.6.22 The tabulation is treated as a guideline and expert judgement will be applied once all the factors of the assessment have been considered and reported. The generic definitions of effects for marine ecology and fisheries receptors are shown in **Table 24.12**.

Table 24.12: Generic definitions of effects to marine ecology and fisheries receptors

Effect	General Description for Assigning Effects
Major	Large changes in the population site or habitat area of ecological receptors within the relevant area. Changes may alter the structure or function or the overall diversity of the ecosystem or food web. Very large or large socio-economic implications. Effects, both positive and negative that are likely to be important considerations at an international or national level because they contribute to achieving international or national objectives or are likely to result in exceedance of statutory objectives and or breaches of legislation.
Moderate	Intermediate changes in ecological receptors that are likely to be important and could cause subtle changes in other ecosystem features or have socio-economic implications. Such effect are likely to be important at regional of local levels.

Effect	General Description for Assigning Effects
Minor	Small change in ecological receptors, with limited discernible effects on other ecosystem features. Small scale socio-economoc implications. These effects may be raised as local issues but are unlikely to be instrumental in the decision-making process.
Negligible	No discernible change in the ecological features. An effect that is likely to have a negligible or no influence, irrespective of other effects. No discernable socio-economic implications.

24.6.23 Following the classification of an effect as presented in **Table 24.11** and general descriptors in **Table 24.12**, a clear statement is made as to whether the effect is 'significant' or 'not significant'. Identification of significant effects is central to the EcIA process and reporting of such effects is a required to allow decision makers to be adequately informed of the positive or negative ecological effects of the Project. As a general rule, major and moderate effects are considered to be significant and minor and negligible effects are considered to be not significant. However, professional judgement is applied where appropriate.

24.6.24 To allow consistency with the wider ES a matrix system is applied to determine effects and their significance. However, the matrix should be regarded as a framework not a strict formulaic process. CIEEM (2018) guidelines for EcIA discourage overreliance on matrices for categorising significance and residual effects and instead advise clarity in presenting the relative importance of the factors underpinning ecological assessments. The distinction between evidence-based and value-based judgements needs to be communicated allowing stakeholders and statutory regulators to understand the judgement of significance.

24.6.25 CIEEM guidance identifies a significant effect as an effect which has implications for the biodiversity conservation objectives for important ecological features, or for biodiversity in general. Additionally, an effect may be deemed significant if the structure or functioning of a defined site, habitat or ecosystem is adversely affected.

24.6.26 Receptor value should therefore be applied to determine the significance of a predicted effect in relation to the socio-economic, conservation and or the ecological value of the receptor. Where effects are considered to be potentially significant, the location of the receptor relative to the impact, its distribution and rarity, and ecological function will all be considered.

24.6.27 The determination of significance thus requires knowledge of the impact magnitude, sensitivity, and value of the receptor in an ecologically coherent context. Expert judgement is required to apply value to determine significance of effects and every effort will be made to allow a transparent assessment detailing both evidence and value-based judgements. In general terms, high value receptors that are sensitive to an impact can increase the significance of an effect particularly when the effect may contravene a conservation objective, result in economic implications or alter

the structure or function of the food web (indirect effects). For example, a minor effect on a designated species with an important ecological function and interdependencies may be considered significant. This is particularly relevant when considering in-combination effects, where a series of interacting minor effects on a given receptor may result in a greater effect outcome that has the potential to become significant. Conversely, low value receptors are unlikely to result in significant effects for Nationally Significant Infrastructure Projects as international and national conservation objectives, socio-economic implications or significant direct or indirect ecological effects are not likely. Effects on low value receptors may result in a reduction of the assessment of significance.

24.6.28 **Table 24.13** provides a simplified process for applying value to determine significance of effects, which should be applied in combination with the effect descriptions in **Table 24.12**.

Table 24.13: Indicative significance ratings for effect assessments based on receptor value*

Sensitivity	Magnitude	Effect	Value		
			Low	Medium	High
Not Sensitive.	*Very Low.*	Negligible	Not Significant.	Not Significant.	Not Significant.
Not Sensitive.	*Low*	Negligible	Not Significant.	Not Significant.	Not Significant.
Not Sensitive.	*Medium*	Minor	Not Significant.	Not Significant.	Not Significant.
Not Sensitive.	*High*	Minor	Not Significant.	Not Significant.	Not Significant.
Low	*Very Low.*	Negligible	Not Significant.	Not Significant.	Not Significant.
Low	*Low*	Minor	Not Significant.	Not Significant.	Not Significant.
Low	*Medium*	Minor	Not Significant.	Not Significant.	**Potentially Significant.**
Low	*High*	Moderate	Not Significant.	Potentially Significant.	Potentially Significant.
Medium	*Very Low.*	Minor	Not Significant.	Not Significant.	Not Significant.
Medium	*Low*	Minor	Not Significant.	Not Significant.	**Potentially Significant.**
Medium	*Medium*	Moderate	Not Significant.	Potentially Significant.	Potentially Significant.
Medium	*High*	Major	Potentially Significant.	Significant	Significant

Sensitivity	Magnitude	Effect	Value		
			Low	Medium	High
High	*Very Low.*	Minor	Not Significant.	Not Significant.	**Potentially Significant.**
High	*Low*	Moderate	Not Significant.	Potentially Significant.	Potentially Significant.
High	*Medium*	Major	Potentially Significant.	Significant	Significant
High	*High*	Major	Significant	Significant	Significant

**Grey boxes show where receptor value is less likely to change the significance of effect judgements. Underlined scores indicate where value may lead to a reduction in the significance of effects. Bold scores indicate where value may result in an increase in the judgement of significance of effects.*

Assessment criteria: fisheries

24.6.29 Effects on fisheries will consider the sensitivity of the specific fishery to development impacts during the construction and operational phase of the Project. Assessments will be based on the fishery (shellfish and finfish) and on fishing gear groups (for example potting, driftnetting, trawling). Recreational fishing from boat based and shore anglers will be considered.

24.6.30 The commercial or recreational value of the fishery will be determined from the results of the commercial and recreational fisheries baseline characterisation and will be based on the value definitions in **Table 24.8**.

24.6.31 The magnitude of predicted impacts will be considered on an individual fishery basis and would be defined spatially and temporally. Assessments would consider whether an impact is temporary or permanent. Magnitude is largely a function of the fishery dependence on the area which may be affected by the Project. **Table 24.14** provides the descriptors of impact magnitude for fisheries receptors.

24.6.32 The duration of impacts associated with construction are short-term to medium-term. Impacts associated with operation are potentially long-term, occurring over the operational lifetime of the Project. The timing of specific seasonal fisheries varies considerably; therefore, due to the highly seasonal nature of certain fisheries, it is not possible to standardise the definition of duration of effects across the receptor groups.

Table 24.14: Fisheries descriptions of impact magnitude

Impact Magnitude	Generic Description
High	A high proportion of the available fishing area and or a high proportion of a commercial species (by weight or landing value) from the study area is impacted. Changes to fishing activity are long-term or permanent.
Medium	A moderate proportion of the available fishing area and or a moderate proportion of a commercial species (by weight or landing value) from the study area is impacted. Changes to fishing activity is temporary but recovery within a reasonable timescale is not possible.
Low	A minor proportion of the available fishing area and or a minor proportion of a commercial species (by weight or landing value) from the study area is impacted. The change is temporary, and recovery is possible within a reasonable timescale.
Very Low.	Little or no history of specific fishing activity in the impacted areas; and or the change is temporary and recovery is rapid.

24.6.33 The sensitivity of each receptor would be scored based on limitations of operating in different fishing grounds and an ability to work more than one gear type. Descriptions of fisheries sensitivity are provided in **Table 24.15**.

Table 24.15: Fisheries descriptions of sensitivity

Sensitivity	Description
High	Restricted operational range and low ability to exploit other areas and or low capability to utilise other gear types. High level of dependence on the fishing area allowing limited spatial tolerance. Limited ability to recovery losses from exploiting alternative fishing grounds.
Medium	Moderate operational range allowing access to other areas and or moderate capability to utilise other gear types. Fishing in alternative areas may only partially recover losses.
Low	Large operational range allowing access to other areas and or capability to utilise different gear types. Fishing in alternative areas allows high recoverability of losses.

Sensitivity	Description
Very Low.	Extensive operational range and or fishing method versatility. Able to target a number of fisheries.

24.6.34 The assessment of effects and significance follow the same approach as presented in **Table 24.11** and **Table 24.12**.

Approach to food web effects

24.6.35 Food webs reveal system-level phenomena that cannot be detected by studying focal species or assemblages alone. For instance, effects mediated via the food web can manifest within an assemblage not directly affected by the development, including changes to resources (for example prey populations) and to predation pressure. The food web therefore represents a synthesis of baseline information (species populations) supported by published feeding interaction data which can help to predict how an ecosystem could respond to environmental change.

24.6.36 The food web will be constructed based on the key taxa identified in characterisation reports.

24.6.37 Important basal resources, intermediate taxa and top predators whose populations are important components of the food web will be identified.

24.6.38 Potential pathways for indirect effects to propagate through the food web will be depicted. However, alternative energy pathways can serve to dampen food web level effects following changes in the distribution and or local abundance of a given taxa due to environmental change associated with the Project. As such the resistance and resilience of the food web to perturbation will be considered.

24.6.39 The Blackwater Estuary is a geographically small delineated area, which connects to the wider southern North Sea. Thus, transfer of water causes exchange of taxa at the base of the food web (for example planktonic organisms), and large mobile taxa, including marine mammals and fish can both import and export resources from the site. Furthermore, mobile taxa especially those with large foraging ranges would likely subsidise their feeding requirements from beyond the estuary.

24.6.40 A qualitative approach using feeding pathway information derived from the North Sea ecosystem diet matrix will be applied to predict food web effects. This approach will allow the potential for system-level perturbations to be identified and described and represents an advancement in describing potential effects at the food web level.

24.6.41 The strength of feeding interactions will be defined at the functional group-level and based on the resources available to a consumer within the study area. Key energy pathways and feeding link diversity which might affect food web resistance and or resilience will be considered.

Approach to in-combination and cumulative effects

24.6.42 The overarching approach to the cumulative effects assessment (CEA) is described in **Chapter 5: The EIA Process and Methods**. Specific issues relating to the scope of this chapter are addressed below.

In-combination

24.6.43 In-combination effects occur when individual pressures co-exist and can influence the overall effect on a receptor. In-combination effects are an important consideration as individually effects may be assessed as insignificant but combine to greater effect.

24.6.44 In-combination effects can act additively, synergistically or antagonistically. For example, sensitivity to chemical contaminants is often temperature dependent, thus the thermal plume could enhance the toxicity of chemical discharges. In-combination effects that will be considered in the assessments include, but are not limited to:

- Dredging, disposal and or drilling activities co-occurring to increase suspended sediment plumes and or sedimentation rates.
- Combined habitat change, as a result of installation of infrastructure.
- The potential for activities causing underwater noise to occur simultaneously.
- The potentially synergistic effects of temperature, salinity and chemical contaminants in the thermal plume.
- The effects on receptor populations from the additive effects of entrainment and impingement in the cooling water system, termed entrapment.
- The effects on receptor populations from combined thermal, chemical and saline discharges.
- The effects on receptor populations from different pressures, for example the combined impact of habitat change and water quality impacts on a receptor.

Cumulative effects

24.6.45 The cumulative effects of the Project in relation to other developments with the potential for overlapping ZoI will be assessed, noting that ZoIs would be receptor dependent. It is assumed infrastructure and anthropogenic activities currently occurring (operational) in the ZoI represent part of the pressure landscape during which baseline conditions were collected. As such, they will not be considered as part of the CEA.

24.6.46 The CEA will apply a temporal and spatial screening approach at relevant receptor-specific scales in order to determine the potential for cumulative effects between the

Project and other developments. This approach is based on the stage of projects within the planning and development process and allows for different levels of uncertainty and differences in quality of data to be taken into account.

24.7 Scope of the Assessment

Potential receptors

24.7.1 Baseline characterisations of the study area would identify the important receptors for assessment purposes. Receptors would be selected for assessment based on socio-economic, conservation or ecological value (see **Section 24.6**). Common and abundant taxa or habitats would also be selected for assessment to be presented in the ES.

24.7.2 The marine ecology and fisheries receptor groups that have been identified as being potentially subject to likely significant effects during both the construction and operational phases include:

- Phytoplankton;
- Zooplankton;
- Benthic Ecology;
- Fish Ecology;
- Marine Mammals; and
- Commercial and Recreational Fisheries.

24.7.3 A WFD compliance assessment will be submitted to support the DCO application and it will consider the potential impact pathways on biological elements of the WFD (phytoplankton, benthic invertebrates, fish and sensitive habitats) and protected areas. The following WFD water bodies are within the wider study area:

- Blackwater transitional (GB520503714000);
- Blackwater Outer coastal (GB650503200000);
- Colne transitional (GB520503713800), and;
- Essex coastal (GB650503520001).

24.7.4 The Project has the potential to affect ecological sites designated as being of European or International Importance for nature conservation. Consequently, a HRA Report to inform Appropriate Assessment will be submitted to support the DCO application. The HRA Report will detail the likely significant effects and assess the potential for adverse effects on-site integrity on the designated features of European Sites including SPAs, SACs and Ramsar sites within the ZoI of the Project. In

parallel with the HRA, the marine ecology EIA will consider the specific marine components (below MHWS) of designated European sites.

24.7.5 Furthermore, a MCZ Assessment will be required for MCZ designated features potentially exposed to pressures from the Project. The EIA will be progressed in parallel to the MCZ assessment to consider relevant species and habitats.

24.7.6 A summary of the designated sites with marine features and potential marine impact pathways that will be assessed for the EIA is presented in **Table 24.16**. Locations of these sites in relation to the relevant Project elements are shown in **Figure 24.1** and **Figure 24.2**. It should be noted this is not an exhaustive list of sites and in addition to the EIA assessment sites, the HRA and MCZ assessment will consider conservation features of other designated sites and protected areas in detail, where there is any pathway for effect.

Table 24.16: Scoping of qualifying features of relevant designated sites

Designated Site	Qualifying Features and Supporting Habitats [5] scoped into marine ecology assessments	Scoping Justification
SAC		
Essex Estuaries SAC.	***Qualifying features.*** • Estuaries (sub-features: Atlantic salt meadows, intertidal coarse sediment, intertidal mixed sediments, intertidal mud, intertidal rock, intertidal sand and muddy sand, intertidal seagrass beds, subtidal coarse sediment, subtidal mixed sediment, subtidal mid, subtidal sand and subtidal seagrass beds). • Mudflats and sandflats not covered by seawater at low tide (sub-features: intertidal mixed sediments, intertidal mud, intertidal sand and muddy sand, intertidal seagrass beds). • Sandbanks which are slightly covered by sea water all the time (sub-features: subtidal coarse sediment, subtidal mixed sediment, subtidal mud, subtidal sand, subtidal seagrass beds).	Features below MHWS are within the potential ZoI, therefore will be considered in the marine ecology assessments. Saltmarsh features within the ZoI above MHWS will be assessed in the terrestrial ecology EIA (see **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**). However, the function of this habitat as a marine resource (i.e. as a nursery or spawning habitat) will be considered in the marine ecology assessments.
Southern North Sea SAC.	***Qualifying features.*** • Harbour porpoise (*Phocoena phocoena*).	Harbour porpoise is known to be present within the potential ZoI (Ref. 24.40 and Ref. 24.42). These highly mobile species will be considered in the marine ecology assessments.

[5] Qualifying features and supporting habitats are taken from https://designatedsites.naturalengland.org.uk

Designated Site	Qualifying Features and Supporting Habitats [5] scoped into marine ecology assessments	Scoping Justification
The Wash and North Norfolk Coast SAC.	***Qualifying features.*** • Common seal (*Phoca vitulina*).	Foraging trips of up to 220km have been recorded for common seal during tagging studies at The Wash (Ref. 24.65), therefore individuals from the SAC could be present within the potential ZoI and will be considered in the marine ecology assessments.
Humber Estuary SAC.	***Qualifying features.*** • Sea lamprey *(Petromyzon marinus*) (potential supporting habitat: water column). • River lamprey *(Lampetra fluviatilis)* (potential supporting habitat: water column). • Grey seal (*Halichoerus grypus)* (potential supporting habitats, dunes with *Hippophae rhamnoides*, embryonic shifting dunes, fixed dunes with herbaceous vegetation, intertidal mixed sediment, intertidal mud, intertidal sand and muddy sand, shifting dunes along the shoreline with *Ammophila arenaria* and water column).	Grey seal, river and sea lamprey are wide-ranging species undertaking extensive movements between sites over distances of several hundred kilometres (Ref. 24.64 and Ref. 24.70). Therefore, they could be present within the potential ZoI and will be considered in the marine ecology assessments. Saltmarsh features within the ZoI above MHWS would be assessed in the ornithology and terrestrial ecology ES (see **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**). However, the function of this habitat as a marine resource (i.e. as supporting habitat for seals) will be considered in the marine ecology assessments.
SPA and Ramsar Site.		
Dengie (Mid-Essex Coast Phase 1)	***Supporting habitats.*** • Intertidal course sediment. • Intertidal mud. • Intertidal sand and muddy sand.	Ornithological features will be assessed in the ornithology and terrestrial ecology chapter (see **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**), however marine supporting habitat (below MHWS) and marine prey within the ZoI would be considered in the marine ecology assessments.

Designated Site	Qualifying Features and Supporting Habitats [5] scoped into marine ecology assessments	Scoping Justification
SPA and Ramsar.	• Water column.	
Blackwater Estuary (Mid-Essex Coast Phase 4) SPA and Ramsar.	***Potential supporting habitats.*** • Intertidal course sediment. • Intertidal mixed sediment. • Intertidal mud. • Intertidal rock. • Intertidal sand and muddy sand. • Intertidal seagrass beds. • Water column. • Intertidal biogenic reef: mussel beds.	Ornithological features would be assessed in the ornithology EIA (see **Chapter 23 Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**), however marine supporting habitat (below MHWS) and marine prey within the ZoI will be considered in the marine ecology assessments.
Outer Thames Estuary SPA.	***Potential supporting habitats.*** • Intertidal sand and muddy sand. • Water column. • Circalittoral rock. • Subtidal coarse sediment. • Subtidal mixed sediments. • Subtidal mud. • Subtidal sand.	Ornithological features would be assessed in the ornithology EIA (see **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**), however marine supporting habitat (below MHWS) and marine prey within the ZoI will be considered in the marine ecology assessments.

Designated Site	Qualifying Features and Supporting Habitats [5] scoped into marine ecology assessments	Scoping Justification
Colne Estuary (Mid-Essex Coast Phase 2) SPA and Ramsar.	***Potential supporting habitats.*** • Intertidal course sediment. • Intertidal mixed sediment. • Intertidal mud. • Intertidal sand and muddy sand. • Water column. • Intertidal biogenic reef: mussel beds.	Ornithological features would be assessed in the ornithology (see **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**), however marine supporting habitat (below MHWS) and marine prey within the ZoI will be considered in the marine ecology assessments.
Foulness (Mid-Essex Coast Phase 5) SPA and Ramsar.	***Potential supporting habitats.*** • Coastal lagoons. • Intertidal course sediment. • Intertidal mixed sediment. • Intertidal mud. • Intertidal sand and muddy sand. • Intertidal rock. • Intertidal seagrass beds. • Water column. • Subtidal seagrass beds. • Intertidal biogenic reef: mussel beds. • Intertidal stony reef.	Ornithological features would be assessed in the ornithology and terrestrial ecology chapter (see **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**), however marine supporting habitat (below MHWS) and marine prey within the ZoI would be considered in the marine ecology assessments.

Designated Site	Qualifying Features and Supporting Habitats [5] scoped into marine ecology assessments	Scoping Justification
Crouch and Roach Estuaries (Mid-Essex Coast Phase 3) SPA and Ramsar.	***Potential supporting habitats.*** • Intertidal mud. • Water column.	Ornithological features would be assessed in the ornithology and terrestrial ecology chapter (see **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**), however marine supporting habitat (below MHWS) and marine prey within the ZoI will be considered in the marine ecology assessments.
Stour and Orwell Estuaries SPA and Ramsar.	***Potential supporting habitats.*** • Intertidal course sediment. • Intertidal mixed sediment. • Intertidal mud. • Intertidal sand and muddy sand. • Intertidal seagrass beds. • Water column.	Ornithological features will be assessed in the ornithology and terrestrial ecology chapter (see **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology**), however marine supporting habitat (below MHWS) and marine prey within the ZoI will be considered in the marine ecology assessments.
Alde-Ore Estuary SPA and Ramsar.	***Potential supporting habitats.*** • Coastal lagoons. • Intertidal course sediment. • Intertidal mixed sediment. • Intertidal mud.	Ornithological features will be assessed in the ornithology and terrestrial ecology chapter (see **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology)**, however marine supporting habitat (below MHWS) and marine prey within the ZoI will be considered in the marine ecology assessments.

Designated Site	Qualifying Features and Supporting Habitats [5] scoped into marine ecology assessments	Scoping Justification
	• Intertidal sand and muddy sand. • Intertidal biogenic reef: mussel beds. • Intertidal rock. • Water column.	
MCZ		
Blackwater, Crouch, Roach and Colne Estuaries MCZ.	***Qualifying features.*** • Clacton Cliffs and Foreshore. • Intertidal mixed sediments. • Native oyster (*Ostrea edulis*). • Native oyster (*Ostrea edulis*) beds.	Features below MHWS are within the potential ZoI, therefore will be considered in the marine ecology assessments.
Medway Estuary MCZ.	***Qualifying features.*** • Smelt (*Osmerus eperlanus*).	There is evidence of smelt occurring in Blackwater Estuary (Ref. 24.51), therefore effects on the species *per se* and the MCZ within the ZoI will be considered in the marine ecology assessments.

Likely significant effects

24.7.7 A matrix-based approach identifying all activity-pressure pathways using the JNCC PAD (described in **Section 24.6**) will be completed to inform the assessments. The matrix will be informed by characterisation reports, site specific activities and pressure pathways, predicted impacts and modelling results. A high-level summary of the primary pressures and likely significant effects associated with each activity on marine ecology receptors groups is provided in **Table 24.17** for the construction phase and **Table 24.18** for the operational phase. These will be further defined in a full pressures-activity approach in assessments. Cumulative effects and indirect effects on food webs will also be taken forward for assessment and the approach to these assessments is included in **Section 24.6**.

Table 24.17: Likely significant marine ecology construction effects

Activity	Description	Pressures	Effects	Receptor Groups
Dredging and dredge disposal.	Dredging and dredge disposal activities would be required on-site for the installation of cooling water infrastructure and potentially to allow grounding of barges associated with the BLF(s). Dredging and any associated dredged material disposal at sea, are licensable activities managed by the MMO under the Marine and Coastal Access Act 2009. If required, an appropriate disposal site, the type of material (including contaminants) and total volume of dredge disposal would be confirmed in consultation with the MMO.	• Changes in suspended solids (water quality). • Transition elements and organo-metals contamination*. • Radionuclide contamination (see **Chapter 9: Radiological**). • Hydrocarbon and PAH contamination*. • Synthetic compound contamination*. • Nutrient enrichment. • Habitat structure changes – removal of substratum (extraction). • Siltation rate changes (heavy).	• Population(s) changes. • Injury and or disturbance. • Displacement and behavioural effects. • Indirect food-web effects.	• Phytoplankton. • Zooplankton. • Benthic Ecology. • Fish Ecology. • Marine mammals.

Activity	Description	Pressures	Effects	Receptor Groups
		• Underwater noise changes. • Barrier to species movement.		
Construction activities including piling and drilling.	Installation of BLF jetty piles (if required) is anticipated to be by piling (impact or vibratory) either from a jack-up vessel or a terrestrial piling vessel, however, this will be confirmed following information on detailed designs. Drilling of vertical connecting shafts through the underlying geology for cooling water infrastructure is anticipated. Installation of piles to secure headworks to the bedrock to ensure seismic qualification is also assumed.	• Changes in suspended solids (water quality). • Siltation rate changes (light). • Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion. • Transition elements and organo-metals contamination*. • Radionuclide contamination (see **Chapter 9: Radiological**). • Hydrocarbon and PAH contamination*. • Synthetic compound contamination*.	• Population(s) changes. • Injury and or disturbance. • Displacement and behavioural effects. • Indirect food-web effects.	• Phytoplankton. • Zooplankton. • Benthic Ecology. • Fish Ecology. • Marine mammals

Activity	Description	Pressures	Effects	Receptor Groups
	Until the absence of UXOs in areas where intrusive physical works in the marine environment are required, a hypothetical worst-case unmitigated underwater noise assessment would be completed. Should an UXO be located, the site-specific management and mitigation measures would be determined in consultation with statutory consultees considering the Merchant and Robinson (2020) recommendations and JNCC SAC guidance.	• Nutrient enrichment. • Underwater noise changes. • Barrier to species movement.		
Physical presence of structure.	Installation of the BLF(s), and cooling water infrastructure, would result in the presence of artificial hard structure(s) in the intertidal and subtidal marine environment.	• Physical change (to another seabed type). • Visual disturbance. • Wave exposure changes.	• Population(s) changes. • Injury and or disturbance. • Displacement and behavioural effects.	• Phytoplankton. • Zooplankton. • Benthic Ecology. • Fish Ecology.

Activity	Description	Pressures	Effects	Receptor Groups
		• Water flow (tidal current) changes, including sediment transport considerations. • Introduction or spread of invasive non-indigenous species.	• Indirect food-web effects.	• Marine mammals
Increased anthropogenic activity and vessel activity.	Increased vessel traffic within the marine infrastructure zone could occur, particularly in association with BLF deliveries but also vessel traffic activities associated with construction vessel operations (for example anchoring and positioning of jack-up barges).	• Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion. • Underwater noise changes. • Death or injury by collision (marine mammals). • Visual disturbance. • Introduction or spread of invasive non-indigenous species.	• Population(s) changes. • Injury and or disturbance. • Displacement and behavioural effects. • Indirect food-web effects.	• Phytoplankton. • Zooplankton. • Benthic Ecology. • Fish Ecology. • Marine mammals

Activity	Description	Pressures	Effects	Receptor Groups
Construction and commissioning discharges.	Discharges including tertiary treated sewage, groundwater from dewatering, surface run-off, tunnelling wastewater, and commissioning discharges are expected via a new combined drainage outfall. It is anticipated that discharges would be subject to treatment such as oil or water separation and "silt-buster" or similar technology to reduce sediment loading.	• Transition elements and organo-metals contamination. • Synthetic compound contamination. • Radionuclide contamination (see **Chapter 9: Radiological**). • Nutrient enrichment. • De-oxygenation. • Introduction of microbial pathogens. • Barrier to species movement.	• Population(s) changes. • Displacement and behavioural effects. • Indirect food-web effects.	• Phytoplankton. • Zooplankton. • Benthic Ecology. • Fish Ecology. • Marine mammals

**Sediment quality surveys proposed at the site would determine the baseline concentrations of these determinants and determine the potential for activities associated with the Project to resuspend sediment-bound contaminants.*

†Marine Ecology assessments would consider pathways for contamination of existing radionuclides. Sediment quality surveys proposed at the site would determine the baseline radionuclide concentrations and determine the potential for activities associated with the Project to resuspend sediment-bound radionuclides.

Table 24.18: Likely significant marine ecology operation effects

Activity	Description	Pressures	Effects	Receptor Groups
Cooling water abstraction.	During standard operating conditions water would be temporarily abstracted from the study area to supply the cooling water systems.	• Death or injury by collision. Impingement and entrainment are considered within the pressure theme of 'Physical interaction between species and project infrastructure' (see **Section 24.6**) but would be considered in detail individually and in-combination (total entrapment) in the marine ecology assessments.	• Population(s) changes. • Death or injury. • Indirect food-web effects.	• Phytoplankton. • Zooplankton. • Benthic Ecology. • Fish Ecology. • Marine mammals (whilst possible it is considered unlikely that marine mammals would enter intakes due to the installation of bar screens with small spacing).

Activity	Description	Pressures	Effects	Receptor Groups
Cooling water discharge.	Abstracted cooling water would be returned to the receiving waters at elevated temperature and salinity. The thermal and saline effluent is expected to be seasonally chlorinated. Additional discharges would include surface drainage water, treated sewage and hydrazine discharges.	• Temperature increase. • Salinity increase. • Synthetic compound contamination. • Nutrient enrichment. • Organic enrichment. • Barrier to species movement. • Radionuclide contamination (see **Chapter 9: Radiological**).	• Population(s) changes. • Displacement and behavioural effects. • Indirect food-web effects.	• Phytoplankton. • Zooplankton. • Benthic Ecology. • Fish Ecology. • Marine mammals.
Dredging and dredge disposal.	Maintenance dredging and dredge disposal activities would be required potentially to allow grounding of barges associated with the BLF during the operational phase. Dredging, requiring dredge disposal, is a licensable activity. An appropriate	• Changes in suspended solids (water quality). • Transition elements and organo-metals contamination*. • Radionuclide contamination (see **Chapter 9: Radiological**).	• Population(s) changes. • Injury and or disturbance. • Displacement and behavioural effects. • Indirect food-web effects.	• Phytoplankton. • Zooplankton. • Benthic Ecology. • Fish Ecology. • Marine mammals.

Activity	Description	Pressures	Effects	Receptor Groups
	disposal site, the type of material (including contaminants) and total volume of dredge disposal would be confirmed in consultation with the MMO.	• Hydrocarbon and PAH contamination*. • Synthetic compound contamination*. • Nutrient enrichment. • Habitat structure changes – removal of substratum (extraction). • Siltation rate changes (heavy). • Underwater noise changes. • Barrier to species movement.		
Physical presence of structure.	The BLF, Bradwell B power station flood defences (if exposed to marine ecology receptors under a future baseline scenario) and cooling water infrastructure will result in the physical presence of artificial hard structure(s) in the intertidal	• Physical change (to another seabed type). • Visual disturbance. • Wave exposure changes.	• Population(s) changes. • Injury and or disturbance. • Displacement and behavioural effects.	• Phytoplankton. • Zooplankton. • Benthic Ecology. • Fish Ecology. • Marine mammals

Activity	Description	Pressures	Effects	Receptor Groups
	and subtidal marine environment.	• Water flow (tidal current) changes, including sediment transport considerations. • Introduction or spread of invasive non-indigenous species.	• Indirect food-web effects.	
Increased anthropogenic activity or vessel activity.	Increased vessel traffic within the study area could occur in association with BLF deliveries.	• Penetration and or disturbance of the substrate below the surface of the seabed, including abrasion. • Underwater noise changes. • Death or injury by collision. • Visual disturbance. • Introduction or spread of invasive non-indigenous species.	• Population(s) changes. • Injury and or disturbance. • Displacement and behavioural effects. • Indirect food-web effects.	• Phytoplankton. • Zooplankton. • Benthic Ecology. • Fish Ecology. • Marine mammals.

Activity	Description	Pressures	Effects	Receptor Groups
Other site discharges.	A fish recovery and return system (FRR) may potentially be employed at the cooling water intakes, in which fish that are drawn into the intakes with seawater and are intercepted and survivors are returned to sea via a dedicated pipeline.	• Organic enrichment.	• Population(s) changes. • Displacement and behavioural effects. • Indirect food-web effects.	• Phytoplankton. • Zooplankton. • Benthic Ecology. • Fish Ecology. • Marine mammals.

**Sediment quality surveys proposed at the site would determine the baseline concentrations of these determinants and determine the potential for activities associated with the Project to resuspend sediment-bound contaminants.*

†Marine Ecology assessments would consider pathways for contamination of existing radionuclides. Sediment quality surveys proposed at the site would determine the baseline radionuclide concentrations and determine the potential for activities associated with the Project to resuspend sediment-bound radionuclides.

Fisheries likely significant effects

24.7.8 The Commercial and Recreational Fisheries assessment will assess effects on fisheries by considering the sensitivity of the specific fishery to development impacts during the construction and operational phase of the Project. Assessments will be based on the different fishing practices (for example potting, driftnetting, trawling). Further details would be available in the Commercial and Recreational Fisheries characterisation. Fisheries assessments will be informed by the results of the direct effects on target species from the fish and benthic ecology assessments and additional fisheries specific pressures associated with marine developments, these will include:

- Effects of the Project on commercially important fin and shellfish populations.
- Effects of the Project on recreationally targeted fish populations.
- Loss or restricted access to fishing grounds.
- Interference with fisheries activities.
- Fisheries displacement including potential increased steaming times to fishing grounds.

24.7.9 Installation of offshore infrastructure would likely require temporary safety zones to be applied surrounding working construction vessels potentially impacting fishing activity. Safety zones would be implemented through Notice to Mariners (NtM). Tiered safety zones of 250m and 500m would typically be applied, the extent of the safety zones and the nature of any required demarcation would be subject to the navigational risk assessment (see **Chapter 19: Navigation**).

24.7.10 Underwater infrastructure presents a potential entanglement hazard to fishing gear or reduce fishing access to a small area to avoid entanglement risks. Such impacts will be assessed.

Effects scoped out of further assessment

24.7.11 The results of modelling impacts associated with the Project, receptor specific characterisation reports and stakeholder consultation will be used to further constrain the ZoI and provide additional confidence to scope out effects. At this stage, worst-case predictions are assumed, and no effects are scoped out of the assessment. In some cases, effects have no impact pathway with marine ecology or fisheries receptors, in such as case receptors are scoped out of the assessment (**Table 24.17** and **Table 24.18**).

24.7.12 Off-site associated development, including off-site highways works, park and ride facilities, freight management facilities and off-site Power Station Facilities, are scoped out of the assessment as they are remote from the marine environment (see **Chapter 3: The Project; Figures 3.3** to **3.6**). Potential marine water quality effects associated with project-provided accommodation near to the main development site

will be considered under the main development site construction effects. Impacts on terrestrial and freshwater receptors are considered in **Chapter 23: Biodiversity - Terrestrial and Freshwater Ecology and Ornithology.**

24.8 Potential Mitigation

24.8.1 The Project wide approach takes the form of the mitigation hierarchy whereby priority is given to avoiding effects, where this is not feasible measures will be taken to minimise effects, if necessary restoration of impacted habitats may occur, the final measure is compensation for habitat loss or damage. The mitigation hierarchy and general approach to mitigation measures are described in **Chapter 5: The EIA Process and Methods** and include design measures (primary mitigation), specific additional mitigation measures (secondary mitigation) that may be implemented to reduce predicted effects or imposed through planning consent, and good practice measures (tertiary mitigation) to meet existing legislative requirements or guidelines.

24.8.2 Measures would be integrated into the design of the Project throughout the iterative planning and design stages to minimise negative environmental impacts, for example the design and placement locations of the cooling water infrastructure and FRR systems. Good practice measures may include ensuring the design of the FRR systems conform to Environment Agency good practice guidelines. Mitigation measures and alternative solutions will be considered in further detail in the assessments. Assessments will consider preliminary effects and residual effects following implementation of appropriate mitigation measures allowing a transparent assessment of the effectiveness of mitigation options.

24.9 Assumptions and Limitations

24.9.1 The assessment approach would assume that natural variability exists in the biological resources and, where appropriate, the future baseline in the absence of development can be adequately characterised.

24.9.2 The following general limitations have been identified:

- Assessments of effects on marine receptors is dependent on the baseline situation. Where high levels of natural variation in population size, distribution or extent occur, the potential to determine effects is reduced. The signal (effect) may be lost within natural variation. Predicted effect sizes in relation to natural variation would be discussed within the assessment for each receptor.

- Sensitivity assessments are reliant on the availability of evidence regarding specific receptors physiology and ecology in similar environmental conditions or impact magnitudes. Where specific information is lacking, representative taxa or scenarios would be considered. In cases of limited evidence, a precautionary assessment using expert judgement would be applied and the confidence in the assessment reported accordingly.

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25. PROPOSED ENVIRONMENTAL STATEMENT STRUCTURE

25.1.1 The Planning Inspectorate's Advice Note Seven (Ref. 25.1) requires that applicants provide an outline structure of what the Environmental Statement (ES) will contain. The structure of the ES for the Project will broadly follow the same order of chapters that are presented in this Scoping Report, acknowledging that changes may need to be made to address the requirements of the Scoping Opinion, both in terms of presentation of the Project to aid understanding, or as the Project design requirements evolve.

25.1.2 An indicative outline structure for the ES is set out in **Table 25.1**.

Table 25.1: Outline structure of the ES

ES Content	Likely Content
Non-Technical Summary (NTS).	• A concise and standalone document that provides a description of the Environmental Impact Assessment (EIA) process and its findings in a manner that is both appealing to read and easily understood by the general public.
Introduction	• Overview of the Project. • Applicant Project team and competency details. • Purpose of the ES. • Structure of the ES. • A brief summary of other relevant assessments and documents (for example, Habitats Regulations Assessment).
Planning policy and legislation.	• Legislative context. • National and local policy context. • Other relevant guidance and policies. • Applicable consents and permits.

ES Content	Likely Content
Description of the Project.	• Description of the Project sites (main development site, off-site associated development and off-site Power Station Facilities) and their surroundings. • Development proposals (site layout and development description, development timescales and programme etc.). • Embedded mitigation and management measures.
Need for the Project and alternatives considered.	• The need for the Project. • Alternatives considered and environmental reasons for the choice of preferred options.
Approach to preparing the ES.	• The EIA process. • EIA terminology. • EIA scoping. • Stakeholder engagement. • Identification of baseline conditions. • Overview of assessment methodology. • Approach to significance evaluation. • Development of mitigation. • Approach to cumulative effects assessment.
Environmental aspect chapters.	• Introduction. • Relevant aspect specific legislation, policy and guidance. • Stakeholder engagement.

ES Content	Likely Content
	• Data gathering methodology. • Baseline description. • Scope of the assessment. • Embedded mitigation measures. • Assessment methodology. • Assessment of effects. • Mitigation. • Limitations and assumptions.
Cumulative and in-combination effects.	• The former occurs as a result of two or more project impacts acting together (i.e.) combined, to result in a new or changed effect on a single receptor. The latter arise as a result of the Project in combination with other large-scale developments or projects.
Assessment summary and implementation of mitigation.	• Summary of the outcome of the environmental aspect assessment and how mitigation will be implemented through for example, a Code of Construction Practice, Waste Management Plan and strategies such as sustainability.

REFERENCES

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26. NEXT STEPS

26.1.1 This Scoping Report has been prepared to provide an overview of the Project and the potential likely significant effects of the Project that need to be considered as part of the Environmental Impact Assessment (EIA) and the proposed scope of the assessment in relation to these effects. It has been prepared in order to assist the Secretary of State in preparing a Scoping Opinion under the EIA Regulations (Ref. 26.1) by setting out the scope of the information that would be contained in the Environmental Statement (ES).

26.1.2 The aim is to ensure the applicant has due regard for the environment, mitigates adverse environmental effects where possible, and takes advantage of opportunities for environmental enhancement.

26.1.3 The next steps in the EIA process, in addition to the continuation of engagement with stakeholders on an aspect-specific basis, are as follows:

- Statutory consultation on the Preliminary Environmental Information; and
- Submission of the ES with the Development Consent Order (DCO) Application.

26.1.4 Engagement with relevant stakeholders will continue throughout the DCO pre-application stage of the Project, including interim or additional consultations on particular aspects of the Project, as per the approach described in **Chapter 1: Introduction**.

REFERENCES

Ref 26.1 Parliament of the United Kingdom. The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. (London, 2017).

APPENDIX 1A
TECHNICAL ENGAGEMENT AND STAGE ONE CONSULTATION – SUMMARY OF GENERAL COMMENTS FROM STAKEHOLDERS

Table 1A.1: Technical engagement to date

Subject of Meeting	Date of Meeting	Consultee Attendance
Defra Group Meeting on Bradwell B Marine Ecological Surveys.	3 September 2019.	Natural England. Marine Management Organisation (MMO). Environment Agency.
Project Introduction Meeting.	14 October 2019.	Maldon District Council (MDC). Essex County Council (ECC). Environment Agency. Royal Society for the Protection of Birds (RSPB). Essex Wildlife Trust (EWT). Natural England. MMO Historic England.
Stakeholder Masterplanning Workshop Meeting 1 (main site development).	16 October 2019.	MDC ECC Environment Agency. RSPB EWT Natural England. Historic England.
Project Introduction Meeting for Natural England and MMO.	6 November 2019.	MMO Natural England.
Bradwell B Transport Workshop (transport	7 November 2019.	ECC

Subject of Meeting	Date of Meeting	Consultee Attendance
strategy and off-site associated development options – long list workshop).		MDC MMO Natural England. RSPB Highways England.
Socio-economic: Scope and Approach to Workstream and Initial Findings.	14 November 2019.	MDC ECC
Discussion of Overwintering Bird and Phase 1 Habitat Survey and Monitoring Plans (SMPs).	19 November 2019.	EWT Natural England. MMO RSPB MDC ECC
Bradwell B Transport Workshop (transport strategy and off-site associated development options – short list workshop).	28 November 2019.	MDC ECC Environment Agency. RSPB EWT Historic England. MMO Natural England.
Bradwell B Socio-economic Workshop.	4 December 2019.	ECC MDC

Subject of Meeting	Date of Meeting	Consultee Attendance
BRB Habitat Regulations Assessment and Marine Conservation Zone Kick-off Meeting.	4 December 2019.	Environment Agency. ECC EWT MMO Natural England. Essex Native Oyster Restoration Initiative (ENORI). MDC RSPB
BRB Master Planning Stakeholder Meeting 2 (main site development and construction site).	9 December 2019.	MDC ECC Environment Agency. Natural England. Historic England. EWT RSPB
Historic Environment Kick-off Meeting.	17 December 2019.	Historic England.
Flood Risk Assessment (FRA) Workshop 1.	22 January 2020.	MDC ECC Environment Agency. Natural England. Office for Nuclear Regulation (ONR).
Methodology for the GI Archaeological Support.	10 February 2020.	ECC

Subject of Meeting	Date of Meeting	Consultee Attendance
Traffic Modelling.	24 March 2020.	ECC
Terrestrial Ecology 2020 SMP.	2 April 2020.	MDC Environment Agency. Natural England. MMO RSPB EWT
Transport Strategy and Modelling.	15 April 2020.	ECC MDC Essex Highways.
Bradwell B Transport Update.	22 April 2020.	MDC ECC Chelmsford City Council (CCC).
Socio-economics Environmental Impact Assessment (EIA) Scoping and Methodology and Economy, Jobs and Supply Chain, Accommodation.	29 April 2020.	MDC ECC
Bradwell B Stage One Update - BRB and Braintree District Council.	14 May 2020.	Braintree District Council. ECC
Bradwell B Stage One Update - BRB and Rochford District Council.	19 May 2020.	Rochford District Council. ECC
Transport Modelling Update.	28 May 2020.	ECC

Subject of Meeting	Date of Meeting	Consultee Attendance
Stakeholder Workshop – Emissions: Air Quality, Noise and Vibration.	16 June 2020.	Environment Agency. ECC MDC CCC Colchester Borough Council (CBC). Natural England.
Stakeholder Workshop – FRA Meeting 2.	16 June 2020.	Natural England. MDC ECC CCC CBC Environment Agency. ONR
National Health Service (NHS) Trust Briefing.	17 June 2020.	NHS Trusts representatives.
Stakeholder Workshop – Ground Conditions and Hydrology.	18 June 2020.	Environment Agency. ECC MDC CCC Natural England
Accommodation and Housing Working Group.	22 June 2020.	MDC ECC CCC

Subject of Meeting	Date of Meeting	Consultee Attendance
Stakeholder Workshop – Terrestrial Ecology (Remote Sensing).	23 June 2020.	Environment Agency. ECC and ECC Place Services. MDC CCC CBC Natural England. EWT
Stakeholder Workshop – Economy, Housing, Community and Recreation Scoping Workshop.	24 June 2020.	ECC MDC CCC CBC
Stakeholder Workshop – Cultural Landscape.	26 June 2020.	ECC and ECC Place Services. MDC CCC CBC Historic England.

Table 1A.2: Stage One Consultation – summary of general comments from stakeholders

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
Project-provided accommodation.	Natural England, and MDC and ECC commented on a lack of information on the project-provided accommodation within the Stage One consultation material and requested further details.	Further information on the project-provided accommodation will be provided to stakeholders for consideration and consultation stages. The Environmental Statement (ES) will detail consideration of the potential effects

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
		of the preferred option and the main alternatives.
Alternatives	The Environment Agency and Natural England highlighted the need for the EIA and other relevant assessments to include consideration of the main alternatives to the Project.	The preferred option and the main alternatives considered will be detailed within the ES and other relevant assessments.
Assessment methodology.	Natural England highlighted the need for collaboration on cross-cutting issues arising from the incoming workforce, such as recreation and biodiversity impacts.	The Project will work collaboratively on cross-cutting issues and the EIA Scoping Report addresses such potential impacts with cross-referencing between aspects as appropriate. Key aspect chapters are likely to be **Chapter 10: Socio-economics**, **Chapter 21: Recreation** and **Chapter 23: Biodiversity: Terrestrial and Freshwater Ecology and Ornithology**.
	MDC and ECC, and Essex Wildlife Trust (EWT) commented on a lack of information on the approach to the baseline data gathering and subsequent assessment.	Details for developing a robust baseline have been shared via the SMPs, discussed during technical working group meetings and also during the HRA Evidence Plan process, further details will be provided as the baseline surveys are completed. Workshops were held to discuss the SMPs, allowing opportunity for discussions with stakeholders. Further information on the Project will be provided to stakeholders for consideration and there will be further opportunity for discussions during future stakeholder engagement and consultation stages.
	Natural England and EWT highlighted that the assessment	The EIA will consider the construction and operational phases and footprint of the Project.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
	should consider the full project footprint and lifecycle.	
Cumulative assessment.	Natural England, and MDC and ECC commented on the requirement to consider the new connection to the electricity grid.	The applicant will liaise with National Grid on the grid connection, but the grid connection will be part of a separate application by National Grid. Once the applicant's connection agreement with National Grid is secured, connection amendments will be addressed and as the Project develops the cumulative impact with the Project can be understood. National Grid will assess the environmental impacts of their proposals. The applicant will need to take account of National Grid's proposals as far as they are developed at the time of the cumulative assessment as far as reasonably possible.
	MDC and ECC highlighted the requirement to consider inter-related effects, and both direct and indirect effects.	Inter-related effects (occurring as a result of two or more project impacts acting together i.e. combined, to result in a new or changed effect on a single receptor) will be considered within the ES. The assessment will include consideration of both direct and indirect effects of the Project.
Off-site associated development.	Natural England commented on a lack of information on the off-site associated development within the Stage One Consultation material and requested further details.	Further information on the off-site associated development will be provided to stakeholders for consideration and consultation stages. Surveys are proposed to start in 2021 for the sites as refined. The ES will detail consideration of the impacts of the preferred option and the main alternatives.
Design	MDC and ECC commented on a lack of information on design process and highlighted that the	The applicant is reviewing all feedback received from Stage One Consultation. This will include

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
	design of the Project should be informed by the National Infrastructure Commission's design principles.	consideration of appropriate design principles for the project, taking into account National Policy Statement (NPS) policy, National Infrastructure Commission (NIC) principles and other relevant guidance. The applicant will consult with relevant stakeholders as appropriate as the design principles continue to develop.
Mitigation	Natural England, MDC and ECC commented on a lack of information on the approach to managing environmental effects.	The EIA will highlight the potentially significant beneficial and adverse effects of the Project. The EIA will include measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment. Further stages of consultation will allow understanding of the ongoing assessment outcomes and the mitigation which is required.
	The Environment Agency highlighted the requirement to produce a Site Waste Management Plan (SWMP).	An SWMP will be provided in support of the Development Consent Order (DCO) application.
	The Environment Agency highlighted that the Contaminated Land: Applications in Real Environments (CL:AIRE) protocol should be adopted and reflected in the Code of Construction Practice (CoCP).	Materials management will give due regard to the CL:AIRE protocol and requirements will be set out within the CoCP.
Main development site.	MDC and ECC commented on a lack of information on the main development site within the Stage One Consultation material and requested further details.	Further information on the off-site associated development will be provided to stakeholders for consideration in future consultation stages.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
Marine infrastructure.	The Environment Agency, Marine MMO and Natural England commented on a lack of information on the marine infrastructure within the Stage One Consultation material and requested further details.	Further information on the marine infrastructure will be provided to stakeholders for consideration, including confirmation of the lifetime and footprint of structures, and there will be further opportunity for discussions and consultations stages. The ES will detail consideration of the impacts of the preferred marine infrastructure options and the main alternatives, this will include consideration of the different sized footprints and associated environmental impacts.
Policy and legislation.	The MMO highlighted the requirement for managing construction, operation, maintenance and decommissioning of the marine infrastructure under appropriate marine licences.	The applicant will consider these activities and welcomes further discussion with respect to marine licencing once relevant design and implementation details are available.
	The MMO highlighted the requirement to produce a robust Marine Plan Policy assessment.	The requirement for a robust Marine Plan Policy assessment is recognised and this is addressed in **Chapter 17: Coastal Geomorphology and Hydrodynamics**, **Chapter 18: Marine Water Quality and Sediments**, **Chapter 19: Navigation** and **Chapter 24: Marine Ecology and Fisheries**, of the Scoping Report.
	South Woodham Ferrers Town Council highlighted the requirement to consider the Local Plan and the Town's Neighbourhood Plan.	Some off-site associated development sites may fall within CCC, so the Chelmsford Local Development Plan and the Neighbourhood Plan for South Woodham Ferrers will be considered in the siting of off-site associated development in discussion with

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
		relevant stakeholders including CCC.
Stakeholder engagement	Natural England, MDC and ECC highlighted a requirement for further engagement on the Project as more detailed information becomes available.	The requirements of further discussion and engagement are noted. Further information on the Project will be provided to stakeholders for consideration and there will be further opportunity for discussions and consultation stages.
	MDC and ECC highlighted the impacts of the Coronavirus pandemic on stakeholder engagement.	The applicant was pleased to receive a very significant number of responses to its Stage One Consultation, comparable, or in excess of those received for projects of a similar scale. The applicant put in place a number of measures to help supplement the consultation aims that would have been achieved through the exhibitions, including telephone surgeries, provision of written material and presentations to local groups including Parish Councils. The applicant will respond to this fully as part of the Stage One Consultation report.
	The UK Innovation Corridor recommended the appointment of an independent Complaints Commissioner.	The EIA will contain a range of technical topics which will consider the potential effects on local communities and human health. This scoping report provides details of how this will be considered and assessed as part of the EIA going forward. The EIA will consider appropriate mitigation (either embedded or additional), which will then be secured, as appropriate, through the DCO.
Transport strategy.	The Environment Agency and Natural England commented on a lack of information on the	Further information on the transport strategy will be provided to stakeholders for consideration.

Theme	Summary of Consultee Comments and Considerations	How this is Accounted for
	transport strategy within the Stage One Consultation material and requested further details.	Ongoing optioneering site selection and masterplanning for the transport infrastructure is being informed by specialist inputs from the EIA team.

APPENDIX 1B
ABBREVIATIONS

Abbreviation	
AA	Appropriate Assessment
AA EQS	Annual Average Environmental Quality Standard
AADT	Annual Average Daily Traffic
AAWT	Annual Average Weekday Traffic
ADMS	Atmospheric Dispersal Modelling System
AE	Actual evapotranspiration
AEP	Annual Exceedance Probability
AES	Annual Employment Survey
AIL	Abnormal Indivisible Load
ALARP	As Low as Reasonably Practicable
ALC	Agricultural Land Classification
ALS	Abstraction Licensing Strategy
AMIE	Archives Monuments Information England
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
AoS	Appraisal of Sustainability
AP	Assessment Point
APIS	Air Pollution Information System
AQAL	Air Quality Assessment Level
AQEG	Air Quality Expert Group
AQMA	Air Quality Management Areas
AQO	Air Quality Objectives
AQS	Air Quality Standards
AQTAG	Air Quality Technical Advisory Group
ATC	Automatic Traffic Counts
B&B	Bed and Breakfast
BAP	Biodiversity Action Plan
BAT	Best Available Techniques
BDC	Braintree District Council
BEEMS	British Energy Estuarine and Marine Studies
BEIS	Department for Business, Energy and Industrial Strategy

Abbreviation	
BGL	Below Ground Level
BGS	British Geological Survey
BLF	Beach Landing Facility
BMV	Best and Most Versatile
BNL	Basic Noise Level
BOD	Biological Oxygen Demand
BPM	Best Practicable Means
BREEAM	Building Research Establishment Environmental Assessment Method
BRES	Business Register and Employment Survey
BS	British Standards
C&M	Care and Maintenance
CA	Combustion Activity
CABE	Commission for Architecture and the Built Environment at Design Council
CAMS	Catchment Abstraction Management Strategy
CBC	Colchester Borough Council
CBP	Chlorination by-products
CCA	Civil Contingencies Act
CCC	Chelmsford City Council
CCRA	Climate Change Risk Assessment
CCRU	Cambridge Coastal Research Unit
CCTV	Closed Circuit Television
CDCZ	Construction Daily Commuting Zone
CDG	Carriage of Dangerous Goods
CDM	Construction Design and Management
CDO	Combined Drainage Outfall
CDOIF	Chemicals and Downstream Oil Industry Forum
CEEQUAL	Civil Engineering Environmental Quality Award
CEA	Cumulative Effects Assessment
CEH	Centre for Ecology and Hydrology
CERC	Cambridge Environmental Research Consultants

Abbreviation	
CES	Census of Employment
CFMP	Catchment Flood Management Plans
CFP	Common Fisheries Policy
CFS	Capable Faulting Study
CFT	Cold Flush Testing
CGS	County Geodiversity Sites
CHESS	Climate, Hydrology and Ecology research Support System
CHP	Combined Heat and Power
CIEEM	Chartered Institute of Ecology and Environmental Management
CIfA	Chartered Institutes for Archaeologists
CIRIA	Construction Industry Research and Information Association
CIS	Common Implementation Strategy
CJIC	Construction Industry Joint Council
CITB	Construction Industry Training Board
CIWEM	Chartered Institute of Water and Environmental Management
CL:AIRE	Contaminated Land: Applications in Real Environments
CNSS	Civil Nuclear Security and Safeguards
CO_2e	Carbon Dioxide Equivalent
CoCP	Code of Construction Practice
COMAH	Control of Major Accident Hazards
CoP	Code of Practice
COSHH	Control of Substances Hazardous to Health
CPNI	Centre for the Protection of National Infrastructure
CPT	Cone Penetration Test
CRN	Calculation of Railway Noise
CRTN	Calculation of Road Traffic Noise
CSM	Conceptual Site Model
CSN	Construction Skills Network
CTD	Conductivity, Temperature and Depth Sensor
CTMP	Construction Transport Management Plan

Abbreviation	
CWDA	Construction Water Discharge Activity (permit)
CWS	County Wildlife Site
CWTP	Construction Worker Travel Plan
DBA	Desk Based Assessment
DBT	Dibutyl-tin
DCLG	Department for Communities and Local Government
DCO	Development Consent Order
DDT	Dichloro-diphenyl-trichloroethane
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
DEHP	Bis(2-ethylhexyl) phthalate
DEPZ	Detailed Emergency Planning Zone
DfE	Department for Education
DfT	Department for Transport
DIN	Dissolved Inorganic Nitrogen
DMO	Destination Management Organisation
DMRB	Design Manual for Roads and Bridges
DMS	Delivery Management System
DO	Dissolved Oxygen
DPD	Development Plan Documents
DS	Drainage Strategy
DSM	Digital Surface Model
DTM	Digital Terrain Model
DWP	Department for Work and Pensions
DWPA	Drinking Water Protected Area
DWS	Drinking Water Standards
DWT	Deadweight Tonnage
EAL	Environmental Assessment Level
EC	European Commission
ECC	Essex County Council
EcIA	Ecological Impact Assessment

Abbreviation	
ECoW	Ecological Clerk of Works
EDG	Emergency Diesel Generator
eDNA	Environmental DNA
EEA	European Economic Area
EEFM	East of England Forecasting Model
EERM	East of England Regional Model
EFT	Emissions Factor Toolkit
EGA	Expert Geomorphological Assessment
EHER	Essex Historic Environment Record
EIA	Environmental Impact Assessment
EIOT	Eastern Institute of Technology
eMARS	European Commission Major Accident Reporting System
EMODNET	European Marine Observation and Data Network
EMU	Entrainment Mimic Unit
ENORI	Essex Native Oyster Restoration Initiative
EPS	European Protected Species
EPUK	Environmental Protection UK
EPZ	Emergency Planning Zone
EQS	Environmental Quality Standards
EQSD	Environmental Quality Standards Directive
ERIC	Eliminate, Reduce, Isolate and Control
ES	Environmental Statement
ESA	Environmentally Sensitive Area
EU	European Union
EWT	Essex Wildlife Trust
FCRM GiA	Flood and Coastal Erosion Risk Management Grant in Aid
FeAST	Feature Activity Sensitivity Tool
FEH	Flood Estimation Handbook
FEP	Farm Environment Plan
FIDO	Fog Investigation and Dispersal Operation
FLO	Fisheries Liaison Officer

Abbreviation	
FRA	Flood Risk Assessment
FRAP	Flood Risk Activities Permit
FRMP	Flood Risk Management Plan
FRR	Fish Recovery and Return
FSA	Formal Safety Assessment
GCS	Geographic co-ordinate system
GCSE	General Certificate of Secondary Education
GDA	Generic Design Assessment
GEML	Great Eastern Main Line
GEP	Good Ecological Potential
GES	Good Ecological Status
GETM	General Estuarine Transport Model
GHG	Greenhouse Gas
GI	Ground Investigation
GIR	Ground Investigation Report
GIS	Geographical Information System
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GNS	General Nuclear System Limited
GPA	Good Practice Advice
GPP	General Principles of Prevention
GPP	Guidance for Pollution Prevention
GPS	Global positioning system
GRR	Guidance on Requirements for Release
GVA	Gross Value Added
GW	Gigawatt
GWDTE	Groundwater-Dependent Terrestrial Ecosystem
Ha	Hectare
HAB	Harmful Algal Bloom
HAP	Health Action Plan
HAZID	Hazard Identification
HB	Home-based

Abbreviation	
HCWS	House of Commons: Written Statement
HDV	Heavy Duty Vehicle
HEO and HRO	Harbour Empowerment Order and Harbour Revision Order
HER	Historic Environment Record
HER	Hydrologically Effective Rainfall
HGV	Heavy Goods Vehicle
HIA	Health Impact Assessment
HLC	Historic Land Characterisation
HMO	House in Multiple Occupation
HMP	Habitat Management Plan
HMWB	Heavily Modified Water Body
HNA	Health Needs Assessment
HoL	Hands-off Level
HPI	Habitats of Principal Importance
HRA	Habitats Regulations Assessment
HSA	Health and Safety Authority
HSAW	Health and Safety at Work
HSC	Hazardous Substance Consent
HSE	Health and Safety Executive
HSI	Habitat Suitability Index
HST	Highways Strategic Transformation
HTL	Hold the Line
IAEA	International Atomic Energy Authority
IAQM	Institute of Air Quality Management
ICE	Institute of Civil Engineering
ICES	International Council for the Exploration of the Seas
ICRP	International Commission on Radiological Protection
IDB	Internal Drainage Board
IECS	Institute of Estuarine and Coastal Studies
IED	Industrial Emissions Directive
IEMA	Institute of Environmental Management and Assessment

Abbreviation	
IFCA	Inshore Fisheries and Conservation Authority
ILO	International Labour Organisation
ILW	Intermediate Level Waste
ILWSF	Intermediate Level Waste Storage Facility
IMO	International Maritime Organization
INIS	Invasive non-indigenous species
IPC	Infrastructure Planning Commission
IPM	Integral Projection Model
IROPI	Imperative Reason of Overriding Public Interest
ISFS	Interim Spent Fuel Store
ISQG	Interim Canadian Sediment Quality Guidelines
ISO	International Standards Organisation
ITIS	Integrated Transport Information System
JHWS	Joint Health and Wellbeing Strategy
JLAG	Joint Local Authority Group
JNCC	Joint Nature Conservation Committee
JSA	Jobseekers Allowance
KEIFCA	Kent and Essex Inshore Fisheries and Conservation Authority
kg	Kilogram
km	Kilometre
kV	Kilovolt
kW	Kilowatt
LAQM	Local Air Quality Management
LCA	Landscape Character Area
LCT	Landscape Character Type
LDP	Local Development Plan
LDS	Local Development Scheme
LDV	Light Duty Vehicle
LEP	Local Enterprise Partnership
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority

Abbreviation	
LLW	Low Level Waste
LNR	Local Nature Reserve
LOAEL	Lowest Observed Adverse Effect
LOCA	Loss of Coolant Accident
LoGS	Local Geodiversity Sites
LPA	Local Planning Authority
LVIA	Landscape and Visual Impact Assessment
LWS	Local Wildlife Sites
m	Metre
M bgl	Metres Below Ground Level
MAC	Maximum Allowable Concentration
MAFF	Ministry of Agriculture, Fisheries and Food
MAGIC	Multi Agency Geographic Information for the Countryside
MAHP	Major Accident Hazard Pipelines
MAID	Marine Accident Investigation Branch
MarESA	Marine Evidence-based Sensitivity Assessment
MarLIN	Marine Life Information Network
MARPOL	Prevention of Pollution from Ships
MAS	Manufacturing Advisory Service
MBT	Monobutyl-tin
MCA	Marine Character Area
MCC	Manual Classified Counts
MCZ	Marine Conservation Zone
MDC	Maldon District Council
MDR	Maximum Deposition Rate
MfS	Manual for Streets
MEEG	Mobile Emergency Equipment Garage
MESH	Mapping European Seabed Habitats
MGN	Marine Guidance Note
MHCLG	The Ministry for Housing, Communities and Local Government

Abbreviation	
MHIC	The Maldon Harbour Improvement Commissioners
MHSAW	Management of Health and Safety at Work
MHWM	Mean High Water Mark
MHWN	Mean High-water Neap Tide
MHWS	Mean High Water Springs
HLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MMP	Materials Management Plan
MOD	Ministry of Defence
MOLF	Marine Offloading Facility
MORECs	Meteorological Office Rainfall and Evaporation Calculation System
mph	Miles per Hour
MPS	Marine Policy Statement
MR	Managed Realignment
MSFD	Marine Strategy Framework Directive
MSL	Mean Sea Level
MSMS	Marine Safety Management System
$MtCO_2e$	Mega tonnes of Carbon Dioxide Equivalent
MW	Megawatt
NAI	No Active Intervention
NAMRAC	Nuclear Advanced Manufacturing Research Centre
NAMTEC	National Metals Technology Centre
NAP	National Adaptation Programme
NATA	New Approach to Appraisal
NCA	National Character Area
NCAAP	North Chelmsford Area Action Plan
NCN	National Cycle Network
NCR	National Cycle Route
NDA	Nuclear Decommissioning Authority
NERC	Natural Environment and Rural Communities

Abbreviation	
NGR	National Grid Reference
NHB	Non-Home Based
NHLE	National Heritage List for England
NHS	National Health Service
NIA	Nuclear Industry Association
NIC	National Infrastructure Commission
nm	Nautical Miles
NMFS	National Marine Fisheries Service
NMP	National Mapping Programme
NNB	New Nuclear Build
NNR	National Nature Reserve
NOAA	National Oceanic and Atmospheric Administration
NOEC	No Observed Effect Concentration
NOEL	No Observed Effect Level
NPPG	National Planning Practice Guidance
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NPSE	Noise Policy Statement for England
NRA	Navigation Risk Assessment
NRA	National Rivers Authority
NRMM	Non-road Mobile Machinery
NSER	No Significant Effects Report
NSG	Noise Sensitive Group
NSIP	Nationally Significant Infrastructure Project
NSL	Nuclear Site Licence
NtM	Notice to Mariners
NTS	Non-Technical Summary
NTS	National Transmission System
NVC	National Vegetation Classification
NVZ	Nitrate Vulnerable Zone
NWP	Numerical Weather Prediction

Abbreviation	
OCNS	Office for Civil Nuclear Security
OD	Ordnance Datum
O-D	Origin-destination
OGV	Other Goods Vehicle
OND	Office for Nuclear Development
ONR	Office for Nuclear Regulation
ONS	Office for National Statistics
OPZ	Outline Planning Zone
ORR	Office of Rail Regulation
OS	Ordnance Survey
OSA	Open Stone Asphalt
OSPAR	Protection of the Marine Environment of the North East Atlantic
PAS	Publicly Available Standard
PCSM	Preliminary Conceptual Site Model
PCSR	Pre-construction Safety Report
PDZ	Policy Development Zone
PEC	Predicted Environmental Concentration
PEI	Preliminary Environmental Information
PFRA	Pluvial Flood Risk Assessment
PHA	Preliminary Hazard Assessment
PHP	Personalised Housing Plan
PINS	Planning Inspectorate
PNEC	Predicted No Effect Concentration
PPC	Pollution Prevention and Control
PPE	Personal Protective Equipment
PPG	Planning Policy Guidance
PRoW	Public Right of Way
PRS	Private Rented Sector
PSA	Particle Size Analysis
pSAC	Possible Special Area of Conservation

Abbreviation	
pSPA	Potential Special Protection Area
PSYM	Predictive System for Multimetrics
PV	Photovoltaic
PWR	Pressurised Water Reactor
PWS	Private water supply
RAF	Royal Air Force
RAMS	Recreational Disturbance Avoidance & Mitigation Strategy
RBD	River Basin District
RBMP	River Basin Management Plan
RCR	Regional Cycle Route
RFID	Radio Frequency Identification
RHP	Registered Housing Provider
RICS	Royal Institution of Chartered Surveyors
RIGS	Regionally Important Geodiversity Sites
RNLI	Royal National Lifeboat Institution
RNR	Roadside Nature Reserve
RP	Requesting Party
RRFSO	Regulatory Reform (Fire Safety) Order
RSPB	Royal Society for the Protection of Birds
RVAA	Residential Visual Amenity Assessment
RYA	Royal Yachting Association
SAAR	Standard Average Annual Rainfall
SAC	Special Area of Conservation
SAL	Site Action Level
SAR	Science Advisory Report
SCA	Seascape Character Area
SCI	Sites of Community Importance
SCT	Seascape Character Type
SELEP	South East Local Enterprise Partnership
SEP	Strategic Economic Plan
SFRA	Strategic Flood Risk Assessment

Abbreviation	
SHMA	Strategic Housing Market Area
SIC	Standard Industrial Classification
SLA	Special Landscape Area
SLR	Sea Level Rise
SMP	Shoreline Management Plan / Soil Management Plan / Survey and Monitoring Plan (as appropriate in context)
SNCB	Statutory Nature Conservation Body
SOAEL	Significant Observed Adverse Effect Level
SoCC	Statement of Community Consultation
SoDA	Statement of Design Acceptability
SoS	Secretary of State
SPA	Special Protection Area
SPI	Species of Principal Importance
SPM	Suspended Particulate Matter
SPZ	Source Protection Zone
SRAM	Safety Report Assessment Manual
SSA	Strategic Siting Assessment
SSC	Suspended Sediment Concentration
SSG	Skills Strategy and Growth
SSSI	Site of Special Scientific Interest
STEM	Science, Technology, Engineering, and Maths
STEMC	Science, Technology, Engineering, Maths, and Construction
STP	Sustainability and Transformation Partnership
SuDS	Sustainable Urban Drainage System
SWFTC	South Woodham Ferrers Town Council
TA	Transport Assessment
TAG	Transport Analysis Guidance
THC	Total Hydrocarbon Content
TIMA	Traffic Incident Management Area
TIMP	Traffic Incident Management Plan
TRL	Transport Research Laboratory

Abbreviation	
UK HPR1000	UK version of the Hualong Pressurised Reactor
UKBAP	UK Biodiversity Action Plan
UKCIP	United Kingdom Climate Impacts Programme
UKCP09	United Kingdom Climate Projections 2009
UKCP18	United Kingdom Climate Projections 2018
UKCS	UK Continental Shelf
UKHO	United Kingdom Hydrographic Office
UM	Unified Model
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UXO	Unexploded Ordnance
VDV	Vibration Dose Value
VISSIM/VISUM	Micro-simulation model
VOC	Volatile Organic Compound
VP	Viewpoint
WDA	Water Discharge Activity
WFD	Water Framework Directive
WHO	World Health Organisation
WMS	Written Ministerial Statement
WMZ	Water Management Zones
WSI	Written Scheme of Archaeological Investigation
WWII	World War Two
ZoI	Zone of Influence
ZTV	Zone of Theoretical Visibility
ZVI	Zone of Visual Influence
ΔT	Temperature Elevation
µg	Microgram

APPENDIX 1C
GLOSSARY

Term	Definition
Abnormal indivisible loads (AILs)	Large loads to be delivered to the main development site which by their nature cannot be broken into smaller multiple deliveries. Some large items included within the definition of AILs must be transported by sea because they are too large or heavy to transport by road, other AILs may come to the site by road.
Above ordnance datum (AOD)	An Ordnance Datum or OD is a vertical datum used by an ordnance survey as the basis for deriving altitudes on maps. A spot height may be expressed as AOD for "Above Ordnance Datum". Usually mean sea level is used for the datum.
Accommodation Strategy	Strategy to ensure there is adequate accommodation for workers during the construction phase within a reasonable travelling distance of the main development site, whilst managing impacts on accommodation capacity.
Additional measures	Further measures required in order to achieve the anticipated outcome. These may be implemented as part of the planning consent (notably the Development Consent Order) or through inclusion in the ES. These are referred to as 'secondary measures' in accordance with IEMA guidelines.
Agricultural land classification (ALC)	A classification of agricultural land in England and Wales according to its quality and agricultural versatility. The classifications range from Grade 1 (the best and most versatile) through Grades 2, 3a, 3b, 4, down to 5 (the least versatile).
Ancillary buildings	The buildings used by staff in the daily operation of the Bradwell B power station that do not support the energy-generating components of the station, including offices, laboratories and workshops.
Annex I habitats	Habitats listed in Annex I of the Habitats Directive 92/43/EEC.
Appropriate assessment (AA)	A process required by the Habitats Directive 92/43/EEC to avoid adverse effects of plans, programmed and projects on Natura 2000 sites and thereby maintain the integrity of the Natura 2000 network and its features.
Associated development	Development which is associated with a Nationally Significant Infrastructure Project (NSIP), as defined in the Planning Act 2008. It should be subordinate to, and necessary for, the construction and/or the effective operation of the NSIP that is the subject of the Development Consent Order application.
Balance of plant	Additional facilities and equipment that are required for the operation of the Bradwell B power station. Many of these buildings and structures are similar to those that would be found on a conventional power station.

Term	Definition
Baseline	The situation prevailing before the Project is commenced (the current baseline), and also to the situation that would prevail in the future without the Project (the projected future baseline).
Bathymetry	Describes the 'topography' or profile of the seabed.
Beach Landing Facility (BLF)	Facility for enabling the transport of bulk materials and AILs to the main development site by sea.
Borrow pit	An excavation to source construction materials for the main development site. Any such borrow pits would be backfilled with arisings which are unsuitable for re-use as a construction material and the land restored.
Bradwell B power station flood defences	In the event of an extreme flood event, it would be necessary to protect the Bradwell B power station from extreme seawater levels wave run-up and overtopping, which would require additional new flood defences.
Bradwell B power station	The proposed Bradwell B power station includes two UK HPR1000 nuclear reactors with an expected gross electrical output of approximately 1,100 megawatts (MW) per unit, giving a total site output capacity of approximately 2,200MW.
Bradwell B Project - 'the Project'	The Bradwell B Project 'the Project' includes the following main elements: • The power station permanent development, including the Bradwell B power station. • Temporary Construction Facilities. • Off-site Power Station Facilities. • Off-site associated development.
Commissioning	Commissioning of a reactor involves a series of tests prior to first operation to demonstrate, to the extent practicable, that the plant, as built and including all components and systems, is capable of safe and reliable operation in accordance with its design specification, performance objectives, and safety requirements.
Conservation Areas	Designated areas of special architectural or historic interest, the character or appearance of which is desirable to preserve or enhance which have protection under the Planning (Listed Buildings and Conservation Areas) Act 1990.
Construction phase	The construction phase for the main development site within which the Bradwell B power station would be located is estimated to take 9 to 12 years to complete and is likely to be split into five phases: site

Term	Definition
	preparation and enabling works, civil construction, installation, commissioning, and site restoration.
Conventional island	Area occupied by two turbine halls (one for each reactor unit) with electrical buildings and associated balance of plant. The turbine halls house the generators which convert energy from high pressure steam into electrical power.
Cooling water infrastructure	Infrastructure including forebay, pump houses, water treatment and cooling plant (including cooling towers).
County Wildlife Site (CWS)	Areas identified and selected for their local nature conservation value.
Decommissioning	When the last unit ceases generating electricity decommissioning would be conducted according to a phased programme of activities which would include the clearance of buildings and infrastructure and ultimately provide a delicensed site which could be made available for re-use. Decommissioning activities will be subject to a separate consent at the relevant time.
Design Measures	Modification to the location or design of the development made during the pre-application phase that are an inherent part of the Project, and do not require additional action to be taken. These are also referred to as 'primary measures' in accordance with IEMA guidelines and will be embedded within the design of the Project.
Development Consent Order (DCO)	Where the Secretary of State proposes to grant consent for a nationally significant infrastructure project (NSIP), this will be through a Development Consent Order (DCO) which is normally made as a statutory instrument – a form of secondary legislation. The DCO not only provides planning consent for the Project but may also incorporate other consents and include authorisation for the compulsory acquisition of land.
Environmental Impact Assessment (EIA)	An EIA is a tool for systematically examining and assessing the impacts and effects of a development on the environment. The objective of the EIA is to identify any likely significant effects which may arise from the Project and identify measures to prevent, reduce or offset any adverse effects.
Environmental Statement (ES)	The outcome of the EIA process is reported within a document called an Environmental Statement (ES).
Fish recovery and return system (FRR)	A system specifically designed to enable fish that are drawn into the intakes with seawater are intercepted and returned to sea via a dedicated pipeline(s).

Term	Definition
Freight management facilities	Facilities to manage the flow of HGVs on the highway network and which may potentially include the temporary storage of material prior to delivery to the main development site.
Future baseline	This is the theoretical situation that would exist in the absence of the Project. This is based upon extrapolating the current baseline using technical knowledge of likely changes over the identified period (for example anticipated habitat change over time, climate change projections, traffic and waste volume growth over time, etc.).
Gravity Model	The Gravity Model calculates where both home-based and non-home-based workers for the Project would be likely to live across the region. It predicts the location of the permanent homes of home-based workers and temporary project-provided accommodation of non-home based workers. Initial development of a worker Gravity Model has been carried out to understand likely worker distribution across a 90-minute reasonable maximum daily commute zone (60 minutes for 'non home-based' workers). The model will address travel distances and potential locations of the workforce required for the construction phase of the Project focussing on the construction of the Bradwell B power station.
Good practice measures	Actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements or actions that are considered to be standard practice used to manage commonly occurring environmental effects. These are referred to as 'tertiary measures' in accordance with the IEMA guidelines and would also be embedded within the design of the Project.
Groundwater	Water occurring below ground in natural formations (typically rocks, gravels and sands).
Historic Parks and Gardens	Parks and gardens identified by English Heritage as being of particular interest and quality by reasons of their historic layout, features and architectural ornaments. Like listed buildings they are graded I, II* and II.
In-combination effects	In-combination effects are effects that occur as a result of two or more project impacts acting together (i.e.) combined, to result in a new or changed effect on a specific receptor.
Intertidal	The area of shore between the highest and lowest tides.
Listed buildings	Buildings and structures which have been identified as being of special architectural or historic interest and whose protection and maintenance are the subject of special legislation (the Planning (Listed Buildings and Conservation Areas) Act 1990. Their curtilage

Term	Definition
	and setting is also protected. Listed building consent is required before any works can be carried out on a listed building.
Main development site	Area in which the Bradwell B power station permanent development and related temporary construction facilities would be located.
Main power block	A single nuclear island and conventional island system, capable of producing steam and generating electricity. Sometimes referred to as a 'unit' i.e. 'unit one' or 'unit two'; Bradwell B would be a power station with two main power blocks, i.e. a two-unit station.
Main power station platform	The platform which is required to be above existing ground level in order to protect the Bradwell B power station from external hazards associated with potential extreme flooding events over the operational lifetime of the power station and encompassing the decommissioning phase, taking account of climate change.
Marine environment	Anything below mean high water springs
Nationally Significant Infrastructure Project (NSIP)	Nationally Significant Infrastructure Projects (NSIPs) are developments (relating to energy, transport, water, or waste) which are identified in the Planning Act 2008 and require a type of consent known as "development consent".
National Nature Reserve (NNR)	NNRs are designated under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981 (as amended) as land primarily for nature conservation. Such a purpose covers the study, research and preservation of flora, fauna and sites with special geological or physiographical features. The NNRs were established to protect the most important areas of wildlife habitat and geological formations in Britain and as places for scientific research. All NNRs are nationally important and are best examples of a particular habitat/ecosystem.
Nuclear island	The nuclear island is the core of the power station, housing the nuclear system (notably the reactor and associated buildings) that produces steam to drive the turbines in the conventional island.
Nuclear Site Licence	Before a new nuclear power station can be built and operated the operator must obtain a number of key site-specific permissions from regulators and Government. These include a Nuclear Site Licence from the Office for Nuclear Regulation (ONR).
Off-site associated development	Comprises development to support the construction and/or operation of the Bradwell B power station, for example park and ride facilities for construction workers, freight management facilities, project-provided accommodation, and both off-line and on-line road and junction improvements.

Term	Definition
Off-site highways works	To manage the proposed number of vehicle movements on the local road network resulting from the construction and operation of the Project a range of highway improvement works may be required.
Off-site Power Station Facilities	These are permanent facilities located away from the main development site, which are essential for the safe operation of the Bradwell B power station.
Operational phase	Anticipated to last 60 years from the date of reactor commissioning. This phase will include the operation of the Bradwell B power station plant and systems for the generation of electricity, including the abstraction and discharge of water for cooling.
Park and ride facilities	Facilities to enable worker journeys to be intercepted at key points before onward travel by bus to the main development site.
Power station permanent development	Permanent works located within the main development site related to the Bradwell B power station which would include the following key operational elements: • Nuclear Island. • Conventional Island. • Balance of Plant. • Cooling water infrastructure. • Power transmission infrastructure, including a connection to a new 400kV sub-station to be provided by National Grid. • Fuel and waste storage facilities, including interim storage for nuclear waste and spent fuel. • Offices, welfare facilities, security and emergency response facilities. • Security facilities including fencing and security checkpoints, as well as security lighting.
Project-provided accommodation	Accommodation for construction workers during the construction phase of the Project.
Public Rights of Way (PRoW)	These are designated routes under the Countryside and Rights of Way [CroW] Act 2000, which the public can use at any time.
Ramsar site	The Ramsar Convention on Wetlands of International Importance, especially as Waterfowl Habitat (1971) imposes a requirement on the UK Government to promote the wise use of wetlands and to protect wetlands of international importance. This includes the designation of

Term	Definition
	certain areas as Ramsar Sites, where their importance for nature conservation (especially with respect to waterfowl) and environmental sustainability meet certain criteria.
Removal and reinstatement	Following the construction of the Bradwell B power station, the off-site associated development sites, with the exception of up to 500 of any permanent houses which would be used first as construction worker accommodation, would be removed and reinstated to their original use, unless otherwise authorised in the DCO.
Rochdale Envelope	The 'Rochdale Envelope' approach is employed where the nature of a proposed development means that some details of a project have not been confirmed (for instance, the precise dimensions of structures) when an application is submitted, and flexibility within clearly defined parameters is therefore sought to address uncertainty.
Scheduled monument	A feature of national, historical or archaeological importance, either above or below the ground, which is included in the schedule of monuments as identified by the Secretary of State. Not all nationally important archaeological remains are scheduled and sites of lesser importance may still merit protection.
Scoping Opinion	A Scoping Opinion is requested from the Planning Inspectorate (PINS), on behalf of the Secretary of State (SoS), to inform the requirements of EIA process and ultimately the Environmental Statement (ES) which will be submitted as part of the application for development consent. Through the scoping process the views of the statutory consultees and other relevant organisations on the proposed scope of the EIA are sought.
Site of Special Scientific Interest (SSSI)	An area designated as being of special interest by reason of any of its flora, fauna or geological or physiographical features. SSSIs are designated by Natural England under the Wildlife and Countryside Act 1981 (as amended) and the Countryside and Rights of Way Act 2000.
Source Protection Zone (SPZ)	Defined by the Environment Agency, these zones show the risk of contamination from any activities that might cause pollution in the area.
Special Area of Conservation (SAC)	A site designated via the European Directive on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC) (i.e. the Habitats Directive) to protect rare and endangered habitats and species at a European level. Together with SPAs they form a network of European sites known as Natura 2000.

Term	Definition
Special Protection Area (SPA)	Designated under Article 4 of the European Directive on the Conservation of Wild Birds (2009/147/EC) (i.e. the Birds Directive) to protect the habitats of threatened and migratory birds.
Spent fuel	The name given to nuclear fuel that has been used and removed from a nuclear reactor.
Strategic road network	The strategic road network (or SRN) is made up of motorways and trunk roads (the most significant 'A' roads).
Subtidal	Areas below water at all states of tide.
Sustainable drainage systems (SuDS)	A sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques.
Waste Management Strategy	The Waste Management Strategy will provide details of the estimated waste arisings produced through the various activities as the Project progresses. It will also identify methods for managing the wastes.
Zone of Influence (ZoI)	An identified geographical area around the Project where there is a potential for impacts to occur.
Zone of Theoretical Visibility (ZTV)	The likely (or theoretical) extent of visibility of a development, usually shown on a map.

APPENDIX 6A
BRADWELL DATA REPORT

Bradwell B Project

Bradwell Data Report

Wood Environment & Infrastructure Solutions UK Limited – September 2020

BBX00510031WOOD02TR

Version C01

CONTENTS

PLATES

APPPENDICES

Annex 4A Specified Dates of the 2019 CGN ATC Data

Annex 4B Specified Dates of the ECC Traffic Data

1. INTRODUCTION

1.1.1 This note has been produced to set out the data collated to supplement the development of a microsimulation model within the area of Malden, Essex.

1.1.2 The Applicant are developing a bespoke microsimulation model to assess the impact of the proposed Bradwell B Project located in Bradwell-on-sea in Maldon which will inform the design of the road network and align with the overall Transport Strategy for the development.

2. STRATEGIC MODEL OUTPUT

2.1.1 The County-Wide Strategic model is made available by Essex County Council (ECC) along with Model Development, Forecast and Variable Demand Reports. The data that is accessible from the county-wide model will be utilised for Base model demand matrix development and to determine traffic growth for future year scenarios.

2.1.2 The Essex county-wide core model was developed with a 2017 base year with synthesised demand matrices using the VISUM software platform.

2.1.3 Existing outputs from the strategic model will be able to inform the O/D matrices for the Bradwell base model. Cordoned demands of the microsimulation area from the 2017 core county-wide model will be requested to construct the O/D matrices.

2.1.4 Demands from the strategic model will be translated into the Bradwell model accounting for the 2-year growth between 2017 and 2019 core model development years. The adjustments will be calculated to accurately represent the link and junction volume/capacity (V/Cs) within the microsimulation model for the year 2019.

2.1.5 A similar approach will be taken when forecasting future year scenarios where demand growth will be accounted for utilising the 2036 county-wide forecast scenario inclusive of proposed major strategic highway schemes across Essex.

2.1.6 **Plate 2.1** and **Plate 2.2** outline the model extent for the ECC county-wide model and the local model proposed by the applicant, respectively.

Plate 2.1: ECC County-Wide Model Highway Network

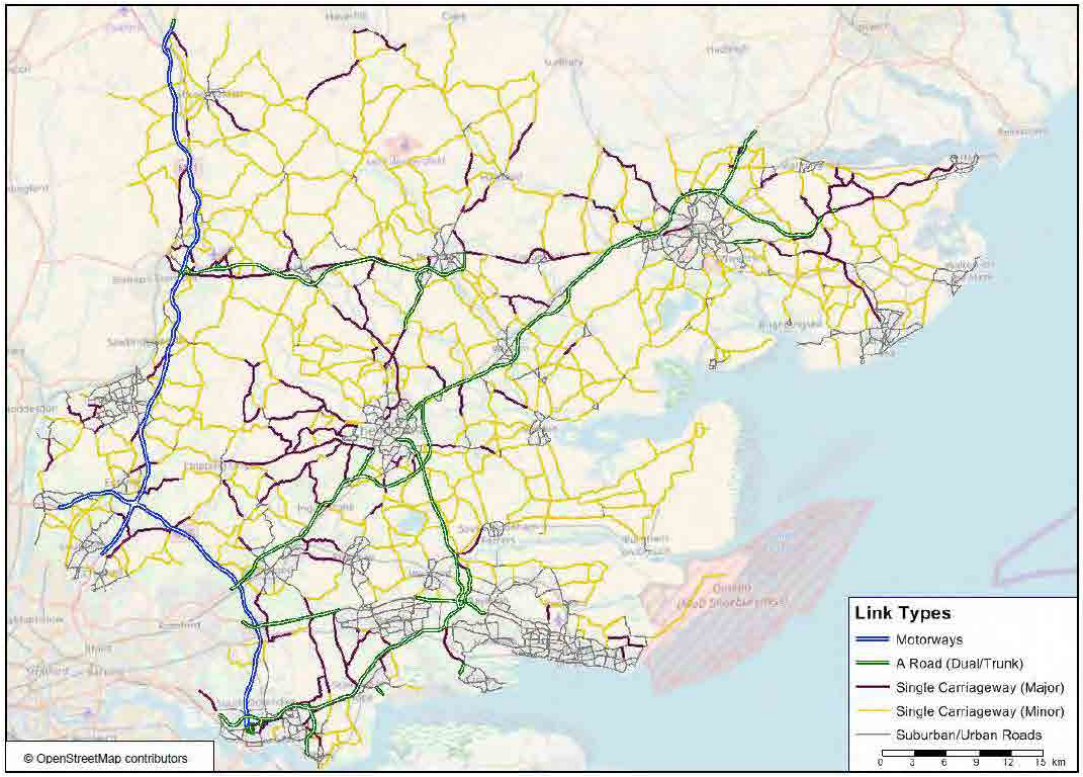
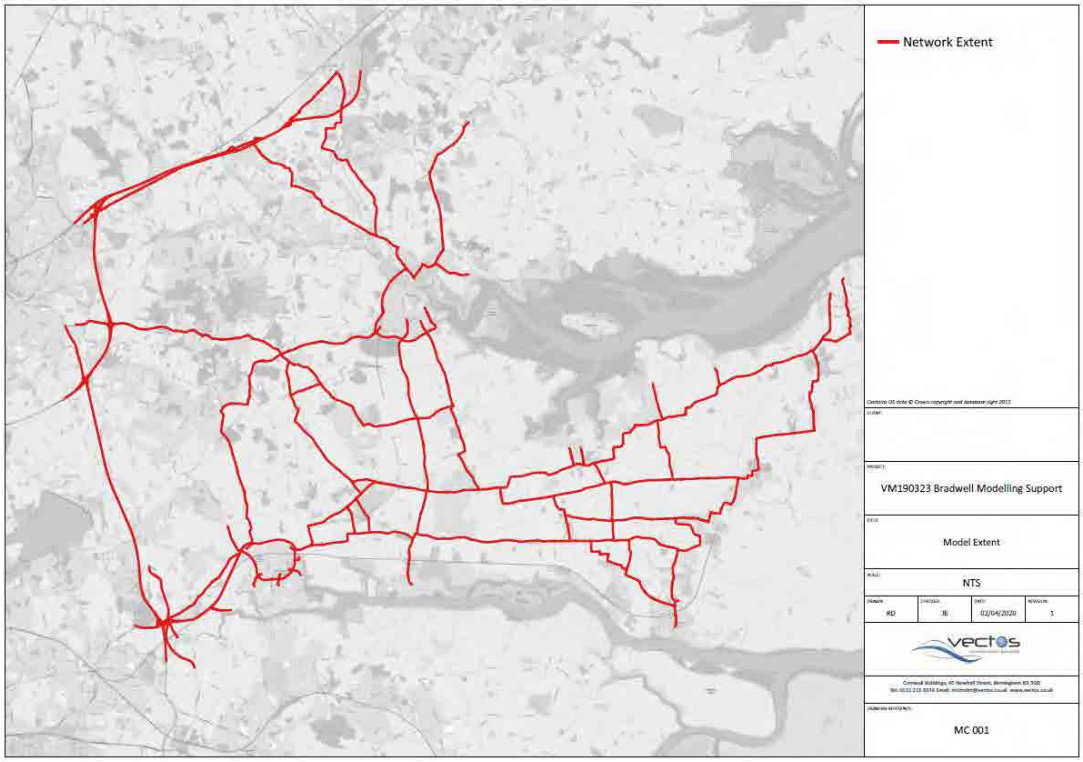


Plate 2.2: Proposed Network Extent



3. OBSERVED TRAFFIC COUNTS

3.1.1 Observed traffic data has been collated for the purpose of informing traffic volumes within the core microsimulation model. In order to develop a Base model that accurately reflects network conditions, all-movement turn counts, in the form of Manual Classified turn Counts (MCCs), and link counts, in the form of Automatic Traffic Counters (ATCs), have been collected. The observed counts that have been surveyed between 2014 and 2019 will be used to assess network calibration.

3.1.2 The survey methodology has been consistent for all obtained data ensuring that the data sets from different sources are compatible. This allows for calibration using a combination of data from the different sources.

3.1.3 Observed traffic data has been made available by ECC. Additionally, surveys have already been specifically commissioned for this project (CGN Data).

3.1.4 The traffic counts surveyed between 2014 and 2018 have been provided by ECC whereas the data surveyed in 2019 is a combination of both ECC and CGN counts.

3.1.5 The model will be developed to cover a full 12-hour period as required to enable impacts and mitigation to be considered within the development traffic peaks rather than just the traditional peaks. All count data provided has been collected over a 12-hour period (07:00 – 19:00) and therefore, sufficient model calibration inclusive of all time periods can be achieved.

3.1.6 **Plates 3.1 – 3.3** detail the locations of the recorded traffic counts.

Plate 3.1: MCC Data Locations

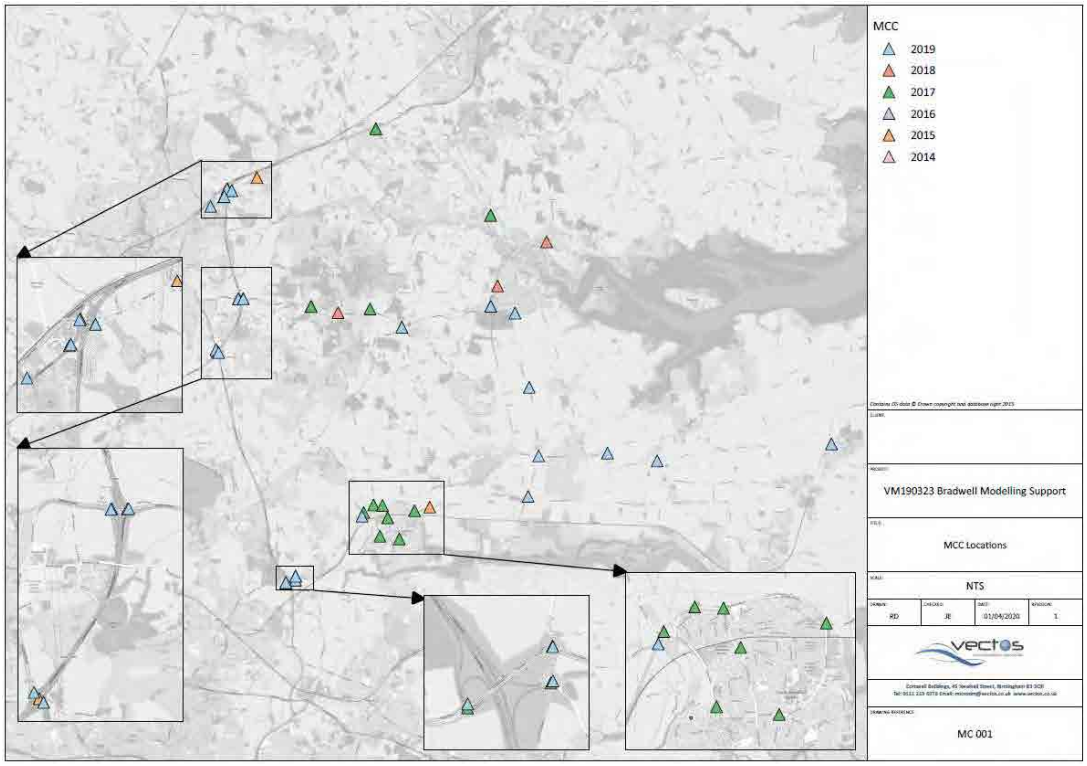


Plate 3.2: ATC Locations

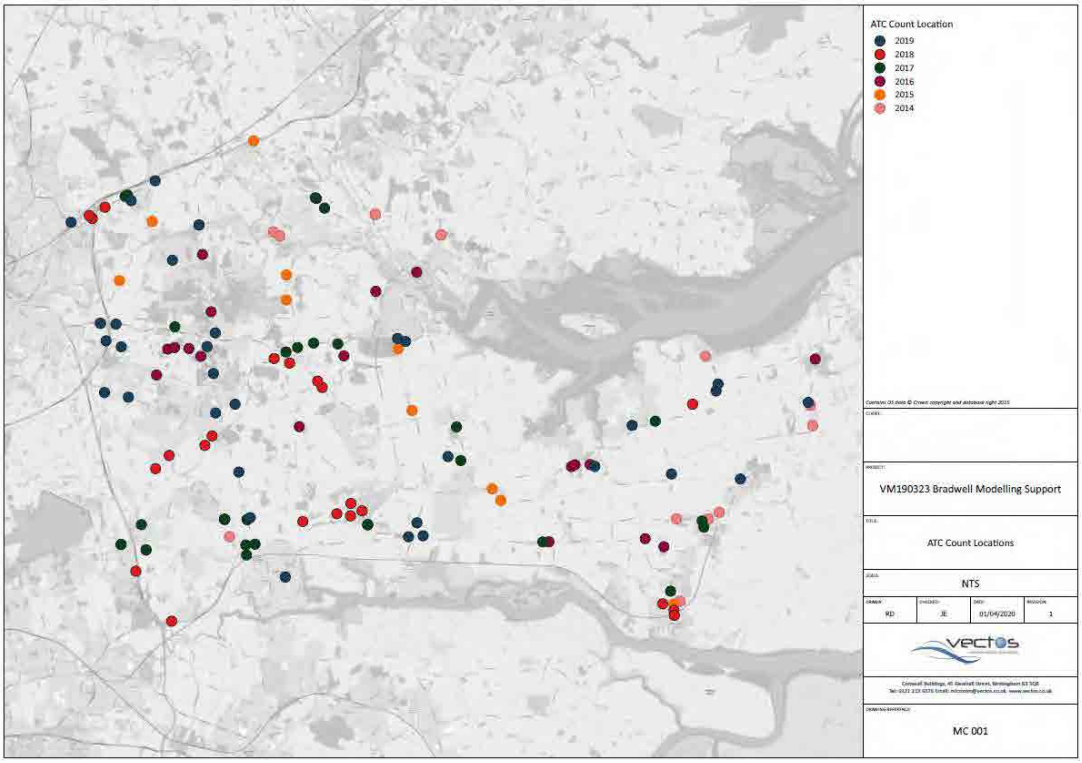
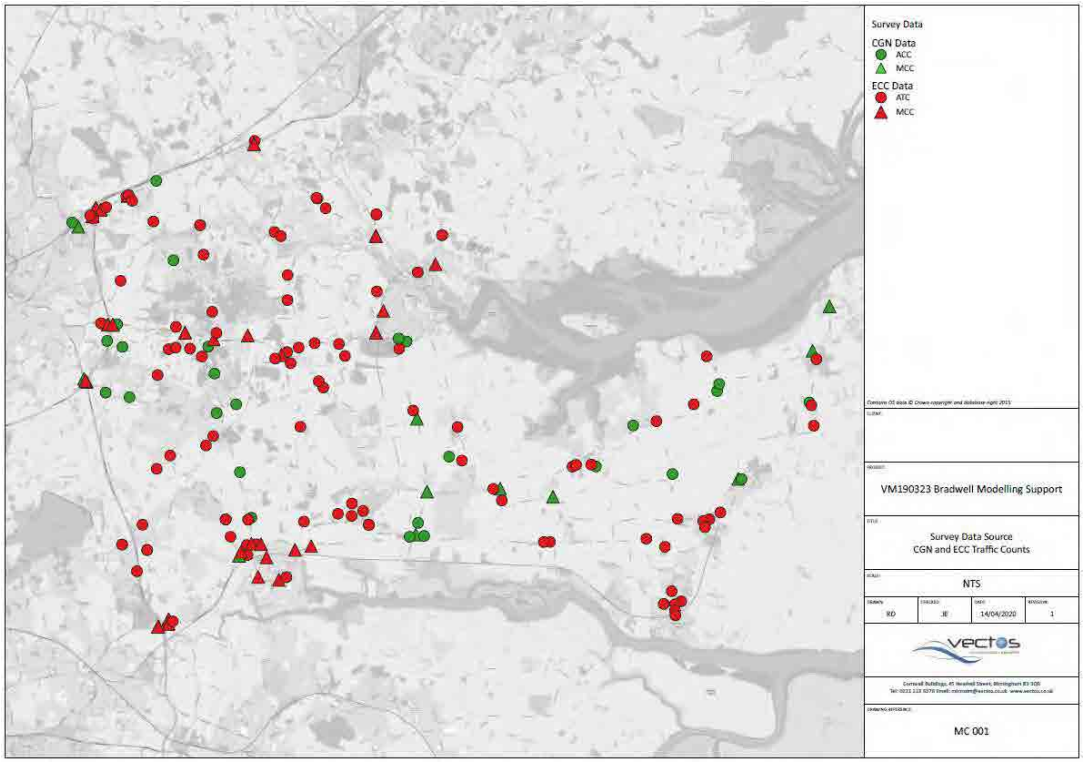


Plate 3.3: Survey Data Sources



4. DATING OBSERVED TRAFFIC COUNTS

4.1.1 The observed traffic counts have been surveyed across a 5-year period between 2014 and 2019.

4.1.2 All CGN surveyed counts were recorded between 22 June 2019 and 8 July 2019. All MCC and queuing data was collected on Tuesday 9 July 2019. **Annex 4A** details the specified dates of which the 2019 CGN ATC data was recorded.

4.1.3 The traffic data provided by ECC had been collated over the 5-year period aforementioned, the dates of which are specified in **Annex 4B.**

4.1.4 The majority of surveyed data is dated from 2019, aligning with the core model development year. Data that has been acquired prior to 2019 may be subject to annualization dependent on the significance in variability of traffic volume over time. Factoring the counts is discussed in further detail later in the note.

4.1.5 **Plates 4.1** – **4.6** outline the locations of the surveyed traffic counts for each year.

Plate 4.1: 2014 Observed traffic counts

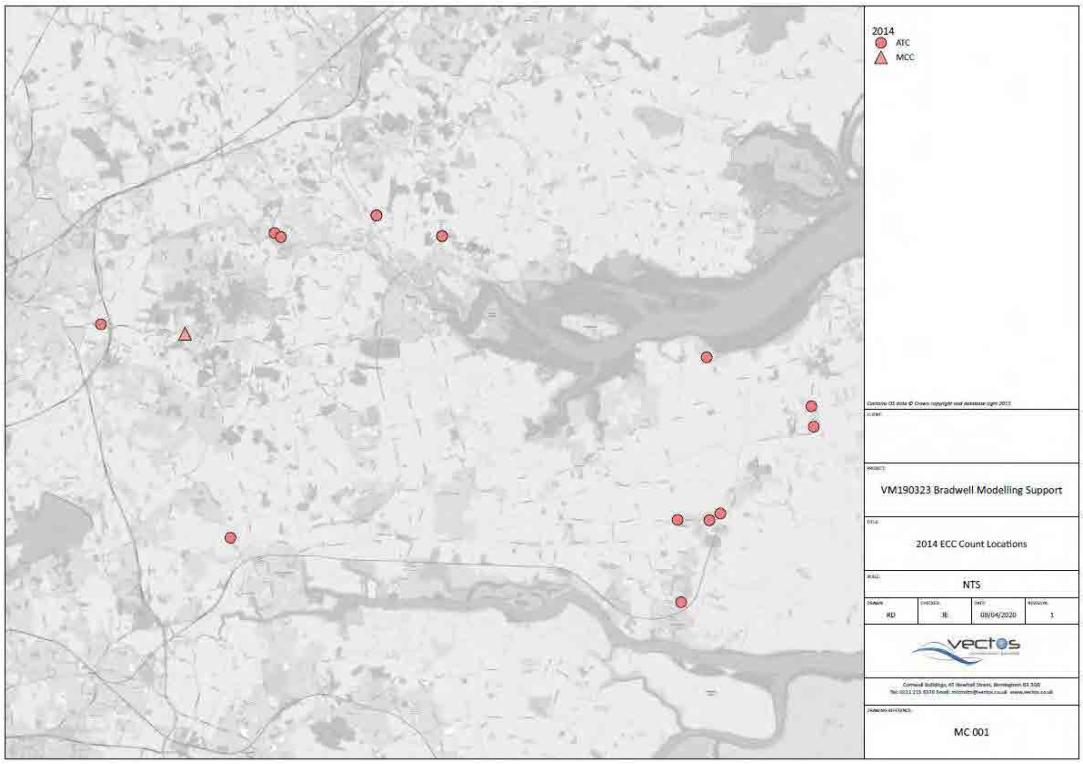


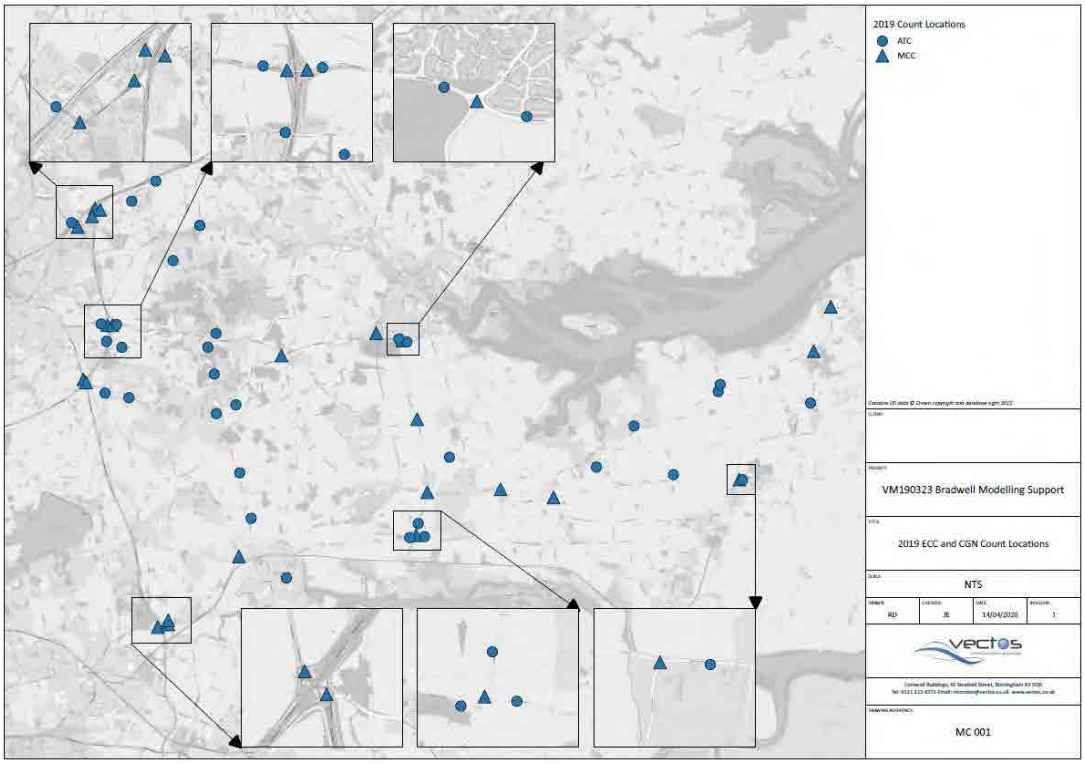
Plate 4.2: 2015 Observed traffic counts

Plate 4.3: 2016 Observed traffic counts

Plate 4.4: 2017 Observed traffic counts

Plate 4.5: 2018 Observed traffic counts

Plate 4.6: 2019 Observed traffic counts



5. APPROACH TO ANNUALISATION

5.1.1 The data utilized for the development of the microsimulation model is identified to have been collected during different time periods. It is recognised that any growth in traffic volumes, determined to have a significant effect on the behaviour and volume of traffic must be accounted for when developing the 2019 Base model.

5.1.2 The Strategic County-Wide core model has been coded for 2017, two years prior to the local models' base year. The applicant will translate the demands from the strategic model into the Bradwell model accounting for the 2-year changes between 2017 and 2019 core model development years using a factor. The adjustments will be calculated to represent the link and junction volume/capacity (V/Cs) within the microsimulation model for the year 2019.

5.1.3 A similar approach will be taken when forecasting future year scenarios where demand growth will be accounted for utilizing the 2036 county-wide forecast scenario inclusive of proposed major strategic highway schemes across Essex.

5.1.4 The survey data has been collected over a 5-year period (2014 – 2019). Any locations with data that has been provided over multiple years can be used to indicate if a normalisation factor is required. If a significant change in traffic volume is recorded in adjacent counts, the earlier recorded data can be annualised using the proxy values.

5.1.5 **Plate 5.1** outlines the junctions where turning counts have been recorded for multiple years.

Plate 5.1: MCC multi-Year data locations

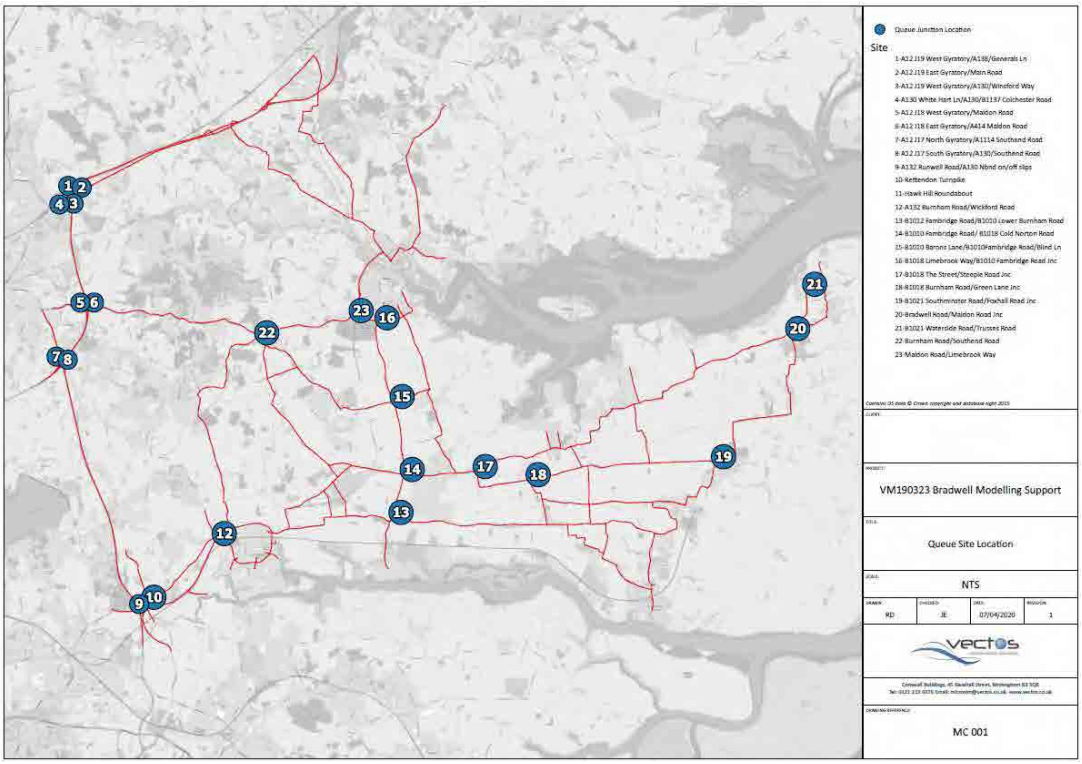
6. QUEUING DATA

6.1.1 Information on the queuing levels experienced during the 12-hour period, at 23 major junction locations, was included in the CGN survey. The queueing data was surveyed 2 July 2019. This information will be processed in the form of average queue lengths in vehicles, at 5-minute intervals. This data will be subsequently reviewed against the modelled queues at the corresponding locations.

6.1.2 The definition of a queue or whether a vehicle is considered to be in a 'queued' state is highly variable and depends heavily upon the criteria by which an observed queue is measured. For example, the point or speed where a vehicle is considered as being in a queued state rather than a 'rolling' queue is difficult to measure. Despite this, it was felt that queue lengths will still provide a useful means of reviewing model operation.

6.1.3 **Plate 6.1** outlines the site locations where queue lengths have been recorded.

Plate 6.1: Queue site locations



7. JOURNEY TIME DATA FOR VALIDATION

7.1.1 Journey time data will be extracted from the Streetwise TomTom dataset for a selection of key corridors across the study area. Two-way routes will be analysed for the AM, PM and Inter-peak periods. Each route comprises of sections that make up the length of the entire route. This data will be used to validate the model delay on key corridors.

7.1.2 An ANPR survey has been collected that captures the distribution between various cordon points on the network and records the travel times between these points. This data will be used, where possible, to supplement the journey time validation, but also to review the distribution occurring in the final Base model.

7.1.3 **Plate 7.1** details the locations of which ANPR surveys have been carried out.

Plate 7.1: ANPR survey data locations

8. POTENTIAL GAPS AND ADDITIONAL DATA REQUESTS

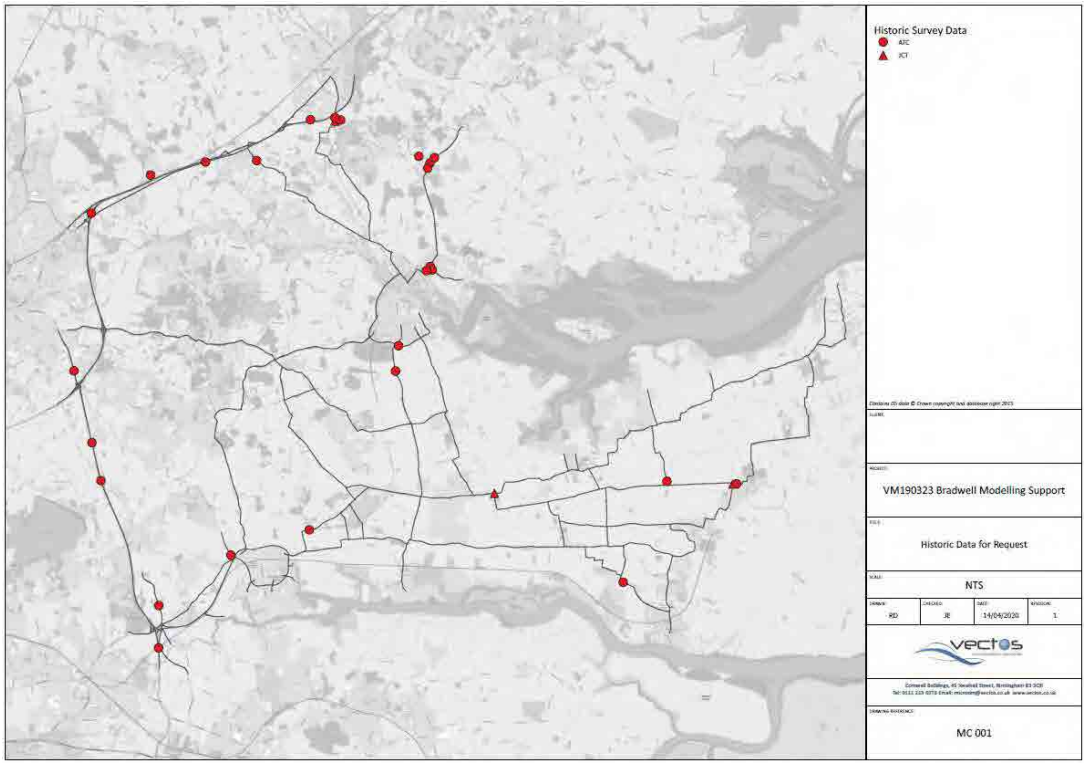
8.1.1 The MCC survey data currently acquired accounts for 39 junctions within the model network. Junctions within the model extent that have not been included in the ECC or CGN turning count surveys can be assumed to be sufficiently calibrated where ATCs are proximal to the junction approaches.

8.1.2 Limitation of data availability is demonstrated by any temporal and spatial variability in the surveyed counts. It is recognised that new traffic count surveys cannot be carried out due to the current anomalistic circumstances arising from Covid-19 movement restrictions. In order to improve accuracy of the model calibration, a review of opportunities to compensate for data gaps with historic data has been completed.

8.1.3 A significant number of data gaps identified within the proposed network can be overcome for using historic survey data that can be made available by Advanced Transport Research (ATR), subject to agreement on costs. The online database displays the locations where historic survey counts are available, further information of which can be requested.

8.1.4 ATRs count database has been reviewed and a number of count locations which would be useful for the base model calibration and validation have been identified. ATR have been requested to provide costs for the data outlined in **Plate 8.1**.

Plate 8.1: Historic data available for request



8.1.5 Any further data that could be made available by ECC or their consultants, where currently there is no observed counts available would be helpful in supplementing the development of the local model.

8.1.6 Additionally, following discussions between ECC and the applicant, the applicant is aware of a number of existing local microsimulation models which ECC has indicated may be helpful in informing the calibration of the larger microsimulation model. Access to existing models developed by Jacobs would be useful for considerations in traffic demand and behaviour when building the core model.

8.1.7 Initially the applicant would request that ECC provide the model locations and, if possible, the associated reports to enable us to understand the extent to which the models will aid in the development and calibration of the large-scale microsimulation model currently under development.

9. SUMMARY

9.1.1 The applicant is developing a bespoke microsimulation model to assess the impact of the proposed Bradwell B development located in Bradwell-on-sea in Maldon which will inform the design of the road network and align with the overall transport strategy for the development.

9.1.2 The data that is accessible from the Strategic county-wide model will be utilised for Base model demand matrix development and to determine traffic growth for future year scenarios.

9.1.3 Observed traffic counts surveyed from 2014 to 2019 will supplement model calibration and validation. The location of these are outlined within this Note.

9.1.4 Journey time data will be extracted from the Streetwise TomTom dataset for a selection of key corridors across the study area. Additionally, ANPR surveys will be used to validate journey time along selected routes.

9.1.5 New traffic count surveys cannot be carried out due to current anomalistic circumstances. Additional data requests for historic survey counts have been provided to transport survey companies to aid in reducing any perceived gaps in the current dataset.

9.1.6 ECC has indicated that additional information may also be made available in the form of local microsimulation models developed within the proposed study area. Initially the reports which accompany these models are considered beneficial to enable all parties to agree which supplementary models would be of most use to the overall model development exercise.

ANNEX 4A
SPECIFIED DATES OF THE 2019 CGN ATC DATA

21971 Dengie Peninsula - ATC Status Report

Site	Site Name	22.06.2019	23.06.2019	24.06.2019	25.06.2019	26.06.2019	27.06.2019	28.06.2019	29.06.2019	30.06.2019	01.07.2019	02.07.2019	03.07.2019	04.07.2019	05.07.2019	06.07.2019	07.07.2019	08.07.2019	10.07.2019	11.07.2019	12.07.2019	13.07.2019	14.07.2019	Notes
21971-001	A130 White Hart Lane East of The Avenue																							
21971-002	A1060 Maldon Road West of Park & Ride Entrance																							
21971-003	A414 Maldon Road East of A12 J18 East Gyratory																							
21971-004	Woodhill Road West of A12 (East of unamed road)																							Site 004 left down for three extra days - data missing due to tube failure
21971-005	Mayes Lane South og Woodhill Road																							
21971-006	Southend Road South of East Hanningfield Road																							
21971-007	East Hanningfield Road																							
21971-008	B1137 Main Road West of Waltham Road																							
21971-009	Church Road East of Chapel Lane																							
21971-010	Penny Royal Road South of Copt Hill																							
21971-011	Gay Bowers Road East of Bicknacre Road																							
21971-012	B1418 White Elm Road																							Road resurfaced, unsuitable for reinstallation of ATC. Link count camera deployed on 27.06.19
21971-013	Priory Road West of B1418 Main Road																							
21971-014	Crows Lane																							
21971-015	Edwin's Hall Road																							
21971-016	B1018 Limebrook Way West of Fambridge Road																							
21971-017	Limebrook Way East of Fambridge Road																							
21971-018	Burnham Road West of Main Road																							
21971-019	B1012 Lower Burnham Road West of Fambridge Road																							
21971-020	B1010 Fmabridge Eoad South of St Stephens Road																							
21971-021	B1010 Lower Burnham Road East of Fambridge Road																							
21971-022	Grange Avenue South of Steeple Road																							
21971-023	Bart's Road North of Foxhall Road																							
21971-024	B1021 Southminster Road West of Brook Lane																							
21971-025	Canney Road North of Maldon Road																							
21971-026	Steeple Rosd North of St Lawrence Hill																							
21971-027	Main Road South of Steeple Road																							
21971-028	Brook Road West of B1021 Bradwell Road																							

KEY

Data Collected
Missing Days
Other

ANNEX 4B
SPECIFIED DATES OF THE ECC TRAFFIC DATA

Site Code	Site Location	Date	Type
14431-01	Broad Street Grn Rd BROAD ST GREEN	24 JUN 2014	ATC
14431-01	Broad Street Grn Rd BROAD ST GREEN	01 JUL 2014	ATC
14431-02	Witham Rd LANGFORD	08 JUL 2014	ATC
14431-02	Witham Rd LANGFORD	01 JUL 2014	ATC
14462-01	Crouchmans Farm Rd (N) ULTING	SEP 2014	ATC
14462-02	Crouchmans Farm Rd (S) ULTING	SEP 2014	ATC
14463-01	B1021 North St TILLINGHAM	SEP 2014	ATC
14463-02	B1021 South St TILLINGHAM	SEP 2014	ATC
14464-01	B1021 North St SOUTHMINSTER	SEP 2014	ATC
14465-02	Main Rd (S) ST LAWRENCE	SEP 2014	ATC
14466-02	Marsh Rd BURNHAM	SEP 2014	ATC
14527-01	B1018 Cripplegate SOUTHMINSTER	OCT 2014	ATC
14527-02	B1018 Scotts Hill SOUTHMINSTER	OCT 2014	ATC
14528-40	Maldon Rd SANDON	OCT 2014	ATC
14528-44	Willow Grove SWF	OCT 2014	ATC
14644-01	Burnham Rd LATCHINGDON	MAR 2015	ATC
14645-01	The Street LATCHINGDON	JAN 2015	ATC
15130-01	Church Rd LT BADDOW	MAR 2015	ATC
15130-03	Hammonds Rd (S) LT BADDOW	MAR 2015	ATC
15172-01	B1021 Church Rd BURNHAM	MAR 2015	ATC
15266-03	B1137 HATFIELD PEVEREL	JUN 2015	ATC
15409-01	Rectory Rd WOODHAM WALTER	NOV 2015	ATC
15409-02	Herbage Park Rd WOODHAM WALTER	NOV 2015	ATC
15412-02	B1018 Fambridge Rd MALDON	NOV 2015	ATC
15412-03	B1018 Fambridge Rd MALDON	NOV 2015	ATC
15426-03	B1137 Main Rd (E) BOREHAM	DEC 2015	ATC
16189-01	Steeple Rd MAYLAND	APR 2016	ATC
16190-01	Lodge Rd WOODHAM MORTIMER	APR 2016	ATC
16210-01	Steeple Rd (W) MAYLAND	MAY 2016	ATC
16210-03	Steeple Rd (E) MAYLAND	MAY 2016	ATC
16211-01	North Hill (N) LT BADDOW	MAY 2016	ATC
16223-01	B1018 The Causeway MALDON	MAY 2016	ATC
16258-01	Hackmans Ln COCK CLARKS	JUN 2016	ATC
16264-01	Woodhill Rd (W) DANBURY	JUL 2016	ATC
16264-02	Woodhill Rd (mid) DANBURY	JUL 2016	ATC
16264-03	Woodhill Rd (E) DANBURY	JUL 2016	ATC
16264-04	Bicknacre Rd DANBURY	JUL 2016	ATC
16265-01	Old Heath Rd (E) SOUTHMINSTER	JUL 2016	ATC
16265-02	Old Heath Rd (W) SOUTHMINSTER	JUL 2016	ATC
16271-01	B1019 Maldon Rd ULTING	JUL 2016	ATC
16272-01	Sporhams Ln (S) SANDON	JUL 2016	ATC
16344-01	B1010 Fambridge Rd Rd ALTHORNE	OCT 2016	ATC
16369-01	The Ridge LT BADDOW	NOV 2016	ATC
16376-01	London Rd MALDON	DEC 2016	ATC
17101-111	Main Rd RETTENDON COMMON	28 FEB 2017	ATC
17101-111	Main Rd RETTENDON COMMON	07 MAR 2017	ATC
17101-112	Creephedge Ln CHELMSFORD	28 FEB 2017	ATC
17101-112	Creephedge Ln CHELMSFORD	07 MAR 2017	ATC
17101-113	B1418 Main Rd CHELMSFORD	28 FEB 2017	ATC
17101-113	B1418 Main Rd CHELMSFORD	07 MAR 2017	ATC
17101-118	Honey Pot Ln CHELMSFORD	28 FEB 2017	ATC

Site Code	Site Location	Date	Type
17101-118	Honey Pot Ln CHELMSFORD	07 MAR 2017	ATC
17112-03	B1019 Maldon Rd (mid) LANGFORD	FEB 2017	ATC
17112-04	B1019 Maldon Rd (E) LANGFORD	FEB 2017	ATC
17128-01	B1018 High St SOUTHMINSTER	FEB 2017	ATC
17128-02	Burnham Rd SOUTHMINSTER	FEB 2017	ATC
17159-02	B1137 Main Rd BOREHAM	APR 2017	ATC
17159-03	B1137 Main Rd (E) BOREHAM	APR 2017	ATC
17193-01	Main Rd RETTENDON	23 MAY 2017	ATC
17200-03	The Street (E) STEEPLE	JUN 2017	ATC
17226-01	South Hanningfield Rd RETTENDON	JUN 2017	ATC
17226-01	South Hanningfield Rd (relaid) RETTENDON	JUN 2017	ATC
17259-01	Main Rd MUNDON	SEP 2017	ATC
17275-02	Ferrers Rd STH WOODHAM FERRERS	SEP 2017	ATC
17275-03	B1012 Burnham Rd (W) STH WOODHAM FERRERS	SEP 2017	ATC
17275-04	B1012 Burnham Rd STH WOODHAM FERRERS	SEP 2017	ATC
17306-02	A414 Maldon Rd (mid) WOODHAM MORTIMER	OCT 2017	ATC
17306-03	A414 Maldon Rd (E) WOODHAM MORTIMER	OCT 2017	ATC
17315-01	B1010 Lower Burnham Rd ALTHORNE	OCT 2017	ATC
17320-01	Burnham Rd LATCHINGDON	OCT 2017	ATC
17352-01	Riffhams Ln DANBURY	NOV 2017	ATC
17388-01	A414 Maldon Rd (E) WOODHAM MORTIMER	JAN 2018	ATC
17388-03	A414 Maldon Rd (W) WOODHAM MORTIMER	JAN 2018	ATC
17392-02	B1021 Southminster Rd (S) BURNHAM	JAN 2018	ATC
18114-01	The Street (W) STOW MARIES	JAN 2018	ATC
18114-02	The Street (E) STOW MARIES	JAN 2018	ATC
18132-01	Church Ln STOW MARIES	FEB 2018	ATC
18132-02	Honeypot Ln STOW MARIES	FEB 2018	ATC
18132-03	Crows Ln STOW MARIES	FEB 2018	ATC
18176-01	B1021 Church Rd BURNHAM	MAR 2018	ATC
18176-02	B1021 Station Rd BURNHAM	MAR 2018	ATC
18213-01	A132 Burnham Rd RETTENDON	APR 2018	ATC
18276-06	Main Rd BOREHAM	JUL 2018	ATC
18276-07	Winsford Way BOREHAM	JUL 2018	ATC
18276-08	Drovers Way BOREHAM	JUL 2018	ATC
18277-01	Steeple Rd ST LAWRENCE	JUL 2018	ATC
18298-01	Old Church Rd EAST HANNINGFIELD	SEP 2018	ATC
18323-01	B1010 Maldon Rd BURNHAM	SEP 2018	ATC
18417-01	The Tye EAST HANNINGFIELD	OCT 2018	ATC
18446-01	Hoe Ln STH HANNINGFIELD	NOV 2018	ATC
18461-01	B1010 Burnham Rd (S) HAZELEIGH	NOV 2018	ATC
18461-02	B1010 Burnham Rd (mid) HAZELEIGH	NOV 2018	ATC
18461-03	B1010 Burnham Rd (N) HAZELEIGH	NOV 2018	ATC
18461-04	B148 Southend Rd RUNSELL GREEN	NOV 2018	ATC
18512-01	Leighams Rd (N) BICKNACRE	DEC 2018	ATC
18512-02	Leighams Rd (S) BICKNACRE	DEC 2018	ATC
19156-01	Ferrers Rd (E) STH WOODHAM FERRERS	APR 2019	ATC
19158-01	Church Rd BOREHAM	APR 2019	ATC
19186-01	Paper Mill Bridge LT BADDOW	20 MAY 2019	ATC
19186-01	Paper Mill Bridge LT BADDOW	13 MAY 2019	ATC
19192-01	Lt Baddow Rd DANBURY	MAY 2019	ATC

Site Code	Site Location	Date	Type
14506-01	A414 Bell Hill DANBURY	10 SEP 2014	MCC
15335-02	B1012 Lower Burnham Rd STH WOODHAM FERRERS	16 SEP 2015	MCC
15426-04	B1137 Main Rd + Church Rd BOREHAM	08 DEC 2015	MCC
16342-17	A12 J18 + Maldon Rd (W) SANDON	18 OCT 2016	MCC
16342-18	A12 J18 + Maldon Rd (E) SANDON	18 OCT 2016	MCC
17112-06	B1137 The Street + B1019 Maldon Rd HATFIELD PEVEREL	07 FEB 2017	MCC
17112-06	B1137 The Street + B1019 Maldon Rd HATFIELD PEVEREL	04 FEB 2017	MCC
17112-07	B1019 Maldon Rd + B1018 Witham Rd LANGFORD	07 FEB 2017	MCC
17112-07	B1019 Maldon Rd + B1018 Witham Rd LANGFORD	04 FEB 2017	MCC
17247-01	Ferrers Rd + Albert Rd + Inchbonnie Rd SWF	06 JUL 2017	MCC
17247-02	Ferrers Rd + Inchbonnie Rd SWF	06 JUL 2017	MCC
17247-03	Burnham Rd + Hamberts Rd + Ferrers Rd SWF	06 JUL 2017	MCC
17275-18	Shaw Farm Roundabout STH WOODHAM FERRERS	20 SEP 2107	MCC
17275-19	B1418 + B1012 Burnham Rd STH WOODHAM FERRERS	20 SEP 2017	MCC
17275-20	B1012 Burnham Rd + Hullbridge Rd STH WOODHAM FERRERS	20 SEP 2017	MCC
17275-21	Hullbridge Rd + Clements Green Ln STH WOODHAM FERRERS	20 SEP 2017	MCC
17275-25	Rettendon Turnpike (N) BATTLESBRIDGE	20 SEP 2017	MCC
17275-26	Hawk Hill Roundabout (S) BATTLESBRIDGE	20 SEP 2017	MCC
17275-27	A130 Northbound slips + A132 Runwell Rd RUNWELL	20 SEP 2017	MCC
17308-01	A414 Maldon Rd + Well Ln DANBURY	23 NOV 2017	MCC
17308-02	A414 Maldon Rd + Runsell Ln DANBURY	23 NOV 2017	MCC
18212-02	Eves Corner DANBURY	10 MAY 2018	MCC
18212-03	Oak Corner RUNSELL GREEN	10 MAY 2018	MCC
18212-04	A414 Maldon Rd + B1018 Limebrook Way MALDON	10 MAY 2018	MCC
18212-05	A414 + Spital Rd MALDON	10 MAY 2018	MCC
18276-02	Generals Ln roundabout BOREHAM	04 JUL 2018	MCC
18276-03	A12 + Main Rd roundabout BOREHAM	04 JUL 2018	MCC
18276-04	Drovers Way roundabout BOREHAM	04 JUL 2018	MCC
18396-01	B1022 Colchester Rd + B1026 Goldhanger Rd HEYBRIDGE	25 SEP 2018	MCC

APPENDIX 6B
PEDESTRIAN CROSSING FACILITIES DESCRIPTIONS

Location	Crossing Type (Controlled/Uncontrolled)	Description
A414	Controlled Crossing	Zebra crossing located on the A414 to the west of the A414 Bell Lane/Well Lane roundabout.
		Pelican crossing to the west of Junction A414/Mayes Lane roundabout.
		Pelican Crossing to the east of Little Baddow Road/A414 Maldon Road roundabout.
		Zebra Crossing to the east of Copt Hill/A414 junction.
		Pelican Crossing located on the western approach to the A414/Belvedere Road T-Junction
	Uncontrolled Crossing	Uncontrolled crossing on A414 to the east of Danbury Palace Bus Stops.
		Uncontrolled crossing on A414 Main Road to the east of Elms Green Lane.
		Uncontrolled crossing to the west of A414/Mayes Lane roundabout.
		Uncontrolled crossing to the west of A414/Mayes Lane roundabout, on the approach to this junction.
		Uncontrolled crossing on the western approach to the A414/B148/B1010 roundabout.
		Uncontrolled crossing to the north west following the Maldon Road/Maldon roundabout.

Location	Crossing Type (Controlled/Uncontrolled)	Description
		Uncontrolled crossing on the approach to A414 Wycke Hill/B1018 Limebrook Way/A414 Maldon Road roundabout.
		Uncontrolled crossing on A414south of River Chelmer from the extension of Beeleigh Road to the east and Beeleigh Chase to the west.
		Uncontrolled crossing on northern arm of Fambridge Road/B1018/B1010 roundabout.
		Uncontrolled crossing on the exiting lane from the A414 Wycke Hill/B1018 Limebrook. Way/A414 Maldon Road roundabout onto A414 Wycke Hill.
		Uncontrolled crossings on all arms of A414/B1018/Fullbridge roundabout.
		Uncontrolled crossing on A414 east of bridge over Chelmer and Blackwater Navigation and west of B1018/A414/Fullbridge roundabout.
B1018	Controlled Crossing	Zebra crossing to the west of Bridgeman's Green.
		Zebra Crossing to the west of The Street/Steeple Road/B1018 mini roundabout.
		Zebra crossing south of The Street/Steeple Road/B1018 mini roundabout, in between Buchanan Way and Lawlinge Road.
	Uncontrolled Crossing	Uncontrolled crossing on the B1018 Scotts Hill western approach to B1018 Scotts Hill/B1021 Southfield Way junction.

Location	Crossing Type (Controlled/Uncontrolled)	Description
B1018	Uncontrolled Crossing	Uncontrolled crossing on the B1018 Scotts Hill eastern approach to B1018 Scotts Hill/B1021 Southfield Way junction.
		Uncontrolled crossing on B1018 approach to B1022 The Street / The Square roundabout.
B1022	Controlled Crossing	Zebra crossing east of the B1018 The Causeway / B1022 The Street roundabout
		Zebra crossings and central refuge island on southern arm of B1022 Colchester Road / B1026 Goldhanger Road roundabout
		Zebra crossing north of Towers Road / Wood Road / B1022 Colchester Road junction.
	Uncontrolled Crossing	Uncontrolled crossing on B1022 east of Hall Road / Colchester Road priority junction.
Maldon Road	Uncontrolled Crossing	Uncontrolled crossing to the east of Essex Yeomanry Way, to the east of Maldon Road/Baddow Hall Crescent junction.
		Uncontrolled crossing to the east of Essex Yeomanry Way, to the west of Maldon Road/Baden Powell Close junction.
		Uncontrolled crossing to the west of Great Baddow bus stop, adjacent to Molrams Lane.
A12	Uncontrolled Crossing	Uncontrolled crossing on the A12 on-slip onto Maldon Road/A414 roundabout.
		Two uncontrolled crossing on Hammonds Road on the approach to A414/Maldon Road roundabout.

Location	Crossing Type (Controlled/Uncontrolled)	Description
A12	Uncontrolled Crossing	Uncontrolled crossing on the off slip on the A12, from the A114/A12.
		Uncontrolled crossing on the off slip on the A130, from the A114/A12/Southend roundabout.
Rettendon Turnpike Roundabout	Uncontrolled Crossing	Uncontrolled pedestrian/cyclist crossing on the A132 at the Rettendon Turnpike roundabout
		Uncontrolled pedestrian/cyclist crossing on Woodham Road at the Rettendon Turnpike roundabout.
		Uncontrolled crossing on Main Road at the Rettendon Turnpike roundabout.
		Uncontrolled pedestrian/cyclist crossing on Burnham Road at the Rettendon Turnpike roundabout.
Hawk Hill Roundabout	Uncontrolled Crossing	Uncontrolled pedestrian/cyclist crossing on Burnham Road at the Hawk Hill roundabout.
A132	Uncontrolled Crossing	Uncontrolled crossing on the A132 prior to Willow Grove/B1012 Burnham Road/Ferrers Road/A132 junction.
B1012 Burnham Road	Controlled Crossing	Pelican Crossing on B1012 Burnham Road east of Sainsbury's access roundabout.
	Uncontrolled Crossing	Uncontrolled crossing on the B1012 Burnham Road prior to Willow Grove/B1012 Burnham Road/Ferrers Road/A132 junction.
		Uncontrolled crossing on the B1012 Burnham Road prior to B1418/B1012 Burnham Road/Old Wickford Road junction.

Location	Crossing Type (Controlled/Uncontrolled)	Description
B1012 Burnham Road	Uncontrolled Crossing	Uncontrolled crossing on B1012 Burnham Road opposite Sainsbury's and Medical Centre Bus Stop
		Uncontrolled crossing on western arm of B1012 Burnham Road/Sainsbury's site access roundabout.
Ferrers Road	Uncontrolled Crossing	Uncontrolled crossing on Ferrers Road arm of B1012 Burnham Road/Ferrers Road/Hamberts Road roundabout with pedestrian refuge island.
Spital Road	Controlled Crossing	Zebra crossing between St Peter's Avenue and Wentworth Meadows.
	Uncontrolled Crossing	Uncontrolled Crossing to the south of A414/Spital Road roundabout.
		Uncontrolled Crossing to the north of A414/Spital Road roundabout.
Southend Road	Uncontrolled Crossing	Uncontrolled crossing on Southend Road as part of a kerb buildout approximately 250m east of A130 roundabout.
		Uncontrolled crossing on Southend Road as part of a kerb buildout approximately 375m east of A130 roundabout.
		Uncontrolled crossing on northern approach to Southend Road/E Hanningfield Road junction.
E Hanningfield Road	Uncontrolled Crossing	Uncontrolled crossing on eastern approach to Southend Road/E Hanningfield Road junction.
		Uncontrolled crossing on East Hanningfield Road at bus stops for Nursery Home.

Location	Crossing Type (Controlled/Uncontrolled)	Description
Bicknacre Road	Uncontrolled Crossing	Uncontrolled crossing on Bicknacre Road south of priority junction with Highfields Mead.
Priory Road in Bicknacre	Uncontrolled Crossing	Uncontrolled crossing on Prioriy Road on approach to B1418 Main Road mini roundabout.
B1418	Uncontrolled Crossing	Uncontrolled crossing at bus stops on Main Road adjacent Ormonds Crescent.
		Uncontrolled crossing at bus stops on Main Road north of Lodge Road priority junction.
		Uncontrolled crossing on Maldon Road north of junction with Hyde Lane
B1021	Controlled Crossing	Zebra crossing located B1021 Church Road to the south of B1021 Southminster Road/Marsh Road/B1021 Church Road junction.
		Zebra crossing located on B1021 Station Road to the south of B1021 Church Road/Devonshire Road/B1021 Station Road/Foundry Lane.
		Zebra crossing located on B1021 Station Road between Queens Road and Western Road
		Zebra crossing located on B1021 Station Road between Remembrance Avenue and Brickwall Close
	Uncontrolled Crossing	Uncontrolled crossing B1021 Southfield Way, on the southern approach to B1018 Scotts Hill/B1021 Southfield Way junction.

Location	Crossing Type (Controlled/Uncontrolled)	Description
B1021	Uncontrolled Crossing	Uncontrolled crossing on B1021 Station Road, to the south of Alexandra Road.
		Uncontrolled crossing on B1021 Station Road, to the south of Devonshire Road.
Hackmans Lane	Uncontrolled Crossing	Uncontrolled crossing on Hackmans Lane on approach to Howe Green Road priority junction.
B1010 Barons Lane	Uncontrolled Crossing	Uncontrolled crossing on Barons Lane west of eth priority junction with Fambridge Road.
Fambridge Road	Controlled Crossing	Zebra crossing on the northern approach to Spital Road/Friars Lane junction.
		Zebra crossing to the south of Spital Street/New Street junction.
		Zebra crossing to the north of Fambridge Road/Mayflower Drive junction.
Latchingdon Road	Controlled Crossing	Zebra crossing located between Cherry Blossom Lane and St Stephens Road.
Maldon Road northwest of Latchingdon	Uncontrolled Crossing	Uncontrolled crossing on northern side of bridge over water course north of Thatchers Croft.
		Uncontrolled crossing on southern side of bridge over water course north of Thatchers Croft.
The Street / Bradwell Road in Steeple	Uncontrolled Crossing	Uncontrolled crossing west of priority junction with Batt's Road / The Street / Bradwell Road.

Location	Crossing Type (Controlled/Uncontrolled)	Description
Burnham Road in Southminster	Uncontrolled Crossing	Uncontrolled crossing north of B1021 Southfield Way/Burnham Road/Rose Drive roundabout.
B1021 North Road in Southminster	Uncontrolled Crossing	Uncontrolled crossing on B1021 north of priority junction of Station Road / North Road.

APPENDIX 7A
NOISE SURVEY AND MONITORING PLAN

Bradwell B Project

Noise Survey and Monitoring Plan

Wood Environment & Infrastructure Solutions UK Limited – August 2020

BBX32810001WOOD00PT

Version P03

Report for

Bradwell Power Generation Company Limited (BRB)

5F Rex House,

4-12 Lower Regent Street

London

SW1 4PE

[redacted]

[redacted]

[redacted]

[redacted]

Wood

Partnership House

Regent Farm Road

Gosforth

Newcastle upon Tyne

NE3 3AF

United Kingdom

Tel +44 (0) 191 272 6100

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Author:	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
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APPPENDICES

1. INTRODUCTION

1.1 Background

1.1.1 Bradwell Power Generation Company Limited (BRB GenCo) proposes to develop a new nuclear power station, called the Bradwell B Project, near Bradwell-on-Sea in Essex (hereafter referred to as the Project). The Project would comprise twin UK HPR1000 reactors with a combined electrical capacity of 2,340 Megawatts (MW).

1.1.2 The area of land within which the Bradwell B power station would be built is located next to the Blackwater Estuary on the Dengie Peninsula, approximately 15 kilometres (km) east of the town of Maldon, 1 km north-east of the village of Bradwell-on-Sea within the District of Maldon, Essex. It lies adjacent to the existing Bradwell Nuclear Power Station, which ceased operation in 2002. The power station is being decommissioned by the Nuclear Decommissioning Authority (NDA) and entered the Care and Maintenance phase in 2018.

1.2 Site Context

1.2.1 For the purposes of this Survey and Monitoring Plan (SMP) the land area covered by the Indicative Main Development Site boundary, Potential Temporary Workers Accommodation site boundary and Potential Expansion Area for Temporary Workers Accommodation: central National Grid Reference (NGR) 601000E, 209000N is identified hereafter as the Site (see **Figure 1.1**).

1.2.2 In addition to the range of development activities that relate to the Site there will be a requirement for off-site Associated Development (AD) in order to construct and operate the Project. Such development is expected to include but may not be limited to: park and ride facilities, off-site freight management and potential new or enhanced transport infrastructure.

1.2.3 The requirements with respect to the locations and extents of the off-site AD are currently being considered and as a result only a high-level methodology is provided in this SMP. However, the overarching methodologies and approaches (where relevant) will still be applicable to these off-site Associated Development sites (ADs), but the survey extents, geographical coverage and study areas will be confirmed once Project requirements with respect to site location, spatial area and design layout are known with sufficient certainty to enable representative baseline monitoring to be undertaken.

1.2.4 The description of the Project, including indicative site boundaries, presented in this SMP reflects the Project status at the point that the SMP was issued to consultees to inform workshops held in June 2020, with subsequent updates to take into account workshop feedback and responses from consultees. As the Project progresses, further iterations of the SMP will be required as proposals are refined, in particular, with respect to off-site ADs. The technical scope contained herein remains applicable irrespective of any future boundary changes (should this be required), subject to a review of receptors and spatial scope.

1.3 Purpose of this Document

1.3.1 The purpose of this SMP is to present the relevant baseline characterisation for agreement with consultees. Such details include the methods to be employed and the spatial and temporal requirements for surveys/monitoring to be undertaken at the Site during 2020 and January-March 2021.

1.3.2 The SMP will be updated in respect of the off-site ADs following completion of desk studies and confirmation of preferred options.

1.3.3 The preliminary purpose of these surveys will be to determine robust and accurate baseline data to inform the Environmental Impact Assessment (EIA) and Habitat Regulations Assessment (HRA).

1.4 Sources scoped out

1.4.1 Vibration effects are usually assessed against a fixed limit at a receptor location, irrespective of existing background vibration levels. The measurement of background vibration levels is therefore not normally carried out, unless a significant source of vibration has been identified, during a pre-monitoring site walkover or as a result of engagement. Therefore, it is not proposed to undertake background vibration monitoring as part of the assessment of the Project.

1.4.2 This does not preclude the measurement of vibration at sensitive buildings during the construction phase. The requirement for such measurement will be considered during the drafting of the Construction Environmental Management Plan, but this does not form part of the baseline characterisation.

1.5 Desktop Study

1.5.1 The desktop study survey area is defined as the Site and an area up to 1 km from the Site boundary. This desk-based data gathering exercise is required to inform the need for further noise and vibration surveys in relation to the Project.

1.5.2 Information will be sought from a range of sources, including aerial photography resources (Ref. 1), planning applications in the vicinity of the Project site and existing survey data to identify data gaps and the surveys required to fill these gaps to support a robust impact assessment.

1.5.3 **Table 1.1** summarises the data accessed and/or identified to date. Should further datasets become available, the survey and monitoring requirements would be assessed and amended as appropriate.

Table 1.1 Sources of data for the desk-based assessment

Name	Brief Description
Site Visit 17 August 2017 'walkover survey' to inform the preliminary Ground Investigations Planning Application.	A Wood. acoustic engineer undertook a site visit on 17 August 2017, during which several observations were made regarding the existing acoustic climate. Although the site visit dates back to 2017, it is considered unlikely that a substantial change to the acoustic climate has occurred.
Bradwell Site Issue 3 Strategic Environmental Assessment, Site Specific Baseline (2014) (Ref. 2).	Noise monitoring used to inform existing baseline conditions.
Bradwell Power Station Intermediate Level Waste Storage Environmental Statement March (2004) (Ref. 3).	Noise monitoring undertaken as part of the planning applications for the decommissioning of Bradwell A.
Bradwell Windfarm Environmental Statement (2006) (Ref. 4).	Noise monitoring undertaken in 2005 as part of the planning applications for Bradwell Wind Farm.
BS 5228-1:2009 + A1:2014 *Code of practice for noise and vibration control on construction and open sites Part 1: Noise* (Ref. 5).	Where there are items of construction plant where no data is available, rather than survey them, information provided in Annex C within BS 5228-1 will be used.
BS 5228-2:2009 + A1:2014 *Code of practice for noise and vibration control on construction and open sites Part 2 – Vibration* (Ref. 6).	Where there are items of construction plant where no data is provided, rather than survey them, information provided in Annex C and Annex D of BS 5228-2 will be used.

2. SURVEY PROPOSALS

2.1 Construction and Operational Noise Surveys at the Site

Survey Area

2.1.1 The operational noise survey area is defined as the Site plus a 1 km buffer (**Figure 2.1**). The construction study area also lies within this Site plus a 1 km buffer.

2.1.2 Surveys are required to inform the assessment of potential noise effects upon human and ecological receptors caused by the construction and operation associated with the Project.

2.1.3 The results of the ambient noise monitoring will be used to facilitate the assessment of potential construction noise impacts from the various elements of the construction programme.

2.1.4 The results of the background and ambient noise monitoring will be used to facilitate the assessment of commercial/industrial noise emissions.

Human Receptors

2.1.5 Noise monitoring locations have been selected to be representative of those properties likely to be worst affected by impacts from the construction and operation of the Project. The noise monitoring locations have been identified using aerial imagery and OS mapping.

2.1.6 In order to label the noise monitoring locations in a logical format and relevant to the assessment methodology the following considerations have been made in this order of priority:

- if the noise monitoring location is within 1km from the main development site boundary = (M) for Main Development site;
- if the noise monitoring location is further than 1km from the main development site boundary = (A) for Associated Development site;
- the anticipated likely dominant noise source at the noise monitoring location during operation: (P) for Power Station and (R) for Road traffic;
- if the noise monitoring will extend for 24hours or more = (L) for long-term monitoring; and,
- if the noise monitoring will not extend for more than 24hours = (S) for short-term monitoring.

2.1.7 The locations likely to be surveyed are listed below and illustrated on **Figure 2.1:**

- A residential property within Bradwell Waterside, which will also likely be representative of noise levels at Bradwell Marina (MPL1);
- A residential property within the residential area forming the western part of Bradwell-on-Sea (MPL2);
- A residential property within the residential area forming the northern part of Bradwell-on-Sea (MPL3);
- A residential property within the residential area forming the southern part of Bradwell-on-Sea (MPL4);
- A residential mobile home or permanent property within Eastland Meadows Country Park (MPL5);
- The Othona Community (MPL6);
- East Hall Farm (MPL7);
- A residential property located adjacent to the B1021 (MPL8); and
- A property located approximately 80 metres (m) to the west of the existing power station site boundary (MPL9).

2.1.8 The specific locations listed above may be refined based on the findings of the Site walkover and reconnaissance in the vicinity of the monitoring locations, and through engagement with the local authority. Third party / landowner approval will also be required and where this is not possible or provided, alternative locations will be proposed and agreement sought from the local authority.

2.1.9 As per the guidance set out in the BS 4142:2014

"To obtain a representative background sound level a series of either sequential or disaggregated measurements ought to be carried out for the period(s) of interest, possibly on more than one occasion".

A number of short term monitoring locations (which will be defined once land access agreements have been confirmed) will be used for monitoring in the area surrounding the long term monitoring locations listed above. These measurements will help characterise the baseline conditions for each assessment location, focusing on multiple sites.

Ornithological Receptors

2.1.10 There will also be a study area for bird species that form part of the qualifying features for Blackwater Estuary SPA/Ramsar Site/SSSI and Dengie SPA/Ramsar Site/SSSI. This study area has been defined in conjunction with the Biodiversity team.

2.1.11 Noise monitoring locations have been selected to be representative of those areas of particular sensitivity to overwintering and breeding birds associated with the designated sites. The noise monitoring locations have been identified using aerial imagery and OS mapping. The locations likely to be surveyed are listed below and illustrated on **Figure 2.1**:

- six locations corresponding with ornithological observation points along the intertidal edge of the Borrow Dyke;
- two locations to the landward side of the Borrow Dyke on the farmland, one close to the Borrow Dyke and one on fields utilised by foraging geese in winter 2020/2021 (exact locations yet to be determined); and,
- a single location on Sandbeach SSSI (designated for overwintering brent geese).

Survey Methods: Human Receptors

2.1.12 Surveys will deploy sound level meters at locations suitable for the purpose and representative of receptors. Long-term measurements of approximately 1-week will be undertaken, supplemented with attended day/evening/night short term measurements to determine the acoustic context of the receptor sites. Overnight measurements will be conducted where long-term measurement locations are unavailable. Short-term measurements of a minimum 3 hours will be carried out for road noise model validation purposes.

2.1.13 Noise measurements at locations representative of the closest sensitive receptors will be undertaken in order to determine the existing baseline ambient and background noise levels at these properties.

2.1.14 The ambient and background noise measurements undertaken in support of the construction and operational noise assessments will include measurements of the existing noise environment, in addition to gathering details of any dominant contributors to the noise climate. Where necessary, noise levels from existing contributors to the noise climate will be measured in order that they can be quantified in the final assessment. Standalone weather stations will be installed at a representative sample of the noise data collection locations over the survey period(s). This information would be used to filter out data collected during adverse weather conditions and thus ensure a robust dataset for assessments.

2.1.15 Surveys will be undertaken when conditions are considered most typical, i.e. outside of school holidays and when impacts from restrictions due to Covid-19 have diminished and are no longer a significant influence on baseline conditions.

2.1.16 The standards and proposed detailed methodology are set out in **Section 2.3.6**.

Survey Methods: Ornithological Receptors

2.1.17 In order to help determine impact on ornithological receptors that form part of the qualifying features for Blackwater Estuary SPA/Ramsar Site/SSSI and Dengie

SPA/Ramsar Site/SSSI a survey of baseline noise is proposed. Surveys will deploy sound level meters at locations suitable for the purpose and representative of receptors.

2.1.18 The survey will capture instantaneous (L_{max}) and baseline and ambient noise (in terms of L_{90} and L_{eq}).

2.1.19 Surveys will be undertaken where practical to coincide with the observational surveys by the ornithology survey team.

2.1.20 Standalone weather stations will be installed at a representative sample of the noise data collection locations for the survey period(s). This information would be used to inform any relevant commentary on the relationship between noise and bird behaviour abundance and distribution. If appropriate, it will also be used to screen out data collected during adverse weather conditions if required to ensure a robust dataset.

2.1.21 The full definition of the noise survey methodology will be confirmed for the European Site qualifying features following further consultation with Natural England, and will be reported in a future SMP update.

2.1.22 The ecological noise monitoring locations are detailed in **Figure 2.3**.

2.2 Road Traffic Noise Survey (The Site)

Survey Area

2.2.1 The road traffic noise survey area is defined by linear corridors along the existing road network extending to the west from the Site (**Figure 2.2**). Surveys will be carried out at specific locations along the roads shown. The surveys are required to inform the assessment of potential effects on human receptors caused by changes in road traffic noise. These noise measurements are also required in order to validate the baseline scenario for predictive noise modelling which will be used in the assessment of changes in road noise emissions at the sensitive receptors during the construction and operation of the Project. The construction vehicle routes are currently in optioneering phase and therefore the study area is not fixed. As a consequence, it is not, at first issue of this SMP, possible to define all the survey locations that will be needed for receptors close to roads used during the construction phase of the Project For surveys associated with proposed changes to the road network, see **Section 2.3**.

2.2.2 At the time of first issue of this SMP, the proposed locations that can be defined for survey are listed below and illustrated in **Figure 2.2:**

- B1021 close to Bradwell Marina (MRS1);

- East End Road between Hockley Lane and Eastland Meadows Country Park (MRS2);
- Adjacent to residential properties close to the junction of Maldon Road and the B1021 (MRS3);
- B1021 Bradwell Road close to the junction with Mark Road (MRS4);
- B1021 within the village of Tillingham (MRS5);
- Along Maldon Road (MRS6);
- Close to residential property on Bradwell Road (MRS7); and
- The Street within the village of Steeple (MRS8).

2.2.3 The specific locations listed above may be refined based upon the findings of the site reconnaissance walkover and engagement with the local authority.

Survey Methods

2.2.4 For predicted changes in road traffic during the construction phase, 3-hour measurements will be undertaken in accordance with the shortened measurement procedure in the Department of Transport document Calculation of Road Traffic Noise (CRTN) 1988 (Ref. 7). These measurements are proposed for model validation purposes at representative locations.

2.2.5 For the assessment of road traffic noise associated with the Site, it is envisaged that measurements would be required at a minimum of 8 locations which are proposed to include those listed in paragraph 2.2.2.

2.2.6 Data collected during road traffic monitoring surveys will include measurements of existing noise levels, and details of the:

- Count of each type of vehicle passing the survey locations during the survey period;
- Prevailing meteorological conditions;
- Road surface type and condition (where practical); and
- Any existing mitigation such as traffic calming measures.

2.2.7 Surveys will be undertaken when conditions are considered most representative and typical, i.e. outside of school holidays and when impacts from travel restrictions due to Covid-19 have diminished.

2.3 Off-Site Associated Development

2.3.1 The off-site ADs will consist of:

- Highways improvements including new sections of road, both on-route & off-route;
- Park and ride sites for construction workers; and
- Freight management facilities.

2.3.2 The potential park and ride sites, freight management facilities, highways improvements, and highway network impacted by these developments, are primarily located within the administrative areas of Maldon District Council and Chelmsford City Council.

2.3.3 At the time of first issue of this SMP, location options for the off-site ADs are currently subject to further assessment. This means that site locations are not currently confirmed and therefore survey locations cannot be fixed at this time. Therefore, the approach set out below is intended to enable engagement with the relevant stakeholders on the selection criteria for the survey locations and the methodology for the surveys.

2.3.4 For the on-route changes to the road network, 3-hour measurements in accordance with the shortened measurement procedure in CRTN are proposed for model validation purposes at representative locations. Additionally, for the off-route changes, it is anticipated that longer term monitoring at suitable locations will be required at locations close to the most exposed residential dwelling relative to the off-route corridor alignment.

2.3.5 Three potential Park and Ride search areas have been identified which are located approximately 20, 30 and 40 minutes' drive from the Site, where construction workers would park their cars and be subsequently taken by bus to the Site.

2.3.6 The current optioneering process is considering requirements for Freight Management Facilities (FMF). FMFs will assist in managing HGV movements on local roads, such as to reduce such movements during peak or sensitive hours.

2.4 Data Collection Methodology

2.4.1 The following data collection methodology details are applicable for noise data collection.

2.4.2 Noise measurements will be supervised on site by suitably qualified personnel. Suitably qualified shall mean qualified to the Institute of Acoustics Certificate of Competence in Environmental Noise Monitoring, as a minimum.

2.4.3 Noise levels will be measured using an integrating averaging sound level meter (SLM) or equivalent system conforming to Class 1 or better as defined by BS EN 61672-1:2013 *Electroacoustics – Sound level meters – Part 1: Specifications* (Ref. 8). An acoustic calibrator will be used to check the sensitivity of the measuring equipment on deployment and collection. Any drift in calibration levels will be noted,

and data discarded and new data gathered in the event that the drift is equal to or greater than 0.5dB.

2.4.4 For all noise surveys, the equipment used would also have undergone laboratory calibration at a UKAS accredited laboratory within a period not exceeding two years prior to use. Equipment to measure local wind speeds (for example a handheld anemometer) and air temperature would also be deployed on the day of each survey.

2.4.5 Wherever possible, and in order to comply with recommendations made in several British Standards, noise measurements will be made during conditions with low windspeeds. For linear transportation, measurements would where practical be selected such that there is likely to be a positive wind component from the source to the monitoring point.

2.4.6 It is envisaged that logging meteorological stations will be installed over the survey period at locations representative of the long-term monitoring sites. These stations will log meteorological data which as a minimum will include wind speed and direction and precipitation. This meteorological information will be used in the analysis of the noise data to ensure that only data collected under appropriate weather conditions will be included in any assessment.

2.4.7 Unless otherwise stated, noise measurements for human receptors will be undertaken in accordance with BS 4142:2014 + A1:2019 Methods for rating and assessing industrial and commercial sound (Ref. 9) and BS 7445-1:2003 *Description and measurement of environmental noise – Part 1: Basic quantities and procedures* (Ref. 10), i.e. with microphones mounted to a minimum height of 1.2 – 1.5 m above ground level, and no less than 3.5 m from any reflecting surface other than ground at a residential receptor or representative proxy.

2.4.8 The proposed long-term unattended baseline monitoring, to be used within the construction and operational noise assessments, will be undertaken continuously for not less than 1 week, at locations likely to be those shown in **Figure 2.1** noting that precise locations may be subject to change following site walkover reconnaissance and the availability of additional Project design and site layout details. This would allow an adequate understanding of the short and long-term changes in baseline and background noise environments at each location.

2.4.9 Receptor sites near Park and Ride and FMF Associated Development, and new off-route road sections will be monitored at representative receptor locations for a period of not less than 1 day.

2.4.10 Road traffic noise will be quantified at each roadside monitoring location using a single set of attended measurements taken within 3 contiguous hours, between the hours of 10:00 – 17:00, in accordance with the shortened measurement method set out within CRTN (Ref. 7).

2.5 Data Presentation

2.5.1 Detailed and comprehensive notes will be undertaken throughout and upon completion of each survey. The survey notes will include, as a minimum, the following information:

- The results of all noise measurements;
- Details of the instrumentation used, including calibration details;
- Details of any corrections made to the noise measurements;
- The type, frequency and duration of any events paused from the measurements;
- Details of extraneous noise events affecting the results; and
- Details of the meteorological conditions prevailing during the surveys.

3. SURVEY PROGRAM

3.1.1 The surveys for the Site, for impacts on human receptors, are anticipated to be undertaken between September 2020 and March 2021.

3.1.2 The off-site ADs surveys will commence after April 2021.

3.1.3 For Special Protection Areas, the surveys will be carried out to a programme to which Natural England's agreement will be sought, and will be reported in a future SMP note following further consultation.

4. REFERENCES

Ref. 1. Google Earth Pro Version 6.2.2.6613, 2012

Ref. 2. Nuclear Decommissioning Authority. Bradwell Site, Strategic Environmental Assessment Site, Specific Baseline. Issue 3. Bradwell: Magnox, 2014.

Ref. 3. Bradwell Power Station Intermediate Level Waste Storage Environmental Statement March 2004.

Ref. 4. RWE Group. Bradwell Windfarm Environmental Statement. Npower Renewables, 2006.

Ref. 5. British Standards Institution. BS 5228-1:2009 + A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise. London, BSI, 2014.

Ref. 6. British Standards Institution. BS 5228-2:2009 + A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration. London, BSI, 2014.

Ref. 7. Great Britain. Department of Transport Welsh Office. Calculation of Road Traffic Noise. London: The Stationery Office, 1988.

Ref. 8. British Standards Institution. BS EN 61672-1:2013 Electroacoustics – Sound level meters – Part 1: Specifications. London, BSI, 2013.

Ref. 9. British Standards Institution. BS 4142:2014 + A1:2019 Methods for rating and assessing industrial and commercial sound. London, BSI, 2019.

Ref. 10. British Standards Institution. BS 7445-1:2003 Description and measurement of environmental noise – Part 1: Basic quantities and procedures. London, BSI, 2003.

APPENDIX A
FIGURES

Figure 1.1: The Site

Figure 2.1: Long term monitoring zones

Figure 2.2: Short term monitoring locations for road traffic noise associated with the Site

Figure 2.3: Ecological moniotoring locations

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Indicative site layout

0 200 400 600 800 m

Scale at A3: 1:15,000

Bradwell B Nuclear Power Plant Project
Noise Survey and Monitoring Plan 2020/21

Figure 1.1
The Site

April 2020

wood.

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Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative site layout
- 1km study area
- Long term monitoring locations

0 200 400 600 800 1,000 1,200 m

Scale at A3: 1:20,000

Bradwell B Nuclear Power Plant Project
Noise Survey and Monitoring Plan 2020/21

Figure 2.1
Long term measurements

August 2020

wood.

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585000 590000 595000 600000 605000

210000 205000 200000 195000

MRS1 MRS2 MRS3 MRS4 MRS5 MRS6 MRS7 MRS8

MALDON DISTRICT

RIVER BLACKWATER

RIVER CROUCH

WALLASEA ISLAND

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative site layout
- Short term monitoring locations

0 1,000 2,000 3,000 4,000 m

Scale at A3: 1:75,000

Bradwell B Nuclear Power Plant Project
Noise Survey and Monitoring Plan 2020/21

Figure 2.2
Short term monitoring locations for road traffic noise associated with the Site

August 2020

wood.

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative site layout
- Ecological monitoring zones
- Ecological monitoring locations

EML1
EML2
EML3
EML4
EML5
EML6
EML7

EMZ1
EMZ2

Sales Point
Community Settlement
OTHONA ROMAN FORT
Chapel of St Peter on the Wall
Weymarks Farm
Irrigation Reservoirs
East Hall Farm
Eastlands
Caravan Park
Munkins Farm
ROMAN ROAD
East Hall
St Peter's Way
Bradwell Marshes
Bradwell Marsh Wind Farm
Glebe Outfall

Bradwell Nuclear Power Station
Electricity Switching Station
Airfield (disused)
Downhall Farm
Bradwell Waterside
Pewet Island
Marina
Playing Field
War Meml
Trusses Road
Down Hall
Peveralls
East End
Woodyards
Westwick Farm
Down Westwick
Waterside Road
Cemy
Sch
Bradwell on Sea
Blackberry Grove
Hockley
Bradwell Lodge
Bacons
Delameres Farm
Orplands
Kennel Barn
Gravel Pit
Mean Low Water
Mean High Water
B1021
BRADWELL-ON-SEA CP

0 200 400 600 800 m

Scale at A3: 1:15,000

Bradwell B Nuclear Power Plant Project
Noise Survey and Monitoring Plan 2020/21

Figure 2.3
Noise monitoring locations for ecological receptors

August 2020

wood.

APPENDIX 8A
AIR QUALITY SURVEY AND MONITORING PLAN

Bradwell B Project

Air Quality Survey and Monitoring Plan

Wood Environment & Infrastructure Solutions UK Limited – August 2020

BBX00550001WOOD02TR

Version P03

Report for

Bradwell Power Generation Company Limited (BRB)

5F, Rex House,

4-12 Lower Regent Street

London

SW1 4PE

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Wood

Partnership House

Regent Farm Road

Gosforth

Newcastle upon Tyne

NE3 3AF

United Kingdom

Tel +44 (0) 191 272 6100

Doc Ref. 42781-WOOD-XX-XX-RP-OA-0001_S0_P03

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Author:	[redacted]
Reviewers:	[redacted]
Owner:	[redacted]

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TABLES

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1. INTRODUCTION

1.1 Background

1.1.1 Bradwell Power Generation Company Limited (BRB GenCo) proposes to develop a new nuclear power station, called the Bradwell B Project, near Bradwell-on-Sea in Essex (hereafter referred to as the Project). The Project would comprise twin UK HPR1000 reactors with a combined electrical capacity of 2,340 MW.

1.1.2 The area of land within which the Bradwell B power station would be built is located next to the Blackwater Estuary on the Dengie Peninsula, approximately 15 kilometres (km) east of the town of Maldon, 1 km north-east of the village of Bradwell-on-Sea within the District of Maldon, Essex. It lies adjacent to the existing Bradwell Nuclear Power Station, which ceased operation in 2002. The power station is being decommissioned by the Nuclear Decommissioning Authority (NDA) and entered the Care and Maintenance phase in 2018.

1.2 Site Context

1.2.1 For the purposes of this Survey and Monitoring Plan (SMP) the land area covered by the Indicative Main Development Site boundary, Potential Temporary Workers Accommodation Site boundary, Potential Expansion Area for Temporary Workers Accommodation Site boundary: central National Grid Reference (NGR) 601000E, 209000N is identified hereafter as the Site (see **Figure 1.1**). This SMP also addresses baseline monitoring at locations along potential road transport routes for early works traffic access to the Site.

1.2.2 In addition to the range of development activities that relate to the Site there will be a requirement for off-site Associated Development (AD) in order to construct and operate the Project. Such development is expected to include but may not be limited to park and ride facilities, off-site freight management and potential new or enhanced transport infrastructure.

1.2.3 The requirements with respect to the locations and extents of the off-site AD are currently being considered. However, the overarching methodologies and approaches will still be applicable to these off-site Associated Development sites (ADs). Since the off-site ADs will be located along the considered transport routes, the proposed survey extent provides sufficient geographical coverage to include future off-site ADs.

1.2.4 The description of the Project, including indicative site boundaries, presented in this SMP reflects the Project status at the point that the SMP was issued to consultees to inform workshops held in June 2020, with subsequent updates to take into account workshop feedback and responses from consultees. As the Project progresses, further iterations of the SMP will be required as proposals are refined, in particular, with respect to off-site ADs. The technical scope contained herein remains applicable irrespective of any future boundary changes (should this be required), subject to a review of receptors and spatial scope.

1.3 Purpose of this Document

1.3.1 The purpose of this SMP is to present the relevant baseline characterisation details for agreement with consultees. Such details include the methods to be employed and the spatial and temporal requirements for air quality surveys/monitoring to be undertaken at the Site (including along potential early years road transport routes to the Site) and the village of Bradwell-on-Sea, from August 2020 to July 2021.

1.3.2 The primary purpose of the survey and monitoring programme is to determine a robust and accurate baseline to inform the Environmental Impact Assessment (EIA) and filed data that will be used to validate the air quality dispersion model.

1.3.3 This survey does not cover monitoring during the construction and operation of the projects. A dedicated monitoring campaign will be planned and performed before the beginning of the construction phase based on the outcome of the air quality assessment and, in particular, based on the result of the dispersion modelling for the different sources and phases of the projects, which will confirm the area of influence of each activity.

2. SURVEY PROPOSALS

2.1.1 Baseline monitoring will be carried out for nitrogen dioxide (NO_2), fine particulate matter (PM_{10}/$PM_{2.5}$) and dust deposition.

2.1.2 It is proposed that air quality monitoring will take place on a monthly basis for a full calendar year between August 2020 and July 2021.

2.2 Survey

Survey Area

2.2.1 The survey area will include monitoring locations within and in the vicinity of the Site boundary, the village of Bradwell-on-Sea and along potential early years road transport routes. The monitoring locations are presented in **Figure 2.1**.

2.2.2 Monitoring locations within the Site boundary will be established to monitor baseline dust deposition, NO_2 and PM_{10}/$PM_{2.5}$ concentration levels which will then be used to inform air quality assessment and related management/mitigation measures focussed upon the construction phase of the Project.

2.2.3 The village of Bradwell-On-Sea, which lies to the south and south-west of the Site, is the main receptor location with respect to air quality in the context of construction and operational activities at the Site, hence, dust deposition, NO_2 and PM_{10}/$PM_{2.5}$ monitoring locations will be sited within the settlement boundary to ascertain the current baseline air quality levels from sources such as road vehicle emissions, track-out i.e. the movement of dust from construction sites onto the road network, which is then re-suspended by vehicle movements, and fugitive dust.

2.2.4 The monitoring locations to be established along potential early years road transport routes to the Site are to monitor vehicle emissions from traffic on the roads which link Bradwell and other settlements to the wider strategic road network.

2.2.5 Within Chelmsford City Council and Maldon District Council administrative areas, diffusion tubes have been installed by the local authorities to monitor NO_2 levels related primarily to road traffic emissions. The proposed approach is to avoid installing additional diffusion tubes in areas already covered by the respective local authorities. Monitoring results from the existing network will be obtained and used to inform the baseline as well as to verify the road traffic emission model. The monitoring locations operated by Chelmsford City Council and Maldon District Council which are proposed to be used are shown in **Figure 2.1**. Contact has been made with the local authority representatives responsible for the monitoring network operation to ensure consistency in terms of equipment used to measure NO_2 concentrations.

Survey Methods

2.2.6 All survey methods outlined within this document have been designed based on best practise guidance from Defra (Ref. 1) and professional judgement.

Nitrogen Dioxide (NO_2)

2.2.7 Nitrogen dioxide monitoring is required in order to inform the assessment of potential effects on receptors caused by changes in air quality resulting from exhaust emissions from plant and site vehicles, site clearance and preparation, construction and operational activities, together with the effects of emissions from road traffic movements on the local road network.

2.2.8 Passive sampling methods (diffusion tubes) will be used for monitoring ambient NO_2 to provide an indicative comparison with the Air Quality Objectives (AQOs) based on the annual mean. The diffusion tubes will be installed and removed monthly (exposure period of 30 days) for a full calendar year at the proposed monitoring locations in accordance with Defra guidance. The diffusion tubes will be assembled on-site prior to installation.

2.2.9 The LAQM (TG) 16 guidance recommends monitoring is undertaken over a minimum consecutive six-month period, including three months during winter and three months during summer, and, preferably, over a calendar year.

2.2.10 During the monitoring events, the start and end dates as well as the start and end times will be recorded to ensure that the final calculations are undertaken correctly. Field log sheets are presented in **Appendix B**.

2.2.11 The accuracy of tubes will be quantified once the laboratory results are received. An appropriate bias adjustment factor specifically for the calendar year of monitoring will be applied to the annual mean.

2.2.12 To ensure consistency between the BRB monitoring survey and the monitoring undertaken by the local authorities, the same type of diffusion tubes currently deployed by CCC and MDC i.e. 50% Triethanolamine (TEA) absorbent in acetone preparation will be used.

2.2.13 Twenty-five locations have been identified and are shown in **Figure 2.1**.

Particulate Matter (PM_{10} and $PM_{2.5}$)

2.2.14 PM_{10} and $PM_{2.5}$ baseline monitoring is required in order to inform the assessment of potential effects on human receptors caused by changes in air quality resulting from site clearance, construction and operational activities.

2.2.15 An Osiris system will be used to monitor PM_{10} and $PM_{2.5}$. This instrument will measure PM_{10} and $PM_{2.5}$ on a continuous basis to facilitate comparison of results with the short-term (24-hour average) and long-term (annual average) AQOs. Access to power will be needed in order to operate the Osiris.

2.2.16 Sim cards will be installed in the Osiris monitor to allow for the remote downloading of PM_{10} and $PM_{2.5}$ monitoring data via a web server. This will also assist the team in monitoring the accuracy and data capture rate of the monitor and ensuring the monitor operates adequately during the survey programme.

2.2.17 During the monthly site visits, the Air Quality Team will undertake basic maintenance on the monitor to ensure that the monitor continues to operate efficiently.

2.2.18 Data will be downloaded monthly and processed for inclusion into the air quality monitoring database for the project.

2.2.19 The preliminary location for the Osiris is shown in **Figure 2.1**. In addition to this, a location for a second Osiris monitor has been identified, however, it is optional.

Dust Deposition

2.2.20 The baseline monitoring of dust is required to inform the assessment of potential effects on human and ecological receptors caused by changes in air quality resulting from, in particular site preparation and clearance and construction activities.

2.2.21 Stand-alone dust settlement gauges will be installed to determine the total dust deposition, in terms of milligrams of dust deposited per square metre per day ($mg/m^2/day$), averaged over the one-month collection period. This will be compared to a 'custom and practice' threshold of 200 $mg/m^2/day$ in the absence of a recognised limit value for fugitive dust (Environment Agency M17[1]).

2.2.22 The dust discs will also provide the Effective Area Coverage (EAC) (i.e. dust soiling or discolouration caused by dust) and Absolute Area Coverage (AAC) (i.e. dust coverage irrespective of colour). The dust data is reported as %AAC and EAC% per sampling period and day.

2.2.23 A field log sheet for dust deposition is included in **Appendix B**. The field log sheet will be used to record the start and end dates as well as site observations noted during the installation and removal of the bottles.

2.2.24 Eight preliminary locations have been identified and are shown in **Figure 2.1**.

[1] Environment Agency (2014) Technical Guidance Note M17: Monitoring particulate matter in ambient air around waste facilities.

3. SURVEY PROGRAM

3.1 Monitoring Points and Site Access Requirements

3.1.1 Monitoring is proposed to be undertaken at the Site, the village of Bradwell-on-Sea and along early years haul routes from the Site. The monitoring locations are presented in **Table 3.1** and **Figure 2.1 (Section 2)**.

3.1.2 **Table 3.1** also details the access requirements for each monitoring point. Overall, it is envisaged that permits to install the monitoring points, as well as site access to a few residential and private properties, are required. To install the Osiris monitor, an electricity source has been identified, however, a qualified electrician from the UK Power Network is required for the installation. Where access may not be granted, alternative monitoring points have been proposed where only a permit to install is required.

Table 3.1: Preliminary location of monitoring points

LA	ID	Locations from the Site	Site Access and Key Requirements	NGR X (m)	NGR Y (m)
MDC	Osiris	1.24 km west, at Bradwell Waterside on Waterside Road (B1021). Installation point will be on a wooden electricity pole.	Power for the Osiris $PM_{10}/PM_{2.5}$ monitor. An electrician from UK Power Network to assist in installing the monitor onto an electricity pole.	599658	207844
MDC	DT1	1.24 km west, at Bradwell Waterside on Waterside Road (B1021).	Permit to install at roadside on a wooden electricity pole.	599658	207844
MDC	DT2	1.62 km south-west, Corner Waterside Road and Trusses Road. Diffusion tube will be installed on wooden pole.	Permit to install at roadside on a wooden electricity pole.	599651	207367
MDC	DT3	1.60 km south-west on E End Road. Diffusion tube will be installed on an electricity pole within a residential property or alternatively on the dust deposition gauge stand.	Permit to install at roadside onto a telephone/electricity pole.	600886	207157
MDC	DT4	1.65 km south-east (inside the Site). Located 160m off E End Road at a residence. Diffusion tube will be installed on wooden pole No. 46.	Permit to install on wooden pole No. 46.	601698	207537
MDC	DT5	0.97 km east (inside the Site). Located on an unnamed road at a residential property. Diffusion tube will be installed on an electricity/telephone pole.	Permit to strap tubes on to telephone/electricity pole and possibly install within a residential property.	601133	208880
MDC	DT6	3.20 km south-west Corner of Maldon Road and St Peters Ct. Diffusion tube will	Permit to install at roadside onto a waterspout pipe.	599126	205844

LA	ID	Locations from the Site	Site Access and Key Requirements	NGR X (m)	NGR Y (m)
		be installed on a waterspout pipe. Located close to residential properties.			
MDC	DT7	4.45 km south-west on Maldon Road Diffusion tube will be installed on a wooden pole on the roadside.	Permit to install at roadside onto a wooden pole.	597770	205274
MDC	DT8	6.24km south-west Corner Bradwell/Steeple Road and Main Road. Diffusion tube will be installed on electricity/telephone pole or alternatively on the dust deposition gauge stand.	Permit to install at roadside onto a telephone/electricity pole.	595996	204477
MDC	DT9	11.89 km south-west on Steeple Road. Located close to residential properties. Diffusion tube will be installed on a wooden pole	Permit to install at roadside onto a telephone/electricity/signage pole	591155	201457
MDC	DT10	1.90 km southwest. Located at a school S. Cedds school gate on E End Road. Diffusion tube will be installed on a road sign.	Permit to install diffusion tube on a road sign	600466	206844
MDC	DT11	2.59 km south-west at the Church of St Peter on the Wall, near the Othona Community. Diffusion tube will be installed on electricity/telephone pole.	Permit/Permission required to install diffusion tube at property.	603088	208152
MDC	DT12	1.32 km to the north of the Site. Diffusion tube may be installed on dust deposition gauge.	Permit to install at the site on a dust deposition tube.	600219	207458

LA	ID	Locations from the Site	Site Access and Key Requirements	NGR X (m)	NGR Y (m)
MDC	DT13	0.87 km to the west of the Site. Diffusion tube may be installed on electricity/telephone pole or alternatively a pole may be erected to install the diffusion tube.	Permit to install at the site and to possibly erect a pole for the diffusion tube if one is not present.	599760	208393
MDC	DT14	14.53 km to the south-west at a roundabout with Steeple Road, Burnham Road and The St. Diffusion tube will be installed on lamp post ECC2.	Permit to install at roadside onto a lamp post ECC2.	588585	200505
MDC	DT15	16.76 km to the south-west at the four way of Cold Norton Road, Latchingdon Road and Fambridge Road (runs across). Diffusion tube will be installed on lamp pole ECC5.	Permit to install at roadside onto a lamp pole ECC5.	586062	200253
MDC	DT16	15.99 km to the west at a roundabout with Fambridge Road (B1010 and Limebrook Way (B1018). Diffusion tube will be installed on lamp pole LB7.	Permit to install at roadside on a lamp pole LB7.	584870	205433
MDC	DT17	16.89 km to the west at a roundabout with Limebrook Way (B1018) and Maldon Road. Diffusion tube will be installed on lamp pole A23.	Permit to install at roadside on a lamp pole A23.	583991	205613
MDC	DT18	16.77 km to the west at a T-Junction between Maldon and Witham Road. Diffusion tube will be installed on the Give Way pole.	Permit to install at roadside on a signage pole i.e. Give Way pole.	583809	208986

LA	ID	Locations from the Site	Site Access and Key Requirements	NGR X (m)	NGR Y (m)
BDC	DT19	20.79 km to the west on Maldon Road (A414). Diffusion tube will be installed on lamp pole No. 24.	Permit to install at roadside onto a lamp pole No. 24.	579946	211393
BDC	DT20	21.40 km to the west on Maldon Road (A414) near a roundabout with The St. Diffusion tube will be installed on lamp pole No. 23.	Permit to install at roadside onto a lamp pole No. 23.	579403	211920
MDC	DT21	19.97 km to the south-west at Lower Burnham Road. Diffusion tube will be installed on a wooden pole.	Permit to install at roadside onto a lamp/electricity/signage pole.	583359	198566
CCC	DT22	21.78 km to the south-west at a roundabout with Woodham Road, Ferres Road and Burnham Road. Diffusion tube will be installed on lamp pole B7.	Permit to install at roadside onto a lamp/electricity/signage pole.	581595	197974
CCC	DT23	22.77 km to the south-west on Burnham Road. Diffusion tube will be installed on lamp pole No. 30.	Permit to install at roadside onto a lamp/electricity/signage pole.	580414	198128
MDC	DT24	9.01 km to the south-west Corner Bradwell/Steeple Road Garden Fields Street. Diffusion tube will be installed on a wooden lamp pole.	Permit to install at roadside onto a lamp/electricity/signage pole.	593616	202981
MDC	DT25	16.43 km to the southwest on Fambridge Road Diffusion tube will be installed on electricity/lamp pole.	Permit to install at roadside onto a lamp/electricity/signage pole.	585919	201318
MDC	DD1	1.32 km south-west at T-Junction with Trusses Road.	Require site access and permit to install at roadside	600220	207460

LA	ID	Locations from the Site	Site Access and Key Requirements	NGR X (m)	NGR Y (m)
MDC	DD2	1.59 km southwest, Corner Waterside Road and Trusses Road.	Permit to install at roadside	599634	207403
MDC	DD3	1.56 km south-west on E End Road.	Require site access and permit to install in residential area	600861	207195
MDC	DD4	1.67 southeast (inside the Site) on E End Road across Eastland Meadows Country Park.	Permit to install at roadside	601722	207536
MDC	DD5	1.02 km east-north-east (inside the Site). Located off an unnamed dirt road.	Require site access and permit to install on to a telephone/electricity pole.	601129	208877
MDC	DD6	3.19 km south-west Corner of Maldon Road and St Peters Ct. Located in close to residential properties.	Permit to install at roadside.	599156	205843
MDC	DD7	4.45 km south-west on Maldon Road. Will be installed 30m away from the road	Permit to install at roadside	597777	205323
MDC	DD8	6.24km south-west Corner Bradwell/Steeple Road and Main Road.	Permit to install at roadside.	595995	204477
	NB: DT – Diffusion Tube DD – Dust Deposition				

3.2 Monitoring Schedule

3.2.1 The air quality survey is proposed to be undertaken from August 2020 to July 2021 to account for monthly, seasonal and annual trends. The initial site visit to install the monitors is proposed for the first week of August 2020. Monitoring for PM_{10}, $PM_{2.5}$, NO_2 and dust deposition will be undertaken concurrently every monthly. The monitoring undertaken will be specifically for the Site and the potential early years road transport routes. The monitoring programme will be extended in 2021 to cover the off-site ADs.

3.2.2 A preliminary monitoring schedule is presented in **Table 3.2**. It should be noted that the monitoring schedule is a guideline for the proposed monitoring and the start and end dates may differ at most by ± 2 days. However, effort will made to ensure sampling is undertaken within 30 days.

Table 3.2: Detailed Monitoring Schedule

Parameters	Month	Start Date	End Date	Days
PM_{10}, $PM_{2.5}$, NO_2 and Dust Deposition	August 2020	01/08/2020	31/08/2020	30
	September 2020	31/08/2020	30/09/2020	31
	October 2020	30/09/2020	31/10/2020	31
	November 2020	31/10/2020	30/11/2020	30
	December 2020	30/11/2020	31/12/2020	31
	January 2021	31/12/2020	30/01/2021	30
	February 2021	30/01/2021	01/03/2021	30
	March 2021	01/03/2021	31/03/2021	30
	April 2021	31/03/2021	30/04/2021	30
	May 2021	30/04/2021	31/05/2021	31
	June 2021	31/05/2021	30/06/2021	30
	July 2021	30/06/2021	31/07/2021	31

Table 3.3: Monthly Monitoring Schedule

Monitoring Task	2020					2021						
	A	S	O	N	D	J	F	M	A	M	J	J
Initial site visit												
PM_{10} and $PM_{2.5}$	Monitoring will be undertaken in 30-day blocks over a calendar month (± 2 days) for a year											
Diffusive sampling – NO_2												
Dust Deposition												

4. QUALITY ASSURANCE/QUALITY CONTROL

4.1.1 In terms of quality assurance and quality control (QA/QC), there will be three diffusion tubes installed at each proposed monitoring location to confirm accuracy of the equipment used. In addition, a trip blank will be submitted with each monthly batch of samples.

4.1.2 For the Osiris monitor, data will be analysed monthly to ensure any errors or anomalous results are identified at an early stage. In addition, this will also ensure that the data capture rate is at least 85%.

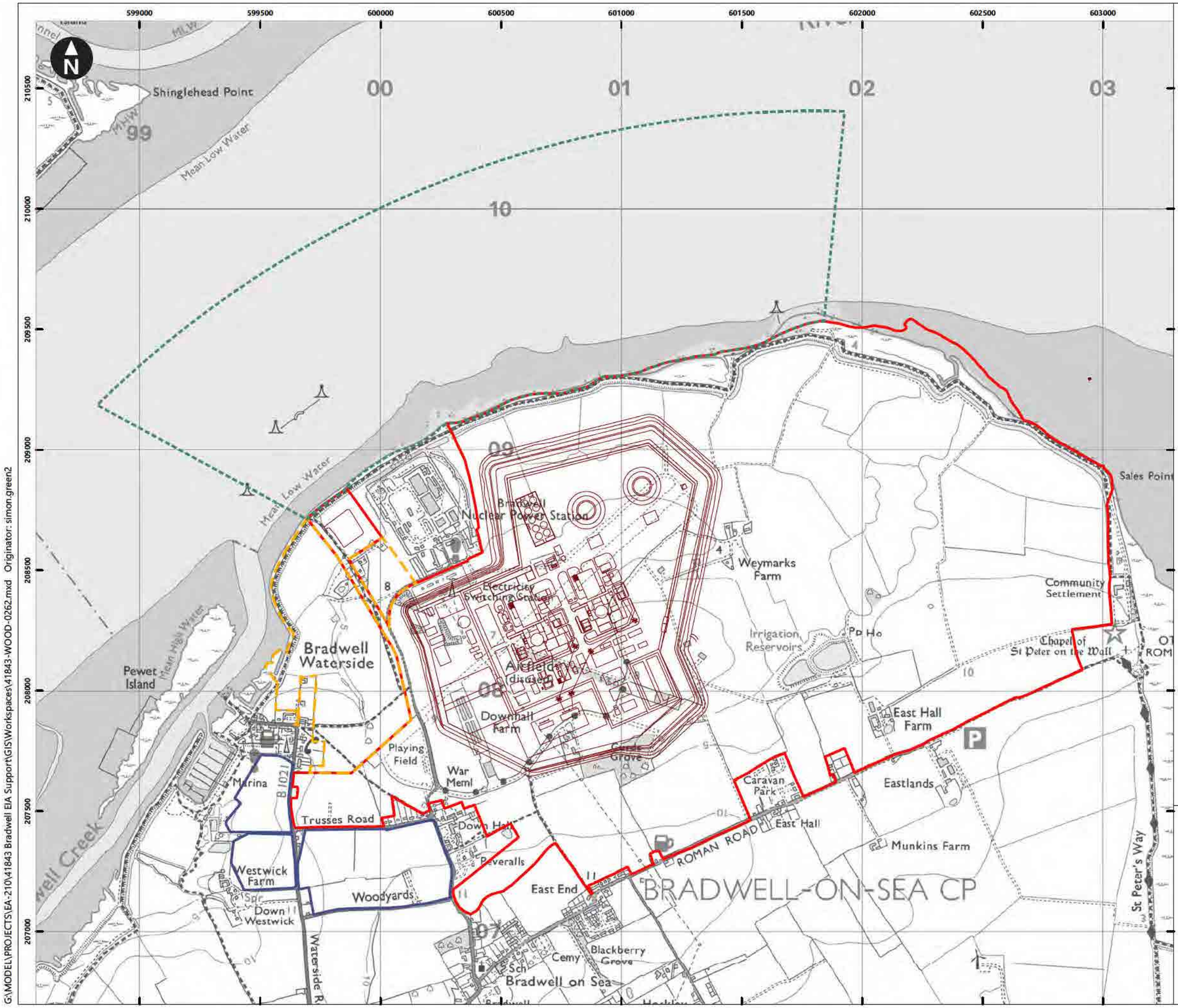
5. REFERENCES

Ref. 1. Defra, 2018. Department of Environment Food and Rural Affairs, Local Air Quality Management, Technical Guidance (TG-16).

APPENDIX A
FIGURES

Figure 1.1: Site Locality Map

Figure 2.1: Preliminary Monitoring Locations



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Bradwell B Nuclear Power Plant Project
Air Quality Survey and Monitoring Plan
2020/21

Figure 1.1
Site locality map

April 2020

wood.

575000 580000 585000 590000 595000 600000 605000

220000 215000 210000 205000 200000 195000

N

Braintree
Coggeshall
Witham
Maldon
Burnham-On-Crouch
South Woodham Ferrers
Bradwell Waterside
Bradwell Nuclear Power Station
Bradwell on Sea
BRADWELL-ON-SEA CP
Market Hill Road AQMA
A414 Maldon Road, Danbury AQMA

DT 20 DT19 CB04 CB31 CB30 CB25 CB18 CB27B CB76 CB76B CB76C CB75 CB93 CB94 CB92 CB96 CB95 CB91 MD1 DT18 MD4 MD3 MD17 MD14 MD5 MD23 MD24 MD25 MD26 MD22A MB22B MD22C MD27 MD28 MD19 MD2 MD2c MD2b DT17 MD12 MD16 DT16 MD13 MD6 MD7 DT13 Osiris DT1 DD2 DT2 DD1 DT12 DD3 DT3 DT10 DD5 DT5 DT4 DD4 DD6 DT6 DD7 DT7 DD8 DT8 DT11 DT24 MD18 DT9 DT25 DT15 DT14 MD8 MD11 MD21 DT21 DT23 DT22

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Indicative site layout
- Early Years Route 1
- Early Years Route 2
- Strategic Route 1
- Diffusion tube monitoring locations
- Diffusion tube - Chelmsford
- Diffusion tube - Maldon
- Dust deposition monitoring locations
- Osiris monitoring location
- Ramsar Sites
- Site of Special Scientific Interest
- Special Area of Conservation
- Special Protection Area
- Air Quality Management Areas (AQMA)

0 1,000 2,000 3,000 4,000 5,000 6,000 m

Scale at A3: 1:110,000

Bradwell B Nuclear Power Plant Project
Air Quality Survey and Monitoring Plan
2020/21

Figure 2.1
Proposed monitroing locations

July 2020

wood.

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APPENDIX B
DUST AND NO_2 FIELD MONITORING LOG SHEETS

NO_2 MONITORING FIELD LOGSHEET							
Client:						Project Name:	
Site:							
Sample ID	Barcode Label	Installation Date	Time Installed	Removal Date	Time Removed	Samplers Name	Observations/Comments

DUST MONITORING FIELD LOGSHEET				
Client:			Project Name:	
Site:				
Sample ID	Installation Date	Removal Date	Samplers Name	Observations/Comments

APPENDIX 8B
AIR QUALITY CONTINUOUS MONITORING AND DIFFUSION TUBE DATA

1.1.1 The details of automatic monitoring stations in Chelmsford is presented in **Table 8B.1** and a summary of the monitoring results for Nitrogen Dioxide (NO_2) and Particulate Matter (PM_{10}) are presented in **Table 8B.2** and **Table 8B.3** respectively.

1.1.2 A summary of passive monitoring locations and NO_2 passive monitoring data for Maldon District Council (MDC), Chelmsford City Council (CCC) and Basildon District Council (BDC) is presented in **Table 8B.4** and **Table 8B.5** respectively.

Table 8B.1: Summary of automatic monitoring locations

Site ID	Site Name	Classification Type	X (m)	Y (m)	Distance to Kerb of Nearest Road (m)
CM1	Chignal St James.	Rural	566463	210830	43.0
CM2	Springfield Road (Prison).	Roadside	571640	207179	2.8
CM3	Rainsford Lane (Fire Station).	Roadside	569912	206881	2.5
CM4	Baddow Road.	Roadside	571654	205798	5.1

Table 8B.2: Summary of NO_2 monitoring data: annual mean (µg/m^3)

Site ID	2015	2016	2017	2018	2019
CM1	12.8	14.2	14.5	12.4	11.9
CM2	18.1	28.9	28.0	29.2	34.5
CM3	27.9	25.6	26.9	24.2	19.9
CM4	25.8	29.6	29.5	27.5	27.0

Table 8B.3: Summary of PM_{10} monitoring data: annual mean (µg/m^3)

Site ID	2015	2016	2017	2018	2019
CM1	20.5	17.1	16.2	13.5	15.9
CM2	27.2	28.4	28.8	27.0	25.3
CM3	21.0	20.8	20.0	17.7	18.7
CM4	20.5	17.1	16.2	13.5	**No data**
*Concentrations in **bold** indicate an exceedance of the 40 µg/m^3 annual mean AQO.*					

Table 8B.4: Summary of passive monitoring locations

Site ID	Site Name	Classification type	X (m)	Y (m)	Distance to Kerb of Nearest Road (m)
Passive monitoring carried out by MDC					
MD1	Opposite Cherry Oak A414.	Roadside	580645	204820	10.7
MD2	A414 Spital Road and A414 Bypass.	Kerbside	583952	205742	1.0
MD2b	A414 Spital Road and A414 Bypass.	Kerbside	583952	205742	1.0
MD2c	A414 Spital Road and A414 Bypass.	Kerbside	583952	205742	1.0
MD3	Heybridge Approach.	Roadside	584763	208107	3.7
MD4	Heybridge Street and The Causeway.	Kerbside	585465	208071	1.3
MD5	Colchester Rd and Heybridge Street Junction.	Roadside	585914	208104	3.9
MD6	High Street (Market Hill Junction).	Urban Centre.	585072	207080	2.1
MD7	Wantz Road and High Street.	Urban Centre.	585307	206943	1.6

Site ID	Site Name	Classification type	X (m)	Y (m)	Distance to Kerb of Nearest Road (m)
MD8	Latchingdon and Burnham Road Junction.	Kerbside	588575	200492	0.4
MD11	Latchingdon Street.	Kerbside	588205	200438	1.3
MD12	A414 Spital Road and A414 Bypass.	Kerbside	583862	205549	1.5
MD13	Limebrook Way and A414 Bypass.	Kerbside	584165	205532	1.5
MD14	The Causeway.	Roadside	585221	207682	9.0
MD16	8 Narvik Close.	Roadside	584309	205776	0.5
MD17	2 Creasen Butt Close.	Suburban	585078	207924	0.5
MD18	Opposite 37 Imperial Avenue, Mayland.	Suburban	590466	202313	9.0
MD19	Adjacent to 16 Mill Road, Maldon.	Kerbside	585565	206723	0.2
MD21	Adjacent to 61 Station Road, Southminster.	Kerbside	596181	199660	0.8
MD22A	10 Market Hill, Maldon.	Roadside	585062	207160	1.5
MB22B	10 Market Hill, Maldon.	Roadside	585062	207160	1.5

Site ID	Site Name	Classification type	X (m)	Y (m)	Distance to Kerb of Nearest Road (m)
MD22C	10 Market Hill, Maldon.	Roadside	585062	207160	1.5
MD23	59-63 Market Hill, Maldon.	Roadside	585055	207324	1.3
MD24	32 Market Hill.	Roadside	585045	207272	1.9
MD25	1 Hillside, Maldon.	Roadside	585016	207241	1.4
MD26	18 Market Hill, Maldon.	Roadside	585045	207186	2.6
MD27	6 Market Hill, Maldon.	Roadside	585073	207132	2.3
MD28	21 Market Hill, Maldon.	Roadside	585067	207116	1.6
MD29	5 The Square, Heybridge.	Roadside	585467	208089	1
MD30	High Street, Maldon.	Roadside	584868	207042	1
MD31	Petchey Course, Fambridge Road.	Roadside	584809	206962	3
MD32	Goings Wharf, Colchester Road.	Roadside	585740	208010	2.5
Passive monitoring carried out by CCC					

Site ID	Site Name	Classification type	X (m)	Y (m)	Distance to Kerb of Nearest Road (m)
CB04	28 Cleves Ct.	Urban Background.	575266	210080	5.0
CB18	180 Maldon Rd.	Roadside	573846	205362	17.0
CB25	20 Allen Way.	Suburban	573992	207985	0.1
CB27	Colchester Road.	Roadside	574080	203469	5.0
CB27A	Colchester Road.	Roadside	574080	203469	5.0
CB27B	Colchester Road.	Roadside	574080	203469	5.0
CB30	Colchester Road.	Roadside	573403	208650	5.0
CB31	Main Road, Boreham.	Roadside	575265	209975	5.0
CB75	Main Road, Danbury.	Roadside	577921	205246	1.0
CB76	5 and 7 Maldon Road, Danbury.	Roadside	578506	205122	1.0
CB76B	5 and 7 Maldon Road, Danbury.	Roadside	578506	205122	1.0
CB76C	5 and 7 Maldon Road, Danbury.	Roadside	578506	205122	1.0

Site ID	Site Name	Classification type	X (m)	Y (m)	Distance to Kerb of Nearest Road (m)
CB91	26 Maldon Road, Danbury.	Roadside	578538	205114	1.0
CB92	26 Maldon Road, Danbury.	Roadside	578538	205114	1.0
CB93	26 Maldon Road, Danbury.	Roadside	578538	205114	1.0
CB94	Copt Hill, Danbury.	Kerbside	578570	205107	2.8
CB95	Eves Corner, Danbury.	Kerbside	578408	205106	2.0
CB96	Heathcote School, Main Road, Danbury.	Kerbside	578363	205119	0.3
Passive monitoring undertaken by BDC					
BR1	Blandford House London Road Braintree.	Roadside	575600	222900	1.2
BR3	Foxden A12 Rivenhall.	Roadside	583859	216497	2
BR4	Beckers Green Road.	Urban Background	577800	222500	8.3
BR5	Chipping Hill Bridge.	Roadside	582002	215111	2
BR6	Railway Street and Victoria St .	Roadside	576204	222958	2

Site ID	Site Name	Classification type	X (m)	Y (m)	Distance to Kerb of Nearest Road (m)
BR7	Stilemans Wood.	Roadside	577680	221964	9
BR9	Hotel Rivenhall.	Roadside	583891	216467	1.5
BR11	High Street Kelvedon.	Roadside	583860	219106	3.5
BR12	The Street Bradwell.	Roadside	580625	223115	2.9
BR13	Bridge Street, Witham.	Roadside	581851	214151	1
BR14	11 Head Street, Halstead.	Kerbside	581542	230738	0.5
BR15	23 Colchester Road, Halstead.	Roadside	581592	230699	2

Table 8B.5: Summary of NO_2 passive monitoring data ($\mu g/m^3$)

Site ID	Data Capture	2015	2016	2017	2018	2019
Passive monitoring undertaken by MDC						
MD1	100	31.87	33.3	31.45	28.75	27.32
MD2	100	31.9	33.3	31.5	28.8	27.3
MD2b	100	28.4	30.9	28.1	28.8	27.0
MD2c	100	28.4	30.9	28.1	28.8	27.0
MD3	100	28.4	30.9	28.1	28.8	27.0
MD5	91.67	32.6	32.3	32.2	29.2	28.2
MD6	75	30.2	30.1	29.7	26.9	25.9
MD7	100	27.0	29.2	31.6	26.4	27.1
MD8	100	28.4	32.1	32.4	29.0	28.3
MD11	100	25.3	23.3	24.7	24.0	23.2
MD12	100	27.0	29.0	27.6	24.5	23.6

Site ID	Data Capture	2015	2016	2017	2018	2019
MD13	100	26.3	25.9	25.5	23.9	23.8
MD14	100	31.3	30.7	29.5	26.6	26.1
MD16	100	16.9	15.7	15.3	13.6	13.8
MD17	100	17.8	18.5	20.9	15.8	17.4
MD18	75	N/A	N/A	14.3	12.2	No data
MD19	91.67	N/A	N/A	**58.2**	**58.4**	**55.1**
MD21	75	N/A	N/A	15.5	12.6	No data
MD22A	86.11	N/A	N/A	**58.2**	**58.4**	**55.1**
MB22B	86.11	N/A	N/A	**58.2**	**58.4**	**55.1**
MD22C	86.11	N/A	N/A	**58.2**	**58.4**	**55.1**
MD23	91.67	N/A	N/A	N/A	37.2	**41.1**
MD24	75	N/A	N/A	N/A	**46.3**	**42.6**
MD25	91.67	N/A	N/A	N/A	30.9	27.5

Site ID	Data Capture	2015	2016	2017	2018	2019
MD26	83.33	N/A	N/A	N/A	39.1	37.5
MD27	100	N/A	N/A	N/A	**61.8**	**51.9**
MD28	100	N/A	N/A	N/A	28.9	27.7
MD29	91.67	N/A	N/A	N/A	N/A	28.9
MD30	91.67	N/A	N/A	N/A	N/A	32.0
MD31	100	N/A	N/A	N/A	N/A	24.5
MD32	91.67	N/A	N/A	N/A	N/A	31.0
Passive monitoring undertaken by CCC						
CB04	100	21.7	22.0	25.3	21.3	No data
CB18	100	17.0	17.0	17.0	16.5	No data
CB25	100	19.8	20.6	17.0	21.4	No data
CB27 (Triplicate Results Averaged)	100.00	28.6	28.9	33.2	29.3	28.0

Site ID	Data Capture	2015	2016	2017	2018	2019
CB27A (Triplicate Results Averaged)	100.00	28.6	28.9	33.2	29.3	28.0
CB27B (Triplicate Results Averaged)	100.00	28.6	28.9	33.2	29.3	28.0
CB30	100	28.2	29.1	31.0	28.5	No data
CB31	100.00	16.3	18.1	20.1	18.3	17.7
CB75	100	30.6	34.3	36.0	33.4	No data
CB76	100.00	11.2	12.2	13.5	11.6	11.7
CB76B	100.00	11.2	12.2	13.5	11.6	11.7
CB76C	100.00	11.2	12.2	13.5	11.6	11.7
CB91	100.00	24.3	27.5	29.8	26.4	26.4
CB92	100.00	24.3	27.5	29.8	26.4	26.4
CB93	100.00	24.3	27.5	29.8	26.4	26.4
CB94	75.07	39.9	35.8	37.0	35.4	39.6

Site ID	Data Capture	2015	2016	2017	2018	2019
CB95	100.00	N/A	37.4	**41.7**	38.5	37.4
CB96	100.00	N/A	30.5	29.6	26.9	26.1
Passive monitoring undertaken by BDC						
BR1	100	29.8	31.0	31.0	28.2	Data not yet published.
BR3	92	**47.1**	**46.4**	**51.9**	**46.1**	Data not yet published.
BR4	100	15.9	17.3	18.3	16.2	Data not yet published.
BR5	100	**40.8**	**45.9**	**45.3**	**40.4**	Data not yet published.
BR6	100	22.8	23.2	24.6	22.9	Data not yet published.
BR7	100	30.5	28.3	31.6	29.2	Data not yet published.
BR9	100	**43.9**	**46.3**	**46.1**	**40.7**	Data not yet published.

Site ID	Data Capture	2015	2016	2017	2018	2019
BR11	100	**46.0**	**46.1**	**45.5**	23.1	Data not yet published.
BR12	75	30.1	27.1	25.9	25.9	Data not yet published.
BR13	83	N/A	N/A	N/A	33.0	Data not yet published.
BR14	92	N/A	N/A	N/A	**59.9**	Data not yet published.
BR15	67	N/A	N/A	N/A	20.0	Data not yet published.
*Concentrations in **bold** indicate an exceedance of the 40 µg/m^3 annual mean AQO prior to the relevant exposure adjustment.*						

APPENDIX 8C
REVIEW OF POTENTIAL IMPACTS ON COASTAL AND MARINE ECOLOGICAL RECEPTORS

EXECUTIVE SUMMARY

The aim of this preliminary assessment was to investigate whether it is likely that the future contribution of the Project to nitrogen deposition is compensated by the reduction in nitrogen inputs from existing agricultural activities within the Bradwell B power station main development site boundary. The review focuses on the potential impacts in terms of eutrophication and acidification of surface water and nitrogen deposition on estuarine habitats.

The review concluded that the Project would represent a new source of nitrogen deposition because of emissions arising from the construction, commissioning, and operational phases of the Project. However, a reduction in agricultural land will correlate with a decrease in nitrogen and phosphorus emissions from agricultural activities which would be offset by the project contribution. Hence nitrogen and phosphorus emissions may be lower or remain the same during the construction, commissioning and operational phases when compared to the current baseline.

In fact, the Project site will extend over more than 200 hectares (ha) of land for more than 10 years, during which no agricultural activities will take place (including fertiliser application and other management practices). The reduction in agricultural land will significantly reduce both nitrogen losses to coastal waters and nitrogen deposition (mainly from ammonia emissions).

In relation to nitrogen deposition on the estuarine habitats, given that the ecological receptors are located within an intertidal area, which is submerged regularly, any nitrogen deposition will be washed out with tidal movements. Hence, it is unlikely that nitrogen deposition would have an adverse impact. A reduction in agricultural land will also contribute to a decrease in ammonia emissions and associated nitrogen deposition.

1.1 INTRODUCTION

1.1.1 The deposition of reactive nitrogen (Nr) from the atmosphere to the surface is an important component of the Nitrogen (N) cycle and a form of atmospheric pollution. Nr comprises both oxidized (for example, nitrogen oxide (NO), nitrogen dioxide (NO_2), nitric acid (HNO_3)) and reduced (ammonia (NH_3)) gases and as well as particle-phase nitrate (NO_3^-) and ammonium (NH_4^+) equivalents.

1.1.2 The chemical fertilisers and animal manure applied to crops, which provide nitrogen compounds necessary to promote growth, are also a source of nitrogen. When nitrogen is not fully utilized by the growing plants, it can be lost through leaching and negatively impact air and downstream water quality. This excess nitrogen, in the form of ammonium (NH_4-N) and nitrate (NO_3-N), can be leached out from soils into waterways during rain events and into groundwater over time.

1.1.3 When denitrification occurs in saturated soil, nitrogen is lost in the form of gaseous, N-based compounds, like NH_3 and nitrogen oxides (NO_X), which can re-deposited to the surface at a later stage.

1.1.4 The European ecological sites of the Dengie Peninsula are found in a large and remote area consisting of tidal mudflats and saltmarshes at the eastern end of the peninsula, between the Blackwater and Crouch Estuaries. The saltmarsh is the largest continuous example of its type in Essex. Foreshore, saltmarshes and beaches support an outstanding assemblage of rare coastal flora. It hosts internationally and nationally important wintering populations of wildfowl and waders, and in summer supports a range of breeding coastal birds including rarities.

1.2 CRITICAL LOADS AND CRITICAL LEVELS

1.2.1 According to the Environment Agency (Ref. 8C.1), agriculture is the dominant source of nitrogen in water and is the largest source of nitrogen pollution to coastal ecosystems.

1.2.2 Considering the characteristics of the study area, with agriculture activity being the primary source of emissions, most relevant critical loads and levels are those related to N-deposition and NH_3 emissions.

1.2.3 **Table 8C.1** provides an overview of receptors sensitive to nitrogen and NH_3, reporting the related ranges for critical load and levels. Information has been obtained from the Air Pollution Information System (APIS) website, as hosted by the Centre for Ecology and Hydrology. This site provides a key database of information pertaining to air pollution effects at ecological designated sites.

Table 8C.1: Species sensitive to nitrogen and ammonia

Designated Site	Features Sensitive to nitrogen	Critical Load	Critical Level
Essex Estuaries SAC.	Estuaries.	20-30* (kg N/ha/yr)	Not sensitive to Ammonia.
Dengie SPA.	Branta bernicla bernicla.	20-30* (kg N/ha/yr)	Annual Average: • 1 µg NH_3/m^3 (if lichens and bryophytes are present). • 3 µg/m^3.
Dengie SSSI.	Littoral sediment.	20-30* (kg N/ha/yr)	
Black Water Estuary SPA.	Sterna albifrons.	8-30 (kg N/ha/yr)	
	Aythya farina.	No comparable habitat with established critical load estimate available.	
Black Water Estuary SSSI.	Branta bernicla bernicla.	20-30 (kg N/ha/yr)	
Sandbeach Meadows SSSI.	Branta bernicla bernicla.	20-30 (kg N/ha/yr)	

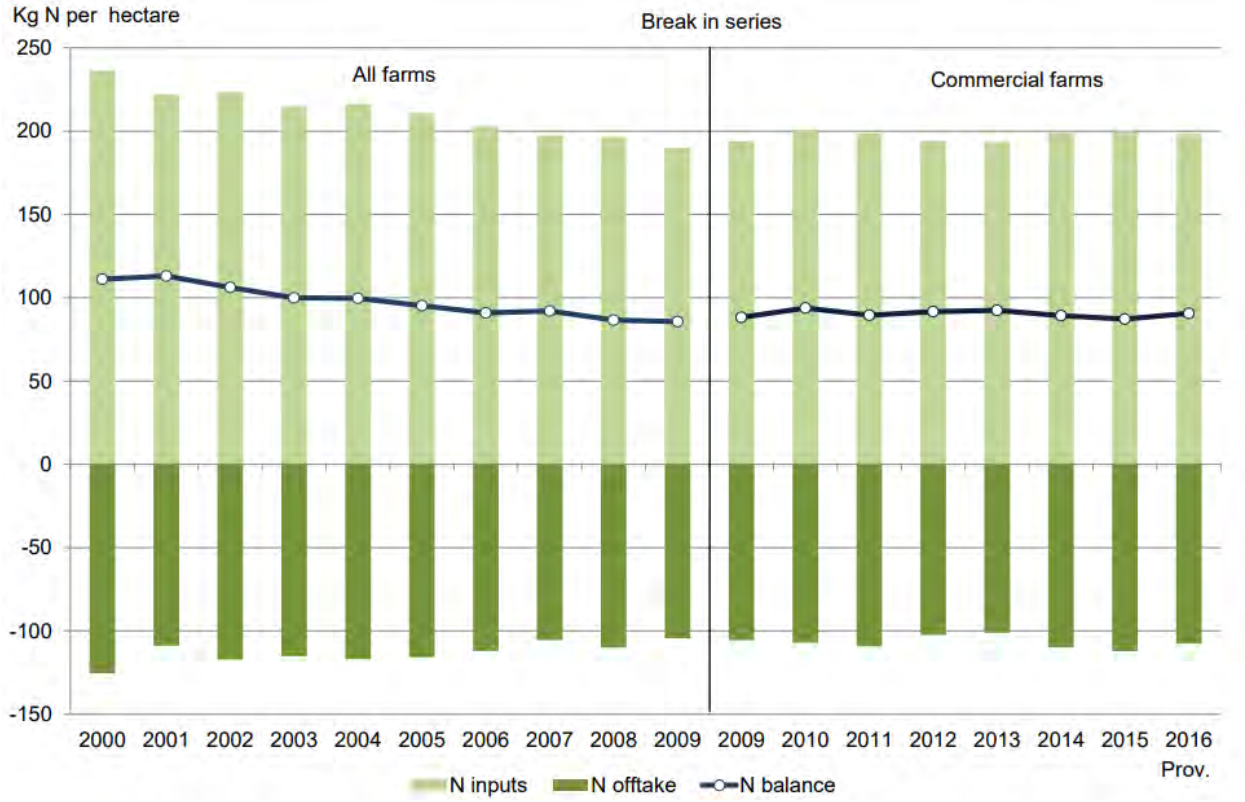
1.3 REVIEW OF POTENTAL IMPACTS

1.3.1 The main mechanisms through which nitrogen can have an adverse effect on ecosystems is through eutrophication, acidification, and direct toxicity. This study considers the role of N-loss, N-deposition and gaseous ammonia in those mechanisms and provides a review of potential impacts.

1.4 NITROGEN LOSS

1.4.1 According to a report ordered by the House of Commons (Ref. 8C.2), every hectare of utilised agricultural land in the UK can lose more than 100kg of nitrogen per year. **Plate 8C.1** shows that the nitrogen balance has remained relatively stable in UK since 2000. Therefore, since the construction phase of the Project will occupy more than 200ha of agricultural land, nitrogen loss to surface waters will be reduced by approximately 20,000kg per year. This should lower the risk of eutrophication of surface waters at identified receptors and compensate for the potential Project contribution to eutrophication from nitrogen deposition.

Plate 8C.1: Summary of nitrogen balance for UK, 2000 to 2016 (kg N per hectare)



1.5 NITROGEN DEPOSITION

1.5.1 Nitrogen-containing compounds (NO_2, NO, NH_3, nitrous oxide (N_2O)) are emitted to the atmosphere from various sectors, including transport, industrial and agricultural activities. In the case of NO, NH_3 and N_2O, agricultural sources are the main contributors. According to Air Quality Expert Group (AQEG) (2018) (Ref 8C.3) and Sutton et al, (2017) (Ref 8C.4), the contribution of NO emissions from agricultural soils has hitherto not been a major focus due to the dominance of vehicles and power generation and other industry as NO sources in the UK. However, as the combustion sources are projected to decrease, the agricultural share of UK total NOx emissions through soil NO emissions is expected to increase (currently estimated at 4% and projected to increase to 6% by 2030.

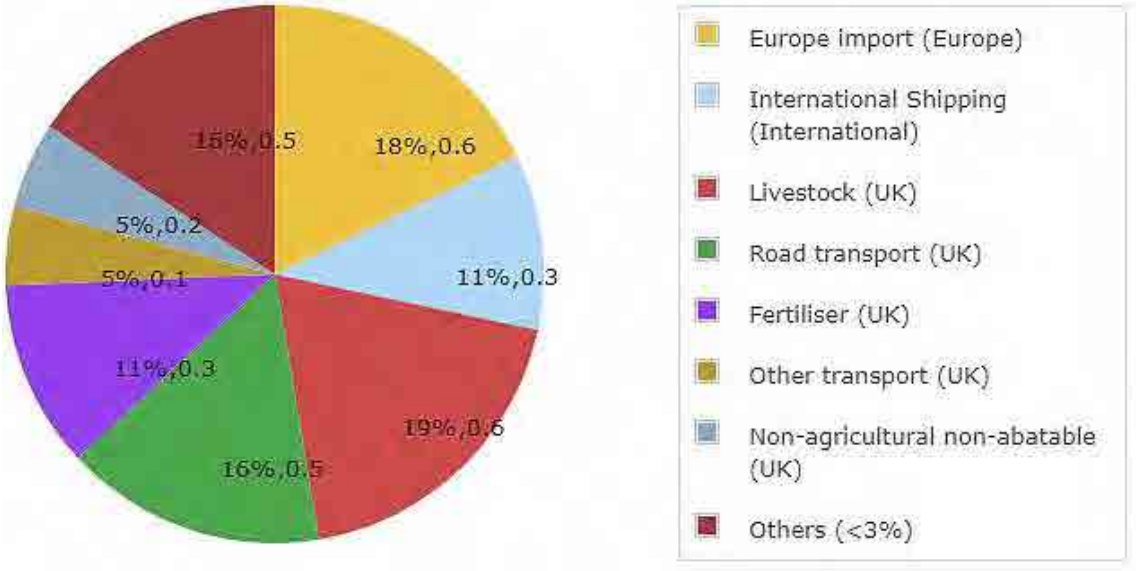
1.5.2 The deposition of nitrogen compounds is a minor contributor (just 0.7%) to the nitrate budget for inland surface waters (Ref. 8C.1) with regards to eutrophication.

1.5.3 **Plate 8C.2** shows the local contributions to nitrogen deposition (expressed in kg N/ha/yr) from different sources for the Dengie SPA obtained from the APIS website. The chart shows that livestock and fertiliser together account for 30% of average local nitrogen depositions on the Dengie SPA. A reduction in agricultural activities is therefore likely to at least partially mitigate the future Project contribution to nitrogen deposition in the same area.

1.5.4 A recent assessment of the impact of NO_X deposition on ecological receptors, in relation to the Hinkley Point C Development Consent Order (Ref 8C.5), concluded that the effects of that project would be negligible and where exceedances of the critical loads are predicted, those are associated with high existing nitrogen deposition levels.

1.5.5 In addition, it should be noted that, given that the habitat is located within an intertidal area, which is submerged regularly, any nitrogen deposition will be regularly removed and it is considered unlikely that nitrogen deposition would have an adverse impact.

Plate 8C.2: Local contributions to nitrogen deposition (in kg N/ha/yr) at the Dengie SPA



1.6 AMMONIA

1.6.1 NH_3 emissions from agriculture in the UK have decreased by 17% over the time period 1990-2017 but have increased by 3.7% since 2005 (Ref 8C.6). Agriculture is the major source of NH_3 emissions to the atmosphere in the UK, accounting for >80% of anthropogenic emissions. Most of these emissions derive from urea excreted by farmed livestock (or uric acid in the case of poultry) and emissions will therefore arise wherever livestock excreta are deposited or managed i.e. at grazing, in livestock housing and during manure storage and application to land. Emissions also arise from inorganic nitrogen fertilisers applied to land.

1.6.2 Gaseous NH_3 can be particularly harmful to vegetation, especially lower plants, through direct foliar damage.

1.6.3 The Project is not expected to generate significant emissions on NH_3, while the conversion of agricultural land to other uses during the construction phase will result in a reduction of NH_3 emissions in the study area, reducing the risk of impacts on ecosystems associated with direct toxicity.

1.7 CONCLUSION

1.7.1 The Project would represent a new source of nitrogen deposition because of emissions arising from the construction, commissioning, and operational phases of the project. However, a reduction in agricultural land will correlate with a decrease in nitrogen and phosphorus emissions from agricultural activities which would be offset by the project contribution. Hence, nitrogen emissions may be lower or remain the same during the construction, commissioning and operational phases when compared to the current baseline.

1.7.2 With respect to potential impact, the following should be considered:

- The construction phase of the Project will occupy more than 200ha of agricultural land, nitrogen loss to surface waters will be reduced by approximately 20,000kg per year.
- Livestock and fertiliser together account for approximately 30% of average local nitrogen depositions in the study area. A reduction in agricultural activities is therefore likely to partially mitigate the future Project contribution to nitrogen deposition in the same area. Given that the habitat is located within an intertidal area, which is submerged regularly, any nitrogen deposition will be regularly washed out, hence, it is unlikely that nitrogen deposition would have an adverse impact.
- The conversion of agricultural land to other uses during the construction phase will result in a reduction of NH_3 emissions in the study area, reducing the risk of impacts on ecosystems associated with direct toxicity. The Project is not expected to generate significant NH_3 emissions.

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APPENDIX 8D
EVIDENCE BASED APPROACH TO SCOPE OUT BASELINE MONITORING AT WEST MERSEA

INTRODUCTION

1.1.1 The purpose of Appendix 8D is to inform the scope of the required air quality baseline monitoring for the Project and to define the area of influence of the Project. Specifically, it considers whether there is value in performing baseline monitoring at West Mersea. West Mersea is approximately 3 kilometres (km) north of the main development site at its closest point, across the Blackwater Estuary. Based on the IAQM (Ref. 8D1) and Design Manual for Roads and Bridges (DMRB) guidance (Ref. 8D2), dust impacts and road traffic impacts on West Mersea are likely to be negligible due to the distance of the closest receptors in this location from any source of emissions.

1.1.2 The principal monitoring that might take place in West Mersea is diffusion tubes measuring nitrogen dioxide (NO_2), so this technical note focusses on long-term NO_2 impacts.

1.1.3 The review also considers whether impacts from the remaining activities are likely to be sufficient to justify baseline monitoring at West Mersea in addition to that proposed for the south side of the estuary. Although West Mersea is only a short distance across the estuary, by road it is approximately 50km from Bradwell Waterside to West Mersea. Undertaking monitoring in West Mersea should be considered only where the survey can add value to the assessment.

ASSUMPTIONS AND LIMITATIONS

1.1.4 The purpose of baseline monitoring is to assist modellers and stakeholders to understand the existing air quality conditions in locations that may be affected by the Project. A proper understanding of the baseline conditions usually requires a mix of monitoring and modelling studies. Monitoring provides a high-quality (though still subject to measurement uncertainty) understanding of current conditions at a specific location, which can be used to calibrate model studies. Modelling provides understanding of conditions at a wider range of locations and is able to predict how conditions are expected to change in the future.

1.1.5 Defra provides background maps of concentrations of key pollutants on a 1km grid square basis. These are semi-empirical, in that they are based on national-scale modelling that is calibrated to the results of the Automatic Urban and Rural Network (AURN) national monitoring network. These represent background locations, i.e. locations that are not strongly influenced by local sources; for example, they are not intended to predict concentrations within 200 metres (m) of major roads.

1.1.6 The specific function of the baseline monitoring is therefore two-fold:

- To validate the Defra maps at background locations; and
- To validate project-specific modelling of local sources such as roads.

Preliminary Assessment

1.1.7 At this stage in the Project design, it is not possible to estimate the likely emissions that will arise from the main development site during the construction, commissioning and operational phases with a high degree of confidence. Instead, a simple modelling study has been carried out based on published emissions for the proposed Wylfa and Sizewell C nuclear new build power stations. These studies were reviewed to establish the expected magnitude of impacts at different distances from the installation.

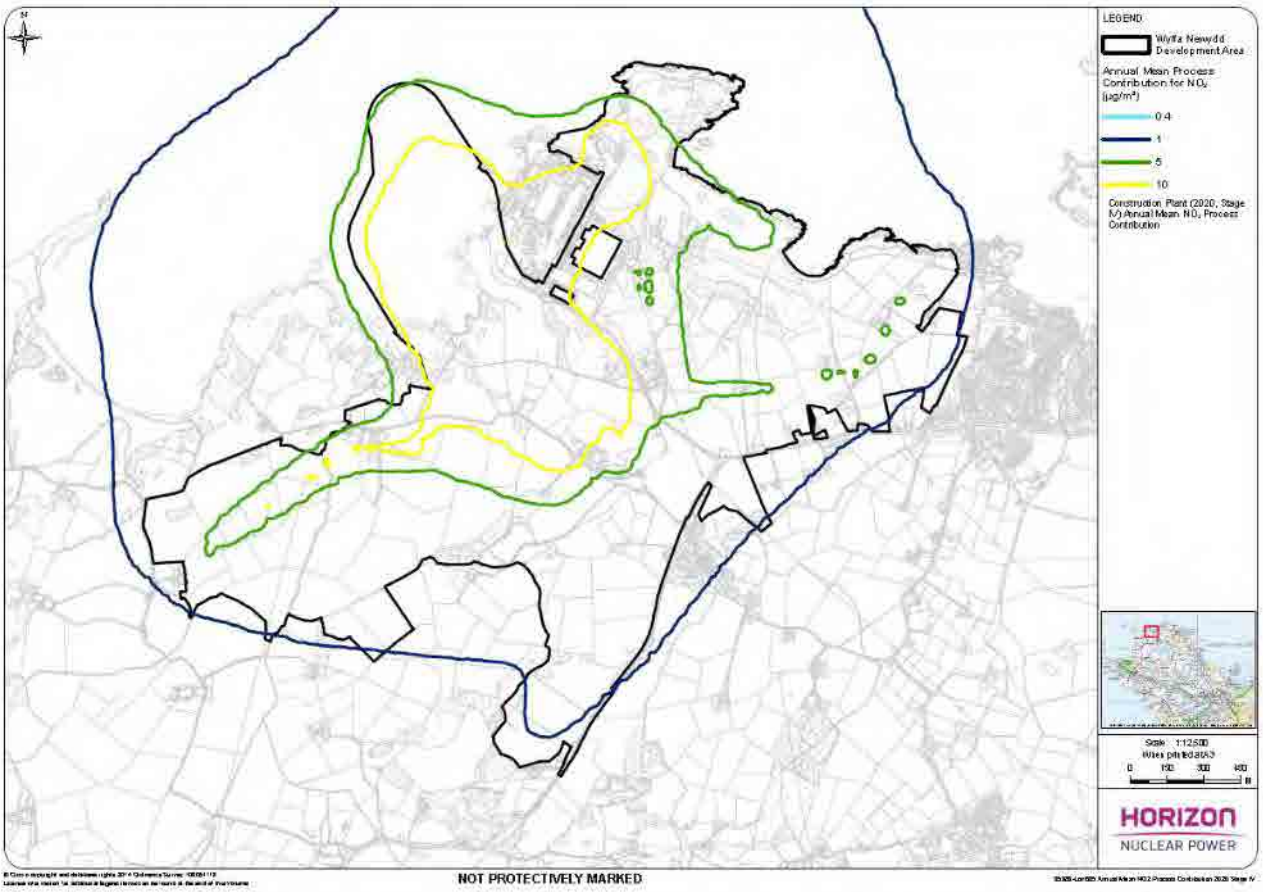
1.1.8 The principal air quality impacts of the Project are:

- Dust impacts from construction activities;
- Air quality impacts from construction activities on site, including power generation and Non-Road Mobile Machinery (NRMM);
- Air quality impacts from shipping sources during construction;
- Air quality impacts from road traffic during construction; and
- Air quality impacts from combustion sources during commissioning and operation of the Bradwell B power station, including standby diesel generators and cooling towers.

Construction and shipping impacts

1.1.9 Contours plots in the Wylfa Assessment (Ref. 8D3) show that, assuming construction plant meets Stage IV emissions standards (which is highly likely since these standard came into force from 2014), annual mean NO_2 project contribution is about 5 µg m^{-3} around the site boundary, falling to 1 µg m^{-3} within about 1 km downwind. **Plate 8D.1** shows the annual mean NO_2 concentrations at Wyifa Newydd due to construction. This includes a contribution from shipping, including stationary vessels docked off the coast with auxiliary engines running. This indicates that concentrations at 3 km, which is approximately the distance from the Project main development site at its closest point to West Mersea, will be well under 1 µg m^{-3}. This is for the year of peak construction, with concentrations being lower in other years.

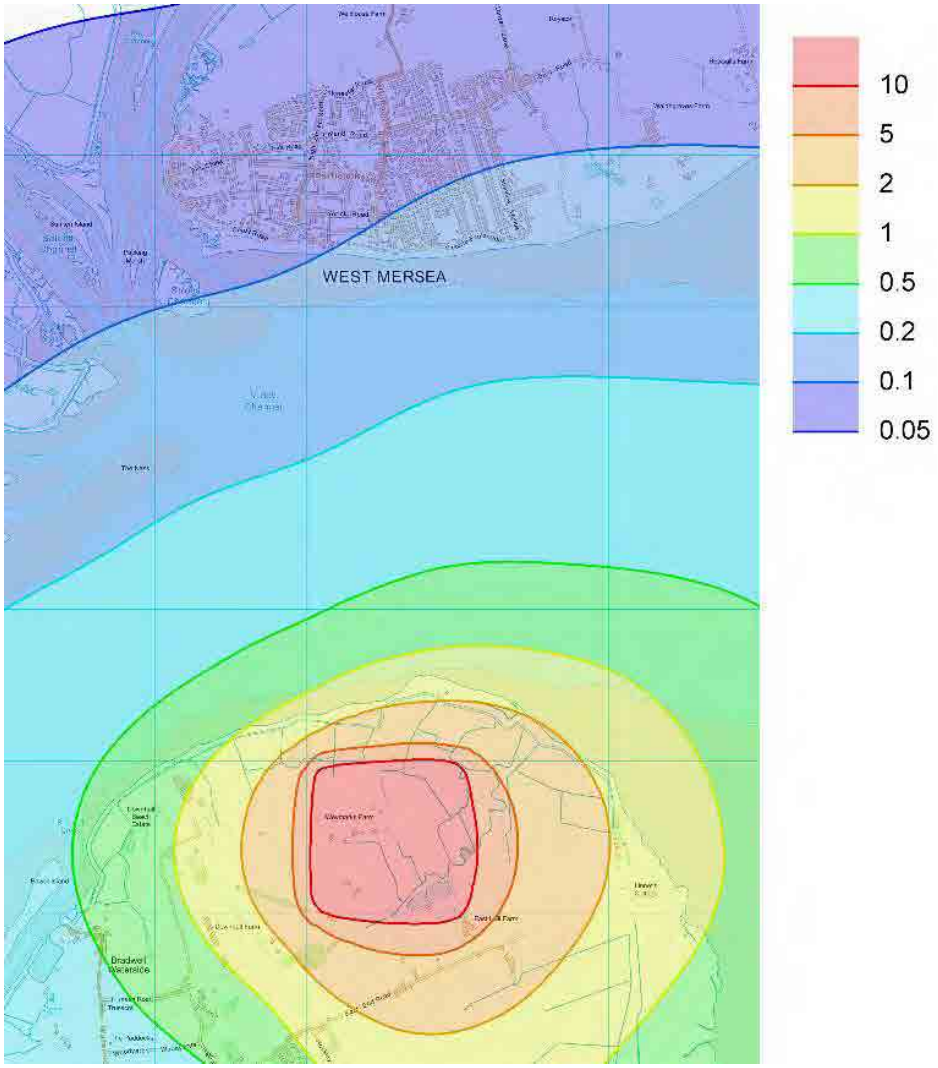
Plate 8D.1: Annual mean NO_2 at Wylfa Newydd due to construction



1.1.10 A simple Atmospheric Dispersal Modelling System (ADMS) model run, assuming the Bradwell B power station construction site covers a 1 km square, has been carried out with a unit emission rate and the outputs scaled to predict a concentration of 5 µg m^{-3} at the site boundary. A contour plot of the resulting concentrations is presented in **Plate 8D.2**.

1.1.11 It will be seen that the estimated concentrations in West Mersea are in the region of 0.1 µg m^{-3} or about 0.2% of the AQO. While this figure is no more than indicative, it suggests that impacts from construction activities at West Mersea will be negligible. One year of meteorological data from Southend for 2016 was used for the model run.

Plate 8D.2: Indicative contours of annual mean of NO_2 from construction activities



Operational impacts

1.1.12 The greatest potential for NO_2 impacts during the Bradwell B power station operational phase will be during the commissioning of the standby diesel generators. The Sizewell Report (Ref. 8D4) suggests that during commissioning, the diesel generators will be run for up to 2,446 engine-hours per year (that is, one engine at a time but with one of the engines running for that many hours of the year), with a NO_X emission rate of about 30g s^{-1}. This implies an annual average emission rate of about 9g s^{-1}.

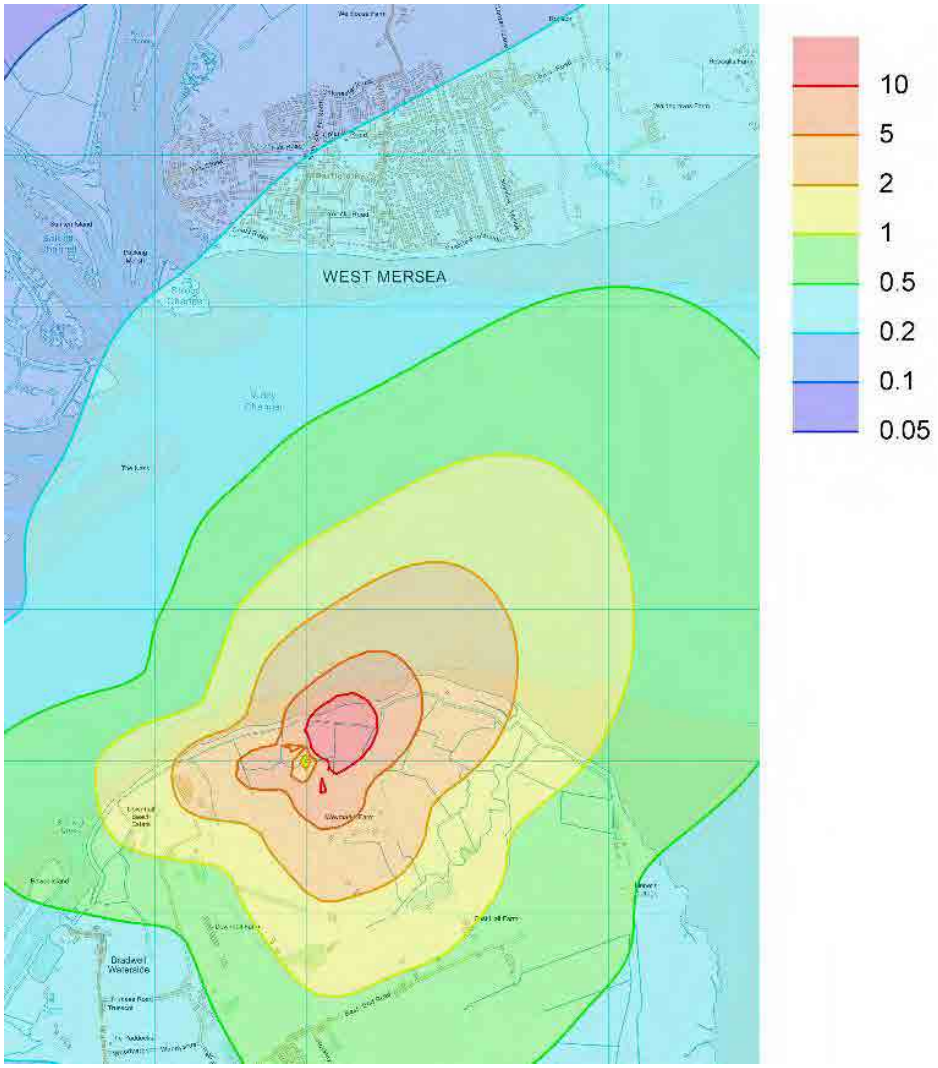
1.1.13 The Wylfa Report (Ref. 8D5) suggests a long-term scenario in which one reactor unit is undergoing routine testing regime which the second is undergoing commissioning for one month followed by its routine testing regime. This gives a total of 920 engine-hours per year, with a NO_X emission rate of 39g s^{-1}. Including a contribution from steam-raising boilers, this implies an annual average emission rate of about 4g s^{-1}.

1.1.14 In both cases, these are for the peak annual emissions during commissioning, and long-term concentrations during routine operation will be lower.

1.1.15 For the Bradwell B power station situation, a simple model using an emission rate of 9g s^{-1} from a point source predicts annual mean NO_X project contribution concentrations in West Mersea in the region of 0.2–0.5µg m^{-3}.

1.1.16 NO_2 concentrations will be somewhat lower, in the region of up to 0.3µg m^{-3}, or a little under 1% of the AQO. While this figure should be treated as indicative, it suggests that impacts from operational activities at West Mersea will be negligible. **Plate 8D.3** presents the indicative contours of annual mean NO_X from annual commissioning at Bradwell B power station.

Plate 8D.3: Indicative contours of annual mean NO_X from operational commissioning at Bradwell B power station



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APPENDIX 13A
LIST OF RECEPTORS

Receptor Type	Potential Receptor
Population and human health.	Populations within the Project including workers involved in construction and operation.
	Workers on project-provided accommodation including worker occupancy in construction phase accommodation.
	Workers at the associated development sites.
	Bradwell-on-Sea.
	Bradwell Waterside.
	Tillingham
	Asheldham
	Southminster
	Maylandsea
	St Lawrence.
	Goldhanger
	Tolleshunt D'Arcy.
	Tollesbury
	Salcott
	Tolleshunt Knighs.
	Tolleshunt Major.
	Great Wigborough.
	Layer Breton.
	Little Wigborough.
	Peldon

Receptor Type	Potential Receptor
Population and human health cont.	Abberton
	West Mersea.
	East Mersea.
	Barrow Hill.
	Brightlingsea.
	Point Clear.
	Bradwell-on-Sea.
	Bradwell Waterside.
	Populations in proximity to the off-site associated development and off-site Power Station Facilities.
Designated sites (internationally important): Ramsar Sites.	Dengie Ramsar (Ref. UK11018).
	Blackwater Estuary Ramsar (Ref. UK11007).
	Foulness Ramsar (Ref. UK11026).
	Abberton Reservoir Ramsar (Ref. UK11001).
	Colne Estuary Ramsar (Ref. UK11015).
Designated sites (internationally important): Special Protection Areas (SPAs).	Abberton Reservoir SPA (Ref. UK9009141).
	Crouch and Roach Estuaries (Mid-Essex Coast Phase 3) SPA (Ref. UK9009244).
	Outer Thames Estuary SPA

Receptor Type	Potential Receptor
	(Ref. UK9020309).
	Blackwater Estuary (Mid-Essex Coast Phase 4) SPA (Ref. UK9009245).
	Colne Estuary (Mid-Essex Coast Phase 2) SPA (Ref. UK9009243).
	Dengie (Mid-Essex Coast Phase 1) SPA (Ref. UK9009242).
	Foulness (Mid-Essex Coast Phase 5) SPA (Ref. UK9009246).
Designated sites (internationally important): Special Areas of Conservation (SACs).	Essex Estuaries SAC (Ref. UK0013690).
Designated sites (nationally important): Sites of Special Scientific Interest (SSSIs).	Dengie SSSI (Ref. 1001690).
	Blackwater Estuary SSSI (Ref. 1001680).
	Goldsands Road Pit SSSI (Ref. 1001893).
	Sandbeach Meadows SSSI (Ref. 1001978).
	Abberton Reservoir SSSI (Ref. 1001673).
	Colne Estuary SSSI (Ref. 1001686).
	Roman River SSSI (Ref. 1001691).
Designated sites (nationally important):	Dengie NNR.

Receptor Type	Potential Receptor
National Nature Reserve (NNR).	(Ref. 1006185).
	Blackwater Estuary NNR (Ref. 1006650).
	Colne Estuary NNR (Ref. 1006041).
Designated sites (nationally important): Marine Conservation Zones.	Blackwater, Crouch, Roach and Colne Estuaries Conservation Zone. (Ref. UKMCZ0003).
Other designated land: Local Wildlife Sites (LWSs).	Bradwell Brook LWS.
	Bradwell Cemetery LWS.
	Marshhouse Seawall LWS.
	Southminster Orchard Meadows LWS.
	Goldsands Road Pits and Lakes LWS.
	Asheldham Pits LWS.
	Asheldham Camp LWS.
Other designated land: Environmentally Sensitive Areas (ESAs).	Essex Coast ESA.
Habitats	Coastal Saltmarsh; Coastal Vegetated Single; Mudflats; Coastal and floodplain grazing marsh; Reedbeds; Deciduous woodland; Arable; Broadleaved woodland; Coniferous woodland; Scrub; Hedgerows; Coastal grassland;

Receptor Type	Potential Receptor
	Semi-improved grassland; Amenity grassland; Waterbodies and wetland habitats; and Hardstanding and buildings.
Fresh and estuarine water receptors.	East Hall Farm Irrigation Reservoir.
	Abberton Reservoir.
	River Blackwater.
	Lawling Creek.
	Mayland Creek.
	Bradwell Drain.
	Bradwell Creek.
	St Lawrence Creek.
	Weymarks River.
Groundwater	Essex Gravels Groundwater body (Ref. GB40503G000400).
Cultural heritage (designated buildings and sites): Scheduled Monuments.	Saxon Shore Fort and Anglo-Saxon monastery at Bradwell-on-Sea. Scheduled Monument (Ref. 1013834).
	Coastal fish weir at the northern end of The Nass. Scheduled Monument (Ref. 1019581).
	Saxon coastal fish weir at Sales Point. Scheduled Monument (Ref. 1019103).
	Coastal fish weir 440m north-west of Pewet Island.

Receptor Type	Potential Receptor
	Scheduled Monument (Ref. 1019105).
	Earthworks in and E of Pandole Wood. Scheduled Monument (Ref. 1002123).
	Crop mark site SW of Oldmoor. Scheduled Monument (Ref. 1002145).
	Roman round building. Scheduled Monument (Ref. 1002195).
	Beckingham Hall (gatehouse and enclosure, walls including turrets). Scheduled Monument (Ref. 1005570).
	Mill Mound: a bowl barrow 300m south-west of Beckingham Hall. Scheduled Monument (Ref. 1009449).
	Great Wigborough Henge. Scheduled Monument (Ref. 1011466).
	Slight univallate hillfort south of End Way Farm Scheduled Monument. (Ref. 1014142).
	Tudor blockhouse 300m south of Mersea Stone. Scheduled Monument (Ref. 1013832).
	Decoy pond 700m north-east of Marsh House Farm Scheduled Monument. (Ref. 1013835).

Receptor Type	Potential Receptor
	Martello tower A and associated battery, Stone Point. Scheduled Monument (Ref. 1017052).
	Square decoy pond 260m south of Pennyhole Fleet, Old Hall Marshes. Scheduled Monument (Ref. 1016863).
	Gore decoy 760m south east of Lauriston Farm. Scheduled Monument (Ref. 1019149).
	Mersea Mount: a Roman barrow at Barrow Hill Farm. Scheduled Monument (Ref. 1019019).
	Coastal fish weirs at West Mersea, 570m south east of St Peter's Well. Scheduled Monument (Ref. 1019104).
	Decoy pond 500m south of Waldegraves Farm Scheduled Monument (Ref. 1019036).
	Roman saltern 750m north-west of Maydays Farm. Scheduled Monument (Ref. 1020490).
	Berechurch Dyke: part of the Iron Age territorial oppidum and Romano-British town of Camulodunum. Scheduled Monument (Ref. 1019036).
	Remains of St Mary the Virgin's Church. Scheduled Monument

Receptor Type	Potential Receptor
	(Ref. 1019880).
	Decoy pond immediately north of Pennyhole Fleet, Old Hall Marshes. Scheduled Monument (Ref. 1021086).
Cultural heritage (designated buildings and sites): Grade I Buildings.	Church of St Peter. Grade I (Ref. 1111097).
	Chapel of St. Peter-on-the-Wall. Grade I (Ref. 1110942).
	Jacobes Hall Grade I (Ref. 1111438).
	Church of St Nicholas. Grade I (Ref. 1142488).
	Church of St Peter And St Paul. Grade I (Ref. 1225167).
	Church of St John The Baptist. Grade I (Ref. 1223841).
	Parish Church of St Edmund King And Martyr. Grade I (Ref. 1239659).
	Church of St Nicholas. Grade I (Ref. 1328214).
Cultural heritage (designated buildings and sites): Grade II* Buildings.	Church of St Thomas. Grade II*

Receptor Type	Potential Receptor
	(Ref. 1308856).
	Bradwell Lodge. Grade II* (Ref. 1337401).
	Church of St Andrew. Grade II* (Ref. 1110914).
	Church of All Saints. Grade II* (Ref. 1110914).
	Tolleshunt D'arcy Hall. Grade II* (Ref. 1142513).
	Gatehouse 40 Metres West of Beckingham Hall. Grade II* (Ref. 1142526).
	Bridge Over Moat, 12 Metres South of Tolleshunt D'arcy. Grade II* (Ref. 1142514).
	Bourchier's Hall. Grade II* (Ref. 1142514).
	Bradwell Hall Grade II* (Ref. 1147175).
	Church of St Stephen. Grade II* (Ref. 1223003).

Receptor Type	Potential Receptor
	Church of St Nicholas. Grade II* (Ref. 1223007).
	Church of St Mary Grade II* (Ref. 1224767).
	Church of St Nicholas. Grade II* (Ref. 1247743).
	Yew Tree House, Gate And Gatepiers. Grade II* (Ref. 1266512).
	Blind Knights. Grade II* (Ref. 1267086).
	Layer Breton Hall Grade II* (Ref. 1267120).
	Games Farmhouse. Grade II* (Ref. 1266661).
	Church of St Leonard Grade II* (Ref. 1264082).
	Church of St Mary The Virgin. Grade II* (Ref. 1328624).
	Highams Farmhouse. Grade II* (Ref. 1337678).

Receptor Type	Potential Receptor
	Dovecote Approximately 35 Metres north-east of Tolleshunt D'arcy Hall. Grade II* (Ref. 1323172).
	Church of St Thomas Grade II* (Ref. 1308856).
	Stows Farmhouse Grade II* (Ref. 1247749).
Cultural heritage (designated buildings or sites): Conservation Areas.	Bradwell-on-Sea Conservation Area (Maldon District Council (MDC)).
	Goldhanger Conservation Area (MDC).
	Southminster Conservation Area (MDC).
	Tillingham Conservation Area (MDC).
	Tolleshunt D'Arcy Conservation Area (MDC).
	Fingringhoe Conservation Area (Colchester Borough Council (CBC)).
	West Mersea Conservation Area (CBC).

APPENDIX 14A
SOILS, GEOLOGY AND LAND USE SURVEY AND MONITORING PLAN

Bradwell B Project

Soils, Geology and Land Use Survey and Monitoring Plan

Wood Environment & Infrastructure Solutions UK Limited – August 2020

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Version P03

Report for

Bradwell Power Generation Company Limited
5F, Rex House,
4-12 Lower Regent Street
London
SW1 4PE

Main contributors

[redacted]

Issued by

[redacted] .....

Approved by

[redacted] .....

Wood

Partnership House
Regent Farm Road
Gosforth
Newcastle-upon-Tyne
NE3 3AF

Doc Ref. 42781-WOOD-XX-XX-RP-OC-0001_S4_P03

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CONTENTS

TABLES

APPPENDICES

1. INTRODUCTION

1.1 Background

1.1.1 Bradwell Power Generation Company Limited (BRB GenCo) proposes to develop a new nuclear power station, called the Bradwell B Project, near Bradwell-on-Sea in Essex (hereafter referred to as the Project). The Project would comprise twin UK HPR1000 reactors with a combined electrical capacity of 2,340 Megawatts (MW).

1.1.2 The area of land within which the Bradwell B power station would be built is located next to the Blackwater Estuary on the Dengie Peninsula, approximately 15 kilometres (km) east of the town of Maldon, 1 km northeast of the village of Bradwell-on-Sea within the District of Maldon, Essex. It lies adjacent to the existing Bradwell Power Station, which ceased operation in 2002. The power station is being decommissioned by the Nuclear Decommissioning Authority (NDA) and entered the Care and Maintenance phase in 2018.

1.2 Site Context

1.2.1 For the purposes of this Survey and Monitoring Plan (SMP) the land covered by the Indicative Main Development Site boundary, Potential Temporary Workers Accommodation Site boundary and Potential Expansion Area for Temporary Workers Accommodation Site boundary: central National Grid Reference (NGR) 601000E, 209000N is identified hereafter as the Site (see **Figure 1.1**). Where differentiation is required the Indicative Main Development Site boundary is referred to as the 'main development site' and the Potential Temporary Workers Accommodation Site boundary and Potential Workers Accommodation Expansion Site is collectively referred to as the 'campus site'.

1.2.2 In addition to the range of development activities that relate to the Site there will be a requirement for off-site Associated Development (AD) in order to construct and operate the Project. Such development is expected to include but may not be limited to: park and ride facilities, off-site freight management and potential new or enhanced transport infrastructure.

1.2.3 The requirements with respect to the location and extents of the off-site AD are currently being considered and as a result they are not given further consideration in this SMP. However, the overarching methodologies and approaches (where relevant) will still be applicable to these off-site Associated Development sites (ADs), but the survey extents, geographical coverage and study areas will be confirmed once Project requirements with respect to site location, spatial area and design layout are known with sufficient certainty to enable representative baseline monitoring to be undertaken.

1.2.4 The description of the Project, including site boundaries, presented in this SMP reflects the Project status at the point that the SMP was issued to consultees to inform workshops held in June 2020, with subsequent updates to take into account workshop feedback and responses from consultees. As the Project progresses,

further iterations of the SMP will be required as proposals are refined, in particular, with respect to off-site ADs. The technical scope contained herein remains applicable irrespective of any future boundary changes (should this be required), subject to a review of receptors and spatial scope.

1.3 Purpose of this Document

1.3.1 The purpose of this SMP is to present the relevant baseline characterisation details for agreement with consultees. Such details include the methods to be employed and the spatial and temporal requirements for surveys/monitoring to be undertaken at the Site during 2020 and January-March 2021.

1.3.2 The SMP will be updated to include requirements once the off-site ADs locations are confirmed. Until this time, the SMP identifies which surveys are likely to be required and the anticipated methodology for those surveys.

1.3.3 It should be noted that the land contamination survey detailed herein is to be performed during the planned ground investigation for the Main Development Site only. This investigation has a geological and geotechnical focus and it is scheduled to commence in Q3 2020. The timing of the land contamination surveys for the Workers Accommodation (Campus) areas and the off-site ADs are subject to confirmation. It should be noted that this SMP does include contamination investigation scope details for the Campus.

1.3.4 The preliminary purpose of the surveys presented in this SMP will be to determine robust and accurate baseline data to inform the Environmental Impact Assessment (EIA).

1.3.5 The data derived from surveys identified under the Water Environment SMP will be used in conjunction with the soils, geology and land use survey results to inform the assessment for the Preliminary Environmental Information to support the Preliminary Environmental Information Report (PEIR) for Stage 2 consultation and the subsequent EIA and Environmental Statement (ES) in support of the Development Consent Order (DCO) application.

2. SURVEY PROPOSALS

2.1 Desk Study

Survey Area

2.1.1 The desk study survey area is defined as the Site (**Figure 1.2**), with an additional buffer of 500 m to cover locations of potential contamination or potential receptors in the immediate surrounds of the site, which require consideration in the subsequent assessment for the PEIR and DCO ES.

2.1.2 The survey area excludes the off-site ADs, the location of which are at present not confirmed. A desk study survey will be required for these sites which will follow the methodology set out below.

Survey Methods

2.1.3 The survey is a desk-based exercise, comprising a review of publicly and commercially available information. This will aid in the identification of potential sources of contamination, receptors and exposure or contaminant migration pathways, to inform the Conceptual Model (CM) for the Site to support contaminated land assessments as part of the PEIR and ES, and also the basis for the dewatering studies. Existing publicly available information on soils and agricultural land classification will be collated and reviewed to support the subsequent assessment.

2.1.4 Key baseline data would be sourced from BRB GenCo, the Environment Agency (EA), British Geological Survey (BGS), Maldon District Council (MDC), Essex Council (EC), the NDA, Natural England and the Cranfield Soil and Agrifood Institute. Commercially available information will be obtained via purchase of a Landmark Envirocheck Report™, or equivalent.

2.1.5 The desk study survey will be informed also by data collected during the EIA walkover survey, detailed in Section 2.2.

Data Collection Locations

2.1.6 Data will be collected for the entirety of the survey area (**Figure 1.2**).

Data Presentation

2.1.7 A factual desk study report will be prepared and will include a detailed review of the information obtained, supported by data from the EIA walkover survey (as detailed in Section 2.2). The report will provide information on the Site's current and historical land uses, likely soil, geological, hydrogeological and hydrological conditions, to support subsequent soil and contaminated land assessments in the PEIR and ES.

2.1.8 The desk study survey (and the walkover survey) data will be used in the review and finalisation of the proposed exploratory hole locations for the land contamination survey as detailed in Section 2.4 and the associated water quality and water level surveys detailed in the Water Environment SMP.

2.2 EIA Site Walkover Survey

Survey Area

2.2.1 The EIA Site Walkover Survey area is defined as the Site (**Figure 1.2**), with an additional buffer of 500 m for identification of both potential contaminant sources and potential off-site receptors.

2.2.2 The survey area excludes the off-site ADs, the location of which are at present not confirmed. A site walkover survey will be required for the off-site ADs and will follow the methodology set out below.

Survey Methods

2.2.3 The survey is a site-based activity in which information will be collated from observations to feed into the desk study survey (detailed in **Section 2.1**). While the aim will be to cover as much of the Site as reasonably practical, the survey will focus on key areas such as areas of potential contamination (e.g. former airfield, existing or former locations of fuel/oil storage tanks) and watercourses. Such areas of focus will be identified in advance of the survey through review of the information collected under the desk study survey (**Section 2.1**).

2.2.4 During the survey, observations will be collected and documented using photography, completion of a site walkover proforma, and annotated site plans. Details to be documented on the proforma include, but are not limited to:

- Topography;
- Current land use;
- Current ground cover (hardstanding, vegetation, crops etc);
- Evidence of fuel storage; and
- Evidence of contamination e.g. stains on the ground, sheens on water courses, odours, presence of asbestos containing materials not part of a structure, evidence of burning etc.

2.2.5 The information collected will be used to inform the desk study survey output (**Section 2.1**).

Data Collection Locations

2.2.6 The survey will cover the entirety of the survey area (**Figure 1.2**) but will focus on key areas determined by prior review of the desk study survey information and observations made during the walkover survey.

Quality Control

2.2.7 The proposed information is 'qualitative' (photographs and notes), therefore quality control will focus on the review of collected data. This will confirm that sufficient coverage, detail and understanding has been obtained and will feed into the completion of the desk study survey (**Section 2.1**).

Data Presentation

2.2.8 The information obtained will be presented in the form of photographs, a completed site walkover proforma and annotated site plans. This information will be incorporated into the desk study report, detailed in **Section 2.1**.

2.3 Geology Survey

Survey Area

2.3.1 The geology survey area is defined as the Site (**Figure 1.1**). The survey will be a desk-based exercise required to inform the geological baseline within the survey area to be included in the PEIR and ES.

2.3.2 The survey area excludes the off-site ADs, the location of which are at present not confirmed. It is not anticipated that a geology survey will be required for the off-site ADs, but this is subject to review on confirmation of the location and geological setting. Where geology survey requirements are identified for the off-site ADs, the survey details will be included in future updates to the SMP.

Survey Methods

2.3.3 Publicly available information will be reviewed to confirm there are no statutory geological sites, Sites of Special Scientific Interest (SSSIs) or Regionally Important Geological and Geomorphological Sites (RIGS) within the survey area. The survey data will be used not only to inform the assessment for the PEIR and ES, but also the definition of any mitigation required.

Data Collection Locations

2.3.4 Data will be collected for the entirety of the survey area (**Figure 1.1**)

Data Presentation

2.3.5 A factual technical note report will be prepared presenting a summary of the information obtained.

2.4 Land Contamination Survey

Survey Area

2.4.1 The land contamination survey area is defined as the Site (**Figure 1.1**). The survey will be a field-based exercise performed during the planned main ground investigation which has a geological and geotechnical focus. This investigation is planned to commence in Q3 2020 and follows an earlier phase of investigation which was undertaken in 2017. The survey will obtain data to inform the baseline description of land quality within the survey area that will be included in the PEIR and ES.

2.4.2 The survey area excludes the off-site ADs, the location of which are at present not confirmed. The requirement for a land contamination survey for the off-site ADs is subject to the completion of a desk study survey. Where land contamination survey requirements are identified for the off-site ADs, the survey details will be included in future updates to the SMP.

Survey Methods

2.4.3 The collection of baseline soil data will:

- Enable a description of land quality for a wide range of parameters, including contaminants that may be associated with historical and / or current land-use within the survey area and immediate surrounds;
- Provide a basis for completing impact assessments with respect to the Project, and where necessary to provide support to the selection and design of management and/or mitigation measures. In particular, land quality data will inform the land contamination risk assessment, for human health, controlled waters, ecological and property receptors; and
- Allow comparison with data collected in the future, thereby providing a basis for identifying and quantifying any change from baseline conditions and to allow potential causes of change to be investigated.

2.4.4 The land contamination survey is one element of a wider scope of intrusive ground investigation works associated with the Project to provide baseline data and inform the Project design. The survey data will be obtained from soils samples collected from exploratory holes excavated or drilled as part of the ground investigation.

2.4.5 In addition to the soil data, the land contamination assessment for the EIA will utilise data from the groundwater quality surveys, groundwater level surveys and surface water quality surveys as detailed in the Water Environment SMP.

Data Collection Locations

2.4.6 A detailed schedule of planned exploratory holes to be excavated / drilled as part of the ground investigation is included in **Appendix A**. The exploratory holes represent

the locations from which soil samples are to be obtained for geo-environmental purposes. The exploratory holes are to be completed during the planned main investigation, during which a series of additional exploratory holes will be completed for geological and geotechnical purposes. These holes are excluded from the schedule in **Appendix A** on the basis that these holes will not be sampled for geo-environmental purposes.

2.4.7 **Table 2.1** provides a summary of the exploratory holes to be drilled / excavated for geo-environmental purposes.

Table 2.1 Proposed Exploratory Hole Type and Numbers

Site Area	Exploratory Hole Type	No. Wells for Installation
Main Development Site	Cable percussive borehole	70
	Trial pit	21
Campus Site	Cable percussive borehole	19
	Trial pit	6

2.4.8 The proposed exploratory hole locations are based on desk study work completed to date to support the planning application for the planned ground investigation. The proposed exploratory hole locations are subject to review following completion of the desk-study survey (**Section 2.1**) and EIA walkover survey (**Section 2.2**). The final locations will, in part, be further informed by review of data from the geophysical survey, detailed in the Historic Environment SMP. Review of the geophysical data will support the targeting of any features of interest which may present a contaminant source (e.g. location of former fuel / oil storage tanks).

2.4.9 **Figures 2.1a** to **Figure 2.1e** shows the proposed location of the exploratory holes. The proposed hole locations have been selected to:

- Establish a robust data set with regard to soil quality to support characterisation of the baseline conditions; and
- Target potential sources of contamination identified during desk-based assessment. The ground investigation includes the completion of exploratory holes in proximity to the boundary of the existing Bradwell nuclear power station to assess whether migration of contaminants from this potential source of contamination has occurred.

2.4.10 The exploratory hole locations for the land contamination survey are the same as those selected for the groundwater quality sampling survey and the groundwater level monitoring survey as detailed in the Water Environment SMP.

Data Collection Methodology

2.4.11 The methodology for the collection, handling and storage of soils samples is based on methods described in:

- British Standard BS 10175:2011 +A2:2017 'Investigation of potentially contaminated sites. Code of practice' (Ref. 1); and
- British Standard BS 5930:2015 'Code of Practice for Ground Investigations (Ref. 2).

2.4.12 Samples will be obtained by an experienced geo-environmental specialist, who will record observations of any potential contamination for each exploratory hole from which samples are obtained.

2.4.13 Samples will be obtained across a range of depths to enable characterisation of the various geological strata.

2.4.14 The selection of samples for analysis will be informed by headspace testing in the field, using a photo ionisation detector (PID) for screening of volatile organic contaminants.

2.4.15 All samples obtained will be placed directly in laboratory prepared containers, labelled, handled and transported as per good practice.

2.4.16 Soils samples will be submitted for laboratory chemical and radiochemical analysis in support of baseline determination. The proposed suites of analysis are included in **Appendix B**.

Quality Control

2.4.17 The drilling of all boreholes and excavation of trial pits will be undertaken in accordance with methods set out in:

- The UK Specification for Ground Investigation (ICE, 2012) (Ref.3);
- British Standard BS 5930:2015 'Code of Practice for Ground Investigations' (Ref. 2); and
- British Standard BS 10175:2011 +A2:2017 'Investigation of potentially contaminated sites. Code of practice' (Ref. 1).

2.4.18 The documents set out current good practice for the execution of ground investigation to ensure the collection of good-quality data.

2.4.19 The testing laboratories will be UKAS/McERTS accredited facilities and will operate under suitable Quality Assurance / Quality Control systems.

2.4.20 Quality assurance (QA) samples are to be obtained and submitted to the laboratories for analysis. The QA samples will comprise duplicate samples collected to allow the comparison of test results and evaluate the reproducibility of the data. Duplicate samples are to be collected from the same exploratory hole at the same sample depth, using the same techniques. The sample is to be labelled and

submitted to the laboratory using a dummy identifier value so that the laboratories cannot identify the corresponding original sample.

Data Presentation

2.4.21 Factual ground investigation reports are to be produced on completion of the ground investigation and will include exploratory hole logs. The logs will provide details of soil sample depths, observations of contamination and the PID readings obtained in the field.

2.4.22 Soil quality data collected during the ground investigation is to be reported in the following:

- A combined soil, surface water and groundwater baseline report will be prepared on completion of the full set of surveys. The report will contain the results of the sampling and analysis conducted inclusive of field observations, field measurements and laboratory analysis certificates. The report will include an interpretation of the data, comprising direct comparison of laboratory analysis data against selected UK published generic assessment criteria for assessing risks from soil contaminants to human health and controlled waters; and
- Soil quality data will be used to inform the EIA and will be referenced in the Soils, Geology and Land Use chapter of the ES.

2.5 Agricultural Land Classification Survey

Survey Area

2.5.1 The Agricultural Land Classification (ALC) Survey Area is defined as the Site (**Figure 1.1**).

2.5.2 The rationale for the survey area is that agricultural land quality is geographically discrete and not substantially influenced by changes to the surroundings.

2.5.3 The survey area excludes the off-site ADs, the location of which are at present not confirmed. The requirements for ALC surveys will be reviewed once locations and current land use are known. Where agricultural land classification survey requirements are identified for the off-site ADs, the survey details will be included in future updates to the SMP.

Survey Methods

2.5.4 The ALC survey will be undertaken according to the Natural England 2018 guidance (Ref. 4), which also refers to the MAFF 1988 guidance (Ref. 5) for conducting field surveys, and will involve:

- Soil observations (by spade and hand auger to 1.2m depth) at intervals across the survey area (one observation per hectare);

- Description of soil type and agricultural land grade encountered across the survey area, utilising shallow hand-dug pits to examine the soil structure;
- Laboratory testing of soils where required to support the classification process (for example particle size distribution analysis to support accurate determination of soil texture); and
- Reporting of ALC survey findings. setting out the methodology used and findings (including plans/maps showing the approximate areas of ALC grades across the survey area).

2.5.5 As the design and consultation processes progress, and the land required for the Project is refined, the need for (and extent of) additional baseline data will also be reviewed and updated.

2.5.6 The extent of the baseline field surveys will be dependent on the availability of site access to undertake the ALC surveys. The survey needs only to be undertaken the once and there are no limitations/restriction for the timing of the surveys with the exception that it cannot be carried out when the ground is frozen nor when vegetation density on the land is too thick (for example when oilseed rape is at a density/thickness preventing a walkover).

3. SURVEY PROGRAM

Survey Type											
	2020								2021		
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Desk study survey											
EIA walkover survey											
Geology survey (desk-based)											
Land contamination survey (1, 2)											
Agricultural land classification survey											

Notes:

(1) Timing relate to the land contamination survey for the main development site only. The timing of the land contamination surveys for the Workers Accommodation (Campus) areas and the off-site ADs are subject to confirmation. It should be noted that this SMP does include contamination investigation scope details for the Campus.

(2) Survey period for land contamination survey is subject to confirmation of the main ground investigation, which is currently scheduled to commence in late September / October 2020. The survey duration indicates includes the period of laboratory analysis for soil quality samples.

(3) Dark grey shading denotes planned / preferred timing of survey. Light grey illustrates other potential windows during which survey works could be undertaken. The shading does not reflect the planned duration of the surveys, which with the exception of the land contamination survey will be discrete periods within the windows indicated in the above.

4. REFERENCES

Ref. 1 British Standard BS 10175:2011 +A2:2017. Investigation of potentially contaminated sites. Code of practice.

Ref. 2 British Standard BS 5930:2015. Code of Practice for Ground Investigations.

Ref. 3 ICE (2012). UK Specification for Ground Investigation, Second Edition.

Ref. 4 Natural England. (January 2018). *Guide to assessing development proposals on agricultural land*. [online]. https://www.gov.uk/government/publications/agricultural-land-assess-proposals-for-development/guide-to-assessing-development-proposals-on-agricultural-land [Accessed 7 April 2020].

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APPENDIX A
EXPLORATORY HOLE SCHEDULE

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
EIA	Main development site	FCP-7028	601480	208339	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-2001	600589.76	208350.627	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-2004	600789.58	208299.855	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for constant rate pump test to support hydrogeological modelling and dewatering design	150mm dia. monitoring well to support constant rate pump test Response zone to target groundwater strike Headworks to be protected by raised cover	✓	✓	✓	✓	✓	✓	✓ (Note 4)	✓
EIA	Main development site	FCP-2005	600770.107	208321.126	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for constant rate pump test to support hydrogeological modelling and dewatering design	150mm dia. monitoring well to support constant rate pump test Response zone to target groundwater strike Headworks to be protected by raised cover	✓	✓	✓	✓	✓	✓	✓ (Note 4)	✓
EIA	Main development site	FCP-2006A	600750.715	208342.91	Borehole	Cable percussive drilling	20	London Clay	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to be located in top 5-10m of London Clay and target any groundwater strikes. Headworks to be protected by raised cover	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-2006B	600750.715	208342.91	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for constant rate pump test to support hydrogeological modelling and dewatering design	150mm dia. monitoring well to support constant rate pump test Response zone to target groundwater strike Headworks to be protected by raised cover	✓	✓	✓	✓	✓	✓	✓ (Note 4)	✓
EIA	Main development site	FCP-2007	600769.849	208278.861	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for constant rate pump test to support hydrogeological modelling and dewatering design	150mm dia. monitoring well to support constant rate pump test Response zone to target groundwater strike Headworks to be protected by raised cover	✓	✓	✓	✓	✓	✓	✓ (Note 4)	✓
EIA	Main development site	FCP-2008A	600750.043	208258.433	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for constant rate pump test to support hydrogeological modelling and dewatering design	150mm dia. monitoring well to support constant rate pump test Response zone to target groundwater strike Headworks to be protected by raised cover	✓	✓	✓	✓	✓	✓	✓ (Note 4)	✓

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
EIA	Main development site	FCP-2008B	600752.1839	208256.3314	Borehole	Cable percussive drilling	20	London Clay	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to be located in top 5-10m of London Clay and target any groundwater strikes. Headworks to be protected by raised cover	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7015	600739.149	207947.569	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-3034	601294.465	208156.8	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-3046	602187.041	208456.222	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-3047	600124.216	208132.18	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-3048	600317.396	208499.845	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield / Electricity switching station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-3049	601336	207889	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-3050	600841.028	209203.818	Borehole	Cable percussive drilling	10	Intertidal deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-3051	600700.963	207507.887	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
										hydrogeological modelling	Headworks to be protected by raised cover.								
EIA	Main development site	FCP-3052	601124.799	207640.336	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-3053	601202.945	207341.001	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-3054	601520.822	207698.613	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-3055	601836.051	207726.428	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-3056	601881.084	208000.597	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-3057	602130.088	207903.909	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-3058	602605.58	207987.352	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-3059	602952.596	208431.057	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source ?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
EIA	Main development site	FCP-3060	602477.104	208244.303	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-3061	602425.449	208946.283	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-3062	602919.484	208894.628	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7001A	600322.77	209053.75	Borehole	Cable percussive drilling	10	Intertidal deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7001B	600325.2359	209052.0414	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7002	600394.051	208850.028	Borehole	Cable percussive drilling	10	Intertidal deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7003	600418.665	208669.518	Borehole	Cable percussive drilling	10	Intertidal deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7004	600442.205	208567.482	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7005	600678.066	208532.016	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former East Wick Farm	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
EIA	Main development site	FCP-7006	601022.711	208584.604	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7007	600129.85	208407.91	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell A nuclear power station / electricity switching station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7008	600330.39	208394.53	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former nuclear power station / electricity switching station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7009	600579.598	208285.746	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7010	600192.08	207942.654	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7011	600499.917	208137.537	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7012	600776.889	208117.415	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7013	600231.879	207713.069	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7014	600459.12	207628.864	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield / Downhall Farm	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
EIA	Main development site	FCP-7016	600939.229	208004.772	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7017	600787.406	207780.532	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former gerneral engineers / distribution services	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7018	600588.539	209016.948	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7019A	600987.388	208859.454	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7019B	600985.8348	208862.0207	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7020A	601366.182	209215.774	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7020B	601366.3386	209212.7781	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7021A	601691.763	209404.036	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7021B	601692.7481	209401.2023	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
EIA	Main development site	FCP-7022	601261.474	208801.66	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7023A	601717.066	208944.492	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7023B	601720.0599	208944.492	Borehole	Cable percussive drilling	10	River Terrace Deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7024A	602419.607	209204.095	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7024B	602421.4063	209201.6945	Borehole	Cable percussive drilling	10	River Terrace Deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7025	601433.885	208533.38	Borehole	Cable percussive drilling	10	Intertidal deposits	✓	Potential infilled pond	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7026	601869.538	208712.351	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7027A	602299.971	208698.395	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
EIA	Main development site	FCP-7027B	602291.4957	208708.4071	Borehole	Cable percussive drilling	10	River Terrace Deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7029A	601897.077	208247.68	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FCP-7029B	601896.1463	208250.532	Borehole	Cable percussive drilling	10	River Terrace Deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	No BRB ID assigned (outside of existing Phase 2b Planning Boundary)	599869.96	208780.0724	Borehole	Cable percussive drilling	10	Intertidal deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-EIA-001-B	599871.8135	208777.7134	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-EIA-002	599800.582	208631.207	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-EIA-017	599677.9918	207630.4153	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-EIA-018	599977.5008	207467.4316	Borehole	Cable percussive drilling	10	Head deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
EIA	Main development site	BHCP-EIA-020	600472.8018	207470.0775	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-EIA-024	600451.6351	207222.427	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	FTP-4055	600316.3	208233.25	Trial Pit	Machine excavated	4.5	River terrace deposits	✓	Former Bradwell Bay airfield	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	FTP-4056	600629.295	208540.878	Trial Pit	Machine excavated	4.5	River terrace deposits	✓	Former East Wick Farm	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	FTP-4057	600753.239	208544.289	Trial Pit	Machine excavated	4.5	River terrace deposits	✓	Former East Wick Farm	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	FTP-4058	600700.458	208730.602	Trial Pit	Machine excavated	4.5	Superficial mapped by BGS as absent	✓	Potential infilled pond	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	FTP-4059	600309.314	207970.235	Trial Pit	Machine excavated	4.5	River terrace deposits	✓	Former Bradwell Bay airfield / Downhall Farm	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	FTP-4060	600401.752	208086.548	Trial Pit	Machine excavated	4.5	River terrace deposits	✓	Former Bradwell Bay airfield	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	FTP-4061	600652.297	208270.89	Trial Pit	Machine excavated	4.5	River terrace deposits	✓	Former Bradwell Bay airfield	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	FTP-4062	600869.256	208526.763	Trial Pit	Machine excavated	4.5	River terrace deposits	✓	Former Bradwell Bay airfield	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	FTP-4063	601063.179	208707.519	Trial Pit	Machine excavated	4.5	River terrace deposits	✓	Former Bradwell Bay airfield	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	FTP-4064	600409.389	207860.86	Trial Pit	Machine excavated	4.5	River terrace deposits	✓	Former Bradwell Bay airfield / Downhall Farm	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	FTP-4065	600417.777	207713.978	Trial Pit	Machine excavated	4.5	River terrace deposits	✓	Former Bradwell Bay airfield / Downhall Farm	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	FTP-4066	600661.715	208113.658	Trial Pit	Machine excavated	4.5	River terrace deposits	✓	Former Bradwell Bay airfield	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
EIA	Main development site	FTP-4067	600867.443	208081.437	Trial Pit	Machine excavated	4.5	River terrace deposits	✓	Former Bradwell Bay airfield	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	FTP-4068	600812.6492	207847.5554	Trial Pit	Machine excavated	5.5	River terrace deposits	✓	Former Bradwell Bay airfield	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	FTP-4069	601094.356	209122.502	Trial Pit	Machine excavated	4.5	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	FTP-4070	601865.216	209190.746	Trial Pit	Machine excavated	4.5	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	FTP-4071	601473.83	208585.57	Trial Pit	Machine excavated	4.5	Superficial mapped by BGS as absent	✓	Potential infilled pond	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	FTP-4072	601789.212	208443.296	Trial Pit	Machine excavated	4.5	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	FTP-4073	601652.393	208105.271	Trial Pit	Machine excavated	4.5	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	FTP-4074	602114.61	208976.007	Trial Pit	Machine excavated	4.5	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Main development site	TP-1021	600083.5438	207807.4109	Trial Pit	Machine excavated	5.5	River terrace deposits	✓	Former Bradwell Bay airfield	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Accommodation Campus Site	BHCP-EIA-003	599994.63	208605.43	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
EIA	Accommodation Campus Site	BHCP-EIA-004	599636.7609	208547.022	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-005	600108.7269	208459.4523	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-006	599859.1471	208385.5783	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Potential infilled pond	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-007-A	599647.0856	208324.7942	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-007-B	599649.1829	208326.9393	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-008	599897.3833	208193.789	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-009	599672.3403	208161.1992	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-010	600049.8587	208087.3116	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
EIA	Accommodation Campus Site	BHCP-EIA-011	600089.1552	207972.2576	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former airfield FIDO tanks	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-012	599929.8757	207957.4409	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-013	599780.6504	207918.2825	Borehole	Cable percussive drilling	10	Head deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-014	600111.3802	207879.1241	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former airfield FIDO tanks	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-015	600024.9064	207845.1255	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former airfield FIDO tanks	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-016	599998.1383	207796.574	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former airfield FIDO tanks	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-019	599401.2371	207439.3857	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-021	599410.233	207292.8063	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
EIA	Accommodation Campus Site	BHCP-EIA-022	600119.3177	207269.5229	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-023	599763.1878	207201.2603	Borehole	Cable percussive drilling	10	Head deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Accommodation Campus Site	TP-1022	599904.7362	208531.2451	Trial Pit	Machine excavated	4.5	River terrace deposits	✓	Potential infilled pond	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Accommodation Campus Site	TP-1023	599856.4128	208449.0587	Trial Pit	Machine excavated	4.5	River terrace deposits	✓	Potential infilled pond	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Accommodation Campus Site	TP-1024	599922.6173	208401.2972	Trial Pit	Machine excavated	4.5	River terrace deposits	✓	Potential infilled pond	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Accommodation Campus Site	TP-1025	599836.0407	208292.3928	Trial Pit	Machine excavated	4.5	River terrace deposits	✓	Potential infilled pond	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Accommodation Campus Site	TP-1026	600056.8759	207910.345	Trial Pit	Machine excavated	4.5	River terrace deposits	✓	Former airfield FIDO tanks	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-
EIA	Accommodation Campus Site	TP-1027	600000.7842	207858.4866	Trial Pit	Machine excavated	4.5	River terrace deposits	✓	Former airfield FIDO tanks	Backfill with arisings	✓	-	✓	✓ (Note 3)	-	✓	-	-

Notes to the Schedule:

1. The exploratory holes listed in the schedule are those included in scope to provide data to meet EIA requirements. The EIA exploratory holes are part of a much larger investigation with a number of other exploratory holes (not included in scheduled) to be completed for geotechnical design purposes.
2. Geological data indicates superficial deposits are present at depths up to 10m below ground level, but in many locations are present to much shallower depths (<5m bgl). The proposed depth is presented on a likely worst-case scenario.
3. The recording of groundwater levels in trial pits is limited to observations made during excavation only. No monitoring wells will be installed in trial pit locations.
4. Slug tests to be undertaken in a representative proportion of boreholes to inform hydrogeological modelling and dewatering design. Slug test locations to be selected based on ground conditions encountered.

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Quality	Land (Soil) Quality Data	Slug tests	Constant rate pump test
EIA	Main development site	BHCP-2018	600589.76	208350.627	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2034	600671.21	207905.011	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2037	601294.465	208156.8	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2049	602187.041	208456.222	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2050-A	600322.77	209053.75	Borehole	Cable percussive drilling	10	Intertidal deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2050-B	600325.2359	209052.0414	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2051	600394.051	208850.028	Borehole	Cable percussive drilling	10	Intertidal deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2052	600418.665	208669.518	Borehole	Cable percussive drilling	10	Intertidal deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Quality	Land (Soil) Quality Data	Slug tests	Constant rate pump test
											Headworks to be protected by raised cover.								
EIA	Main development site	BHCP-2053	600442.205	208567.482	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2054	600678.066	208532.016	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former East Wick Farm	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2055	601022.711	208584.604	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2056	600129.85	208407.91	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell A nuclear power station / electricity switching station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2057	600330.39	208394.53	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former nuclear power station / electricity switching station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2058	600579.598	208285.746	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2059	600192.08	207942.654	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Quality	Land (Soil) Quality Data	Slug tests	Constant rate pump test
EIA	Main development site	BHCP-2060	600499.917	208137.537	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2061	600776.889	208117.415	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2062	600231.879	207713.069	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2063	600459.12	207628.864	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield / Downhall Farm	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2065	600939.229	208004.772	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2066	600829.764	207795.805	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former gerneral engineers / distribution services	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2067	600588.539	209016.948	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2068-A	600987.388	208859.454	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Quality	Land (Soil) Quality Data	Slug tests	Constant rate pump test
											Headworks to be protected by raised cover.								
EIA	Main development site	BHCP-2068-B	600985.8348	208862.0207	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2069-A	601366.182	209215.774	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2069-B	601366.3386	209212.7781	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2070-A	601691.763	209404.036	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2070-B	601692.7481	209401.2023	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2071	601261.474	208801.66	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2072-A	601717.066	208944.492	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Quality	Land (Soil) Quality Data	Slug tests	Constant rate pump test
EIA	Main development site	BHCP-2072-B	601720.0599	208944.6831	Borehole	Cable percussive drilling	10	River Terrace Deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2073-A	602419.607	209204.095	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2073-B	602421.4063	209201.6945	Borehole	Cable percussive drilling	10	River Terrace Deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2074	601421.496	208527.688	Borehole	Cable percussive drilling	10	Intertidal deposits	✓	Potential infilled pond	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2075	601869.538	208712.351	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2076-A	602299.971	208698.395	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2076-B	602296.9759	208698.566	Borehole	Cable percussive drilling	10	River Terrace Deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2077	601251.971	208330.286	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Quality	Land (Soil) Quality Data	Slug tests	Constant rate pump test
											Headworks to be protected by raised cover.								
EIA	Main development site	BHCP-2078-A	601897.077	208247.68	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2078-B	601896.1463	208250.532	Borehole	Cable percussive drilling	10	River Terrace Deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2079	600789.58	208299.855	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for constant rate pump test to support hydrogeological modelling and dewatering design	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	✓
EIA	Main development site	BHCP-2080	600770.107	208321.126	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for constant rate pump test to support hydrogeological modelling and dewatering design	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	✓
EIA	Main development site	BHCP-2081-A	600750.715	208342.91	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for constant rate pump test to support hydrogeological modelling and dewatering design	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	✓
EIA	Main development site	BHCP-2081-B	600752.8786	208344.9882	Borehole	Cable percussive drilling	20	London Clay	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to be located in top 5- 10m of London Clay and target any groundwater strikes. Headworks to be protected by raised cover	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Quality	Land (Soil) Quality Data	Slug tests	Constant rate pump test
EIA	Main development site	BHCP-2082	600769.849	208278.861	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for constant rate pump test to support hydrogeological modelling and dewatering design	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	✓
EIA	Main development site	BHCP-2083-A	600750.043	208258.433	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for constant rate pump test to support hydrogeological modelling and dewatering design	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	✓
EIA	Main development site	BHCP-2083-B	600752.1839	208256.3314	Borehole	Cable percussive drilling	20	London Clay	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to be located in top 5- 10m of London Clay and target any groundwater strikes. Headworks to be protected by raised cover	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2084	600124.216	208132.18	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2085	600317.396	208499.845	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield / Electricity switching station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2086	601336	207889	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2087	600841.028	209203.818	Borehole	Cable percussive drilling	10	Intertidal deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Quality	Land (Soil) Quality Data	Slug tests	Constant rate pump test
EIA	Main development site	BHCP-2088	600700.963	207507.887	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2089	601124.799	207640.336	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2090	601202.945	207341.001	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2091	601520.822	207698.613	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2092	601836.051	207726.428	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2093	601881.084	208000.597	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2094	602138.36	207906.38	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2095	602605.58	207987.352	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Quality	Land (Soil) Quality Data	Slug tests	Constant rate pump test
											Headworks to be protected by raised cover.								
EIA	Main development site	BHCP-2096	602952.596	208431.057	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2097	602477.104	208244.303	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2098	602425.449	208946.283	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-2099	602919.484	208894.628	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-EIA-001-A	599869.96	208780.0724	Borehole	Cable percussive drilling	10	Intertidal deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-EIA-001-B	599871.8135	208777.7134	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	✓
EIA	Main development site	BHCP-EIA-002	599800.582	208631.207	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Quality	Land (Soil) Quality Data	Slug tests	Constant rate pump test
EIA	Main development site	BHCP-EIA-017	599677.9918	207630.4153	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-EIA-018	599977.5008	207467.4316	Borehole	Cable percussive drilling	10	Head deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-EIA-020	600472.8018	207470.0775	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Main development site	BHCP-EIA-024	600451.6351	207222.427	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-003	599994.63	208605.43	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	-	-
EIA	Accommodation Campus Site	BHCP-EIA-004	599636.7609	208547.022	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	-	-
EIA	Accommodation Campus Site	BHCP-EIA-005	600108.7269	208459.4523	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	-	-
EIA	Accommodation Campus Site	BHCP-EIA-006	599859.1471	208385.5783	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Potential infilled pond	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation.	✓	✓	✓	✓	✓	✓	-	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Quality	Land (Soil) Quality Data	Slug tests	Constant rate pump test
											Headworks to be protected by raised cover.								
EIA	Accommodation Campus Site	BHCP-EIA-007-A	599647.0856	208324.7942	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	-	-
EIA	Accommodation Campus Site	BHCP-EIA-007-B	599649.1829	208326.9393	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	✓ (Note 4)	✓
EIA	Accommodation Campus Site	BHCP-EIA-008	599897.3833	208193.789	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	-	-
EIA	Accommodation Campus Site	BHCP-EIA-009	599672.3403	208161.1992	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	-	-
EIA	Accommodation Campus Site	BHCP-EIA-010	600049.8587	208087.3116	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	-	-
EIA	Accommodation Campus Site	BHCP-EIA-011	600089.1552	207972.2576	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former airfield FIDO tanks	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	-	-
EIA	Accommodation Campus Site	BHCP-EIA-012	599929.8757	207957.4409	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	-	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Quality	Land (Soil) Quality Data	Slug tests	Constant rate pump test
EIA	Accommodation Campus Site	BHCP-EIA-013	599780.6504	207918.2825	Borehole	Cable percussive drilling	10	Head deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	-	-
EIA	Accommodation Campus Site	BHCP-EIA-014	600111.3802	207879.1241	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former airfield FIDO tanks	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	-	-
EIA	Accommodation Campus Site	BHCP-EIA-015	600024.9064	207845.1255	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former airfield FIDO tanks	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	-	-
EIA	Accommodation Campus Site	BHCP-EIA-016	599998.1383	207796.574	Borehole	Cable percussive drilling	10	River terrace deposits	✓	Former airfield FIDO tanks	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	-	-
EIA	Accommodation Campus Site	BHCP-EIA-019	599401.2371	207439.3857	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	-	-
EIA	Accommodation Campus Site	BHCP-EIA-021	599410.233	207292.8063	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	-	-
EIA	Accommodation Campus Site	BHCP-EIA-022	600119.3177	207269.5229	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	✓	✓	✓	✓	✓	✓	-	-
EIA	Accommodation Campus Site	BHCP-EIA-023	599763.1878	207201.2603	Borehole	Cable percussive drilling	10	Head deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation.	✓	✓	✓	✓	✓	✓	-	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Quality	Land (Soil) Quality Data	Slug tests	Constant rate pump test
											Headworks to be protected by raised cover.								

Notes to the Schedule:

1. The exploratory holes listed in the schedule are those included in scope to provide data to meet EIA requirements. The EIA exploratory holes are part of a much larger investigation with a number of other exploratory holes (not included in scheduled) to be completed for geotechnical design purposes.
2. Geological data indicates superficial deposits are present at depths up to 10m below ground level, but in many locations are present to much shallower depths (<5m bgl). The proposed depth is presented on a likely worst case scenario.
3. The recording of groundwater levels in trial pits is limited to observations made during excavation only. No monitoring wells will be installed in trial pit locations.
4. Slug tests to be undertaken in a representative proportion of boreholes to inform hydrogeological modelling and dewatering design.

APPENDIX B
ANALYTICAL SUITES

Table 1 Soil Sampling – Radiochemical Analysis

Determinand	Estimated No. Samples	
	Main Development Site	Campus Site
Gross alpha (as Am-241)/gross beta (as K-40)	45	13
High resolution gamma spectrometry	23	7
Strontium-90	23	7
Technetium-99	23	7
Aqueous tritium	45	13

Notes:
1) Allowance for analysis of a single soil sample from 50% of sample locations for gross alpha/beta and tritium and 25% of sample locations for gamma spec, Sr-90 and Tc-99

Table 2 Soil Sampling – Chemical Analysis

Determinand	Estimated No. Samples	
	Main Development Site	Campus Site
Arsenic (S) by ICP OES	182	50
Asbestos Soil Identification (S)	36	10
Cadmium (S) by ICP OES	182	50
Chromium (S) by ICP OES	182	50
Copper (S) by ICP OES	182	50
Fraction Organic Carbon (S) by IR	36	20
Hexavalent Chromium (S) by Spectrophotometric	36	10
Lead (S) by ICP OES	182	50
Mercury (S) by ICP OES	182	50
Nickel (S) by ICP OES	182	50
PAH Speciated 16 (S) by GC MS	36	20
PCB WHO 12 Congeners (S) by GC MS	36	10
pH Value (S) by Meter	182	50
Selenium (S) by ICP OES	182	50

Determinand	Estimated No. Samples	
	Main Development Site	Campus Site
Sulphate (Soluble 2:1 Extract) (S) by Spectrophotometric	182	50
Sulphide Easily Liberated (S) by ISE	182	50
SVOC (S) by GC MS	36	20
TPH CWG (S) by GC/MS (includes MTBE and BTEX)	36	20
Vanadium (S) by ICP OES	182	50
VOC (S) by GC MS	36	20
Zinc (S) by ICP OES	182	50
Perfluorooctane sulfonic acid and its derivatives (PFOS)	36	3

Notes:

1) 100% of samples to be tested, except for asbestos, hexavalent chromium and PCB WHO 12 congeners (test 20% of samples), and fraction organic carbon, PAH, soil organic matter, TPH, SVOC and VOC (test 40% of samples). Samples for PFOS analysis will be limited to target “sentinel” boreholes around the existing Bradwell Nuclear Power Station and a representative number of boreholes across the former WW II airfield.

APPENDIX C
FIGURES

Figure 1.1	The Site
Figure 1.2	The Site and 500m Buffer
Figure 2.1 b - f	Ground Investigation – EIA Exploratory Hole Locations

599000 599500 600000 600500 601000 601500 602000 602500 603000

210500 210000 209500 209000 208500 208000 207500 207000

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure

0 200 400 600 800 m

Scale at A3: 1:15,000

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Figure 1.1
The Site

April 2020

wood.

598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000

211000 210500 210000 209500 209000 208500 208000 207500 207000 206500 206000

N

River Blackwater

The Nass

Great Cob Island

South Channel

Virley Channel

Shinglehead Point

MLW

MHW

Mean Low Water

Mean High Water

Pewet Island

Bradwell Creek

Bradwell Waterside

Bradwell Nuclear Power Station

Electricity Switching Station

Weymarks Farm

Airfield (disused)

Downhall Farm

Playing Field

War Meml

Gurds Grove

Irrigation Reservoirs

Pp Ho

Community Settlement

Chapel of St Peter on the Wall

OTHONA ROMAN FORT

Tip Head

Sales Point

East Hall Farm

Caravan Park

Eastlands

Munkins Farm

ROMAN ROAD

East Hall

Gunners Creek

St Peter's Way

Marina

B 1021

Trusses Road

Down Hall

Peverells

East End

Westwick Farm

Woodyards

Down Westwick

Waterside Road

BRADWELL-ON-SEA CP

Cemy

Sch

Bradwell on Sea

Blackberry Grove

Hockley

Bradwell Lodge

Bacons

Delameres Farm

Orplands

Kennel Barn

Gracedale

Gravel Pit

Bradwell Marshes

Bradwell Marsh Wind Farm

Glebe Outfall

St Pet

00 01 02 03 04 99 10 11 09 08 07 06

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- 500m buffer

0 200 400 600 800 1,000 1,200 m

Scale at A3: 1:20,000

Bradwell B Nuclear Power Plant Project
Soils, Geology and Land Use Survey and Monitoring Plan 2020/21

Figure 1.2
The Site and 500m buffer

April 2020

wood.

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599500
600000
600500
209500
209000
208500
N
FCP-7001A
FCP-7001B
FCP-7018
FCP-7002
BHCP-EIA-001-A
BHCP-EIA-001-B
FTP-4058
FCP-7003
BHCP-EIA-002
BHCP-EIA-003
FCP-7004
BHCP-EIA-004
TP-1022
FTP-4056
FCP-7005
FCP-3048
BHCP-EIA-005
TP-1023
TP-1024
FCP-7007
FCP-7008
BHCP-EIA-006
FCP-2001
BHCP-EIA-007-B
BHCP-EIA-007-A
TP-1025
FCP-7009
FTP-4061
FTP-4055
BHCP-EIA-008

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Groundwater monitoring wells
- Trial pit
- Surface water quality sampling point
- Installation selected for constant rate pump test

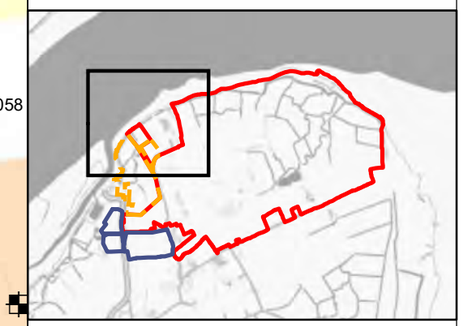
Artificial geology

- Infilled Ground - artificial deposit

Superficial geology

- Intertidal Deposits
- River Terrace Deposits
- Storm Beach Deposits

This drawing illustrates the locations of exploratory holes to be included for EIA purposes in the main ground investigation. Additional geotechnical exploratory holes to be completed as part of the investigation are not shown here. The exploratory hole positions shown represent the locations from which soil samples will be obtained to inform baseline conditions. In addition, all boreholes shown are to be installed with monitoring wells and represent monitoring and sampling points for the groundwater level monitoring and groundwater quality sampling surveys.



0 50 100 150 200 250 300 m

Scale at A3: 1:5,000

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Figure 2.1b
Ground Investigation - EIA exploratory hole locations

August 2020

wood.

C:\Users\Simon.Green2\Desktop\41843 Bradwell EIA Support\GIS\Workspaces\41843-WOOD-0255_v2.mxd Originator: simon.green2

601000
601500
602000
209500
209000
208500
N
FCP-7021A
FCP-7021B
FCP-3050
FCP-7020A
FCP-7020B
FTP-4070
FTP-4069
FTP-4074
FCP-7023A
FCP-7023B
FCP-7019B
FCP-7019A
FCP-7022
FTP-4058
FTP-4063
FCP-7026
FCP-7006
FTP-4071
FTP-4057
FTP-4062
FCP-7005
FCP-7025
FTP-4072
FCP-3046
FCP-2006B
FCP-2006A
FCP-2005
FCP-2004
FCP-2007
FTP-4061
FCP-2008A
FCP-2008B
FCP-7028
FCP-7029B
FCP-7029A

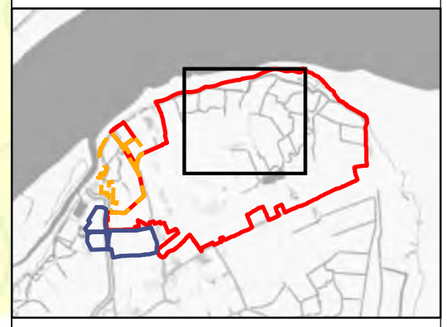
Key

- Indicative Main Development Site
- Groundwater monitoring wells
- Trial pit
- Surface water quality sampling point
- Installation selected for constant rate pump test

Superficial geology

- Intertidal Deposits
- River Terrace Deposits
- Storm Beach Deposits

This drawing illustrates the locations of exploratory holes to be included for EIA purposes in the main ground investigation. Additional geotechnical exploratory holes to be completed as part of the investigation are not shown here. The exploratory hole positions shown represent the locations from which soil samples will be obtained to inform baseline conditions. In addition, all boreholes shown are to be installed with monitoring wells and represent monitoring and sampling points for the groundwater level monitoring and groundwater quality sampling surveys.



0 50 100 150 200 250 300 m

Scale at A3: 1:5,000

Bradwell B Nuclear Power Plant Project
Soils, Geology and Land Use Survey and Monitoring Plan 2020/21

Figure 2.1c
Ground Investigation - EIA exploratory hole locations

August 2020

wood.

C:\Users\Simon.Green2\Desktop\41843 Bradwell EIA Support\GIS\Workspaces\41843-WOOD-0255_v2.mxd Originator: simon.green2

601500
602000
602500
603000
209000
208500
208000

FTP-4070
FCP-7024A
FCP-7024B
FTP-4074
FCP-7023A
FCP-7023B
FCP-3061
FCP-3062
FCP-7026
FCP-7027B
FCP-7027A
FTP-4071
FTP-4072
FCP-3046
FCP-3059
FCP-7028
FCP-7029B
FCP-7029A
FCP-3060
FTP-4073
FCP-3056
FCP-3058
FCP-3057

Key

- Indicative Main Development Site
- Groundwater monitoring wells
- Trial pit
- Surface water quality sampling point

Superficial geology

- Head
- Intertidal Deposits
- River Terrace Deposits
- Storm Beach Deposits

This drawing illustrates the locations of exploratory holes to be included for EIA purposes in the main ground investigation. Additional geotechnical exploratory holes to be completed as part of the investigation are not shown here. The exploratory hole positions shown represent the locations from which soil samples will be obtained to inform baseline conditions. In addition, all boreholes shown are to be installed with monitoring wells and represent monitoring and sampling points for the groundwater level monitoring and groundwater quality sampling surveys.

0 50 100 150 200 250 300 m

Scale at A3: 1:5,000

Bradwell B Nuclear Power Plant Project
Soils, Geology and Land Use Survey and Monitoring Plan 2020/21

Figure 2.1d
Ground Investigation - EIA exploratory hole locations

August 2020

wood.

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599500
600000
600500
208000
207500
207000
N

BHCP-EIA-008
BHCP-EIA-009
BHCP-EIA-010
BHCP-EIA-011
BHCP-EIA-012
BHCP-EIA-013
BHCP-EIA-014
BHCP-EIA-015
BHCP-EIA-016
BHCP-EIA-017
BHCP-EIA-018
BHCP-EIA-019
BHCP-EIA-021
BHCP-EIA-022
BHCP-EIA-023
BHCP-EIA-024
FCP-3047
FCP-7010
FCP-7011
FCP-7013
FCP-7014
FCP-7015
FCP-7030
FCP-3051
FTP-4055
FTP-4059
FTP-4060
FTP-4064
FTP-4065
FTP-4066
TP-1026
TP-1027
TP-1021

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Groundwater monitoring wells
- Trial pit
- Surface water quality sampling point
- Installation selected for constant rate pump test

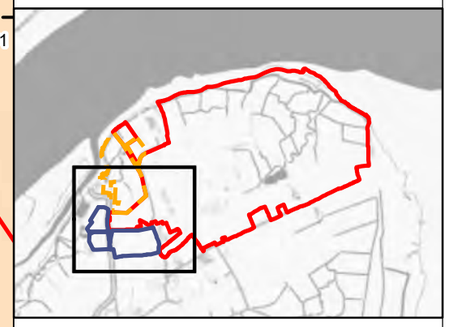
Artificial geology

- Made Ground - artificial deposit
- Worked Ground - void

Superficial geology

- Head
- Intertidal Deposits
- River Terrace Deposits

This drawing illustrates the locations of exploratory holes to be included for EIA purposes in the main ground investigation. Additional geotechnical exploratory holes to be completed as part of the investigation are not shown here. The exploratory hole positions shown represent the locations from which soil samples will be obtained to inform baseline conditions. In addition, all boreholes shown are to be installed with monitoring wells and represent monitoring and sampling points for the groundwater level monitoring and groundwater quality sampling surveys.



0 50 100 150 200 250 300 m

Scale at A3: 1:5,000

Bradwell B Nuclear Power Plant Project
Soils, Geology and Land Use Survey and Monitoring Plan 2020/21

Figure 2.1e
Ground Investigation - EIA exploratory hole locations

August 2020

wood.

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601000
601500
602000
208000
207500
207000
N
FCP-2008B
FCP-7029A
FCP-3034
FTP-4066
FCP-7012
FTP-4067
FTP-4073
FCP-7016
FCP-3056
FCP-7015
FCP-3057
FCP-3049
FTP-4068
FCP-7017
FCP-3055
FCP-3054
FCP-3052
FCP-3051
FCP-3053

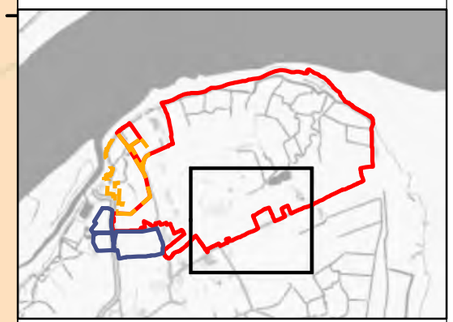
Key

- Indicative Main Development Site
- Groundwater monitoring wells
- Trial pit
- Surface water quality sampling point
- Installation selected for constant rate pump test

Superficial geology

- Head
- Intertidal Deposits
- River Terrace Deposits

This drawing illustrates the locations of exploratory holes to be included for EIA purposes in the main ground investigation. Additional geotechnical exploratory holes to be completed as part of the investigation are not shown here. The exploratory hole positions shown represent the locations from which soil samples will be obtained to inform baseline conditions. In addition, all boreholes shown are to be installed with monitoring wells and represent monitoring and sampling points for the groundwater level monitoring and groundwater quality sampling surveys.



0 50 100 150 200 250 300 m

Scale at A3: 1:5,000

Bradwell B Nuclear Power Plant Project
Soils, Geology and Land Use Survey and Monitoring Plan 2020/21

Figure 2.1f
Ground Investigation - EIA exploratory hole locations

August 2020

wood.

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APPENDIX 15A
WATER ENVIRONMENT SURVEY AND MONITORING PLAN

Bradwell B Project

Water Environment Survey and Monitoring Plan

Wood Environment & Infrastructure Solutions UK Limited – August 2020

BBX20232001WOOD03PT

Version P03

Report for

Bradwell Power Generation Company Limited (BRB)

5F, Rex House,

4-12 Lower Regent Street

London

SW1 4PE

Main contributors

[redacted]

Issued by

[redacted] .....

Approved by

[redacted] .....

Wood

Partnership House

Regent Farm Road

Gosforth

Newcastle upon Tyne

NE3 3AF

United Kingdom

Tel +44 (0) 191 272 6100

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Revision	Amendment	By	Date
P01	Draft	[redacted]	05/05/2020
P02	Final Issue	[redacted]	01/06/2020
P03	Post-workshop Issue	[redacted]	14/08/2020

CONTENTS

TABLES

APPENDICES

1. INTRODUCTION

1.1 Background

1.1.1 Bradwell Power Generation Company Limited (BRB GenCo) proposes to develop a new nuclear power station, called the Bradwell B Project, near Bradwell-on-Sea in Essex (hereafter referred to as the Project). The Project would comprise twin UK HPR1000 reactors with a combined electrical capacity of 2,340 MW.

1.1.2 The area of land within which the Bradwell B power station would be built is located next to the Blackwater Estuary on the Dengie Peninsula, approximately 15 kilometres (km) east of the town of Maldon, 1 km north-east of the village of Bradwell-on-Sea within the District of Maldon, Essex. It lies adjacent to the existing Bradwell Nuclear Power Station, which ceased operation in 2002. The power station is being decommissioned by the Nuclear Decommissioning Authority (NDA) and entered the Care and Maintenance phase in 2018.

1.2 Site Context

1.2.1 For the purposes of this Survey and Monitoring Plan (SMP) the land area covered by the Indicative Main Development Site boundary, Potential Temporary Workers Accommodation Area and Potential Expansion Area for Temporary Workers Accommodation: central National Grid Reference (NGR) 601000E, 209000N is identified hereafter as the Site (see **Figure 1.1**). Where differentiation is required the Indicative Main Development Site boundary is referred to as the 'main development site' and the Potential Temporary Workers Accommodation Site boundary and Potential Workers Accommodation Expansion Site is collectively referred to as the 'campus site'.

1.2.2 In addition to the range of development activities that relate to the Site there will be a requirement for off-site Associated Development (AD) in order to construct and operate the Project. Such development is expected to include, but may not be limited to, park and ride facilities, off-site freight management and potential new or enhanced transport infrastructure.

1.2.3 The requirements with respect to the locations and extents of the off-site AD are currently being considered and as a result their monitoring requirements are not given further consideration in this SMP. However, the overarching methodologies and approaches (where relevant) will be applicable to these off-site Associated Development sites (ADs), but the survey extents, geographical coverage and study areas will be confirmed once Project requirements with respect to site location, spatial areas and design layout are known with sufficient certainty to enable representative baseline monitoring to be undertaken.

1.2.4 The description of the Project, including indicative site boundaries, presented in this SMP reflects the Project status at the point that the SMP was issued to consultees to inform workshops held in June 2020, with subsequent updates to take into account workshop feedback and responses from consultees. As the Project

progresses, further iterations of the SMP will be required as proposals are refined, in particular, with respect to off-site ADs. The technical scope contained herein remains applicable irrespective of any future boundary changes (should this be required), subject to a review of receptors and spatial scope.

1.3 Purpose of this Document

1.3.1 The purpose of this SMP is to present the relevant baseline characterisation for agreement with consultees. Such details include the methods to be employed and the spatial and temporal requirements for surveys/monitoring to be undertaken at the Site during 2020 and 2021.

1.3.2 The purpose of the flood risk assessment walkover (**Section 2.1**) is primarily to ground-truth the baseline understanding of sources, pathways and receptors to flooding. The walkover information together with that acquired during the topographic survey and flood defence condition surveys/monitoring (also **Section 2.1**) will assist in ensuring appropriate representation of watercourses, existing flood defences and associated watercourse and other infrastructure in any subsequent flood modelling to be carried out.

1.3.3 The planned surface water flow monitoring (**Section 2.2**) will inform the conceptual understanding of the surface flow regime so as to allow development of a conceptual water balance for the site (in combination with the groundwater monitoring). This understanding will also inform the assessments of aquatic/water dependent habitats. The monitoring will also assist in ensuring appropriate representation of conveyance through watercourses for the flood modelling programme and development of the drainage strategy.

1.3.4 The surface water quality (SWQ) sampling (**Section 2.3**) will enable the characterisation of the water quality baseline of the key surface water features and also provide a basis for completing SWQ risk assessments and impact assessments, and where necessary provide support to the selection and design of management and/or mitigation measures.

1.3.5 The groundwater level (GWL) monitoring (**Section 2.4**) will, alongside the surface water level monitoring, enable the characterisation of shallow GWLs, including seasonal change, flow direction and potentially the degree of interaction between the different hydrogeological units and also between these units, the surface water flow regime, and any tidal influences (whether directly through permeable strata or due to the influence of sluice tide-locking). This understanding will provide the basis for the proposed later numerical groundwater modelling, and associated groundwater quantity impact assessments and mitigation strategies.

1.3.6 The groundwater quality (GWQ) monitoring (**Section 2.5**) will inform the GWQ baseline, risk assessment, Water Framework Directive (WFD) assessments, and land contamination assessment (including the human health and controlled waters risk assessment), and any associated mitigation requirements.

1.3.7 Field permeability tests (**Section 2.6**) are required to obtain data to inform the conceptualisation of aquifer properties and the parameterisation of the groundwater model, and to support the design of the proposed land-raise and earthworks dewatering activities.

1.3.8 The purpose of the Environmental Impact Assessment (EIA) water features walkover (**Section 2.7**) is to establish the setting of the wider area (3 km) around the Site with respect to the water environment and potential water receptors.

2. SURVEY PROPOSALS

2.1 Flood Risk Assessment – Site Walkover, Topographic Survey and Flood Defence Condition Survey/Monitoring

Survey Area

2.1.1 The survey area of the flood risk assessment walkover, topographic survey and flood defence condition survey/monitoring is defined as the Site (see **Section 1.2**), which corresponds with the study areas for the Flood Risk and Drainage topic.

Survey Methods

2.1.2 The objective of the surveys outlined here is to inform the accurate assessment of flood risk at the site to support the development of final development design proposals. The walkover will allow a refined, 'ground-truthed' understanding of the existing site conditions to further inform that obtained from existing reports/data sources, discussion and consultation feedback. It will enable the viewing of observable features relevant to the understanding of flood risk, such as sources, pathways or barriers, and potential receptors. This in turn will inform the conceptual understanding of flood risk mechanisms at the site to be confirmed for analysis, or, if gaps/uncertainties in understanding remain, enable further investigation to be scoped and consulted upon.

2.1.3 The topographic survey and flood defence condition survey are the key initially identified specific surveys required to achieve the objective identified above. The topographic survey will provide a more detailed understanding of defence crest levels, and watercourse and in-channel structure dimensions to support suitably accurate flood modelling. The flood defence survey will provide a more detailed understanding of current defence condition, and hence lifetime and reliability, which in combination with the emerging development proposals will be used to identify potential requirements for flood risk management procedures, secondary defences (e.g. via development earthworks), or defence improvements.

Data Collection Locations

2.1.4 The walkover will visit the following key features (see also **Figure 2.1**):

- Tidal flood defence embankment:
  - To view and record the condition of the existing coastal flood defences and document varying construction types, in particular the seaward revetment face and its current condition, to confirm areas that are particularly exposed/foreshore erosion is evident, or subject to deposition;
  - To view the two tidal sluices near Downhill (Downhall Sluice) and to the north-east of Bradwell A (Weymarks Sluice) in order to understand construction

technique/functioning and the likelihood of erosion/deposition around the outlets/debris bocage at the inlets;

- To view the adjacent borrow dyke[1] on the landward side, and to check the hydraulic continuity of this feature (whether embankments/access tracks crossing the borrow dyke from adjacent farmland include culverts or not and the size of these features); and

- To ascertain view the presence of any secondary flood defence features. For example, the Environment Agency has indicated that counterwalls (low embankments that sub-divide the main defended area) are present between the main tidal defence and Bradwell A, and at Bradwell Waterside.

- Weymarks River Environment Agency 'Main River', Bradwell Waterside ordinary watercourse and the borrow dyke are the key 'arterial' watercourses within the survey area, and key pathways for surface water flooding. The walkover will examine existing channel conditions/flows and existing culverts to gain an understanding of conveyance;

- Irrigation reservoirs – two raised reservoirs are situated in the eastern part of the Site. The Environment Agency's flood risk from reservoirs flood mapping indicates that part of the Site would be at risk of flooding should the embankments fail. Whilst it is understood the reservoirs would be decommissioned as part of pre-construction phase works, a visit is proposed to characterise the baseline conditions; and

- Northern edge of Bradwell-on-Sea – since this area is in close proximity to the Site boundary it has been included in order to ensure the implications of any landform changes on drainage patterns are identified and managed.

2.1.5 The topographic survey(s) will cover key features of interest to the flood risk discipline, principally the key arterial watercourses (the borrow dyke and the Weymarks River), further detail on the dimensions of the two existing tidal sluices, and the flood defence (dimensions of the embankment, crest elevation etc). The programme of surveying will proceed in tandem with the developing level of detail in the flood risk assessment. This will likely involve an initial topographic survey of hydraulic features identified as key to understanding flood risk at the site by the initial high-level flood modelling. This will be progressively refined as the flood risk modelling is developed in step with refinements to the construction phase master planning. A detailed scope will be developed for each topographic survey programme.

[1] A 'borrow dyke' is a term used to describe an artificial watercourse formed via excavation to provide material for the construction of a flood defence/enable collection and routing of land drainage from the defended area to discharge points through the defence. The watercourse on **Figure 2.1** that follows the coastal flood defence is the borrow dyke with the inland Weymarks River flowing into the borrow dyke in the north east. The borrow dyke is a gravity-only (i.e. no pumping) system.

2.1.6 Any flood defence condition surveys will focus on the section of tidal flood defence embankment between Bradwell Waterside and Othona. The exact extent will be confirmed following initial flood modelling and further development of the construction phase master plan. The scope of this survey will be agreed with the Environment Agency as the key stakeholder.

Data Collection Methodology

2.1.7 The flood risk assessment walkover survey is primarily aimed at ground-truthing the baseline understanding of sources, pathways and receptors to flooding. Whilst existing datasets are available, these are generally produced for large areas at a time, and hence rely on assumptions and are not site-specific, or will have become dated due to time elapsed since surveys were undertaken. For this reason in particular, the walkover will include visual assessment of the existing coastal flood defences and existing drainage infrastructure. As a result, the walkover will further develop the understanding of flood risk infrastructure obtained from discussions with, and information supplied by, the Environment Agency. The information acquired will in combination with the proposed topographic surveys (key watercourses, flood defences) assist in ensuring appropriate representation of watercourses, defences and associated infrastructure in the flood modelling, and in the production of any subsequent detailed topographic survey specifications.

2.1.8 The walkover methodology will incorporate the following three stages:

- The use of desk-study information collated during initial tasks to produce a list of features requiring appraisal. This will be reviewed by a senior member of the flood risk/flood modelling team to ensure all key locations are identified;
- A walkover of the Site using a hand-held tablet device with ArcGIS field capture software to obtain georeferenced photographs and notes of key features observed on-site; and
- Presentation, write up and quality control (QC) of collected information.

2.1.9 The topographic survey methodology will comprise the following:

- Production of a topographic survey brief, to include the spatial extent of the survey, the key features to be surveyed, and the density of survey points required to characterise features (i.e. to ensure suitably representative cross-sections of watercourse/embankments, the distance between cross-sections), expected quality standards, type of output (outputs as CAD and pdf, as well as specific digital file types for direct importation into flood modelling software), and access and health and safety;
- Procurement of suitably qualified and experienced sub-contractors (i.e. registered/certified by RICS/CICES or similar); and
- QC - upon receipt of completed surveys these will be reviewed before being approved for use in support of flood modelling.

2.1.10 A methodology for flood defence condition surveys and any subsequent condition monitoring would be developed at a subsequent stage in the programme. The condition survey scope will be developed by a team of civil/geotechnical engineers before appointment of a suitably qualified and experienced sub-contractor. This will be done in consultation with the Environment Agency as the stakeholder with the overall responsibility for the flood defences, utilising its guidance on asset inspection (Ref. 17) to inform the proposed scope. Installation of monitoring on the flood defences will then monitor changes over time. This may comprise initial use of erosion pins/repeat survey, followed by telemetric monitoring installations to support the construction phase.

Quality Control

2.1.11 The proposed walkover information is 'qualitative' (photographs and notes) and therefore QC will focus on the review of the collected data by a senior member of the team. This review will confirm that sufficient coverage/detail/understanding has been obtained, and feed into the write up of the Site walkover and recommendations for further specialist surveys. The review will ensure that complete datasets are obtained relevant to the key concerns identified in the conceptual understanding of flood mechanisms at the Site. This will ensure that data gaps are filled, and older/poorer quality data is updated with suitable new information.

2.1.12 For the topographic survey the primary means of QC will be the appointment of a suitably qualified and experienced contractor, registered with RICS/CICES. Surveys will be undertaken to appropriate standards (i.e. such as those set out in RICS, 2014 (Ref. 1)) which give full guidance on required standards for setting out, locational/measurement accuracy and appropriate capture of topographic data. Once received, sub-contractor data will be reviewed before approval for use on the project. This will primarily take the form of a sense check against existing datasets to identify unexpected discrepancies. Only approved data will be taken forward for use on the project.

2.1.13 A QC procedure will be developed for the flood defence condition survey and monitoring to support the future development of this programme element. The procedure will follow similar protocols to that for the topographic survey.

Data Presentation

2.1.14 A flood risk walkover report will be produced for the Site, cataloguing features observed and the key findings, whether these suitably inform the existing conceptual understanding, and whether further survey will be required, and the nature/timing of any subsequent survey. The report will include an appendix with tabulated information from the visit (generated via processing of the ArcGIS data collector), including location number, grid reference, field notes and photographs. Feature locations will also be shown on an accompanying figure. The data will also be used to inform the WFD assessment baseline.

2.1.15 Topographic survey information will be presented in a variety of forms. Deliverables from the sub-contractor will be expected to take the form of a package of digital data,

comprising pdf/CAD drawings, digital files compatible with specified modelling packages, photographs and a summary report documenting key elements of the survey and quality assurance.

2.1.16 Flood defence condition survey information will be presented in a similar form to that detailed for topographic surveys. For the monitoring periodic reporting will be produced detailing any changes to the defence condition, and if identified the magnitude/nature of the changes in defence condition.

2.2 Surface Water Flow and Level Monitoring

Survey Area

2.2.1 The survey area of the surface water flow monitoring is defined as the Site (see **Section 1.2**), which corresponds with the study areas for the Flood Risk and Drainage topic.

Survey Methods

2.2.2 The objective of the surveys outlined here is to provide an understanding of baseline conditions for the typical discharge (quantity of water) passing through the Weymarks River and connected borrow dyke system. The data will primarily confirm the range of discharges experienced in the system, typical water levels and responsiveness to rainfall events. The data may also help to confirm how tide-locked the system is, the effectiveness of the existing sluices to the tidal environment, potentially the degree of ephemerality of the upper Weymarks River, and the degree of baseflow support from groundwater sources. The ingress of sea water via wave overtopping/flow to/from the marine environment through shallow deposits may be discernible if significant. The information acquired will inform the appraisal of baseline conditions (value/sensitivity as a receptor) and suitable future design measures (drainage design), and also environmental measures such as avoidance, mitigation and compensation. The data will also be used to support calibration of the proposed flood and groundwater models.

Data Collection Locations

2.2.3 **Figure 2.2** shows the seven proposed monitoring locations (three velocity and level, four level only), and these locations are also summarised in **Table 2.1**.

Table 2.1: Surface Water Flow and Level Monitoring Locations

Monitoring point ID	Monitoring type	Location description	Grid reference	Types of equipment
SWqnt1	Level	Upper Weymarks River, north of reservoirs	TM 01841 08254	Level (+ rating curve to establish flow) (Impress IMSL)
SWqnt2	Level	Borrow dyke - east of Weymarks River	TM 02485 09181	Level (+ rating curve to establish flow) (Impress IMSL)
SWqnt3	Level	Borrow dyke - west of Weymarks River	TM 01353 09239	Level (+ rating curve to establish flow) (Impress IMSL)
SWqnt4	Level	Bradwell Waterside ordinary watercourse	TL 99845 08049	Level (+ rating curve to establish flow) (Impress IMSL)
SWqnt5	Level and velocity	At tidal outfall - Weymarks sluice	TM 01684 09433	Velocity + Level (Nivus PCM4 + Impress IMSL)
SWqnt6	Level and velocity	At tidal outfall - Downhall sluice	TL 99578 08455	Velocity + Level (Nivus PCM4 + Impress IMSL)
SWqnt7	Level and velocity	Borrow dyke north-east of the existing Bradwell power station – flow between Weymarks Sluice and Downhall Sluice drainage catchments	TM 00199 09011	Velocity + Level (Nivus PCM4 + Impress IMSL)

Data Collection Methodology

2.2.4 The following monitoring is proposed, reflecting the system being primarily 'level-driven' with ephemeral upper reaches, and static water in the borrow dyke:

- Water level gauging equipment – seven locations (marked on **Figure 2.2** as 'SWqnt' (for 'surface water quantity') 1 to 7); and
- Additional velocity gauging equipment – at three of the above level monitoring locations (marked on **Figure 2.2** as "SWqnt" 5 to 7). These will be located at the two tidal outfall locations (Bradwell Waterside, and NE of the existing Bradwell power station), plus a third in the ditch north of the existing Bradwell power station which forms the 'link' between these two flood cells.

2.2.5 The locations identified are those considered most significant in terms of water movement through the system (in response to rainfall, and discharges when not tide-locked). The level-only stations will characterise more peripheral sections of the network that are expected to be dry/have minimal flow though parts of the year.

2.2.6 The methodologies for the installation and maintenance of the gauging and associated equipment will be based on, and comply with, methods described in the British Standards for Hydrometry BS EN ISO 18365:2013 'Hydrometry. Selection, establishment and operation of a gauging station' (Ref. 2).

2.2.7 The gauging equipment will be located in suitably clear sections of channel/pipe to minimise interference with flows and maximise reliability of the data collected (BS EN ISO 18365:2013).

2.2.8 The methodologies for collecting flow and level data will be based on, and comply with, methods described in the British Standards for Hydrometry ISO 1100-2:2010 Ed 3 'Hydrometry. Measurement of liquid flow in open channels - Part 2: Determination of the Stage-Discharge relationship' (Ref. 3); and BS ISO 15769:2010 'Hydrometry. Guidelines for the application of acoustic velocity meters using the Doppler and echo correlation methods' (Ref. 4).

2.2.9 The proposed gauging locations will utilise either the stage-discharge or velocity-index method depending on whether the gauge installed records level only, or both velocity and level respectively. Equipment such as the Nivus PCM4 flow meter to record velocities and the Impress IMSL submersible level transmitter to record water levels or equivalent will be used. The two methodologies are described in more detail below.

2.2.10 The stage-discharge methodology involves the measurement of water level (stage) at a gauging location on a continuous (15 minute) basis and the development of a relationship between water level and flow (the stage-discharge relationship) through a series of current meter gaugings (discharge measurements) over a range of flows and discharges. The methodology requires that there is a relationship between stage and discharge recorded at a stable natural or man-made control downstream of the water level measurement point. The development of such relationships is described in ISO 1100-2:2010, which recommends that 15 to 20 current meter gaugings are undertaken throughout the flow range to develop a stage-discharge relationship.

2.2.11 The velocity-index methodology involves the measurement of velocity (index velocity) and water level (stage) at a gauging location on a continuous (15 minute) basis and the development of a relationship between the index velocity and the mean velocity at the gauging location through a series of current meter gaugings over a range of flows. This methodology does not require a stable relationship between stage and discharge and can thus be used at gauging locations where the stage-discharge relationship is either unstable or insensitive.

2.2.12 The requirement to develop such relationships recognises that in nearly all open channel applications, the velocity meter will not measure the mean velocity in the cross-section as it can only sample the portion of the channel immediately upstream of it. It is therefore necessary to develop the velocity-index relationship to adjust the measured velocity at each gauging location. Given that most velocity meters are installed in the centre of the channel where the highest velocity is usually found, not making such adjustments will result in a significant over-estimate of the flow.

2.2.13 The velocity-index methodology is described in detail in BS ISO 15769:2010, which recommends that 15 to 20 current meter gaugings are carried out over a range of flows to develop a velocity-index relationship.

2.2.14 Whichever methodology is used, the following process is proposed for the flow monitoring:

- Agreement of monitoring locations/scope – discussions with regulators on the suitability of proposed monitoring locations and methodologies;
- Pre-installation visit – site walkover with the selected monitoring contractor to confirm the suitability of the potential locations, micro-siting and specifics for each installation location;
- Preparation and agreement of Flood Risk Activities Permits (Environment Agency, where the installation is located on a Main River) or Waterways Consents (Essex County Council as the Lead Local Flood Authority for installations located in the remining ‘Ordinary Watercourses’ on site);
- Installation and commissioning – contractor on-site to install the agreed monitoring equipment, undertake testing, calibration, and sign off as fully commissioned;
- Maintenance visits – periodic visits to check installations, clean sensors, cut back/remove vegetation and debris; and
- Decommissioning – monitoring will proceed throughout the pre-DCO submission period, and into the construction phase. Precise proposals for decommissioning will be confirmed as required.

2.2.15 Application materials will be prepared for the Flood Risk Activity Permits and Watercourse Consents for submission to the Environment Agency and Essex County Council respectively. These will reflect the final installation proposals

developed following a site visit with the monitoring specialist contractor. The Environment Agency guidance available online indicates that an exclusion, exemption or standard rules approach is not available, and that a bespoke application is required (typically due to the varied/rare nature of this) type of application.

2.2.16 The Environment Agency require a 20 day period to assess an application and confirm acceptability or ask for further details, whilst Essex County Council require 8 weeks. A brief standard consent pro-forma will be developed, detailing the proposed monitoring installation location, a channel cross-section with details of the equipment, a method statement for the installation, and confirmation that the installations will not have an adverse effect on channel ecology or WFD status. The pro-forma will be modified slightly to suit each of the proposed monitoring installations for submission to the Environment Agency or Essex County Council respectively.

2.2.17 The continuous monitoring will ensure both "dry" season (summer) and "wet" season (autumn and winter) conditions are captured. The flow monitoring programme comprises the following:

- Continuous data recorded by the gauging/logging equipment installed at all the proposed flow gauging locations. Water level (in metres Above Ordnance Datum, mAOD) and river flow data (in m^3/s) will be collected at an interval of 15 minutes. Loggers will be downloaded at every spot gauging visit (described below), although continuous data will also be automatically uploaded via telemetry to an online Isodaq Timeview Telemetry database;

- A series of visits to the Site will be undertaken under a range of flow conditions to take spot gauging measurements at all of the proposed flow gauging locations. This will enable a stage-discharge rating curve or index/mean velocity relationship to be defined for every location to generate flow data, taking into account the range of seasonal flows that occur during the period of monitoring; and

- The first visit to each gauging location will include a topographical survey of the channel cross-section. Calibration of equipment will also take place on this visit against atmospheric pressure gauges.

2.2.18 Incoming data will be reviewed by both the survey team and the technical delivery team to identify suspicious or erroneous data points or periods before being formally accepted to be utilised in ongoing technical work.

Quality Control

2.2.19 An experienced, quality approved contractor will be appointed for the provision, installation, calibration and commissioning of the monitoring equipment. All monitoring, data logging and transmission equipment and software will be appropriately certified for environmental monitoring. An agreed protocol will be put in place for the review of logged data, following discussions with the monitoring

contractor and confirmation of any built-in data quality flagging within the monitoring software. This is likely to involve the periodic retrieval and processing of data within a spreadsheet application, to check for equipment failure or drift. The quality review will ensure that complete datasets are obtained relevant to understand surface water quantity and the overall water balance at the Site. This will ensure that data gaps are filled, and older/poorer quality data is updated with suitable new information.

2.2.20 All work will be carried out in accordance with BS EN ISO 18365:2013, ISO 1100-2:2010 and BS ISO 15769:2010.

Data Presentation

2.2.21 An initial report covering the installation of gauging equipment, calibration and rating curves generation will be prepared. Data will be made available via periodic reporting/to support meetings, although will need to be treated as indicative until all flow gauging is completed to provide suitable rating curves.

2.2.22 Surface water flow data collected during the monitoring programme will be reported in the following ways:

- A combined surface water and groundwater report will be prepared mid-way (interim) and on completion (final) of the surface water and groundwater monitoring programme. With respect to surface water flow, the reports will contain the results of the monitoring conducted during each monitoring round completed. This will include graphed data for each of the monitoring locations, and accompanying figures to illustrate the identified water environment characteristics (flowing, static, dry); and
- The data will also be published and interpreted as part of the Stage 2 Consultation and in the DCO application.

2.3 Surface Water Quality Sampling

Survey Area

2.3.1 The SWQ monitoring survey area is defined as the Site (see **Section 1.2**).

Survey Methods

2.3.2 The objective of the surveys outlined here is to provide an understanding of baseline conditions for the typical discharge (quality of water) passing through the Weymarks River and connected borrow dyke system. The data will primarily confirm the range of water quality experienced in the system, including that during rainfall and tidal events, and will also help identify local areas of contamination. The surveys will provide a basis for completing SWQ risk assessments and impact assessments, and where necessary provide support to the selection and design of management and/or mitigation measures. They will also allow comparison with SWQ samples

collected in the future, thereby providing a basis for identifying and quantifying any change from baseline conditions and to allow the investigation of potential causes.

Data Collection Locations

2.3.3 A total of eight locations have been selected for SWQ sampling**. Figures 2.3a to f** show the location of the proposed SWQ sampling points. **Figure 2.3a** is a master overview map, which presents the entire SWQ/GWL and GWQ monitoring network. This master map is also split into five subareas in **Figures 2.3b to 2.3f**. The sample points target the borrow dyke and Weymarks River as the key surface water features, plus drainage ditches in the survey area that feed into these watercourses.

2.3.4 The distribution of the SWQ sampling points across the survey area is based on obtaining a robust data set representative of the survey area. Sampling points are also selected with regard to the following:

- The direction of flow of surface watercourses;
- Targeting the point at which the borrow dyke and Weymarks River converge; and
- Sufficient proximity to the proposed groundwater monitoring wells (GMWs, also shown on **Figures 2.3a-f**) to enable direct comparison of groundwater and SWQ and levels and any seasonal variation in the parameters measured.

Data Collection Methodology

2.3.5 Surface water sampling will be undertaken at the eight SWQ locations at monthly intervals. Additional field measurements/sampling at the borrow dyke sampling locations and/or the incorporation of pH/turbidity/conductivity logging capability at selected borrow dyke flow monitoring locations (**Table 2.1)** are currently being considered to determine surface water quality variations during specific hydrological events, such as high tides. Further field measurements/sampling will also be undertaken with respect to any identified or suspected local contamination.

2.3.6 Surface water samples will be collected, handled and stored in accordance with methods described in British Standard BS ISO 5667-6:2016 ‘Water quality. Guidance on sampling of rivers and streams’ (Ref. 5) and BS EN ISO 5667-3:2018 ‘Water Quality. Sampling. Preservation and Handling of Water Samples’ (Ref. 6).

2.3.7 Immediately prior to sampling water levels at the sampling point will be measured to enable a comparison with previously recorded levels and observations in trends (e.g. increase or decrease in levels) with adjacent GMWs.

2.3.8 All samples will be obtained using a stainless-steel scoop connected to a telescopic pole, with samples placed directly into laboratory-prepared containers, labelled, handled and transported as per good practice. Samples will be filtered, stored and preserved according to the requirements of the selected suite of analysis, laboratory

analytical methods and the requirements of any associated analytical accreditations.

2.3.9 Field measurements of the following water quality indicator parameters are to be obtained prior to sample collection using a hand-held multi-parameter probe:

- pH;
- Temperature;
- Dissolved oxygen;
- Redox potential (ORP); and
- Electrical conductivity.

2.3.10 Proposed analytical suites for laboratory based testing are detailed in **Appendix B.**

Quality Control

2.3.11 The testing laboratories will be UKAS/McERTS accredited facilities and will operate under suitable Quality Assurance (QA)/QC systems.

2.3.12 The multi-parameter probe used for field measurements will be calibrated prior to each sampling round using manufacturer's instructions and standard calibration solutions. Further calibration will be undertaken in the field daily.

2.3.13 QA samples are to be obtained and submitted to the laboratories for analysis. The QA samples will comprise the following:

- Duplicate samples collected to allow the comparison of test results and evaluate the reproducibility of the data. Duplicate samples are to be collected from the sample locations at the same sample depth, using the same techniques. The sample is to be labelled and submitted to the laboratory using a dummy identifier value so that the laboratories cannot identify the corresponding original sample; and

- Blank samples ('trip blanks') comprising sealed laboratory containers containing pure deionised water prepared at the laboratory. The blank samples will be kept sealed during the monitoring and submitted along with the field samples. Analysis of trip blanks allows the determination of any contamination of samples arising as a result of the collection, transit and storage of samples, or during the analytical processing of the sample.

Data Presentation

2.3.14 Surface water quality data collected during the monitoring programme will be reported in the following ways:

- As mentioned previously, a combined surface water and groundwater report will be prepared mid-way (interim) and on completion (final) of the surface water and groundwater monitoring programme. With respect to SWQ, the reports will contain the results of the sampling and analysis conducted during each monitoring round completed together with the results of any specific event monitoring, inclusive of in-situ water quality parameter data, surface water flows and GWLs at the monitoring points, and laboratory analysis certificates. Interpretation will be limited to a direct comparison of laboratory analysis data against selected WFD Environmental Quality Standards (EQSs), as agreed with the Environment Agency during stakeholder consultation;

- It is currently intended that the data will also be presented as part of the Preliminary Environmental Information to support Stage 2 Consultation. It will subsequently be provided in support of the DCO application; and

- The data will also be used in the ES Soils, Geology and Land use chapter, where it will be of assistance in assessing the potential effect of soil contamination on groundwater.

2.4 Groundwater Level Monitoring

Survey Area

2.4.1 The EIA GWL monitoring survey area is defined as the Site (see **Section 1.2**).

Survey Methods

2.4.2 The objective of the surveys outlined here is to enable characterisation of shallow hydrogeological conditions, namely GWLs, including seasonal change, flow direction and potentially the degree of interaction between the different hydrogeological units. They will also aid understanding of the response of GWLs to rainfall events, the potential local influence of subsurface infrastructure on hydrogeological conditions and groundwater flow paths, and groundwater-surface water interaction within the survey area, including the relationship and connectivity of groundwater with the borrow dyke and Weymarks River.

2.4.3 The data set will provide a basis for completing impact assessments with respect to the Project, and where necessary, provide support to the selection and design of management and/or mitigation measures. In particular, GWL data will inform the parameterisation and calibration of the proposed later numerical groundwater model, and associated groundwater quantity impact assessments and mitigation strategies. The data will also allow comparison with data collected in the future, thereby providing a basis for identifying and quantifying any change from baseline conditions and to allow potential causes to be investigated.

2.4.4 The GWL surveys are one element of a wider scope of intrusive EIA GI works (Ref. 7) associated with the Project to provide baseline data and inform the design of the Project. The wider investigation includes the drilling/excavation of exploratory holes

to gather information on ground and groundwater conditions across the survey area, and the GWL surveys are to be undertaken alongside the GWQ monitoring surveys and field permeability investigations detailed in **Sections 2.4** and **2.6**, respectively.

Data Collection Locations

2.4.5 A detailed schedule of EIA GMWs to be installed as part of the ground investigation (GI) for GWL monitoring is included in **Appendix C**. A summary of the planned GMWs with their planned target installation strata is provided in **Table 2.2**.

Table 2.2: EIA Groundwater Monitoring Well Details

Site Area	Target installation strata for GMWs	Number of GMWs
Main development site	Head deposits	1
	Intertidal deposits	17
	River Terrace deposits	42
	London Clay	2
	Superficial strata mapped by British Geological Survey (BGS) as absent – target strata to be confirmed following drilling (probably London Clay)	8
Campus site	Head deposits	2
	Intertidal deposits	3
	River Terrace deposits	13
	Superficial strata mapped by BGS as absent – target strata to be confirmed following drilling	1
Total number of GMWs:		89

2.4.6 **Figures 2.3a to f** show the location of proposed location of the EIA GMWs. The GMWs have been located to establish a robust monitoring network to support characterisation of the shallow groundwater baseline conditions and to determine the nature of the interaction between groundwater and key surface water features (including Weymark's River and borrow dyke). This understanding will provide the basis for the proposed later numerical groundwater modelling, and the associated groundwater quantity impact assessments and mitigation strategies.

2.4.7 The EIA GMWs are designed to support the characterisation of shallow hydrogeological conditions only. This is on the basis that it is this shallow aquifer that is most likely to be impacted by the proposed development. The London Clay

is present at significant thicknesses beneath the area and affords considerable protection to the deeper Chalk aquifer, to the extent that it may be possible to eventually 'scope out' the Chalk from further assessment. In the meantime, the Chalk is retained for assessment and will be sufficiently characterised by baseline studies and by the geological and geotechnical GI outwith the EIA GMW programme.

2.4.8 The EIA GMWs selected for the GWL sampling survey are the same as those for the GWQ sampling survey detailed in **Section 2.5**.

Data Collection Methodology

2.4.9 Data will be collected from EIA GMWs in the monitoring network on a monthly basis, by the following means:

- Continuous GWL measurements (hourly readings) using data loggers installed in a proportion of the GMWs, targeting key areas such as proposed areas of dewatering and locations where groundwater is most likely to be subject to tidal influences and interact with surface watercourses; and
- Manual measurements using a dip meter across the remainder of the monitoring network.

Quality Control

2.4.10 The drilling of all GMWs is to be undertaken in accordance with methods set out in the UK Specification for Ground Investigation (ICE, 2012) (Ref. 8) and British Standard BS 5930:2015 'Code of Practice for Ground Investigations' (Ref. 9). These documents set out current good practice for the design and installation of good-quality GMWs.

2.4.11 GWL monitoring is also to be undertaken in accordance with the above documents and with reference to British Standard BS 22475-3:2011 'Geotechnical investigation and testing. Sampling methods and groundwater measurements. Conformity assessment of enterprises and personnel by their party' (Ref. 10).

2.4.12 GWL data will be compiled, tabulated following each monitoring round and reviewed for QC and preliminary evaluation. As part of the data interpretation in the ES, GWL data will be presented both temporarily and spatially, to aid in the identification of 'outliers'.

2.4.13 Data from data loggers will be downloaded during each monitoring round, with functionality tests performed to check the data loggers are working as expected. Functionality tests will include power tests, plus correction for barometric pressure and comparison with the manual dip data.

Data Presentation

2.4.14 Factual GI reports are to be produced on completion of the EIA GI and will include GMW logs. The logs will provide GMW construction details and GWL data at the time of the drilling works.

2.4.15 GWL data collected during the monitoring programme will be reported in the following ways:

- As mentioned previously, a combined surface water and groundwater report will be prepared mid-way (interim) and on completion (final) of the surface water and groundwater monitoring programme. With respect to GWLs, the reports will contain the results of the groundwater level monitoring conducted during each monitoring round completed, in the form of tabular data and hydrographs;
- The data will also be published and interpreted as part of the Stage 2 Consultation and in the DCO application; and
- The data will also be used in the ES Soils, Geology and Land use chapter, where it will be of assistance in assessing the potential effect of soil contamination on groundwater.

2.5 Groundwater Quality Sampling

Survey Area

2.5.1 The EIA GWQ sampling survey area is defined as the Site (see **Section 1.2**).

Survey Methods

2.5.2 The objective of the surveys outlined here is to provide site-specific data to deliver a robust description of the baseline GWQ within the shallow hydrogeological units underlying the survey area. They will characterise GWQ for a wide range of water quality parameters, including pollutants that may be associated with historical and current land use within the survey area and the immediate surrounds. They will also allow the seasonal variability in GWQ conditions to be assessed and enable comparisons with relevant EQSs for parameters listed under the Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 (Ref. 11). The surveys will provide a basis for completing impact assessments with respect to the Project, and where necessary to provide support to the selection and design of management and/or mitigation measures. In particular, GWQ data will inform the GWQ risk assessment, WFD assessments, and land contamination assessment (including the human health and controlled waters risk assessment). Finally, the surveys will allow comparison with data collected in the future, thereby providing a basis for identifying and quantifying any change from baseline conditions and to allow potential causes to be investigated.

2.5.3 The GWQ surveys are one element of a wider scope of intrusive EIA GI works associated with the Project to provide baseline data and inform the design of the

proposed development. The wider investigation includes the drilling/excavation of exploratory boreholes to gather information on ground and groundwater conditions across the survey area, and the GWQ surveys are to be undertaken alongside the GWL monitoring surveys and field permeability investigations detailed in **Sections 2.4** and **2.6**, respectively.

Data Collection Locations

2.5.4 The GWQ monitoring utilises the same GMW network used for the EIA GWL monitoring and hence the same comments apply with regard to data collection locations as presented in **Section 2.4** (see also **Figures 2.3a to f** and **Appendix C)**.

2.5.5 Additional considerations which need to be taken into account for the planning of the EIA GMW network from a GWQ perspective include the following:

- There is a need to target potential sources of contamination identified during previous desk-based assessment. The GI includes the installation of sentinel monitoring points around the periphery of the existing Bradwell nuclear power station to assess for migration of contaminants from this potential source; and
- The final proposed location of groundwater sampling points will be subject to review of the desk study survey detailed in the Soils, Geology and Land Use SMP and the geophysical survey data detailed in the Historic Environment SMP. Review of the sampling points on completion of these surveys will provide further certainty that the data points are targeting any areas or features of interest which may represent a contaminant source and which need to be a focus of the proposed baseline GWQ survey.

Data Collection Methodology

2.5.6 The groundwater sampling methodology and handling of samples are based on methods described in the following:

- British Standard BS 10175:2011 +A2:2017 'Investigation of potentially contaminated sites. Code of practice' (Ref. 12);
- British Standard BS 22475-3:2011 'Geotechnical investigation and testing. Sampling methods and groundwater measurements. Conformity assessment of enterprises and personnel by their party'; and
- British Standard BS EN ISO 5667-3:2018 'Water Quality. Sampling. Preservation and Handling of Water Samples'.

2.5.7 Prior to sampling all GMWs are to be developed to ensure they are serviceable and that any groundwater samples obtained are representative of groundwater within the intended response zone.

2.5.8 All samples are to be obtained using low-flow groundwater sampling techniques, typically using a peristaltic pump.

2.5.9 Immediately prior to sampling, GMWs are to be purged, with continuous monitoring of water quality indicator parameters using a closed flow-through cell until stabilisation of the parameters in accordance with the suggested purging stability criteria from CL:AIRE (2008) 'Principles and Practice for the Collection of Representative Groundwater Samples' (Ref. 13). Applying the stability criteria ensures a representative groundwater sample is obtained.

2.5.10 Water quality indicator parameters to be measured in the field are:

- pH;
- Temperature;
- Dissolved oxygen;
- ORP; and
- Electrical conductivity.

2.5.11 Samples are to be obtained on stabilisation of the water quality parameters. All samples obtained will be placed directly in laboratory-prepared containers, labelled, handled and transported as per good practice. Samples will be filtered, stored and preserved according to the requirements of the selected suite of analysis, laboratory analytical methods and the requirements of any associated analytical accreditations.

2.5.12 Groundwater samples are to be submitted for laboratory-based chemical and radiochemical analysis in support of baseline determination. The proposed suites of analysis are included in **Appendix B**.

2.5.13 Waste groundwater generated during purging as part of the sampling process will be temporarily stored on site pending analysis data to support off-site disposal or discharge.

Quality Control

2.5.14 The drilling of all GMWs is to be undertaken in accordance with methods set out in the UK Specification for Ground Investigation (ICE, 2012) and British Standard BS 5930:2015 'Code of Practice for Ground Investigations'. These documents set out current good practice for the design and execution of good-quality GMWs.

2.5.15 The testing laboratories will be UKAS/McERTS accredited facilities and will operate under suitable QA/QC systems.

2.5.16 QA samples are to be obtained and submitted to the laboratories for analysis. The QA samples will comprise the following:

- Duplicate samples collected to allow the comparison of test results and evaluate the reproducibility of the data. Duplicate samples are to be collected from the sample GMW at the same sample depth, using the same techniques. The sample is to be labelled and submitted to the laboratory using a dummy identifier value so that the laboratories cannot identify the corresponding original sample; and

- Blank samples comprising sealed laboratory containers containing pure deionised water prepared at the laboratory. The blank samples will be kept sealed during the monitoring and submitted along with the field samples. Analysis of trip blanks allows the determination of any contamination of samples arising as a result of the collection, transit and storage of samples, or during the analytical processing of the sample.

Data Presentation

2.5.17 As mentioned previously, factual GI reports are to be produced on completion of the EIA GI and will include GMW logs. The logs will provide GMW construction details and GWL data at the time of the drilling works.

2.5.18 GWQ data collected during the monitoring programme will be reported in the following:

- As mentioned previously, a single combined surface water and groundwater report, will be prepared mid-way (interim) and on completion (final) of the surface water and groundwater monitoring programme. With respect to groundwater quality, the reports will contain the results of the sampling and analysis conducted during each monitoring round completed, inclusive of in-situ water quality parameter data, GWLs and laboratory analysis certificates. Interpretation will be limited to a direct comparison of laboratory analysis data against selected EQSs;

- The data will also be published and interpreted as part of the Stage 2 Consultation and in the DCO application; and

- The data will also be used in the ES Soils, Geology and Land use chapter, where it will be of assistance in assessing the potential effect of soil contamination on groundwater.

2.6 Field Permeability Testing

Survey Area

2.6.1 The field permeability testing survey area is defined as the Site (see **Section 1.2**).

Survey Methods

2.6.2 The objective of the testing outlined here is to inform the conceptualisation of aquifer properties and the parameterisation of the numerical groundwater model and to

support the design of the proposed land forming and earthworks dewatering activities.

2.6.3 The field permeability tests are one element of a wider scope of intrusive EIA GI works associated with the Project to provide baseline data and inform the design of the Project. The wider investigation includes the drilling/excavation of exploratory holes and the subsequent installation of GMWs to gather information on ground and groundwater conditions across the survey area.

2.6.4 In addition, the field permeability tests are to be undertaken alongside the EIA GWL monitoring survey and GWQ sampling survey detailed in **Sections 2.4** and **2.5** respectively.

Data Collection Locations

2.6.5 The schedule of EIA GMWs presented in **Appendix C** highlights those wells in which field permeability testing is to be completed. **Figures 2.3 a to f** shows the proposed location of all EIA GMWs and highlight the five boreholes selected for a constant rate pumping test. The boreholes will be installed with 150mm diameter GMWs, with a response zone targeting the River Terrace deposits. In addition, a selection of GMWs installed in the Head deposits and River Terrace deposits will be selected for slug permeability testing[2]. The locations to be selected are dependent on field observations (confirmation of anticipated geology and confirmed groundwater strike), and as such the locations will be selected during the GI.

2.6.6 The GMWs selected for the field permeability tests will be from the EIA GWL and GWQ networks detailed in **Sections 2.4** and **2.5**, respectively.

Data Collection Methodology

2.6.7 The field permeability tests comprise the following:

- Slug tests performed in GMWs within the footprint of the Site and immediate surrounding area. The purpose of these tests is to establish the lateral variability in aquifer properties in the saturated superficial deposits and to understand whether there is likely to be any significant variation in drainage and dewatering requirements in different parts of the survey area; and

- A constant rate pumping test in a single array of GMWs within the proposed footprint of the main power blocks. The main objectives of the pumping test are to establish the bulk aquifer properties in the area to aid the design of dewatering during the power station build.

[2] A slug test is a particular type of aquifer test where water is quickly added or removed from a GMW, and the change in hydraulic head is monitored through time, to determine the near-well aquifer characteristics.

2.6.8 The slug tests will be undertaken using a datalogger with capability to record water levels at intervals on a logarithmic time cycle. The slug test data will be reviewed to determine the appropriateness of undertaking the constant rate test.

2.6.9 The available information for the Site indicates low values of hydraulic conductivity for the superficial deposits (e.g. Amec Foster Wheeler (2017) quotes 0.4 m/d for the River Terrace deposits), and the saturated thickness is unclear, as many of the previously drilled boreholes have been reported as dry. As such, the constant rate pump tests may not be appropriate, and their inclusion is presented as an optional extra subject to the review of the GWL level survey data and slug test data.

2.6.10 The constant rate pumping test GMW array will comprise a central pumping well, with four observations wells arranged on a minimum of two lines at spacings of approximately 10 and 30m from the pumping well, together with London Clay GMWs at the each of the 30m locations. Dataloggers will be installed in the pumping wells, observations wells and any other GMWs within 100m of the pumping well in advance of the test to determine baseline conditions. Given the coastal proximity, monitoring will also include either sea level at a coastal gauging station or GWL in a GMW close to the coast but distant from the pumping test to aid the understanding of tidal influences on GWLs.

Quality Control

2.6.11 The drilling of all GMWs is to be undertaken in accordance with methods set out in the UK Specification for Ground Investigation (ICE, 2012) and British Standard BS 5930:2015 ‘Code of Practice for Ground Investigations’. These documents set out current good practice for the design and execution of good quality GMWs.

2.6.12 The field tests will be undertaken in accordance with the following:

- BS 5930:2015 Code of Practice for Ground Investigations;
- BS ISO 14686:2003 Hydrometric determinations. Pumping tests for water well. Considerations and guidelines for design, performance and use (Ref. 14);
- BS ISO 22282-1:2012 Geotechnical investigation and testing. Geohydraulic testing. General rules (Ref. 15); and
- BS ISO 22282-2:2012 Geotechnical investigation and testing. Geohydraulic testing. Water permeability tests in a borehole using open systems (Ref. 16).

Data Presentation

2.6.13 Factual GI reports are to be produced on completion of the EIA GI and will include exploratory borehole logs. The logs will provide GMW construction details and GWL data at the time of the drilling works.

2.6.14 Field permeability test data will be reported and interpreted as part of the ES Water Environment chapter and will be used to inform the ES assessments. Reporting will

include the details of the data collection methodology and the QC procedures followed.

2.7 EIA Water Features Walkover

Survey Area

2.7.1 The survey area for the surface water component of the Water Environment has been informed by the extent of the Site and the associated zone of influence. It is delineated by the upstream and downstream catchment areas draining to and from the Site, in order to capture potential direct effects on surface water receptors from the proposed development (**Figure 2.4**). A 3km radius survey area around the Site has been defined for the groundwater component of the Water Environment (**Figure 2.5**). Given the distribution and hydraulic properties of the near-surface superficial aquifers, this study area is considered of sufficient extent to include all potentially significant groundwater effects. Areas within the 3km study area to the north of the Blackwater Estuary have not been considered since these water features in this area can be considered to be hydraulically disconnected from the Site.

Survey Methods

2.7.2 The purpose of the walkover survey is to establish the setting of the Site in the water environment and its relationship with potential water receptors. The survey of water features is required to provide site-specific data to deliver a robust description of the baseline in the study areas. In addition, the survey will be undertaken to gain a fuller appreciation of the overall surface water and groundwater monitoring setting.

Data Collection Locations

2.7.3 The walkover will comprise the following:

- A survey of the main river catchments and observation of key surface water features (i.e. borrow dyke, Weymarks River, reservoirs, ponds and other watercourses and drainage features). The direction and volume of flows on watercourses will be estimated (**Figure 2.4**);
- Observations on topography and its relationship to underlying superficial and geological units and resultant impacts on hydrology and/or hydrogeology (**Figure 2.4**). Any exposure of superficial deposits or bedrock is to be recorded, as well as seepage or spring lines observed at geological boundaries and/ or topographic breaks in slope;
- Observation of human infrastructure associated with the water environment, particularly within the downstream catchment areas, for example, the Waymarks and Downhall Sluice gates (**Figure 2.4**);
- Observations of the planned surface and groundwater monitoring locations (**Figure 2.4**). It is not suggested that all monitoring locations are visited, rather selected key surface water monitoring points, such as inland sites and a few on

the borrow dyke. Similarly, key groundwater monitoring locations should be visited, such as the proposed location for the constant rate pumping test. In addition, the survey of a few selected existing groundwater monitoring boreholes is recommended, to record construction headworks, etc;

- Observations where possible of the identified water environment receptor sites within the study areas will comprise the following:
  - Rivers and other water bodies (such as the Bradwell Brook and associated tributaries, other watercourses and drainage, lakes, ponds and reservoirs) (**Figure 2.5**);
  - Springs (such as at Westwick Farm to the south west of the Site) and zones of influence (by appraising the surrounding topography, geology and other features) **(Figure 2.5)**;
  - Key licensed surface water and groundwater abstraction site locations and setting. The key abstraction sites to be visited will be determined by proximity to the Site and key environmental features, abstracted volumes, importance of the supply, etc. A data request has been made to the Environment Agency, but at the time of writing no data have been received to inform specific locations for the walkover;
  - Key licensed discharge locations and setting. The key discharge sites to be visited will be determined by proximity to the Site and key environmental features, discharged volumes, etc. A data request has been made to the Environment Agency, but at the time of writing no data have been received to inform specific locations for the walkover;
  - Key private water supply (PWSs) locations, setting, type (i.e. borehole, spring or surface water abstraction), layout (i.e. design and layout from source, transport, storage and delivery points) and zones of influence. A data request has been made to the Environment Agency and the Local Authority, but at the time of writing no data have been received to inform specific locations for the site walkover; and
  - Conservation sites (**Figure 2.5**).

2.7.4 Specific data collection locations are summarised within **Table 2.3** below. Priority should be given to the Site water features during the walkover survey.

Table 2.3 Water Features Walkover Proposed Survey Locations

Survey Location Type	Description	Grid Reference	Comments
Site (Figure 2.4)			

Survey Location Type	Description	Grid Reference	Comments
Watercourses	Borrow dyke	N/A	The borrow dyke follows the coastal boundary of the Site. Exact locations along the watercourse to be determined during site visit planning.
	Weymarks River	TM 0117 0777 to TM 0243 0920	Exact locations along the watercourse to be determined during site visit planning. It should be noted that the head of the watercourse is at Curds Grove (TM 0100 0772).
	Bradwell Waterside	TL 9996 0786	Identified as an ordinary watercourse.
Reservoirs	Two artificial reservoirs	TM 0174 0808 and TM 0189 0815	Located north northwest of East Hall.
Ponds	Small pond on OS mapping	TM 0211 0784	Adjacent to East Hall Farm.
Human infrastructure	Waymarks Sluice	TM 0188 0942	
	Downhall Sluice	TL 9955 0846	
Planned surface monitoring locations	Bradwell Waterside	TL 9996 0786	All NGRs for surface water monitoring points are approximate.
	Curds Grove	TM 0135 0787	Watercourse downstream of Curds Grove.
	Borrow dyke	N/A	Five possible locations along the borrow dyke but is envisaged that only one or two appropriate sites would be visited.

Survey Location Type	Description	Grid Reference	Comments
Planned groundwater monitoring locations	Borehole cluster	TM 0075 0832	GMWs installed for the constant rate pumping test.
	BHCP-EIA-012	TL 9996 0786	GMW within the same location as a surface water monitoring point (at Bradwell Waterside - see above).
	BHCP-EIA-017	TL 9967 0765	Located within the Head deposits.
	BHCP-2071	TM 0123 0881	Located within the River Terrace deposits. Theses deposits equate to the Essex Gravels WFD Groundwater Body.
	BHCP-2093	TM 0193 0803	Located within the London Clay.
	BHCP-2070	TM 0169 0942	Located within the Intertidal deposits.
Study Area (3km buffer) (Figure 2.5)			
Watercourses	Bradwell Brook	Various (see comments)	On Bradwell Road – minor road B1021 (TL 9939 0507); Sandbeach (TM 0236 0537); and Sandbeach Outfall (TM 0301 0537)/ Glebe Outfall (TM 0301 0537).
	Tillingham Brook	TL 9863 0405	On Brook Road.
Ponds	Mill End	TL 9863 0405	Cluster of ponds and lakes at Mill End, particularly large lake at Reed Grove (TL 9913 0535) and at Mark Grove (TL 9969 0503).
	Westwick Farm	TL 9934 0734	Ponds and surface water drainage features in this area.

Survey Location Type	Description	Grid Reference	Comments
Springs	Spring on OS mapping	TL 9943 0712	Near Westwick Farm.
Human infrastructure	Bradwell Marina	TL 9931 0769	Bradwell marina and associated watercourses (Bradwell Creek) and drainage within the Bradwell waterside into the marina area.
Conservation Sites	Sandbeach Meadows	TM 0214 0505	A Site of Special Scientific Interest (SSSI) and Groundwater Dependent Terrestrial Ecosystem (GWDTE) habitat.
	Blackwater Estuary/ Essex Estuaries	TL 9887 0759	The Essex Estuaries Special Area of Conservation (SAC), Dengie Special Protection Area (SPA), Blackwater Estuary Ramsar, SSSIs and National Natural Reserve (NNR) coastal sites, general observations along the northern foreshore areas only.
General water environment	Bradwell Marshes	TM 0231 0697	Overview of the water environment required only (no specific location).

Note: Licenced surface water and groundwater abstraction, licensed discharge locations and unlicensed abstractions/PWSs have not been included within the table because at the time of writing data requested from the Environment Agency and the Local Authority had not been received.

Data Collection Methodology

2.7.5 The collection of water features survey data will be undertaken by making visual observations and a photographic record of the key surface water and groundwater features and receptors of water environment.

2.7.6 The equipment to be used will include a camera and Ordnance Survey (OS) mapping, and GPS or similar mobile GIS mapping system.

Quality Control

2.7.7 The proposed information is 'qualitative' (photographs and notes), therefore QC will focus on the review of collected data by a senior member of the team. This will aim to confirm that sufficient coverage/detail/understanding has been obtained, and feed into the walkover write up and any recommendations for further specialist surveys.

Data Presentation

2.7.8 Data and photographs collected during the walkover survey will be presented in a short technical note.

3. SURVEY PROGRAMME

3.1.1 The EIA survey programme to be undertaken during Stage 2 (2020 and 2021) is outlined in the **Table 3.1**.

Table 3.1: Proposed 2020 - 2021 Survey Programme

Survey Type	Sep 20	Oct 20	Nov 20	Dec 20	Jan 21	Feb 21	Mar 21	Apr 21	May 21	Jun 21	Jul 21	Aug 21	Sep 21	Oct 21	Nov 21	Dec 21
Flood risk assessment – site walkover, topographic survey, and flood defence condition survey/monitoring (1)																
Surface water flow and level monitoring (2)																
Surface water quality survey (3)																
GWL monitoring survey (3)																
GWQ sampling survey(3)																

Survey Type	Sep 20	Oct 20	Nov 20	Dec 20	Jan 21	Feb 21	Mar 21	Apr 21	May 21	Jun 21	Jul 21	Aug 21	Sep 21	Oct 21	Nov 21	Dec 21
Field permeability test survey (4)																
Water features survey (5)																

Notes:

(1) The flood risk assessment walkover is scheduled towards the end of Q3 2020 due to the ongoing Covid 19 pandemic. Topographic survey(s) will be programmed as required during this period and subsequently to inform specific elements of the assessment, such as the ongoing flood modelling programme. The programme for and scope of any flood defence condition surveys will be confirmed following the flood risk walkover. These defence condition surveys will in turn inform the need for more detailed live monitoring of the flood defences, which will be installed for use during the construction phase.

(2) The initiation of the surface water flow monitoring is also scheduled towards the end of Q3 2020 due to the ongoing Covid 19 pandemic. The monitoring will initially be undertaken for a 12 months period.

(3) Surface water quality survey to be undertaken during the same one year period as the GWL and GWQ surveys. The groundwater surveys are to be commenced on completion of the necessary GI works (December 2020/January 2021.

(4) Field permeability survey (slug tests) to be undertaken during the main GI, which is scheduled for September 2020 to January 2021. The constant rate pump test is to be undertaken after the slug tests in December 2020/January 2021, subject to the slug test results.

(5) The water features survey is scheduled for January 2021 due to the ongoing Covid 19 pandemic.

4. REFERENCES

Ref. 1 RICS (2014) Measured surveys of land, buildings and utilities. Third Edition.

Ref. 2 British Standards for Hydrometry BS EN ISO 18365:2013 ‘Hydrometry. Selection, establishment and operation of a gauging station’

Ref. 3 British Standards for Hydrometry ISO 1100-2:2010 Ed 3 'Hydrometry. Measurement of liquid flow in open channels - Part 2: Determination of the Stage-Discharge relationship';

Ref. 4 British Standards for Hydrometry ISO 15769:2010 'Hydrometry. Guidelines for the application of acoustic velocity meters using the Doppler and echo correlation methods'

Ref. 5 British Standards BS ISO 5667-6:2016. Water quality. Guidance on sampling of rivers and streams.

Ref. 6 British Standards BS EN ISO 5667-3:2018. Water Quality. Sampling. Preservation and Handling of Water Samples.

Ref. 7 Amec Foster Wheeler. Bradwell B Preliminary Ground Investigations: Phase 1 Contaminated Land Desk Study. 2017.

Ref. 8 ICE (2012). UK Specification for Ground Investigation, Second Edition.

Ref. 9 British Standards BS 5930:2015. Code of Practice for Ground Investigations.

Ref. 10 British Standards BS 22475-3:2011. Geotechnical investigation and testing. Sampling methods and groundwater measurements. Conformity assessment of enterprises and personnel by their party.

Ref. 11 Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

Ref. 12 British Standards BS 10175:2011 +A2:2017. Investigation of potentially contaminated sites. Code of practice.

Ref. 13 CL:AIRE (2008). Technical Bulletin 03, Principles and Practice for the Collection of Representative Groundwater Samples.

Ref. 14 British Standards BS ISO 14686:2003. Hydrometric determinations. Pumping tests for water well. Considerations and guidelines for design, performance and use.

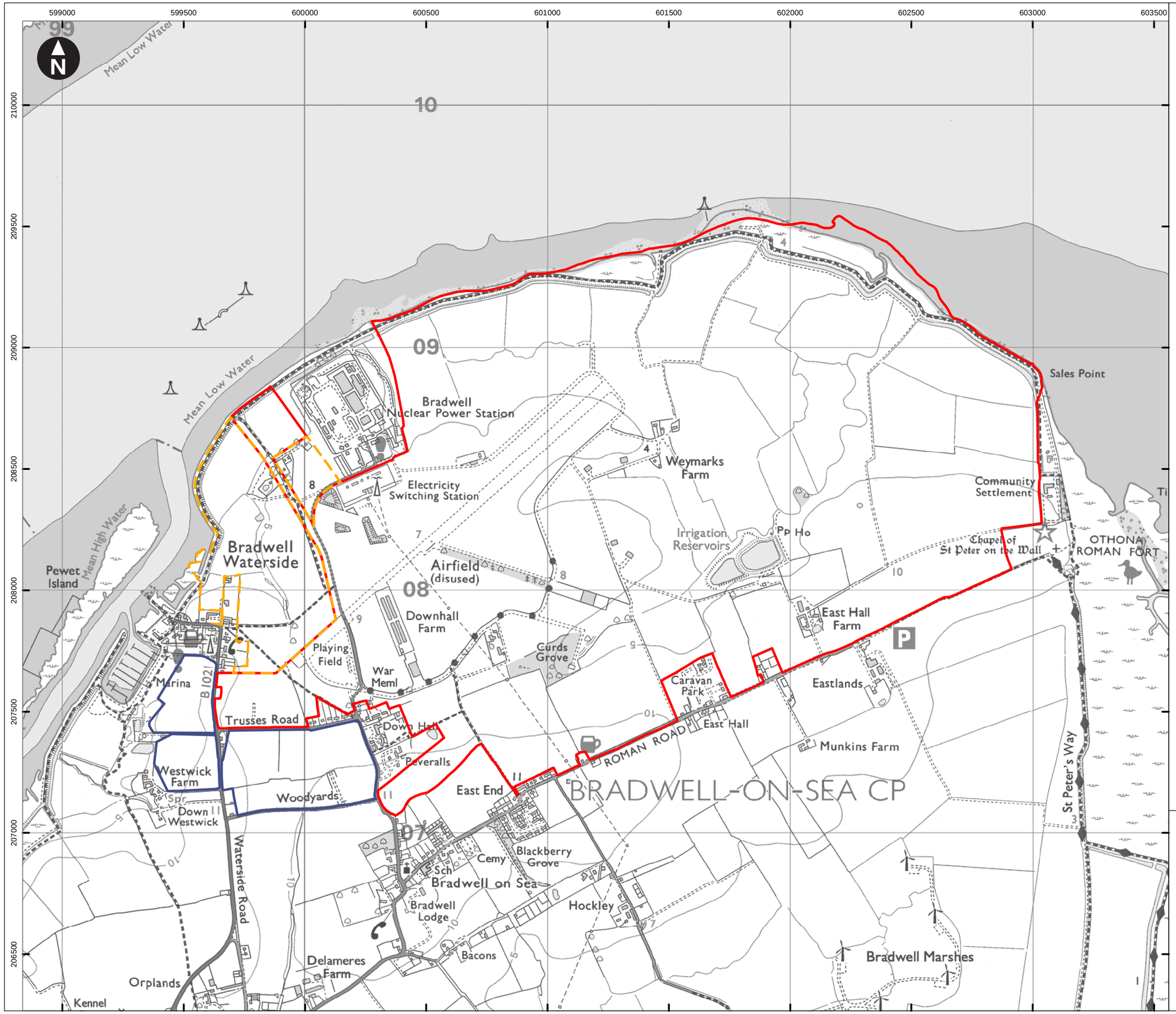
Ref. 15 British Standards BS ISO 22282-1:2012. Geotechnical investigation and testing. Geohydraulic testing. General rules.

Ref. 16 British Standards BS ISO 22282-2:2012. Geotechnical investigation and testing. Geohydraulic testing. Water permeability tests in a borehole using open systems.

Ref 17 Environment Agency (2014). Asset performance tools – asset inspection guidance. Report – SC110008/R2.

APPENDIX A
FIGURES

Figure 1.1	The Site
Figure 2.1	Flood risk assessment walkover
Figure 2.2	Surface water monitoring (level/velocity)
Figure 2.3 (a to f)	EIA monitoring - groundwater quality, groundwater level and surface water quality sampling locations
Figure 2.4	EIA water features walkover –Main development site
Figure 2.5	EIA water features walkover - Study Area (3km buffer)



Bradwell B Nuclear Power Plant Project
Water Environment Survey and Monitoring Plan 2020/21

Figure 1.1
The Site

April 2020

wood.

599000 599500 600000 600500 601000 601500 602000 602500 603000 603500

210000 209500 209000 208500 208000 207500 207000 206500

Borrow dyke

Weymarks sluice

Borrow dyke forms a connection between land lying west and east of Bradwell A Nuclear Power Station

Downhall sluice

Weymarks River

Bradwell Waterside ordinary watercourse

Artificial reservoirs

Bradwell Waterside
Bradwell Nuclear Power Station
Electricity Switching Station
Weymarks Farm
Community Settlement
Chapel of St Peter on the Wall
OTHONA ROMAN FORT
Airfield (disused)
Downhall Farm
Playing Field
War Meml
Marina
B 1021
Trusses Road
Down Hall
Caravan Park
East Hall Farm
Eastlands
ROMAN ROAD
East Hall
Munkins Farm
Peveralls
East End
Woodyards
Westwick Farm
Down Westwick
Waterside Road
Cemy
Blackberry Grove
Sch
Bradwell on Sea
Bradwell Lodge
Hockley
Bacons
Delameres Farm
Orplands
Kennel
Bradwell Marshes
St Peter's Way
Power Island
Mean Low Water

BRADWELL-ON-SEA CP

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Key watercourses
- Coastal flood defences
- Flood Zone 2
- Flood Zone 3
- Artificial reservoirs
- Sluice
- Drain to Downhall sluice
- Drain to Weymarks sluice

0 200 400 600 800 m

Scale at A3: 1:15,000

Bradwell B Nuclear Power Plant Project
Water Environment Survey and Monitoring Plan 2020/21

Figure 2.1
Flood risk assessment walkover

April 2020

wood.

G:\MODEL\PROJECTS\EA-210\41843 Bradwell EIA Support\GIS\Workspaces\41843-WOOD-0265.mxd Originator: simon.green2

599000 599500 600000 600500 601000 601500 602000 602500 603000 603500

210000 209500 209000 208500 208000 207500 207000 206500

SWqnt1 SWqnt2 SWqnt3 SWqnt4 SWqnt5 SWqnt6 SWqnt7

Mean Low Water

Mean High Water

Pewet Island

Bradwell Wat

Bradwell Nuclear Power Station

Electricity Switching Station

Weymarks Farm

Irrigation Reservoirs

Airfield (disused)

Downhall Farm

Playing Field

War Meml

Curds Grove

Caravan Park

East Hall

East Hall Farm

Eastlands

Munkins Farm

Sales Point

Community Settlement

Chapel of St Peter on the Wall

OTHONA ROMAN FORT

ROMAN ROAD

St Peter's Way

Marina

B 1021

Trusses Road

Down Hall

Peveralls

Woodyards

Westwick Farm

Down Westwick

Waterside Road

East End

BRADWELL-ON-SEA CP

Cemy

Sch

Bradwell on Sea

Blackberry Grove

Hockley

Bradwell Lodge

Bacons

Delameres Farm

Orplands

Kennel

Bradwell Marshes

09 10 08 07

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Key watercourses

Proposed surface water monitoring locations

- Level
- Level and velocity

0 200 400 600 800 m

Scale at A3: 1:15,000

Bradwell B Nuclear Power Plant Project
Water Environment Survey and Monitoring Plan 2020/21

Figure 2.2
Surface water monitoring (level/velocity)

April 2020

wood.

G:\MODEL\PROJECTS\EA-210\41843 Bradwell EIA Support\GIS\Workspaces\41843-WOOD-0264.mxd Originator: simon.green2

599000 599500 600000 600500 601000 601500 602000 602500 603000 603500

210000 209500 209000 208500 208000 207500 207000 206500

Mean Low Water

Bradwell Nuclear Power Station

Weymarks Farm

Electricity Switching Station

Bradwell Waterside

Airfield (disused)

Irrigation Reservoir

Community Settlement

Chapel of St Peter on the Wall

OTHONA ROMAN FORT

Sales Point

Pewet Island

Marina

Playing Field

War Mem

Downhall Farm

Cards Grove

East Hall Farm

Caravan Park

Eastlands

Trusses Road

ROMAN ROAD

East Hall

Munkins Farm

Beverells

Westwick Farm

Woodyards

East End

BRADWELL-ON-SEA CP

St Peter's Way

Waterside Road

Cemy

Blackberry Grove

Bradwell on Sea

Hockley

Bradwell Lodge

Bacons

Delameres Farm

Bradwell Marshes

Orplands

Kennel

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Key watercourses
- Flow direction
- Surface water quality sampling point
- Installation selected for constant rate pump test

Groundwater monitoring wells

- Head
- Intertidal Deposits (ID)
- River Terrace Deposits (RTD)
- Paired wells - A (ID) & B (RTD)
- Paired wells - A (RTD) & B (London Clay)
- To be confirmed

Artificial geology

- Landscaped Ground - artifically modified ground
- Made Ground - artificial deposit
- Infilled Ground - artificial deposit
- Worked Ground - void

Superficial geology

- Head
- Intertidal Deposits
- River Terrace Deposits
- Storm Beach Deposits

This drawing illustrates the locations of exploratory holes to be included for EIA purposes in the main ground investigation. Additional geotechnical exploratory holes to be completed as part of the investigation are not shown here. All boreholes shown are to be installed with monitoring wells and represent monitoring and sampling points for the groundwater level monitoring and groundwater quality sampling surveys. Surface water quality sampling points are aligned with adjacent groundwater monitoring wells to enable comparison of water levels and water quality data for groundwater and surface water.

0 100 200 300 400 500 600 700 800 900 m

Scale at A3: 1:15,000

Bradwell B Nuclear Power Plant Project
Water Environment Survey and Monitoring Plan 2020/21

Figure 2.3a
EIA monitoring - groundwater quality, groundwater level and surface water quality sampling locations

August 2020

wood.

C:\Users\Simon.Green2\Desktop\41843 Bradwell EIA Support\GIS\Workspaces\41843-WOOD-0349_v2.mxd Originator: simon.green2

599500
600000
600500
209500
209000
208500
N
FCP-7001A
FCP-7001B
FCP-7018
FCP-7002
BHCP-EIA-001-A
BHCP-EIA-001-B
FCP-7003
BHCP-EIA-002
BHCP-EIA-003
FCP-7004
BHCP-EIA-004
FCP-7005
FCP-3048
BHCP-EIA-005
FCP-7007
FCP-7008
BHCP-EIA-006
FCP-2001
BHCP-EIA-007-A
BHCP-EIA-007-B
FCP-7009
BHCP-EIA-008

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Flow direction
- Groundwater monitoring wells
- Surface water quality sampling point
- Installation selected for constant rate pump test

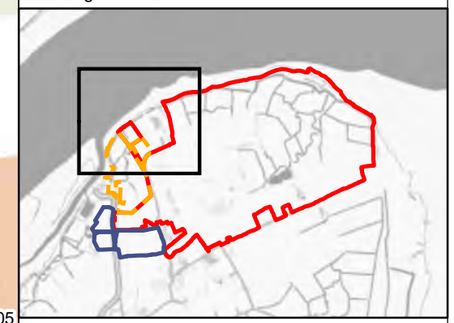
Artificial geology

- Infilled Ground - artificial deposit

Superficial geology

- Intertidal Deposits
- River Terrace Deposits
- Storm Beach Deposits

This drawing illustrates the locations of exploratory holes to be included for EIA purposes in the main ground investigation. Additional geotechnical exploratory holes to be completed as part of the investigation are not shown here. All boreholes shown are to be installed with monitoring wells and represent monitoring and sampling points for the groundwater level monitoring and groundwater quality sampling surveys. Surface water quality sampling points are aligned with adjacent groundwater monitoring wells to enable comparison of water levels and water quality data for groundwater and surface water.



0 50 100 150 200 250 300 m

Scale at A3: 1:5,000

Bradwell B Nuclear Power Plant Project
Water Environment Survey and Monitoring Plan 2020/21

Figure 2.3b
EIA monitoring - groundwater quality, groundwater level and surface water quality sampling locations

August 2020

wood.

C:\Users\Simon.Green2\Desktop\41843 Bradwell EIA Support\GIS\Workspaces\41843-WOOD-0350_v2.mxd Originator: simon.green2

601000
601500
602000
209500
209000
208500
N
FCP-7021A
FCP-7021B
FCP-3050
FCP-7020A
FCP-7020B
FCP-7023A
FCP-7023B
FCP-7019B
FCP-7019A
FCP-7022
FCP-7026
FCP-7006
FCP-7005
FCP-7025
FCP-3046
FCP-2006B
FCP-2006A
FCP-2005
FCP-2004
FCP-2007
FCP-2008A
FCP-2008B
FCP-7028
FCP-7029B
FCP-7029A

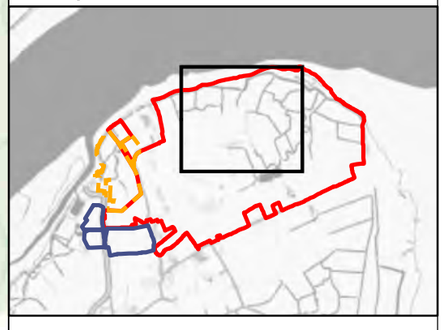
Key

- Indicative Main Development Site
- Flow direction
- Groundwater monitoring wells
- Surface water quality sampling point
- Installation selected for constant rate pump test

Superficial geology

- Intertidal Deposits
- River Terrace Deposits
- Storm Beach Deposits

This drawing illustrates the locations of exploratory holes to be included for EIA purposes in the main ground investigation. Additional geotechnical exploratory holes to be completed as part of the investigation are not shown here. All boreholes shown are to be installed with monitoring wells and represent monitoring and sampling points for the groundwater level monitoring and groundwater quality sampling surveys. Surface water quality sampling points are aligned with adjacent groundwater monitoring wells to enable comparison of water levels and water quality data for groundwater and surface water.



0 50 100 150 200 250 300 m

Scale at A3: 1:5,000

Bradwell B Nuclear Power Plant Project
Water Environment Survey and Monitoring Plan 2020/21

Figure 2.3c
EIA monitoring - groundwater quality, groundwater level and surface water quality sampling locations

August 2020

wood.

C:\Users\Simon.Green2\Desktop\41843 Bradwell EIA Support\GIS\Workspaces\41843-WOOD-0350_v2.mxd Originator: simon.green2

601500
602000
602500
603000
209000
208500
208000
N

FCP-7024A
FCP-7024B
FCP-7023A
FCP-7023B
FCP-3061
FCP-3062
FCP-7026
FCP-7027B
FCP-7027A
FCP-3046
FCP-3059
FCP-7028
FCP-7029B
FCP-7029A
FCP-3060
FCP-3056
FCP-3058
FCP-3057

Key

- Indicative Main Development Site
- Flow direction
- Groundwater monitoring wells
- Surface water quality sampling point

Superficial geology

- Head
- Intertidal Deposits
- River Terrace Deposits
- Storm Beach Deposits

This drawing illustrates the locations of exploratory holes to be included for EIA purposes in the main ground investigation. Additional geotechnical exploratory holes to be completed as part of the investigation are not shown here. All boreholes shown are to be installed with monitoring wells and represent monitoring and sampling points for the groundwater level monitoring and groundwater quality sampling surveys. Surface water quality sampling points are aligned with adjacent groundwater monitoring wells to enable comparison of water levels and water quality data for groundwater and surface water.

0 50 100 150 200 250 300 m

Scale at A3: 1:5,000

Bradwell B Nuclear Power Plant Project
Water Environment Survey and Monitoring Plan 2020/21

Figure 2.3d
EIA monitoring - groundwater quality, groundwater level and surface water quality sampling locations

August 2020

wood.

C:\Users\Simon.Green2\Desktop\41843 Bradwell EIA Support\GIS\Workspaces\41843-WOOD-0350_v2.mxd Originator: simon.green2

599500
600000
600500
208000
207500
207000
N
BHCP-EIA-008
BHCP-EIA-009
FCP-3047
FCP-7011
BHCP-EIA-010
BHCP-EIA-011
BHCP-EIA-012
FCP-7010
FCP-7015
BHCP-EIA-013
BHCP-EIA-014
BHCP-EIA-015
BHCP-EIA-016
FCP-7013
BHCP-EIA-017
FCP-7014
BHCP-EIA-018
FCP-7030
FCP-3051
BHCP-EIA-019
BHCP-EIA-021
BHCP-EIA-022
BHCP-EIA-023
BHCP-EIA-024

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Flow direction
- Groundwater monitoring wells
- Surface water quality sampling point
- Installation selected for constant rate pump test

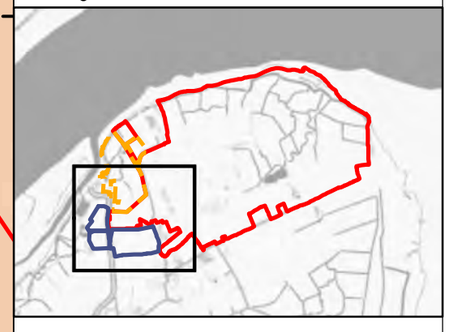
Artificial geology

- Made Ground - artificial deposit
- Worked Ground - void

Superficial geology

- Head
- Intertidal Deposits
- River Terrace Deposits

This drawing illustrates the locations of exploratory holes to be included for EIA purposes in the main ground investigation. Additional geotechnical exploratory holes to be completed as part of the investigation are not shown here. All boreholes shown are to be installed with monitoring wells and represent monitoring and sampling points for the groundwater level monitoring and groundwater quality sampling surveys. Surface water quality sampling points are aligned with adjacent groundwater monitoring wells to enable comparison of water levels and water quality data for groundwater and surface water.



0 50 100 150 200 250 300 m

Scale at A3: 1:5,000

Bradwell B Nuclear Power Plant Project
Water Environment Survey and Monitoring Plan 2020/21

Figure 2.3e
EIA monitoring - groundwater quality, groundwater level and surface water quality sampling locations

August 2020

wood.

C:\Users\Simon.Green2\Desktop\41843 Bradwell EIA Support\GIS\Workspaces\41843-WOOD-0350_v2.mxd Originator: simon.green2

601000
601500
602000
208000
207500
207000
N
FCP-2008B
FCP-7029A
FCP-3034
FCP-7012
FCP-7016
FCP-3056
FCP-7015
FCP-3057
FCP-3049
FCP-7017
FCP-3055
FCP-3054
FCP-3052
FCP-3051
FCP-3053

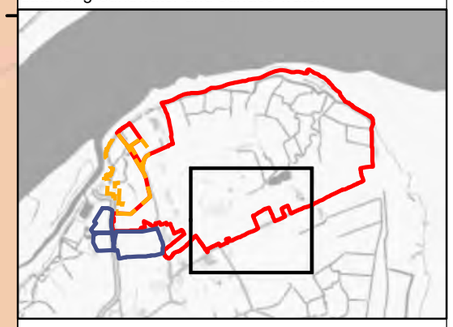
Key

- Indicative Main Development Site
- Flow direction
- Groundwater monitoring wells
- Surface water quality sampling point
- Installation selected for constant rate pump test

Superficial geology

- Head
- Intertidal Deposits
- River Terrace Deposits

This drawing illustrates the locations of exploratory holes to be included for EIA purposes in the main ground investigation. Additional geotechnical exploratory holes to be completed as part of the investigation are not shown here. All boreholes shown are to be installed with monitoring wells and represent monitoring and sampling points for the groundwater level monitoring and groundwater quality sampling surveys. Surface water quality sampling points are aligned with adjacent groundwater monitoring wells to enable comparison of water levels and water quality data for groundwater and surface water.



0 50 100 150 200 250 300 m

Scale at A3: 1:5,000

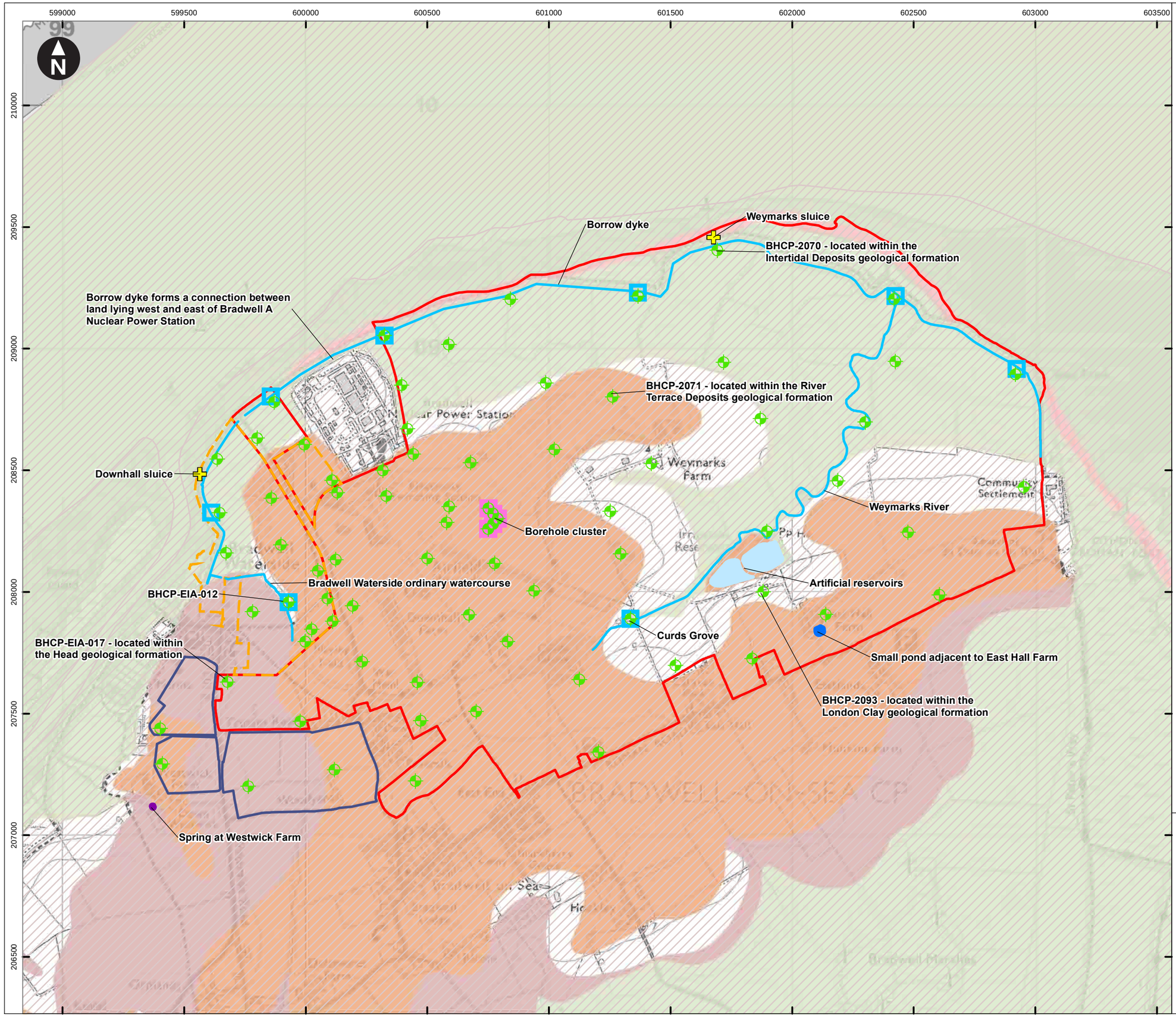
Bradwell B Nuclear Power Plant Project
Water Environment Survey and Monitoring Plan 2020/21

Figure 2.3f
EIA monitoring - groundwater quality, groundwater level and surface water quality sampling locations

August 2020

wood.

C:\Users\Simon.Green2\Desktop\41843 Bradwell EIA Support\GIS\Workspaces\41843-WOOD-0350_v2.mxd Originator: simon.green2



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Bradwell B Nuclear Power Plant Project
Water Environment Survey and Monitoring Plan 2020/21

Figure 2.4
EIA water features walkover - Indicative Main Development Site

April 2020

wood.

596000 597000 598000 599000 600000 601000 602000 603000 604000 605000 606000

213000 212000 211000 210000 209000 208000 207000 206000 205000 204000

N

River Blackwater

Borrow dyke

Borrow dyke forms a connection between land lying west andeast of Bradwell A Nuclear Power Station

Weymarks River

Bradwell Waterside ordinary watercourse

Curds Grove

Bradwell Marina

Pond at WestwickFarm

Spring at Westwick Farm

Bradwell Marshes

Glebe Outfall

Bradwell Brook

Mill End

Reed Grove

Sandbeach

Sandbeach Outfall

Mark Grove

Tillingham Brook

B1021 road

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- 3km study area
- Key watercourses
- Ponds
- Spring at Westwick Farm
- Sandbeach Meadows SSSI and GWDTE
- Blackwater Estuary Ramsar

Elevation (m AOD)

- > 0.0
- 0.1 - 5.0
- 5.1 - 10.0
- 10.1 - 15.0
- 15.1 - 20.0
- 20.1 - 25.0
- 25.1 - 30.0
- 30.1 - 35.0
- > 35.1

Note: Licenced surface water and groundwater abstraction, licensed discharge locations and PWSs have not been included within the table because at the time of writing data requested from the Environment Agency and the Local Authority have not yet been received.

0 500 1,000 1,500 2,000 m

Scale at A3: 1:35,000

Bradwell B Nuclear Power Plant Project
Water Environment Survey and Monitoring Plan 2020/21

Figure 2.5
EIA water features walkover – study area (3km buffer)

April 2020

wood.

G:\MODEL\PROJECTS\EA-210\41843 Bradwell EIA Support\GIS\Workspaces\41843-WOOD-0277.mxd Originator: simon.green2

APPENDIX B
ANALYTICAL SUITES

Surface Water Quality Sampling

Table 1 Main development site Surface Water Sampling – Radiochemical Analysis

Determinand	Main development site - Estimated No. Samples												
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	Per Annum
Gross alpha (as Am-241)/gross beta (as K-40)	6	6	6	6	6	6	6	6	6	6	6	6	72
High resolution gamma spectrometry	6	6	6	6	6	6	6	6	6	6	6	6	72
Strontium-90	6	6	6	6	6	6	6	6	6	6	6	6	72
Technetium-99	6	6	6	6	6	6	6	6	6	6	6	6	72
Aqueous tritium	6	6	6	6	6	6	6	6	6	6	6	6	72

Notes:
1) Number of samples is based on twelve monthly sampling events (R1 to R12).
2) 100% of groundwater samples from each round to be analysed for each determinand listed.
3) In addition to the above sample numbers the following QA/QC samples are to be obtained per round: 1 duplicate and 1 trip blank.

Table 2 Campus site Surface Water Sampling – Radiochemical Analysis

Determinand	Campus site - Estimated No. Samples												
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	Per Annum
Gross alpha (as Am-241)/gross beta (as K-40)	2	2	2	2	2	2	2	2	2	2	2	2	24
High resolution gamma spectrometry	2	2	2	2	2	2	2	2	2	2	2	2	24
Strontium-90	2	2	2	2	2	2	2	2	2	2	2	2	24
Technetium-99	2	2	2	2	2	2	2	2	2	2	2	2	24
Aqueous tritium	2	2	2	2	2	2	2	2	2	2	2	2	24

Notes:
1) Number of samples is based on twelve monthly sampling events (R1 to R12).
2) 100% of groundwater samples from each round to be analysed for each determinand listed.
3) In addition to the above sample numbers the following QA/QC samples are to be obtained per round: 1 duplicate and 1 trip blank.

Table 3 Main development site Surface Water Sampling – Chemical Analysis

Determinand	Main development site - Estimated No. Samples												
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	Per Annum
Alkalinity Bicarbonate as CaCO3 (W) by Titration	6	6	6	6	6	6	6	6	6	6	6	6	72
Aluminium Filtered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Ammonia Free/Unionised Suite (includes Amm N2 and pH)(W)	6	6	6	6	6	6	6	6	6	6	6	6	72
Ammoniacal Nitrogen as N (W) by Spectrophotometric	6	6	6	6	6	6	6	6	6	6	6	6	72
Arsenic Filtered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Arsenic Unfiltered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Barium Filtered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
BOD True Total (w) by Meter	6	6	6	6	6	6	6	6	6	6	6	6	72
Boron Filtered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Boron Unfiltered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Bromide (W) by IC	6	6	6	6	6	6	6	6	6	6	6	6	72
Cadmium Filtered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Cadmium unfiltered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Calcium Filtered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Chloride (W) by Spectrophotometric	6	6	6	6	6	6	6	6	6	6	6	6	72
Chromium filtered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72

Determinand	Main development site - Estimated No. Samples												
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	Per Annum
Chromium Unfiltered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Chromium III Suite (W)	6	6	6	6	6	6	6	6	6	6	6	6	72
Cobalt filtered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Cobalt unfiltered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Copper Filtered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Copper Unfiltered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Dissolved organic carbon (W) by IR	6	6	6	6	6	6	6	6	6	6	6	6	72
Electrical Conductivity (W) by Meter	6	6	6	6	6	6	6	6	6	6	6	6	72
Fluoride (W) by Spectrophotometric	6	6	6	6	6	6	6	6	6	6	6	6	72
Iron (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Iron Filtered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Lead (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Lead Filtered (W)by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Lithium filtered by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Lithium Unfiltered by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Magnesium Filtered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Magnesium Unfiltered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Manganese (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Manganese Filtered (W)by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Mercury Filtered (W) by CVAF	6	6	6	6	6	6	6	6	6	6	6	6	72
Mercury Unfiltered (W) by CVAF	6	6	6	6	6	6	6	6	6	6	6	6	72
Molybdenum Filtered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Molybdenum Unfiltered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Nickel (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Nickel Filtered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Nitrate as NO3 (W) by Spectrophotometric	6	6	6	6	6	6	6	6	6	6	6	6	72
Nitrite as NO2 (W) by Spectrophotometric	6	6	6	6	6	6	6	6	6	6	6	6	72
PAH Speciated 16 (W) by GC MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Phenol (W) by HPLC	6	6	6	6	6	6	6	6	6	6	6	6	72
Phosphate (Orthophosphate as P) (W) by Spectrophotometric	6	6	6	6	6	6	6	6	6	6	6	6	72
Phosphorus (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Potassium (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Selenium Filtered (W)by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Selenium Unfiltered (W)by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Sodium (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Strontium Filtered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Sulphate Soluble (W) by Spectrophotometric	6	6	6	6	6	6	6	6	6	6	6	6	72
SVOC (W) by GC MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Total Inorganic Nitrogen (W) by Spectrophotometric	6	6	6	6	6	6	6	6	6	6	6	6	72
Total Organic Carbon (W) by IR	6	6	6	6	6	6	6	6	6	6	6	6	72
Total Suspended Solids 105C (W) by Gravimetric	6	6	6	6	6	6	6	6	6	6	6	6	72
TPH CWG (W) by GC FID	6	6	6	6	6	6	6	6	6	6	6	6	72
VOC (W) by GC MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Zinc (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Zinc Filtered (W) by ICP MS	6	6	6	6	6	6	6	6	6	6	6	6	72
EIA Water Framework Directive Suite – PCBs & OCPs	6	6	6	6	6	6	6	6	6	6	6	6	72
PCB 7 Congeners (W) by GC MS	6	6	6	6	6	6	6	6	6	6	6	6	72
Pesticides by GCMS (W)	6	6	6	6	6	6	6	6	6	6	6	6	72

Notes:

1) Number of samples is based on twelve monthly sampling events (R1 to R12).

2) 100% of groundwater samples from each round to be analysed for each determinand listed.

3) In addition to the above sample numbers the following QA/QC samples are to be obtained per round: 1 duplicate and 1 trip blank.

Table 4 Campus site Surface Water Sampling – Chemical Analysis

Determinand	Campus site - Estimated No. Samples												
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	Per Annum
Alkalinity Bicarbonate as CaCO3 (W) by Titration	2	2	2	2	2	2	2	2	2	2	2	2	24
Aluminium Filtered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Ammonia Free/Unionised Suite (includes Amm N2 and pH)(W)	2	2	2	2	2	2	2	2	2	2	2	2	24
Ammoniacal Nitrogen as N (W) by Spectrophotometric	2	2	2	2	2	2	2	2	2	2	2	2	24
Arsenic Filtered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Arsenic Unfiltered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Barium Filtered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
BOD True Total (w) by Meter	2	2	2	2	2	2	2	2	2	2	2	2	24
Boron Filtered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Boron Unfiltered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Bromide (W) by IC	2	2	2	2	2	2	2	2	2	2	2	2	24
Cadmium Filtered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Cadmium unfiltered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Calcium Filtered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Chloride (W) by Spectrophotometric	2	2	2	2	2	2	2	2	2	2	2	2	24
Chromium filtered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Chromium Unfiltered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Chromium III Suite (W)	2	2	2	2	2	2	2	2	2	2	2	2	24
Cobalt filtered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Cobalt unfiltered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Copper Filtered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Copper Unfiltered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Dissolved organic carbon (W) by IR	2	2	2	2	2	2	2	2	2	2	2	2	24
Electrical Conductivity (W) by Meter	2	2	2	2	2	2	2	2	2	2	2	2	24
Fluoride (W) by Spectrophotometric	2	2	2	2	2	2	2	2	2	2	2	2	24
Iron (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Iron Filtered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Lead (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Lead Filtered (W)by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Lithium filtered by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Lithium Unfiltered by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Magnesium Filtered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Magnesium Unfiltered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Manganese (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Manganese Filtered (W)by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Mercury Filtered (W) by CVAF	2	2	2	2	2	2	2	2	2	2	2	2	24
Mercury Unfiltered (W) by CVAF	2	2	2	2	2	2	2	2	2	2	2	2	24
Molybdenum Filtered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Molybdenum Unfiltered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Nickel (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Nickel Filtered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Nitrate as NO3 (W) by Spectrophotometric	2	2	2	2	2	2	2	2	2	2	2	2	24
Nitrite as NO2 (W) by Spectrophotometric	2	2	2	2	2	2	2	2	2	2	2	2	24
PAH Speciated 16 (W) by GC MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Phenol (W) by HPLC	2	2	2	2	2	2	2	2	2	2	2	2	24
Phosphate (Orthophosphate as P) (W) by Spectrophotometric	2	2	2	2	2	2	2	2	2	2	2	2	24
Phosphorus (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Potassium (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Selenium Filtered (W)by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Selenium Unfiltered (W)by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Sodium (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Strontium Filtered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Sulphate Soluble (W) by Spectrophotometric	2	2	2	2	2	2	2	2	2	2	2	2	24
SVOC (W) by GC MS	2	2	2	2	2	2	2	2	2	2	2	2	24

Determinand	Campus site - Estimated No. Samples												
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	Per Annum
Total Inorganic Nitrogen (W) by Spectrophotometric	2	2	2	2	2	2	2	2	2	2	2	2	24
Total Organic Carbon (W) by IR	2	2	2	2	2	2	2	2	2	2	2	2	24
Total Suspended Solids 105C (W) by Gravimetric	2	2	2	2	2	2	2	2	2	2	2	2	24
TPH CWG (W) by GC FID	2	2	2	2	2	2	2	2	2	2	2	2	24
VOC (W) by GC MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Zinc (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Zinc Filtered (W) by ICP MS	2	2	2	2	2	2	2	2	2	2	2	2	24
EIA Water Framework Directive Suite – PCBs & OCPs	2	2	2	2	2	2	2	2	2	2	2	2	24
PCB 7 Congeners (W) by GC MS	2	2	2	2	2	2	2	2	2	2	2	2	24
Pesticides by GCMS (W)	2	2	2	2	2	2	2	2	2	2	2	2	24

Notes:

1) Number of samples is based on twelve monthly sampling events (R1 to R12).

2) 100% of groundwater samples from each round to be analysed for each determinand listed.

3) In addition to the above sample numbers the following QA/QC samples are to be obtained per round: 1 duplicate and 1 trip blank.

Groundwater Quality Sampling

Table 5 Main development site and campus site Groundwater Sampling – Radiochemical Analysis

Determinand	Main development site - Estimated No. Samples					Accommodation campus - Estimated No. Samples				
	Q1	Q2	Q3	Q4	Per Annum	Q1	Q2	Q3	Q4	Per Annum
Gross alpha (as Am-241)/gross beta (as K-40)	70	70	70	70	280	19	19	19	19	76
High resolution gamma spectrometry	35	0	35	0	70	10	0	10	0	20
Strontium-90	18	0	18	0	36	5	0	5	0	10
Technetium-99	18	0	18	0	36	5	0	5	0	10
Aqueous tritium	70	70	70	70	280	19	19	19	19	76

Notes:

1) Number of samples is based on four quarterly sampling events for Main development site and Accommodation campus (Q1 to Q4).

2) 100% of groundwater samples from each quarterly round (Main development site and Accommodation campus) to be analysed for the following: Gross alpha, gross beta and tritium.

3) 50% of samples to be analysed for gamma spectrometry and 25% of samples for strontium-90 and technetium-90 for Rounds 1 and 3 only.

4) The number of samples for collection and analysis of each determinand will be reviewed after each round to refine the sampling and analytical requirements.

5) In addition to the above sample numbers the following QA/QC samples are to be obtained per round: 3 duplicates and 1 trip blank per Main development site round and 1 duplicate and 1 trip blank per Accommodation campus round.

Table 6 Main development site and campus site Groundwater Sampling – Chemical Analysis

Determinand	Main development site - Estimated No. Samples					Accommodation campus - Estimated No. Samples				
	Q1	Q2	Q3	Q4	Per Annum	Q1	Q2	Q3	Q4	Per Annum
Alkalinity Bicarbonate as CaCO3 (W) by Titration	70	70	70	70	280	19	19	19	19	76
Aluminium Filtered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Ammonia Free/Unionised Suite (includes Amm N2 and pH)(W)	70	70	70	70	280	19	19	19	19	76
Ammoniacal Nitrogen as N (W) by Spectrophotometric	70	70	70	70	280	19	19	19	19	76
Arsenic Filtered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Arsenic Unfiltered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Barium Filtered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
BOD True Total (w) by Meter	70	70	70	70	280	19	19	19	19	76
Boron Filtered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Boron Unfiltered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Bromide (W) by IC	70	70	70	70	280	19	19	19	19	76

Determinand	Main development site - Estimated No. Samples					Accommodation campus - Estimated No. Samples				
	Q1	Q2	Q3	Q4	Per Annum	Q1	Q2	Q3	Q4	Per Annum
Cadmium Filtered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Cadmium unfiltered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Calcium Filtered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Chloride (W) by Spectrophotometric	70	70	70	70	280	19	19	19	19	76
Chromium filtered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Chromium Unfiltered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Chromium III Suite (W)	70	70	70	70	280	19	19	19	19	76
Cobalt filtered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Cobalt unfiltered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Copper Filtered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Copper Unfiltered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Dissolved organic carbon (W) by IR	70	70	70	70	280	19	19	19	19	76
Electrical Conductivity (W) by Meter	70	70	70	70	280	19	19	19	19	76
Fluoride (W) by Spectrophotometric	70	70	70	70	280	19	19	19	19	76
Iron (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Iron Filtered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Lead (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Lead Filtered (W)by ICP MS	70	70	70	70	280	19	19	19	19	76
Lithium filtered by ICP MS	70	70	70	70	280	19	19	19	19	76
Lithium Unfiltered by ICP MS	70	70	70	70	280	19	19	19	19	76
Magnesium Filtered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Magnesium Unfiltered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Manganese (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Manganese Filtered (W)by ICP MS	70	70	70	70	280	19	19	19	19	76
Mercury Filtered (W) by CVAF	70	70	70	70	280	19	19	19	19	76
Mercury Unfiltered (W) by CVAF	70	70	70	70	280	19	19	19	19	76
Molybdenum Filtered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Molybdenum Unfiltered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Nickel (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Nickel Filtered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Nitrate as NO3 (W) by Spectrophotometric	70	70	70	70	280	19	19	19	19	76
Nitrite as NO2 (W) by Spectrophotometric	70	70	70	70	280	19	19	19	19	76
PAH Speciated 16 (W) by GC MS	35	35	35	35	140	10	10	10	10	40
Phenol (W) by HPLC	35	35	35	35	140	10	10	10	10	40
Phosphate (Orthophosphate as P) (W) by Spectrophotometric	70	70	70	70	280	19	19	19	19	76
Phosphorus (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Potassium (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Selenium Filtered (W)by ICP MS	70	70	70	70	280	19	19	19	19	76
Selenium Unfiltered (W)by ICP MS	70	70	70	70	280	19	19	19	19	76
Sodium (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Strontium Filtered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Sulphate Soluble (W) by Spectrophotometric	70	70	70	70	280	19	19	19	19	76
SVOC (W) by GC MS	35	35	35	35	140	10	10	10	10	40
Total Inorganic Nitrogen (W) by Spectrophotometric	70	70	70	70	280	19	19	19	19	76
Total Organic Carbon (W) by IR	70	70	70	70	280	19	19	19	19	76
Total Suspended Solids 105C (W) by Gravimetric	70	70	70	70	280	19	19	19	19	76
TPH CWG (W) by GC FID	35	35	35	35	140	10	10	10	10	40
VOC (W) by GC MS	35	35	35	35	140	10	10	10	10	40
Zinc (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
Zinc Filtered (W) by ICP MS	70	70	70	70	280	19	19	19	19	76
EIA Water Framework Directive Suite – PCBs & OCPs	18	0	18	0	36	5	0	5	0	10
PCB 7 Congeners (W) by GC MS	18	0	18	0	36	5	0	5	0	10
Pesticides by GCMS (W)	18	0	18	0	36	5	0	5	0	10
Perfluorooctane sulfonic acid and its derivatives (PFOS)	11	0	11	0	22	2	0	2	0	4

Determinand	Main development site - Estimated No. Samples					Accommodation campus - Estimated No. Samples				
	Q1	Q2	Q3	Q4	Per Annum	Q1	Q2	Q3	Q4	Per Annum

Notes:

1) Number is based on four quarterly sampling events for Main development site and Accommodation campus (Q1 to Q4).

2) 100% of groundwater samples to be analysed for all determinants, expect for organics and pesticides. A representative 50% of samples will be analysed for organics and 25% of samples for pesticides. PCB and pesticide analysis to be undertaken on R1 and R3 only.

3) The number of samples for collection and analysis of each determinand will be reviewed after each round to refine the sampling and analytical requirements.

4) In addition to the above sample numbers the following QA/QC samples are to be obtained per round: 3 duplicates and 1 trip blank per Main development site round and 1 duplicate and 1 trip blank per Accommodation campus round.

APPENDIX C
GROUNDWATER MONITORING WELL (GMW) INSTALLATION SCHEDULE

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
EIA	**Main development site**	FCP-7028	601480	208339	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-2001	600589.76	208350.627	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-2004	600789.58	208299.855	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for constant rate pump test to support hydrogeological modelling and dewatering design	150mm dia. monitoring well to support constant rate pump test Response zone to target groundwater strike Headworks to be protected by raised cover	ü	ü	ü	ü	ü	ü	ü (Note 4)	ü
EIA	**Main development site**	FCP-2005	600770.107	208321.126	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for constant rate pump test to support hydrogeological modelling and dewatering design	150mm dia. monitoring well to support constant rate pump test Response zone to target groundwater strike Headworks to be protected by raised cover	ü	ü	ü	ü	ü	ü	ü (Note 4)	ü
EIA	**Main development site**	FCP-2006A	600750.715	208342.91	Borehole	Cable percussive drilling	20	London Clay	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to be located in top 5- 10m of London Clay and target any groundwater strikes. Headworks to be protected by raised cover	ü	ü	ü	ü	ü	ü	ü (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
EIA	**Main development site**	FCP-2006B	600750.715	208342.91	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for constant rate pump test to support hydrogeological modelling and dewatering design	150mm dia. monitoring well to support constant rate pump test Response zone to target groundwater strike Headworks to be protected by raised cover	ü	ü	ü	ü	ü	ü	ü (Note 4)	ü
EIA	**Main development site**	FCP-2007	600769.849	208278.861	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for constant rate pump test to support hydrogeological modelling and dewatering design	150mm dia. monitoring well to support constant rate pump test Response zone to target groundwater strike Headworks to be protected by raised cover	ü	ü	ü	ü	ü	ü	ü (Note 4)	ü
EIA	**Main development site**	FCP-2008A	600750.043	208258.433	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for constant rate pump test to support hydrogeological modelling and dewatering design	150mm dia. monitoring well to support constant rate pump test Response zone to target groundwater strike Headworks to be protected by raised cover	ü	ü	ü	ü	ü	ü	ü (Note 4)	ü
EIA	**Main development site**	FCP-2008B	600752.1839	208256.3314	Borehole	Cable percussive drilling	20	London Clay	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to be located in top 5- 10m of London Clay and target any groundwater strikes. Headworks to be protected by raised cover	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7015	600739.149	207947.569	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-3034	601294.465	208156.8	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well	ü	ü	ü	ü	ü	ü	ü (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
											installation. Headworks to be protected by raised cover.								
EIA	**Main development site**	FCP-3046	602187.041	208456.222	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-3047	600124.216	208132.18	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-3048	600317.396	208499.845	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former Bradwell Bay airfield / Electricity switching station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-3049	601336	207889	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-3050	600841.028	209203.818	Borehole	Cable percussive drilling	10	Intertidal deposits	ü	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
											Headworks to be protected by raised cover.								
EIA	**Main development site**	FCP-3051	600700.963	207507.887	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-3052	601124.799	207640.336	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-3053	601202.945	207341.001	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-3054	601520.822	207698.613	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-3055	601836.051	207726.428	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well	ü	ü	ü	ü	ü	ü	ü (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
											installation. Headworks to be protected by raised cover.								
EIA	**Main development site**	FCP-3056	601881.084	208000.597	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-3057	602130.088	207903.909	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-3058	602605.58	207987.352	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-3059	602952.596	208431.057	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-3060	602477.104	208244.303	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well	ü	ü	ü	ü	ü	ü	ü (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
											installation. Headworks to be protected by raised cover.								
EIA	**Main development site**	FCP-3061	602425.449	208946.283	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-3062	602919.484	208894.628	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7001A	600322.77	209053.75	Borehole	Cable percussive drilling	10	Intertidal deposits	ü	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7001B	600325.2359	209052.0414	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7002	600394.051	208850.028	Borehole	Cable percussive drilling	10	Intertidal deposits	ü	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well	ü	ü	ü	ü	ü	ü	ü (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
											installation. Headworks to be protected by raised cover.								
EIA	**Main development site**	FCP-7003	600418.665	208669.518	Borehole	Cable percussive drilling	10	Intertidal deposits	ü	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7004	600442.205	208567.482	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7005	600678.066	208532.016	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former East Wick Farm	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7006	601022.711	208584.604	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7007	600129.85	208407.91	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former Bradwell A nuclear power station / electricity switching station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
											Headworks to be protected by raised cover.								
EIA	Main development site	FCP-7008	600330.39	208394.53	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former nuclear power station / electricity switching station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	Main development site	FCP-7009	600579.598	208285.746	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	Main development site	FCP-7010	600192.08	207942.654	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	Main development site	FCP-7011	600499.917	208137.537	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	Main development site	FCP-7012	600776.889	208117.415	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
											Headworks to be protected by raised cover.								
EIA	**Main development site**	FCP-7013	600231.879	207713.069	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7014	600459.12	207628.864	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former Bradwell Bay airfield / Downhall Farm	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7016	600939.229	208004.772	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former Bradwell Bay airfield	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7017	600787.406	207780.532	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former gerneral engineers / distribution services	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7018	600588.539	209016.948	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
											Headworks to be protected by raised cover.								
EIA	**Main development site**	FCP-7019A	600987.388	208859.454	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7019B	600985.8348	208862.0207	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7020A	601366.182	209215.774	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7020B	601366.3386	209212.7781	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7021A	601691.763	209404.036	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be	ü	ü	ü	ü	ü	ü	ü (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
											protected by raised cover.								
EIA	**Main development site**	FCP-7021B	601692.7481	209401.2023	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7022	601261.474	208801.66	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7023A	601717.066	208944.492	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7023B	601720.0599	208944.492	Borehole	Cable percussive drilling	10	River Terrace Deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7024A	602419.607	209204.095	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well	ü	ü	ü	ü	ü	ü	ü (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
											installation. Headworks to be protected by raised cover.								
EIA	**Main development site**	FCP-7024B	602421.4063	209201.6945	Borehole	Cable percussive drilling	10	River Terrace Deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7025	601433.885	208533.38	Borehole	Cable percussive drilling	10	Intertidal deposits	ü	Potential infilled pond	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7026	601869.538	208712.351	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7027A	602299.971	208698.395	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7027B	602291.4957	208708.4071	Borehole	Cable percussive drilling	10	River Terrace Deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be	ü	ü	ü	ü	ü	ü	ü (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
											protected by raised cover.								
EIA	**Main development site**	FCP-7029A	601897.077	208247.68	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	FCP-7029B	601896.1463	208250.532	Borehole	Cable percussive drilling	10	River Terrace Deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	No BRB ID assigned (outside of existing Phase 2b Planning Boundary)	599869.96	208780.0724	Borehole	Cable percussive drilling	10	Intertidal deposits	ü	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	**BHCP-EIA-001-B**	599871.8135	208777.7134	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Main development site**	**BHCP-EIA-002**	599800.582	208631.207	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well	ü	ü	ü	ü	ü	ü	ü (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
											installation. Headworks to be protected by raised cover.								
EIA	Main development site	BHCP-EIA-017	599677.9918	207630.4153	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	Main development site	BHCP-EIA-018	599977.5008	207467.4316	Borehole	Cable percussive drilling	10	Head deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	Main development site	BHCP-EIA-020	600472.8018	207470.0775	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	Main development site	BHCP-EIA-024	600451.6351	207222.427	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-003	599994.63	208605.43	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well	ü	ü	ü	ü	ü	ü	ü (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
											installation. Headworks to be protected by raised cover.								
EIA	**Accommodation Campus Site**	**BHCP-EIA-004**	599636.7609	208547.022	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Accommodation Campus Site**	**BHCP-EIA-005**	600108.7269	208459.4523	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Bradwell A former nuclear power station	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Accommodation Campus Site**	**BHCP-EIA-006**	599859.1471	208385.5783	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Potential infilled pond	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Accommodation Campus Site**	**BHCP-EIA-007-A**	599647.0856	208324.7942	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	**Accommodation Campus Site**	**BHCP-EIA-007-B**	599649.1829	208326.9393	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well	ü	ü	ü	ü	ü	ü	ü (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
											installation. Headworks to be protected by raised cover.								
EIA	Accommodation Campus Site	BHCP-EIA-008	599897.3833	208193.789	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-009	599672.3403	208161.1992	Borehole	Cable percussive drilling	10	Intertidal deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-010	600049.8587	208087.3116	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-011	600089.1552	207972.2576	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former airfield FIDO tanks	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-012	599929.8757	207957.4409	Borehole	Cable percussive drilling	10	Superficial mapped by BGS as absent	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be	ü	ü	ü	ü	ü	ü	ü (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
											protected by raised cover.								
EIA	Accommodation Campus Site	BHCP-EIA-013	599780.6504	207918.2825	Borehole	Cable percussive drilling	10	Head deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-014	600111.3802	207879.1241	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former airfield FIDO tanks	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-015	600024.9064	207845.1255	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former airfield FIDO tanks	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-016	599998.1383	207796.574	Borehole	Cable percussive drilling	10	River terrace deposits	ü	Former airfield FIDO tanks	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-019	599401.2371	207439.3857	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well	ü	ü	ü	ü	ü	ü	ü (Note 4)	-

Hole Type	Site Area	Borehole ID (Note 1)	Grid Reference (X Co-ordinate)	Grid Reference (Y Co-ordinate)	Exploratory Hole Type	Method	Wood Proposed Exploratory Hole Depth (m bgl) (Note 2)	Target Strata for Monitoring Well Installation	Potential Contaminant Source Identified?	Potential Contamination Source Details	Proposed Installation / Backfill Details	Samples to be Obtained		Data to be Obtained					
												Soil	Ground-water	Geology	Groundwater Level	Groundwater Chemistry	Soil Chemistry Data	Slug tests	Constant rate pump test
											installation. Headworks to be protected by raised cover.								
EIA	Accommodation Campus Site	BHCP-EIA-021	599410.233	207292.8063	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-022	600119.3177	207269.5229	Borehole	Cable percussive drilling	10	River terrace deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-
EIA	Accommodation Campus Site	BHCP-EIA-023	599763.1878	207201.2603	Borehole	Cable percussive drilling	10	Head deposits	-	N/A - included for general site characterisation to support hydrogeological modelling	50mm dia. monitoring well Response zone to target groundwater strike. Refer to details of target strata for monitoring well installation. Headworks to be protected by raised cover.	ü	ü	ü	ü	ü	ü	ü (Note 4)	-

APPENDIX 21A
RECREATION SURVEY AND MONITORING PLAN

Bradwell B Project

Recreation Survey and Monitoring Plan

Wood Environment & Infrastructure Solutions UK Limited – July 2020

BBX32840001WOOD00PT

Version P03

Report for

Bradwell Power Generation Company Limited (BRB)

5F Rex House,

4-12 Lower Regent Street

London

SW1 4PE

Main contributors

[redacted]

Issued by

[redacted] .....

Approved by

[redacted] .....

Wood

Partnership House

Regent Farm Road

Gosforth

Newcastle upon Tyne

NE3 3AF

United Kingdom

Tel +44 (0) 191 272 6100

Doc Ref. 42781-WOOD-XX-XX-RP-O-0001_S4_P03

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DOCUMENT CONTROL

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P01	First draft	[redacted]	30/04/20
P02	Second Issue	[redacted]	03/06/20
P03	Third Issue	[redacted]	10/08/20

CONTENTS

TABLES

1. INTRODUCTION

1.1 Background

1.1.1 Bradwell Power Generation Company Limited (BRB GenCo) proposes to develop a new nuclear power station, called the Bradwell B Project, near Bradwell-on-Sea in Essex (hereafter referred to as the Project). The Project would comprise twin UK HPR1000 reactors with a combined electrical capacity of 2,340 MW.

1.1.2 The area of land within which the Bradwell B power station would be built is located next to the Blackwater Estuary on the Dengie Peninsula, approximately 15 kilometres (km) east of the town of Maldon, 1 km northeast of the village of Bradwell-on-Sea within the District of Maldon, Essex. It lies adjacent to the existing Bradwell Nuclear Power Station, which ceased operation in 2002. The power station is being decommissioned by the Nuclear Decommissioning Authority (NDA) and entered the Care and Maintenance phase in 2018.

1.2 Site Context

1.2.1 For the purposes of this Survey and Monitoring Plan (SMP) the Site consists of the area covered by the Indicative Main Development Site boundary, Potential Temporary Workers Accommodation Site boundary, Potential Expansion Areas for Temporary Workers Accommodation Site boundary and Zone for Marine Infrastructure.

1.2.2 In addition to the range of development activities that relate to the Site there will be a requirement for off-site Associated Development (AD) in order to construct and operate the Project. Such development is expected to include, but may not be limited to: park and ride facilities, off-site freight management and potential new or enhanced transport infrastructure.

1.2.3 The requirements with respect to the locations and extents of the off-site AD are currently being considered. The methodologies, survey extents, geographical coverage and study areas for these off-site Associated Development sites (ADs) will be confirmed once Project requirements with respect to site location, spatial area and design layout are known with sufficient certainty to enable baseline research to be undertaken.

1.2.4 The description of the project, including indicative site boundaries, presented in this SMP reflects the Project status at the point that the SMP was issued to consultees to inform workshops held in June 2020, with subsequent updates to take into account workshop feedback and responses from consultees. As the Project progresses, further iterations of the SMP will be required as proposals are refined, in particular, with respect to off-site ADs. The technical scope contained herein remains applicable irrespective of any future boundary changes (should this be required), subject to a review of receptors and spatial scope.

1.3 Purpose of this Document

1.3.1 The purpose of this SMP is to present proposals for survey and monitoring activities for agreement with consultees. The proposals include the methods to be employed and the spatial and temporal requirements for survey/monitoring to be undertaken at the Site. The proposals for surveys and monitoring set out in this SMP will provide baseline information that will build upon that acquired through the desk-based baseline study.

1.3.2 A separate SMP will be prepared for off-site ADs once proposals for these sites have achieved the degree of design maturity necessary to enable the completion of desk studies.

1.3.3 The purpose of the surveys outlined below is to determine a robust and accurate baseline dataset to inform the development of appropriate environmental measures, the subsequent Environmental Impact Assessment (EIA) and, ultimately, the Development Consent Order (DCO) application. It should be noted that, in addition to informing the Recreation Impact Assessment this baseline data will also inform other assessments included in the EIA (e.g. the assessment of impact on birds that may be affected by onshore recreational activity along the coast).

1.3.4 Any screening and assessment under the Habitat Regulations 2017 will be undertaken by the biodiversity and ornithology assessment teams. The recreation assessment team will work closely with these teams to ensure that proposals in relation to recreation provision are consistent with the requirements of the Habitat Regulations.

1.3.5 In developing appropriate environmental measures, both the recreation and the biodiversity and ornithology assessment teams will be cognisant of the Essex Coast Recreation, Disturbance and Avoidance Mitigation Strategy (RAMS). It is also noted that the RAMS includes user survey data that is likely to be valuable with respect to informing the recreation baseline.

2. SURVEY PROPOSALS

2.1 Work to Date and Outstanding Data Requirements

2.1.1 The survey proposals have been informed by a desk-based study of outdoor recreational resources undertaken in February and March 2020. The desk-based study is ongoing and may be subject to amendment in the light of additional information. It is noted that *A Green Infrastructure Strategy for Maldon*, published in March 2019 (Ref. 1), represents an important source of information that may inform both the current and future baseline.

2.1.2 The desk study will be subject to verification following the walkover survey described below and the parts of the study pertaining to Public Rights of Way will be subject to validation following inspection of the Definitive Rights of Way Map held by Essex County Council to be undertaken during the summer of 2020.

2.1.3 The desk-based study has identified the following categories of recreational receptor:

- greenspaces and recreation grounds (Ref. 2);
- Public Rights of Way (Ref. 3);
- promoted recreational routes (Refs. 4, 5, 6, 7, 8 and 9);
- nature reserves (with public access) (Ref. 2);
- coastal access areas (Refs. 7, 8 and 9);
- other public recreational routes and places; and
- offshore recreational resources.

2.1.4 The onshore and offshore recreational resources identified by the desk-based study are shown on **Figure 2.1** and **Figure 2.2,** respectively.

2.1.5 Whilst the desk-based study identifies numerous recreational resources, it does not provide the information on the current quality and condition, levels of use or the users of those resources that is necessary to allow the Recreation Impact Assessment to assess the levels of effect that the construction and operation of the Project is likely to have on users recreational amenity. The following surveys are therefore proposed to fill these information gaps:

- a walkover survey of identified onshore recreational resources;
- a visitor and user survey;
- automatic user counts; and

- consultation with user groups of the River Blackwater.

2.1.6 The objective, study area, method and output of each of these surveys is set out below.

2.2 Walkover Survey

Survey Objective

2.2.1 The walkover survey will be undertaken in order to:

- verify by direct observation the existence of countryside access resources which have been identified from desk-based study;
- identify additional resources which may not be apparent from the desk-based study;
- assess the current condition and context of the resources; and
- make general observations about current usage, taking into account observations from the overwintering birds survey which has been conducted over the period October 2019-March 2020.

Survey Area

2.2.2 This survey would be undertaken within the onshore study area. The onshore study area encompasses all land within the Site and extends to the south towards Tillingham and west beyond Bradwell Waterside; to encompass land areas within which there may be recreational and amenity assets that could be directly affected or which may have a physical or functional connection with assets that may be directly affected. In the context of the Site, the primary functional connections are considered to be between the coastal recreational routes and the inland network of Public Rights of Way that link locations on the east and west coasts of the peninsula thereby providing opportunities for circular recreational routes. The onshore study area is shown on **Figure 2.1**.

2.2.3 It should be noted that the assessment of effects on recreation will consider potential effects on the recreational amenity of those undertaking outdoor recreational activities in onshore areas outside the onshore study area (e.g. users of the proposed England Coast Path on Mersea Island). However, any such effects sustained by these users would be experienced via a visual effects pathway and the potential for such effects to be experienced will be established by the Visual Impact Assessment, which will itself be informed by the production of maps of the Zone of Theoretical Visibility of the construction activities and proposed development within the Site. The Recreation Impact Assessment will therefore draw upon the findings of the Visual Impact Assessment in relation to these users and no recreation-specific surveys are proposed in relation to users of recreational resources located out with the onshore study area.

2.2.4 The Recreation assessment team will liaise closely with the Landscape and Visual assessment team to ensure that appropriate recreational receptors are identified within the visual assessment baseline.

Survey Methods

2.2.5 The walkover survey of recreational routes and spaces will include notes and a photographic record to be taken at each resource.

Survey Output

2.2.6 The results of the survey will be incorporated into the Recreation baseline to be reported in the Preliminary Environmental Information Report (PEIR) and the Environmental Statement (ES).

2.3 Visitor and User Survey

Survey Objective

2.3.1 Visitor and user surveys are proposed for recreational routes and spaces potentially affected by the construction and operation of the Site.

2.3.2 The objective of the survey is to obtain data pertaining to the number of visitors/ users of specific recreational resources and, where users are willing to be interviewed, information regarding their home locations, how far they have travelled to visit the resource, the frequency and duration of visits, reasons for visiting, barriers to access and what they value about the resource.

Survey Area

2.3.3 These surveys will be undertaken at locations within the onshore study area that are considered likely to experience the highest levels of recreational use. The number and location of survey stations will be determined once the walkover surveys described above have been completed.

Survey Methods

2.3.4 Surveys will be undertaken by trained surveyors using standardised questionnaires. Standard practice would be for surveys to be undertaken over a three-day period at a time of likely high-usage (e.g. the August bank holiday weekend). See **Section 3** for a consideration of the potential impact of Covid19 on timescale.

2.3.5 Given the restrictions and imposed by social-distancing requirements and the potential for Covid19 related measures to have altered usual patterns of recreation, the recreation assessment team will also investigate the possibility of supplementing the baseline with data that may be commercially available from providers of smartphone apps used for tracking exercise. Whilst such data would pertain to only a subsection of users, it may provide a longer time-series that could inform an

understanding of changes to patterns of usage before and after Covid19 related restrictions were introduced. Similarly, consideration will also be given to any data that may be available from non-commercial organisations such as walking/rambling groups, running groups and parish councils.

Survey Output

2.3.6 The full results of the survey will be reported in a stand-alone report appended to the Recreation baseline. A summary of the results will be included in the Recreation baseline.

2.4 Automatic User Counts

Survey Objective

2.4.1 The objective of the survey is to obtain data pertaining to the number of users of recreational routes, in the vicinity of the Site, that will form the part of the proposed England Coast Path.

Survey Area

2.4.2 To be installed at a suitable point(s) along the proposed England Coast Path within the onshore study area. The automatic counter(s) will be located on the section(s) of the England Coast Path that are likely to experience the most disturbance as a result of the construction and operation of the Project (e.g. between the existing Bradwell power station and Sales Point). The optimum location for the installation of the automatic counter(s) will be informed by walkover survey and by local knowledge from stakeholders.

Survey Methods

2.4.3 Surveys will be undertaken using automated counters. Standard practice would be to obtain data for at least a twelve-month period. The counters could be installed during summer 2020, once a suitable location has been agreed with stakeholders. See **Section 3** for a consideration of the potential impact of Covid19 on timescale.

Survey Output

2.4.4 The full results of the survey will be reported in a stand-alone report appended to the Recreation baseline, with a summary of the results included in the Recreation baseline.

2.5 Consultation with User Groups of the River Blackwater

Survey Objective

2.5.1 The objective of the consultation is to understand patterns of usage or events for users of recreational watercraft on the River Blackwater that may have the potential to be affected by the construction or operation of the Project.

Survey Area

2.5.2 Consultation will be undertaken with representatives of the sailing and yacht clubs within the offshore search area. The offshore search area has been defined to include all craft that are either berthed at a harbour or marina on, or are launched directly onto, the River Blackwater or its tributaries. The offshore study area includes the River Blackwater reach from Maldon to Sales Point and the River Colne from Wivenhoe to Colne Point. The offshore study area and the sailing and yacht clubs identified within it are shown on **Figure 2.2**. In addition to the organisations identified on **Figure 2.2**, consultation will also be undertaken with the Maldon Harbour Improvement Commissioners, as the statutory harbour authority for the Port of Maldon, and the Marine Management Organisation, as the marine planning authority.

Survey Methods

2.5.3 Contact will be made via letter or email with the boat or yachting clubs and marinas shown in **Figure 2.2** which have been derived from a review of mapping, aerial photography, and internet searches at Scoping Stage. Further clubs and marinas may be added following consultation.

Survey Output

2.5.4 The results of the survey will be incorporated into the Recreation and Amenity baseline to be reported in the PEIR and ES.

3. SURVEY PROGRAMME

3.1.1 Field surveys and usage data pertaining to outdoor recreational activity will be strongly influenced by the movement restrictions and social distancing requirements in force as a result of the Covid19 pandemic. Where the start date of a survey cannot yet be identified due to these restrictions, it is marked as To Be Confirmed (TBC). An overview of the proposed programme is detailed in **Table 3.1**:

Table 3.1: Survey Programme (Proposed)

Survey Type	Proposed Start Date	Proposed Duration
Desktop study	March 2020	1 months
Review of Definitive Map	Summer 2020	1 day
Walkover survey	TBC	1 month
Visitor and user survey	TBC	1 weekend
Automatic user counts	Summer 2020	12 months (dependent on programme)
Consultation with user groups of the River Blackwater	Summer 2020	2 months

3.1.2 All surveys will be undertaken during optimal conditions when possible.

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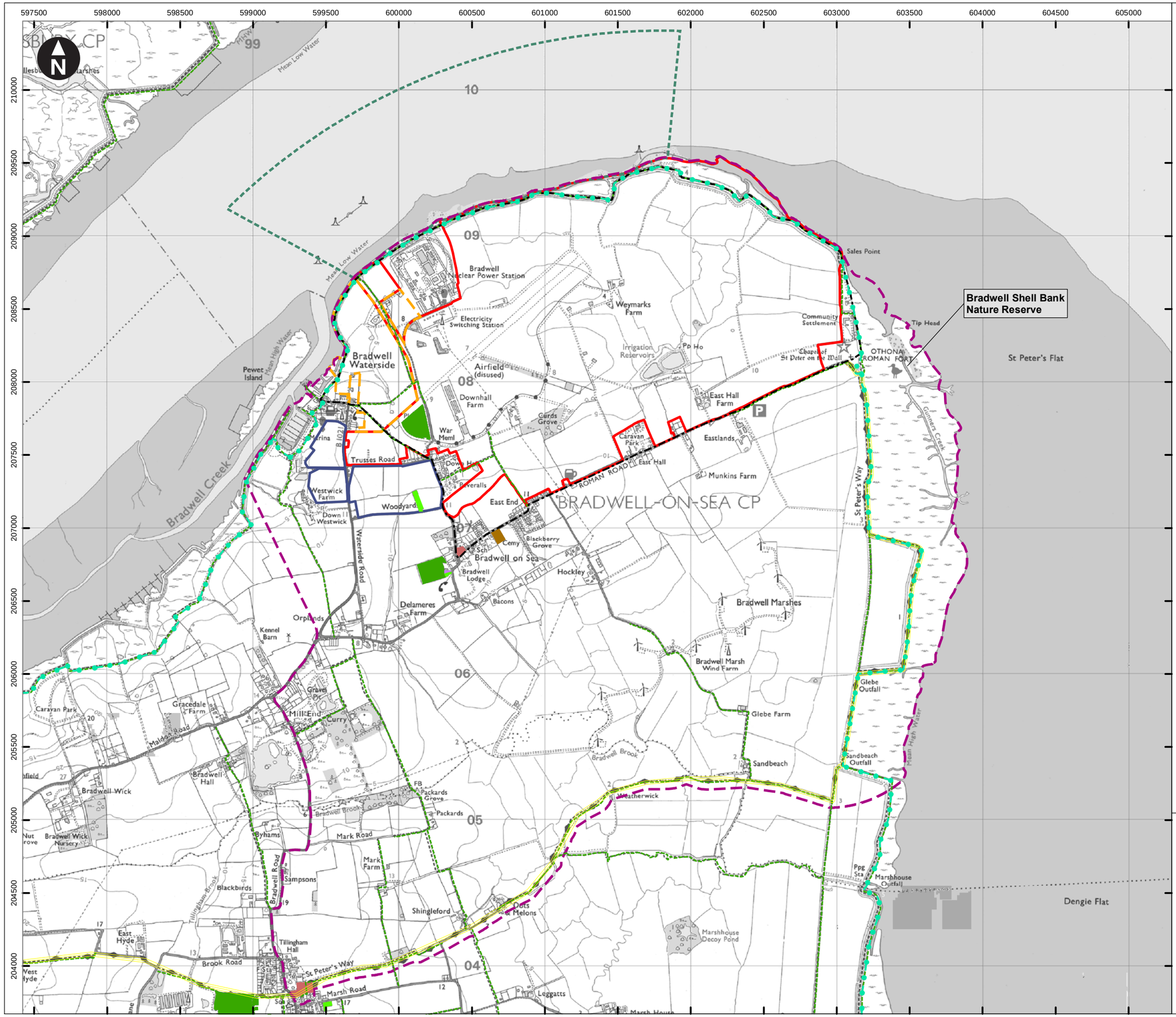
APPENDIX A
FIGURES

Figure 2.1 Main development site and temporary workers accommodation site: Recreation onshore study area

Figure 2.2 Main development site and temporary workers accommodation site: Recreation offshore search area



Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Onshore study area
- Public Right of Way
- Cockle Spit Route
- St.Peter's Way Long Distance Route
- Proposed England Coast Path Walk

Greenspaces

- Allotments Or Community Growing Spaces
- Cemetery
- Play Space
- Playing Field
- Religious Grounds

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

Bradwell B Nuclear Power Plant Project
Recreation Survey and Monitoring Plan 2020/21

Figure 2.1
Main development site and temporary workers accommodation site: Recreation onshore study area

May 2020

wood.

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G:\MODEL\PROJECTS\EA-210\41843 Bradwell EIA Support\GIS\Workspaces\41843-WOOD-0293.mxd Originator: simon.green2

585000 590000 595000 600000 605000 610000

220000 215000 210000 205000 200000

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Offshore search area
- Sailing/Yacht Clubs

1 - Bradwell Quay Yacht Club
2 - Bradwell Marina
3 - Stone Sailing Club
4 - Marconi Sailing Club
5 - Harlow (Blackwater) Sailing Club
6 - Blackwater Marina
7 - Maldon Yacht Club
8 - Blackwater Sailing Club
9 - Saltcote Sailing Club
10 - Goldhanger Sailing Club
11 - Tollesbury Cruising Club
12 - West Mersea Yacht Club
13 - Wivenhoe Sailing Club
14 - Brightlingsea Sailing Club

0 1,000 2,000 3,000 4,000 5,000 m

Scale at A3:1:90,000

Bradwell B Nuclear Power Plant Project
Recreation Survey and Monitoring Plan 2020/21

Figure 2.2
Main development site and temporary workers accommodation site: Recreation offshore search area

May 2020

wood.

APPENDIX 22A
HISTORIC ENVIRONMENT SURVEY AND MONITORING PLAN

Bradwell B Project

Historic Environment Survey and Monitoring Plan

Wood Environment & Infrastructure Solutions UK Limited – August 2020

BBX20210001WOOD03PT

Version P03

Report for

Bradwell Power Generation Company Limited (BRB)

5F Rex House,

4-12 Lower Regent Street

London

SW1 4PE

Main contributors

[redacted]

Issued by

[redacted] .....

Approved by

[redacted] .....

Wood

Partnership House

Regent Farm Road

Gosforth

Newcastle upon Tyne

NE3 3AF

United Kingdom

Tel +44 (0) 191 272 6100

Doc Ref. 42781-WOOD-XX-XX-RP-OH-0001_S4_P03

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P02	Final Issue	[redacted]	08/06/20
P03	Revised following consultation	[redacted]	10/08/20

CONTENTS

TABLES

APPPENDICES

1. INTRODUCTION

1.1 Background

1.1.1 Bradwell Power Generation Company Limited (BRB GenCo) proposes to develop a new nuclear power station, called the Bradwell B Project, near Bradwell-on-Sea in Essex (hereafter referred to as the Project). The Project would comprise twin UK HPR1000 reactors with a combined electrical capacity of 2,340 MW.

1.1.2 The area of land within which the Bradwell B power station would be built is located next to the Blackwater Estuary on the Dengie Peninsula, approximately 15 kilometres (km) east of the town of Maldon, 1km northeast of the village of Bradwell-on-Sea within the District of Maldon, Essex. It lies adjacent to the existing Bradwell Nuclear Power Station, which ceased operation in 2002. The power station is being decommissioned by the Nuclear Decommissioning Authority (NDA) and entered the Care and Maintenance phase in 2018.

1.2 Site Context

1.2.1 For the purposes of this Survey and Monitoring Plan (SMP) the land area covered by the Indicative Main Development Site boundary, Potential Temporary Workers Accommodation Site boundary and Potential Expansion Area for Temporary Workers Accommodation Site boundary: central National Grid Reference (NGR) 601000E, 209000N is identified hereafter as the Site (see **Figure 1.1**).

1.2.2 In addition to the range of development activities that relate to the Site there will be a requirement for off-site Associated Development (AD) in order to construct and operate the Project. Such development is expected to include, but may not be limited to: park and ride facilities, off-site freight management and potential new or enhanced transport infrastructure.

1.2.3 The requirements with respect to the locations and extents of the off-site AD are currently being considered. However the overarching methodologies and approaches (where relevant) will still be applicable to these off-site Associated Development sites (ADs), but the survey extents, geographical coverage and study areas will be confirmed once Project requirements with respect to site location, spatial area and design layout are known with sufficient certainty to enable representative baseline monitoring to be undertaken.

1.2.4 The description of the project, including indicative site boundaries, presented in this SMP reflects the Project status at the point that the SMP was issued to consultees to inform workshops held in June 2020, with subsequent updates to take into account workshop feedback and responses from consultees. As the Project progresses, further iterations of the SMP will be required as proposals are refined, in particular, with respect to off-site ADs. The technical scope contained herein remains applicable irrespective of any future boundary changes (should this be required), subject to a review of receptors and spatial scope.

1.3 Purpose of this Document

1.3.1 The purpose of this SMP is to present the relevant baseline characterisation details for agreement with consultees. Such details include the methods to be employed and the spatial and temporal requirements for surveys/monitoring to be undertaken at the Site during 2020 and January-March 2021.

1.3.2 This SMP will be updated to address requirements for off-site ADs following completion of desk studies which are proposed to be undertaken in accordance with the methodology approaches presented in this document.

1.3.3 The purpose of the surveys outlined below is to determine a robust and accurate baseline dataset to inform the Environmental Impact Assessment (EIA).

1.3.4 A multi-faceted approach will be implemented, combining information from desktop studies along with geophysical survey, trial trenching and palaeoenvironmental assessment to determine a coherent research strategy for the site and surroundings and to inform a program of further investigations.

2. SURVEY PROPOSALS

2.1 Desktop Study

Survey Area

2.1.1 The desktop study area is defined as the Site (**Figure 1.1)** and off-site ADs, with additional buffers for historic environment receptors (see **Table 2.1**). The desktop study will comprise a data-gathering exercise required to inform the need for further non-intrusive and intrusive work in relation to the Project.

Survey Methods

2.1.2 The desktop survey will gather and collate information from a range of sources, including remote sensing such as LiDAR[1], aerial photography and geophysical survey results. It will also comprise known heritage asset records, both designated (listed buildings, scheduled monuments and conservation areas) and non-designated (Historic Environment Record (HER), local lists of buildings and heritage assets published by Colchester Borough Council, Maldon District Council and Chelmsford City Council). Searches will also be undertaken for relevant historic mapping, archival and documentary material.

Table 2.1 Desk study Search Areas (Terrestrial)

Heritage receptor	Search buffer around the Site	Source(s)
Designated Assets	1km	Historic England National Heritage List for England (NHLE) LPA Conservation Areas
Non-designated assets	1km	Essex Historic Environment Record (EHER) LPA Local List Aerial Photography Other cartographic, archival and secondary sources
Designated Assets (Minor offline and online highway improvements)	500m	Historic England National Heritage List for England (NHLE) LPA Conservation Areas

[1] LiDAR data readily accessible through the Environment Agency, which includes 1m resolution full site coverage and 25cm and 50cm partial site coverage, https://environment.data.gov.uk/DefraDataDownload/?Mode=survey

Non-designated assets (Minor offline and online highway improvements)	500m	Essex Historic Environment Record (EHER) LPA Local List Aerial Photography Other cartographic, archival and secondary sources

2.1.3 The Site will be subject to a walkover survey as part of the desktop survey, including areas within the intertidal zone. Where necessary access to specific locations will be by prior agreement with the relevant landowner or occupier. The survey will be non-intrusive and will comprise a walk around or through (where possible) the relevant spatial areas, making a photographic record of existing land conditions and development. The aims of the visual assessment are to highlight areas of pre-existing impact and as such assess the potential survival for the below ground archaeological resource.

2.1.4 The desktop study will be programmed such that the relevant information is available to allow the collation and presentation of the data summarised above in the Preliminary Environmental Information to support Stage 2 Consultation.

2.2 Settings Survey

Survey Area

2.2.1 A wider study area extending to a 12km radius from the Site (**Figure 1.2**) will be used for identifying heritage assets which may be subject to adverse effects arising through change to setting resulting from visibility of the permanent power station buildings. Heritage assets will be identified from the NHLE and LPA Conservation Area data and Local Lists as noted at **Table 2.1**.

2.2.2 Heritage assets which may be adversely affected by off-site ADs will be identified using either a 500 metre (m) buffer (minor online and offline highway improvements) or a 2km buffer (other off-site Associated Development) from the boundaries of these off-site ADs. These buffers will allow an assessment of both direct and indirect effects of these development proposals.

2.2.3 Neither NPS nor Historic England guidance (Ref. 1.) provide specific advice on the extent of a study area for the purpose of identifying heritage assets which may be subject to adverse effects, noting that the distance at which effects may arise will vary according to the sensitivity of heritage assets, the nature of their settings and the character of the proposed development.

2.2.4 The permanent power station development and the related construction works area are located in a prominent position on the coast, therefore elements of both are likely to be visible from some heritage assets from a long distance in views across the Blackwater and Colne estuaries from the north and north-east, and the study area reflects this potential for more distant heritage assets to be affected. The potential

for an effect would, however, also be influenced by perceptual prominence, and it is likely that effects would be primarily experienced close to the permanent development and construction works where their physical elements are not screened by intervening planting or structures, and where construction or operational noise may also become a factor.

2.2.5 The survey would consider these factors to identify heritage assets which could be affected by change in their settings, to assess the degree to which these settings contribute to heritage significance of the assets and to form the basis for an assessment of the effects of the Project. This identification process will be informed with reference to appropriate visualisations, including the Zone of Theoretical Visibility (ZTV). This work will be supported by the use of photomontages from key heritage assets, as agreed with consultees.

2.2.6 Following the staged approach in Historic England *Good Practice Advice in Planning Note 3* (GPA3: Ref. 1.), the full scope of heritage assets to be assessed will be set out in the EIA Scoping Report.

Survey Methods

2.2.7 Receptor visits will be required for each asset within the 12km radius of the Site for which the setting is identified as being at risk of impact from the Project. This will comprise visits to individual offsite heritage assets to understand the present setting and the potential perceptual presence of the Project. A photographic and written record of views of and from each identified asset will be made on site.

2.2.8 Walkovers will be undertaken by a surveyor or surveyors with photographic and recording equipment following guidance from Historic England (Ref. 1. and Ref. 2.). For remote settings where lone working may present health and safety issues a second surveyor may be present.

2.2.9 The surveyor will adhere to public rights of way and agreed access locations at all times. The duration of the survey is unknown at present and is dependent upon the number and location of the identified receptors. However, the collection of the data summarised above is anticipated to be collated for presentation in the Preliminary Environmental Information to support Stage 2 Consultation.

2.3 Geophysical Survey

Survey Area

2.3.1 Geophysical survey in the form of magnetometry will be carried out across the Site and off-site ADs, where appropriate and accessible. The purpose of this survey is to identify potential anomalies of archaeological interest and assess the potential of the Site for survival of archaeological assets.

2.3.2 Magnetometry measures and maps patterns of magnetism in the underlying soil. Past activity, such as burning, can be identified due to the differential magnetic

signal by comparison to the natural geology. As a result, 'cut' features, such as in-filled ditches and pits, can be identified due to the differential magnetic properties of the material used to backfill them. As such, archaeological features can be highlighted due to higher or lower magnetic readings.

2.3.3 The results of the surveys will be utilised, alongside other remote sensing data, to inform further intrusive phases of work. Magnetometry survey has already been undertaken on the Load Test Area within the Site, the results of which are being used to inform a program of trial trenching at this area (defined in **Section 2.6** and illustrated in **Figures 1.4** and **1.5**).

Survey Methods

2.3.4 Geophysical survey will be undertaken across the Site by an approved third-party company with appropriate accreditations. All works will be carried out in line with defined guidance from the Chartered Institute for Archaeologists (Ref. 3.) and the European Archaeological Council (Ref. 4). This will provide an assessment of the presence or absence of below ground anomalies based upon differential magnetic responses. Where possible these will be ranked from being likely, potentially or probably archaeological in nature or a result of other processes including industrial debris, field boundaries and services.

2.3.5 Not all areas will be suitable for survey such as those covered with hardstanding, extant buildings and dense woodland and as such will be excluded. Surveys would need to be completed at a suitable time of year with no livestock, deep plough scars or furrows or overgrown crops present in the survey areas.

2.3.6 Given unrestricted access, the Site (excluding the unsuitable areas defined above) could be surveyed over a 10 week period by two teams of surveyors. The latter assumes a continuous on-site presence with no stand-down. Each team would comprise two personnel.

2.4 Geoarchaeological Watching Brief/ Deposit Modelling

Survey Area

2.4.1 A geoarchaeological watching brief will be carried out during any planned ground investigations across the Site (**Figure 1.3**).

2.4.2 It is anticipated that the results of the watching brief will be utilised to update and refine the pre-existing deposit model (Ref. 5). The aim is to refine understanding of the Palaeolithic potential across the Site.

Survey Methods

2.4.3 The following ground investigations will be subject to a geoarchaeological watching brief:

- Window Sampling

- Ground Investigation Test Pitting

2.4.4 Borehole (Rotary/Sonic drilling) will not be fully monitored. However, a sample of borehole locations will be monitored with reference to the existing deposit model, and samples will be retained for review and analysis by the appointed geoarchaeologist. Cone Penetration Testing will not be monitored as this technique is minimally intrusive to any surviving archaeological horizons and presents no opportunity to monitor and therefore interpret the arisings archaeologically.

2.4.5 The watching brief will be carried out and reported on an ongoing basis during the works by an approved subcontractor (geoarchaeologist) with accreditations where appropriate. The location and sequence of works will be dictated by the ground investigation programme with a single geoarchaeologist in attendance. The ground investigation which has a geological and geotechnical focus is currently planned to commence in Q3 2020. The archaeological monitoring works will follow guidance from Historic England (Ref. 6. and Ref. 7.).

2.4.6 The proposed load test excavation works are subject to a separate scheme of geophysical survey and intrusive archaeological investigation the details of which have been agreed in principle with Essex County Council as part of the planning consent process for the load test works. The findings from this archaeological investigation will be used to inform the historic environment baseline for the Site and to assist the design of further survey works as appropriate.

2.5 Marine Desk-based Assessment

Survey Area

2.5.1 Data on designated and non-designated heritage assets within the offshore and intertidal areas will be collected from a study area extending 2km from the boundary of the Marine Infrastructure Zone[2] (**Figure 1.6**) to cover the width of the estuary, with reference to relevant contextual secondary material on marine archaeology, geoarchaeology and geology and terrestrial archaeology from the wider area (see **Table 2.2**).

Survey Methods

2.5.2 The off-shore areas of the Site will be surveyed in line with Historic England (Ref. 8.) guidance, and with reference to additional guidance by Cowrie (Ref. 9. and Ref.10.), the Joint Nautical Archaeological Policy Committee (Ref. 11.) and Oxford Archaeology (Ref. 12.). Reference will be made to research agendas outlined by Ransley (Ref. 13.).

2.5.3 The Desktop survey will draw together a range of sources, including remote sensing such as Aerial Photography, off-shore bathymetry, geophysical survey and offshore

[2] The Marine Infrastructure Zone is shown at Figure 3. It extends between the existing Bradwell A power station site and Sales Point from Mean High Water to approximately 1km into the Blackwater Estuary. The Marine Infrastructure Zone and associated Marine Study Area are shown at Figure 1.6.

ground investigation results, both from surveys carried out to support the Project and available from publicly accessible sources, in addition to readily available historic mapping and archival material. Searches will be undertaken of known heritage asset records, both designated (designated wrecks, listed buildings, scheduled monuments and conservation areas) and non-designated records (HER, Archives Monuments Information England, United Kingdom Home Office).

Table 2.2 Desk study Search Areas (Marine)

Heritage receptor	Search buffer around the Marine Infrastructure Area	Source(s)
Designated assets	2km	Historic England National Heritage List for England (NHLE)
Non-designated assets	2km	Essex Historic Environment Record (EHER) Archaeological Monuments Inventory England (AMIE) UK Hydrographic Office Wrecks database (UKHO) Aerial Photography

2.5.4 The intertidal zone will be subject to a walkover survey as part of the Desktop Survey. This will be undertaken by two suitably qualified and experienced surveyors who will adhere to agreed access routes at all times. The survey will be non-intrusive and will comprise a walk around or through (where possible) the intertidal area within the Marine Infrastructure Zone, making a photographic record of existing land conditions and development.

2.5.5 The marine archaeology desk-based assessment will make recommendations on the need for and scope of any further marine archaeological surveys that may be required[3]. Any further surveys would be restricted to the Marine Infrastructure Area.

2.5.6 The results of all of the intertidal and marine surveys will be collated and appraised together with the terrestrial surveys.

2.6 Further Archaeological Surveys

2.6.1 Recommendations for further archaeological surveys will be made in the light of the results of the desk-based assessment, geophysical surveys and works carried out at the Load Test Area and the emerging development proposals. The need for and

[3] The assessment of effects on the Marine Historic Environment will have regard to effects arising through direct disturbance and, where appropriate, through change to coastal processes arising from the proposed development. Details of the assessment of change to coastal processes will be set out in the EIA scoping report.

scope of these surveys will be defined in consultation with ECC Place Services and Historic England, and may include works such as:

- Archaeological trial trenching;
- Targeted geophysical surveys;
- Targeted geoarchaeological test-pitting or coring (the scope of geoarchaeological surveys in areas of identified potential will be set out in the relevant site-specific DBA);
- Detailed buildings survey;
- Detailed aerial photographic analysis;
- Additional/periodic intertidal walkovers (including walkover following winter storms); and
- Review of full coastal process assessment (to enable assessment of effects on heritage assets through changes to coastal processes).

3. SURVEY PROGRAMME

3.1.1 The survey programme to be undertaken is outlined and summarised in each individual section. An overview of the proposed programme is detailed in **Table 3.1**:

Table 3.1 Survey Program (Proposed)

Survey Type	Proposed Start Date	Proposed Duration
Desktop study and site walkovers (Terrestrial)	June 2020	12 months
Settings study and site visits	June 2020	12 months
Desktop study and intertidal walkover (Marine)	June 2020	12 months
Geophysical survey for the Site	Q3-Q4 2020	2 months
Monitoring of Ground Investigation	Q3 2020	Dependent on GI programme – estimated at 5-6 months
Load test trial trenching	May-June 2020	3 weeks
Load test mitigation	TBC following completion of all trial trenching	Approximately 10 weeks
Trial Trenching for the Site	TBC 2021	TBC

3.1.2 All survey methods outlined within this document have been designed taking account of best practice guidance and professional judgement. Methods will be applied during optimal conditions wherever practical.

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APPENDIX A
FIGURES

Figure 1.1 Designated heritage assets within 1km of the Site (National Heritage List for England, 2020)

Figure 1.2 Designated heritage assets within 12km of the Site (National Heritage List for England, 2020)

Figure 1.3 Ground Investigations (site wide)

Figure 1.4 Load Test Area (with ground investigations)

Figure 1.5 Load Test Area proposed trial trenching layout

Figure 1.6 Designated heritage assets within 2km of the Marine Infrastructure Area (National Heritage List for England, 2020)

598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500

210500 210000 209500 209000 208500 208000 207500 207000 206500 206000 205500

N

Shinglehead Point
Mean Low Water
Mean High Water
Bradwell Nuclear Power Station
Electricity Switching Station
Weymarks Farm
Irrigation Reservoirs
Pp Ho
Community Settlement
Sales Point
Tip Head
St Peter's Flat
Chapel of St Peter on the Wall
Airfield (disused)
Downhall Farm
Gurds Grove
Caravan Park
Eastlands
East Hall Farm
East Hall
Munkins Farm
Gunners Creek
St Peter's Way
Playing Field
War Meml
Marina
Trusses Road
Down Hall
Beveralls
Westwick Farm
Down Westwick
Woodyards
East End
BRADWELL-ON-SEA CP
Bradwell Creek
Bradwell Waterside
Pewet Island
Blackberry Grove
Bradwell-on-Sea
Bradwell Lodge
Hockley
Bacons
Delameres Farm
Orplands
Kennel Barn
Bradwell Marsh Wind Farm
Bradwell Brook
Weatherwick
Gracedale Farm
Mill End
Curry
Maldon Road
Bradwell Hall
FB Packards
Gravel Pit
Glebe F
Sandbe

1019103
1019105
1013834
1110942
1146868
1110941
1110940
1308791
1337399
1337398
1337397
1110939
1110938
1110977
1146663
1147234
1337405
1147242
1110958
1110976
1337374
1110973
1110974
1110975
1110950
1147096

Bradwell-on-Sea Conservation Area

1337400
1110943
1146887
1110949
1110948
1430630
1308668
1308856
1110937
1391238
1110947
1308701
1337396
1337403
1110944
1147037
1110946
1308704
1308762
1337402
1146967
1337401
1110945
1146949
1337375

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- 1km study area
- Conservation Area
- Grade I Listed Building
- Grade II* Listed Building
- Grade II Listed Building
- Scheduled Monument

0 200 400 600 800 1,000 1,200 m

Scale at A3:1:20,000

Bradwell B Nuclear Power Plant Project
Historic Environments Survey and Monitoring Plan 2020/21

Figure 1.1
Designated heritage assets within 1km (National Heritage List for England, 2020)

April 2020

wood.

G:\MODEL\PROJECTS\EA-210\41843 Bradwell EIA Support\GIS\Workspaces\41843-WOOD-0256.mxd Originator: simon.green2

590000
595000
600000
605000
610000
615000
220000
215000
210000
205000
200000
195000
N
Church of St. John the Baptist. LB 1223841.
Church of St. Andrew. LB 1110914.
Layer Marney Tower. LB 1223988.
Abberton Reservoir
Martello Tower A and Associated Battery, Stone Point. LB 1309070.
Martello Tower A and Associated Battery, Stone Point. SM 1017052.
Mersea Island
Mersea Flats
West Mersea Conservation Area
West Mersea
Tolleshunt D'Arcy Conservation Area
Tollesbury Conservation Area
Tudor Blockhouse (300m south of Mersea Stone). SM 1013832.
Martello Tower C, St. Osyth Beach, Clacton-on-Sea. LB 1165569.
Martello Tower C, St. Osyth Beach, Clacton-on-Sea. SM 1018954.
A133
Goldhanger Conservation Area
Bradwell-On-Sea Conservation Area
Dengie Flat
Tillingham Conservation Area
Ray Sand Channel
Ray Sand
Southminster Conservation Area
Whitaker Channel
Bridgemarsh Island
Burnham-On-Crouch
Foulness Sands
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Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- 12km study area
- Conservation Area
- Grade I Listed Building
- Grade II* Listed Building
- Grade II Listed Building
- Registered Parks and Gardens
- Scheduled Monument

0 1,000 2,000 3,000 4,000 5,000 6,000 m

Scale at A3:1:100,000

Bradwell B Nuclear Power Plant Project
Historic Environment Survey and Monitoring Plan 2020/21

Figure 1.2
Designated heritage assets within 12km (National Heritage List for England, 2020)

April 2020

wood.

599000 599500 600000 600500 601000 601500 602000 602500 603000

210500 210000 209500 209000 208500 208000 207500 207000

N

River Blackwater

Pewet Island

Bradwell Waterside

Weymarks Farm

Curds Grove

East Hall Cottages

Linnet's Cottage

Trusscot

Westwick Farm

The Paddocks

Bradwell on Sea

Khyber

B1021

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Borehole - rotary / sonic drilling
- Cable percussion borehole
- Cone penetration test
- Trial pit

0 100 200 300 400 500 600 700 800 900 m

Scale at A3:1:15,000

Bradwell B Nuclear Power Plant Project
Historic Environment Survey and Monitoring Plan 2020/21

Figure 1.3
Ground Investigations (site wide)

April 2020

wood.

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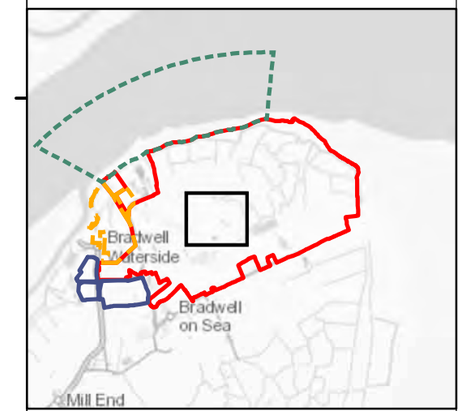
600800 601000 601200 601400

208400 208200 208000

Up to 2.2m High Security Fencing
Settlement / Retention / Pollution Control Pond
Gate
Up to 8m High Spoil Storage Bund
Up to 8m High Spoil Storage Bund
Load Test Investigation Excavation
Up to 6m High Surcharge Test Bund
Gate
Existing 11 kV overhead electricity cables and 20m wide exclusion zone
Existing Building
Gate
Topsoil Storage Area
Existing Building
Wheel wash, plant and materials storage / laydown area
Up to 6m High Surcharge Test Bund
Temporary Cesspool (Foul Water)
Unadopted road
Existing Access
Gate
Topsoil Storage Area
Contractors Office and Welfare Facilities
Parking (10 cars approximately)
Existing Business Unit
Parking (30 cars and 6 PLG vehicles approximately)

Key

- Load test area and load test site compound
- Proposed trial pit location
- Proposed window sample location with monitoring installation (Atkins)



0 25 50 75 100 125 150 m

Scale at A3: 1:2,500

Bradwell B Nuclear Power Plant Project
Historic Environments Survey and Monitoring Plan 2020/21

Figure 1.4
Load test area (with ground investigations)

April 2020

wood.

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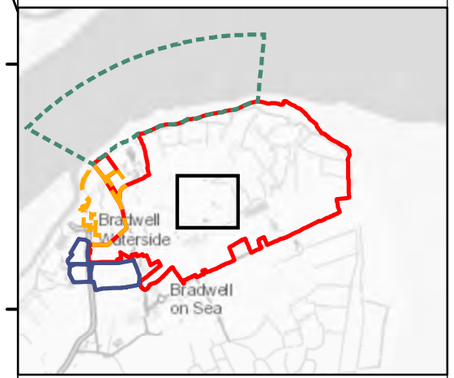
600800 600900 601000 601100 601200 601300 601400 601500

208500 208400 208300 208200 208100 208000 207900

N

Key

- Load test area
- Proposed archaeological trenches (4% sample)
- Borehole - rotary / sonic drilling
- Cable percussion borehole
- Cone penetration test
- Trial pit



0 20 40 60 80 100 120 140 m

Scale at A3: 1:2,500

Bradwell B Nuclear Power Plant Project
Historic Environments Survey and Monitoring Plan 2020/21

Figure 1.5
Load test area proposed trial trenching layout

April 2020

wood.

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Key

- Indicative Zone for Marine Infrastructure
- 2km study area
- Conservation Area
- Grade I Listed Building
- Grade II Listed Building
- Scheduled Monument

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

Bradwell B Nuclear Power Plant Project
Historic Environments Survey and Monitoring Plan 2020/21

Figure 1.6
Designated heritage assets within 2km of the zone for marine infrastructure (National Heritage List for England, 2020)

July 2020

wood.

APPENDIX 22B
DESIGNATED HERITAGE ASSETS

1.1.1 Designated heritages assets (National Heritage List for England (NHLE) January 2020) located within main development site boundary and those within the 1 kilometre (km) study area extending beyond the site boundary are identified in **Table 22B.1** and **Table 22B.2** respectively.

Table 22B.1: Designated heritage assets within the main development site

List Entry	Grade	Name
1110940	II	Easthall Farmhouse.
1110941	II	Barn approximately 15 metres (m) west of Easthall Farmhouse.
1308791	II	Byres and stable ranges approximately 25m south-west of Easthall Farmhouse.
1337399	II	Byres and stable ranges approximately 25m south-west of Easthall Farmhouse.

Table 22B.2: Designated heritage assets within the main development site 1km study area

Scheduled Monument	
List Entry	**Name**
1013834	Saxon Shore Fort and Anglo-Saxon monastery at Bradwell-on-Sea.
1019103	Saxon coastal fish weir at Sales Point.
1019105	Coastal fish weir 440m north-west of Pewet Island.

Listed Building		
List Entry	**Grade**	**Name**
1110942	I	Chapel of St Peter-on-the-Wall.
1337401	II*	Bradwell Lodge.
1308856	II*	Church of St Thomas.
1110937	II	Cage Row.
1110938	II	Cricketers Cottage.
1110939	II	Munkins Farmhouse.
1110943	II	Workshop formerly a smithy with two attached cast iron advertisement plaques relating to Bentall and Maldon Ironworks.
1110944	II	Walled Garden approximately 50m north-east of Bradwell Lodge.
1110945	II	Rissington Cottage and attached cottage to right.
1110946	II	15 and 16, High Street.
1110947	II	Orchard Cottage.
1110948	II	Barn approximately 30m north of New Hall.

Listed Building		
List Entry	**Grade**	**Name**
1110949	II	Tudor Cottage.
1110950	II	Goodgrooms
1110958	II	Down Westwick.
1110973	II	Bacons
1110974	II	Attached barn and cartlodge approximately 30m south-west of Bacons.
1110975	II	Barn approximately 50m south-west of Bacons.
1110976	II	Brewhouse adjacent to north-east of Bacons.
1110977	II	The Post Office and Post Office House.
1146663	II	Timbercot
1146868	II	Linnett's Cottage approximately 100m south-east of the chapel of St Peter-on-the-Wall.
1146887	II	Bay Cottage, Baytree Cottage, Baytree House and Baytrees.
1146949	II	Pilgrims Porch.

Listed Building		
List Entry	**Grade**	**Name**
1146967	II	Stable to rear, approximately 10m west of the Kings Head.
1147037	II	Claremont
1147234	II	The Old Cottage.
1147242	II	Truscott
1308668	II	New Hall.
1308701	II	White Lyons Cottage.
1308704	II	Well Cottage.
1308762	II	Former Coach House and Stables approximately 30m north of Bradwell Lodge.
1337374	II	Pump adjacent to west of brewhouse, Bacons.
1337375	II	Mounting steps and post south entrance to churchyard to St Thomas.
1337396	II	Village lock up with stocks and whipping post attached to doorframe, south east corner of churchyard of St Thomas.
1337397	II	Munkins Cottage.

Listed Building		
List Entry	**Grade**	**Name**
1337398	II	Barn approximately 25m south west of Munkins Farmhouse.
1337400	II	Forge Cottages.
1337402	II	Stable or brewhouse to rear, approximately 10m north-west of the Kings Head.
1337403	II	White Lyons.
1337405	II	Trusses
1391238	II	The Old School House and Outbuilding.
1430630	II	Bradwell-on-Sea War Memorial.
Conservation Area		
Bradwell-On-Sea.		

Table 22B.3: Designated heritage assets within the marine infrastructure area 2km study area

Scheduled Monument	
List Entry	**Name**
1013834	Saxon Shore fort and Anglo-Saxon monastery at Bradwell-on-Sea.
1019103	Saxon coastal fish weir at Sales Point.
1019104	Coastal fish weirs at West Mersea, 570m south east of St Peter's Well.
1019105	Coastal fish weir 440m north west of Pewet Island.
1019581	Coastal fish weir at the northern end of The Nass.

Listed Building		
List Entry	**Grade**	**Name**
1110938	II	Cricketers Cottage.
1110940	II	Easthall Farmhouse.
1110941	II	Barn approximately 15 metres west of Easthall Farmhouse.
1110942	I	Chapel of St Peter on-the-Wall.

Listed Building		
List Entry	**Grade**	**Name**
1110943	II	Workshop formerly a smithy with 2 attached cast iron advertisement plaques relating to Bentall and Maldon ironworks.
1110947	II	Orchard Cottage.
1110948	II	Barn approximately 30 metres north of new hall.
1110949	II	Tudor Cottage.
1110958	II	Down Westwick.
1110977	II	The post office and post office house.
1146663	II	Timbercot
1146868	II	Linnett's cottage approximately 100 meters southeast of the Chapel of St Peter-on-the-Wall.
1146887	II	Bay Cottage. Baytree Cottage. Baytree House. Baytrees.
1147037	II	Claremont
1147234	II	The Old Cottage.

Listed Building		
List Entry	**Grade**	**Name**
1147242	II	Truscott
1308668	II	New Hall.
1308701	II	White Lyons Cottage.
1308791	II	Byres and stable ranges approximately 25 metres south west of Easthall Farmhouse.
1337397	II	Munkins Cottage.
1337398	II	Barn approximately 25 metres south west of Munkins Farmhouse.
1337399	II	Byres and stable ranges approximately 40 metres south west of Easthall Farmhouse.
1337400	II	Forge Cottages.
1337403	II	White Lyons.
1337405	II	Trusses
Conservation Area		
Bradwell-On-Sea.		

APPENDIX 23A
BIODIVERSITY SURVEY AND MONITORING PLAN

Bradwell B Project

Biodiversity Survey and Monitoring Plan

Wood Environment & Infrastructure Solutions UK Limited – August 2020

BBX20234002WOOD03GN

Version P04

Report for

Bradwell Power Generation Company Limited (BRB)

5F, Rex House,

4-12 Lower Regent Street

London

SW1 4PE

Main contributors

[redacted]

Issued by

[redacted] .....

Approved by

[redacted] .....

Wood

Partnership House

Regent Farm Road

Gosforth

Newcastle upon Tyne NE3 3AF

United Kingdom

Tel +44 (0) 191 272 6100

Doc Ref. 41843-WOOD-XX-XX-RP-OE-0004

Management systems

This document has been produced by Wood Environment & Infrastructure Solutions UK Limited in full compliance with our management systems, which have been certified to ISO 9001, ISO 14001 and OHSAS 18001 by LRQA.

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Owner:	Name: [redacted]	Date: 10/08/2020

Revision history / Record of comments

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P02	Final	[redacted]	06/03/2020
P03	Updated following consultee responses	[redacted]	01/06/2020
P04	Updated post scoping workshops	[redacted]	10/08/2020

CONTENTS

TABLES

APPPENDICES

1. INTRODUCTION

1.1 Background

1.1.1 Bradwell Power Generation Company Limited (BRB GenCo) proposes to develop a new nuclear power station, called “Bradwell B”, near Bradwell-on-Sea in Essex (hereafter referred to as the proposed development). The proposed development would comprise twin UK HPR1000 reactors with a combined electrical capacity of 2,340 MW.

1.1.2 The area of land within which the proposed development would be built is located next to the Blackwater Estuary on the Dengie Peninsula, approximately 15 km east of the town of Maldon, 1 km northeast of the village of Bradwell-on-Sea within the District of Maldon, Essex. It lies adjacent to the existing Bradwell Nuclear Power Station, which ceased operation in 2002. The power station is being decommissioned by the Nuclear Decommissioning Authority (NDA) and entered the Care and Maintenance phase in 2018.

1.2 Site Context

1.2.1 For the purposes of this survey and monitoring plan (SMP) the land area covered by the Indicative Main Development Site boundary, Potential Temporary Workers Accommodation Site boundary and Potential Expansion Area for Temporary Workers Accommodation Site boundary: central National Grid Reference (NGR) 601000E, 209000N is identified hereafter as the Site (**Figure 1**).

1.2.2 In addition to the range of development activities that relate to the Site there will be a requirement for off-site Associated Development (AD) in order to construct and operate the Project. Such development is expected to include but may not be limited to park and ride facilities, off-site freight management and potential new or enhanced transport infrastructure.

1.2.3 The requirements with respect to the locations and extents of the off-site AD are currently being considered and as a result they are not given further consideration in this report. However, the overarching methodologies and approaches (where relevant) will still be applicable to these off-site Associated Development sites (ADs), but the survey extents, geographical coverage and study areas will be confirmed once Project requirements with respect to site location, spatial area and design layout are known with sufficient certainty to enable representative baseline monitoring to be undertaken.

1.2.4 The description of the Project, including indicative site boundaries, presented in this SMP reflects the Project status at the point that the SMP was issued to consultees to inform workshops held in June 2020, with subsequent updates to take into account workshop feedback and responses from consultees. As the Project progresses, further iterations of the SMP will be required as proposals are refined, in particular, with respect to off-site ADs. The technical scope contained herein

remains applicable irrespective of any future boundary changes (should this be required), subject to a review of receptors and spatial scope.

1.3 Purpose of this Document

1.3.1 The purpose of this SMP is to present the relevant details for agreement with consultees, the methods to be employed for the programme of biodiversity surveys to be undertaken at the Site during 2020 and January - March 2021.

1.3.2 A separate SMP will be prepared for off-site ADs following completion of desk studies and extended Phase 1 habitat surveys which are proposed to be undertaken in accordance with the methodology approaches presented in this document.

1.3.3 The preliminary purpose of these surveys will be to determine a robust and accurate baseline data to inform the Environmental Impact Assessment (EIA) and Habitat Regulations Assessment (HRA). application.

1.3.4 In addition to the biodiversity survey programme detailed within this document, SMPs and assessments for other technical disciplines including Recreation & Amenity, Noise, Air Quality and Water Quality will be used in conjunction with the biodiversity survey results to inform the HRA and biodiversity assessment for the EIA.

1.3.5 An example of this inter-disciplinary approach is the avian receptor noise assessment (including modelling analysis and ambient/background noise level monitoring) which will be conducted in tandem with the overwintering bird surveys.

2. SURVEY PROPOSALS

2.1 Desktop Study

Survey Area

2.1.1 The desktop study survey area is defined as the Site, with an additional buffer for ecological receptors as defined in **Table 2.1**. The desktop study is a desk-based data gathering exercise required to inform the need for further ecological surveys in relation to the proposed development.

Survey Methods

2.1.2 Information has been sought from a range of sources, including the Multi-Agency Geographic Information for the Countryside website (MAGIC), local environmental record centres (LERCs), British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS), BTO Low Tide counts, and existing survey data to obtain information relating to statutory and non-statutory nature conservation designations, habitats of principal importance (HPI), species of principal importance (SPI) and other legally protected and controlled species.

Table 2.1: Desk Study Search Areas

Ecological receptor	Search buffer around the Site	Source(s)
Statutory designated sites (national and international)	2 km	MAGIC Natural England's designated sites website Essex Wildlife Trust Biological Record Centre
International statutory designated sites with ornithological qualifying features	20 km	MAGIC Natural England's designated sites website Essex Wildlife Trust Biological Record Centre
International statutory designated sites with bat-related qualifying features.	10 km	MAGIC Natural England's designated sites website Essex Wildlife Trust Biological Record Centre

Ecological receptor	Search buffer around the Site	Source(s)
National statutory designated sites with ornithological or bat-related qualifying features.	10 km	MAGIC Natural England's designated sites website Essex Wildlife Trust Biological Record Centre
Non-statutory designated sites	2 km	Essex Wildlife Trust Biological Record Centre
Priority habitats and ancient woodland	2 km	MAGIC Natural England's Priority Habitat Inventory
Legally protected and notable species (excluding bats and aquatic mammals)	2 km	MAGIC The Essex Recorders Partnership (Essex Field Club) Essex Badger Protection Trust Essex Wildlife Trust Biological Record Centre Natural England's Open Data (Great Crested Newt eDNA and Habitat Suitability Index Survey results for Ponds surveyed for District Level Licensing) Historical biodiversity survey reports produced in support of other development proposals
Bats and aquatic mammals (otter and water vole)	5 km	MAGIC The Essex Recorders Partnership (Essex Field Club) Essex Wildlife Trust Biological Record Centre Historical biodiversity survey reports produced in support of other development proposals
Water bodies not separated from the Site by major barriers to great crested newt	500 m	1:10,000 Ordnance Survey maps

Ecological receptor	Search buffer around the Site	Source(s)
movement (e.g. major roads and rivers)		

2.1.3 The desktop study was undertaken in April and May 2020.

2.2 Extended Phase 1 Habitat Survey

Survey Area

2.2.1 The extended Phase 1 habitat survey area is defined as the Site plus a 100m buffer (**Figure 1**). The purpose of this survey is to map broad habitats present on the Site and assess the potential of the Site to support legally protected and notable species. The results of this survey will also be used in order to inform the scope of, and interpret the results of, any further protected species surveys.

Survey Methods

2.2.2 Habitats within the survey area will be mapped and classified in line with the Handbook for Phase 1 Habitat Survey (JNCC, 2010). The dominant plant species will be noted in order to appropriately classify the broad habitats present on the Site, alongside any protected, uncommon or invasive species. Full botanical species lists will not be compiled during this survey.

2.2.3 During the extended Phase 1 habitat survey, particular features of interest with respect to fauna will also be target noted, and this data will enable more targeted surveys for legally protected and notable species.

2.2.4 The extended Phase 1 habitat survey was undertaken in May 2020 and consists of one survey visit to the site.

2.3 National Vegetation Classification (NVC)

Survey Area

2.3.1 Specific habitat parcels with the potential to be of notable botanical value, and thus requiring a more detailed level of botanical survey, will be identified as part of the extended Phase 1 habitat survey (section 2.2). It is anticipated that, as a minimum, NVC survey work will include all saltmarsh and coastal grassland.

2.3.2 NVC is required in order to inform the assessment of potential direct and indirect effects of construction and operation on areas of botanical value, and to provide a baseline against which changes to areas of retained vegetation can be assessed, if required, during construction and operation.

Survey Methods

2.3.3 NVC will follow methods outlined in Rodwell (1991) to provide details of the species composition and structure of plant communities. Data will be presented as vegetation community maps using standard NVC codes, or bespoke codes where communities do not fit the standard ones. These will be accompanied by quadrat composition tables, and summary descriptions of plant communities.

2.3.4 NVC survey work will take place in June/July 2020 and consists of one survey visit to the site.

2.4 Ditch Habitat Survey

Survey Area

2.4.1 The ditch habitat survey area is defined as the Site plus a 100 m buffer (**Figure 1**). The purpose of this survey is to assess the condition of the ditch habitats and inform an understanding of potential effects that may occur as a result of the proposed development.

Survey Methods

2.4.2 At least one sample will be taken from each ditch that holds water perennially, with additional samples taken from longer ditches and those of greater interest associated with the statutory designated sites (e.g. the Borrow Dyke). Each sample will constitute a representative 20 m section of the ditch, supported by recording species present elsewhere on the same ditch.

2.4.3 The method for this survey has been adapted from the Farm Environment Plan (FEP) (Natural England, 2010) protocol, with the aim of identifying and classifying ditch habitats according to their distinctiveness and condition. For each ditch section sampled the following features will be recorded.

- Number of Wetland Indicator Species (WIS) and their relative abundance using the DAFOR scale (dominant, abundant, frequent, occasional, or rare). WIS are defined in Palmer *et al*. (2013).
- Average water depth (cm).
- Average algal cover (%).
- Combined coverage of common duckweed, fennel pondweed and yellow water-lily (%).
- Presence and coverage of invasive plant species (as listed on Schedule 9 of the *Wildlife and Countryside Act 1981*, as amended).
- Shading of the channel (%).

2.4.4 Wetland plants observed within the ditch channel (up to the bank top) will be recorded, but an exhaustive list of all plant species present in the ditch will not be compiled.

2.4.5 Ditches will be recorded and mapped as separate features wherever multiple ditches diverge or converge, if there is a significant change in the physical conditions (for example water depth), or if a dry section greater than 10m is observed. Supplementary information on the wetness of ditches at other times of the year will be collected as an incidental part of other survey activities (e.g. water vole survey visits in April and September – see section 2.19).

2.4.6 Chloride/electrical conductivity (for salinity) and pH will be measured at each of the habitat sample locations as part of the ditch habitat survey. In addition, eight sample locations across the ditch network will be subject to a programme of monthly surface water monitoring over a 12 month period, which will provide data to supplement that collected as part of the biodiversity surveys (see *Water Environment Survey and Monitoring Plan*).

2.4.7 The information collected will be used to attribute a 'distinctiveness' rating to the ditches based upon the following criteria.

- **High** – ditches that contain more than ten submerged, floating or emergent WIS per 20 m stretch. These ditches are usually wet for most of the year.
- **Moderate** – ditches that support ten or fewer WIS per 20 m stretch, but more than the minimum number and abundance, as per the thresholds below. These ditches regularly contain standing or flowing water.
  - Between four and ten WIS of any score on the DAFOR scale.
  - Three WIS species that are 'occasional', 'frequent', 'abundant' or 'dominant' on the DAFOR scale.
  - Two WIS species that are 'frequent', abundant' or 'dominant'; or
  - One WIS species that is 'abundant' or 'dominant'.
- **Low** – ditches that support no WIS, or they support up to three WIS below the abundance thresholds mentioned above. These are usually dry ditches, or ditches which infrequently contain standing or flowing water (for example, during heavy rain only).

2.4.8 Once the habitat distinctiveness has been identified, the condition of the ditch will be assessed. A condition rating of 'good', 'moderate' or 'poor' will be assigned based upon how many of the habitat condition criteria were not met. 'Low' distinctiveness ditches will be automatically assigned 'poor' condition, without the need to use the habitat condition criteria. The ditch habitat condition criteria are:

- The ditch contains more than ten submerged, floating or emergent WIS per 20 m section.
- Cover of macro-algae is less than 30% in the summer (i.e. during the June to mid-September survey period).
- The following species together make up less than 75% of the vegetation cover: common duckweed, fennel pondweed and yellow water-lily.
- The following invasive species make up less than 10% of the vegetation cover: New Zealand pygmyweed, floating pennywort, waterfern and parrot's feather; and
- Less than 20% of the ditch is in heavy shade (unless the ditch is adjacent to a hedge or within a woodland).

2.4.9 Ditch condition bands are as follows:

- **Good** – all of the ditch habitat condition criteria met.
- **Moderate** – all but one of the ditch habitat condition criteria me; and
- **Poor** – fails to meet two or more of the ditch habitat condition criteria.

2.4.10 Field survey work will be conducted in June/July to coincide with the optimum period for surveying wetland plant species and will comprise one survey visit.

2.5 Predictive System for Multimetrics (PSYM) Assessment

Survey Area

2.5.1 The PSYM survey area is defined as the Site plus a 100 m buffer (**Figure 1**). The purpose of this survey is to assess the condition of pond habitats and inform and understanding of potential effects that may occur as a result of the proposed development.

Survey Methods

2.5.2 The PSYM method was developed by the Environment Agency and Pond Conservation (2002). The PSYM method parallels the approach defined in the EU Water Framework Directive. This includes requirements for (i) comparisons with minimally impacted baseline conditions, and for (ii) assessments to be based on multiple parameters related to degradation.

2.5.3 The method uses information from both the macrophyte and macroinvertebrate communities present in ponds as these groups span a complementary range of sensitivities to potential degradation factors.

2.5.4 The macrophyte survey method comprises recording all the wetland plants present. The surveyor walks, or wades, the entire perimeter of the dry and shallow water areas of the waterbody. Deeper water areas are sampled using a pond net or grapnel.

2.5.5 The invertebrate survey method uses a standard three minute hand-net sampling approach. Additionally, a further 1 minute is spent searching for animals which may otherwise be missed in the three-minute sample. Invertebrate sorting and identification methods follow standard laboratory techniques and are identified to family level for most groups, and class level for oligochaetes.

2.5.6 Environmental data are also collected from each pond. These include grid reference, altitude, pH, pond area, pond overhung, % of pond edge grazed by livestock, pond base composition, inflow present and emergent plant cover.

2.5.7 The metrics used for ponds are:

- Invertebrates:
  - Average score per taxon (ASPT).
  - Number of dragonfly (Odonata) and alderfly (Megaloptera) families (F_OM); and
  - Number of beetle (Coleoptera) families (F_COL).
- Plants:
  - Number of submerged and emergent plant species (SM_NTX).
  - Trophic ranking score for aquatic and emergent plants (TRS_ALL); and
  - Number of uncommon plant species (PL_NUS).

2.5.8 The data for environmental variables, macrophytes and macroinvertebrates is entered into an Excel Proforma and into the PSYM computer program. This compares the observed data to predicted from un-degraded conditions and calculates the scores for each metric.

2.5.9 The relationship between observed and expected is presented as a percentage of similarity, and then transformed to a four point scale e.g. 0, 1, 2 and 3 where 0 represents poor quality, and 3 represents good quality (i.e. no deviation from expected). All metric scores are then summed to give an overall quality index, which is presented as a percentage of the maximum score and, potentially, forms the basis of general quality assessment and categorisation of a site.

2.5.10 The surveys will be carried out in the period from June to August 2020 inclusive, and will comprise one survey visit.

2.6 Terrestrial Invertebrate Survey

Survey Area

2.6.1 Specific habitats with the potential to be of notable invertebrate value will be identified as part of the extended Phase 1 habitat survey (section 2.2). Precise sampling locations for the terrestrial invertebrate survey will draw on this information, but will be refined on-site by an experienced entomologist. It is anticipated that the survey will include sampling points on the Site plus a 100m buffer (including the adjacent Ramsar/SAC saltmarsh).

2.6.2 Terrestrial invertebrate survey work is required in order to inform the assessment of potential direct and indirect effects of construction and operation on invertebrate communities of biodiversity conservation value. Survey work in 2020 will aim to provide preliminary results for this purpose, but will also aim to identify the requirement for and focus of follow on surveys targeted at specific species groups.

Survey Methods

2.6.3 Survey work will be designed to provide a high level overview of communities present, and also to provide a preliminary assessment of the value of the site to legally protected species, species of principal importance for biodiversity, Red Data Book species, Nationally Scarce species and Ramsar qualifying features. A combination of methods will be adopted in 2020, including:

- *Sweep-netting* – for sampling low-growing vegetation and scrub, particularly for aculeate Hymenoptera, Diptera, phytophagous Coleoptera and Hemiptera;
- *Direct searching* – undertaken in combination with sweep-netting to record readily identifiable insects, for example on flower-heads or in flight; and
- *Moth-trapping* – Robinson Mercury Vapour moth traps connected to petrol driven portable generators will be used at three sample locations, running from dusk until dawn.

2.6.4 Distinctive species will be identified in the field, but most specimens will be retained for detailed inspection and identification under magnification.

2.6.5 The survey will be carried out in the period from June to September 2020, inclusive, and will comprise three survey visits.

2.7 Aquatic Macroinvertebrate Survey

Survey Area

2.7.1 Specific habitats with the potential to be of notable invertebrate value will be identified as part of the extended Phase 1 habitat survey (section 2.2). It is anticipated that this will comprise sampling points on the Site plus a 100 m buffer. The Borrow Dyke and Weymarks River will be included for this survey.

2.7.2 These data are required to deliver a robust description of baseline conditions against which potential environmental impacts that may result from the proposed development can be assessed. This includes both directly and indirectly, e.g. through changes in the hydrological system.

Survey Methods

2.7.3 Macroinvertebrate communities will be sampled using standard kick sampling methods (UKTAG, 2014) on watercourses. This will provide data to characterise the aquatic invertebrate communities present, as well as highlighting any rare or notable species present.

2.7.4 At each sample location a single three-minute kick/sweep net (as appropriate) sample will be collected following the standard protocol for collecting and analysing macroinvertebrate samples. A 25 cm wide sample net with a 1 mm mesh will be used. Each sample will encompass all the in-stream micro-habitats present at the sampling location in proportion to their occurrence over the three-minutes sampling time. Habitat metrics will be recorded in order to calculate biotic indices. Samples will be preserved in 80% industrial methylated spirits in sealed containers for transportation.

2.7.5 Examination of samples will be made under magnification and identified by employing multiple standard keys e.g. Dobson *et. al.* (2012). Specimens will be identified to the appropriate taxonomic level to provide a biological assessment of water quality using BMWP and ASPT scores. A measure of productivity will be obtained by a total count of invertebrates in each sample. Species will also be checked for rarities using the JNCC Taxon Designations spreadsheet (JNCC 2011).

2.7.6 Data will feed into an assessment of the Water Framework Directive (WFD) ecological status class for invertebrate parameters as a measure of water quality of watercourses. It will also be used to assess of the biodiversity conservation value of the water bodies for invertebrates, using taxon richness.

2.7.7 The surveys will be carried out during the period from June to October 2020, inclusive, and will comprise two survey visits.

2.8 Badger Activity Survey

Survey Area

2.8.1 The badger survey area is defined as the Site with an additional 100 m buffer (**Figure 1**). The purpose of this survey is to establish the distribution of badger activity, and the number and type of badger setts present across the Site. The results of the badger activity survey will be used to inform the badger bait marking study (Section 2.9).

Survey Methods

2.8.2 A single survey visit walkover survey was carried out across the Site and an additional 100 m buffer between December 2019 and February 2020, particularly focussing on those habitats that were optimal for badger sett building and foraging, such as blocks of woodland, field boundaries and hedgerows.

2.8.3 During the walkover, evidence of badgers was recorded including:

- Setts – comprising holes or series of holes which are likely to be connected through a series of underground tunnels.
- Hairs – distinctive hairs with an ovoid cross section, and a white root, black band and white tip.
- Footprints – often located in soft mud and around sett entrances.
- Evidence of foraging – including snuffle holes (small scrapes in the ground created by badgers searching for invertebrates).
- Dung pits - characteristic excavated pits containing faeces.
- Latrines - a concentration of dung pits typically used to demarcate territorial boundaries; and
- Pathways – well-used pathways, often leading to setts and foraging areas.

2.8.4 The level of activity of each identified sett was recorded (as outlined in **Table 2.2**) and the sett will be classified in line with Cresswell *et al.* (1990) and Wilson *et al*. (1997), as outlined in **Table 2.3**.

Table 2.2: Classification of Level of Activity at Badger Setts

Activity level	Definition
Well used	Well-worn entrance, freshly excavated soil, bedding material.
Partially used	Holes with twigs and/or leaves in the entrance, and/or mosses and other plants growing in or around entrance.
Disused	Entrance partially or completely blocked, with considerable amount of excavation required for reoccupation.

Table 2.3: Badger Sett Classification

Sett type	Definition
Main	Several entrance holes with large spoil heaps and obvious pathways leading to, from and between sett entrances.
Annexe	Usually located within 150m of a main sett, comprising several entrance holes. Often linked to the main sett by obvious pathways. May not be in continuous use.
Subsidiary	Not in continuous use, with no obvious pathways connected to the main sett.
Outlier	Usually only one or two entrance holes with no obvious paths leading to the main sett.

2.8.5 All badger setts and field signs recorded during the badger activity surveys were mapped to show the distribution of badger activity and badger setts within the survey area.

2.9 Badger Bait-marking

Survey Area

2.9.1 The survey area for the badger bait-marking study was informed by the results of the badger activity survey and initially focussed on the Site and 100 m buffer (**Figure 1**), but extended to a wider study area as required to help define badger clan territories. The survey aimed to identify individual social groups and their territories.

Survey Methods

2.9.2 The badger bait marking study was carried out following methods recommended by Delahay *et al*. (2000). All main setts identified during the badger activity surveys were visited and an edible bait mix was fed for a period of 14 days. The bait comprised a feed mix combined with coloured indigestible pellets, with each main sett being allocated a different colour of pellet. The pellets are specifically manufactured for the purpose of badger bait marking studies and pose no harm to badgers when ingested.

2.9.3 Following the feeding period, the badger activity survey was repeated across the Site, with a focus on identifying and recording latrines containing marked badger dung. National grid-references of all latrines and the colour of pellets identified were recorded. The results of the bait marking study are being analysed using the minimum convex polygon (MCP) method to determine the territory size of individual badger social groups.

2.9.4 The badger bait marking study was carried out in April 2020, when badgers were actively marking their territories.

2.10 Bat Roost Identification Survey

Survey Area

2.10.1 A full suite of bat survey methods will be carried out across the Site in order to identify potential roosts that may be affected by the proposed development. The specific survey area for each method is shown in **Table 2.4**. All surveys will be carried out in line with best practice guidelines (e.g. Mitchell-Jones, 2004; Mitchell-Jones & McLeish, 2012; Collins *et al*., 2016), interpreted using professional experience. It is worth noting that this section sets out the general methods that will be adopted, although the detailed application of these methods will be refined to some extent as preliminary survey data becomes available and the bat survey programme evolves.

Table 2.4: Bat Roost Identification Survey Areas

Survey type	Proposed survey areas (see Figure 1)
Preliminary scoping of trees and built structures	Site and a 500 m radius
Ground level visual assessment of trees	Site and a 100 m radius

Survey type	Proposed survey areas (see Figure 1)
Aerial inspection of trees	Site and up to a 100 m radius (the exact survey radius will depend on findings from preliminary survey and assessment)
Monitoring of built structures with high potential for hibernating bats	Site and a 100 m radius
External building inspections	Site and up to a 500 m radius (the exact survey radius will depend on findings from preliminary survey and assessment)
Internal building inspections	Site and up to a 100 m radius (the exact survey radius will depend on findings from preliminary survey and assessment)
Emergence and re-entry surveys	Site and a up to a 100 m radius (the exact survey radius will depend on findings from preliminary survey and assessment)

Survey Methods

Preliminary Scoping of Trees and Built Structures

2.10.2 A walkover survey of the Site plus a 500 m buffer was undertaken in December 2019. During this survey all trees/blocks of trees and built structures were assessed for their potential to support roosting bats. This included a visual inspection of the exterior of built structures to consider the presence of potential roost features (PRFs) such as roof voids or weatherboarding. The quality of the surrounding habitat, including a consideration of expected levels of artificial lighting and potential disturbance, was also noted.

2.10.3 This was a high-level scoping exercise and did not involve assessing every individual tree, but where groups of trees occur together (e.g. woodland) a general assessment was made of the tree group and its potential to support bat roosts. Similarly, not every building was inspected in detail, with some assessed from Public Rights of Way using binoculars.

Ground Level Visual Assessment of Trees (GLVA)

2.10.4 All trees within the relevant survey area (**Table 2.4**), where access could be secured, were visually inspected by a suitably experienced ecologist using close focussing binoculars and a high-powered torch to search for PRFs such as knot holes, tear outs, woodpecker holes, wounds and cankers. PRFs were recorded and assessed following guidance set out within the Bat Tree Habitat Key (Andrews *et*

al., 2018). Any evidence of bats such as scratching, staining or droppings was also recorded.

2.10.5 Trees were categorised in accordance with their level of potential to support roosting bats, as follows.

- **Confirmed roosts** - where it was possible to determine that the tree supports a PRF that is used or has been used by bats.
- **High potential suitability** - a tree with one or more PRFs that are obviously suitable for use by large numbers of bats on a regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.
- **Moderate potential suitability** - a tree with one or more PRFs that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat, but that are unlikely to support a roost type of high conservation status.
- **Low potential suitability** - a tree with one or more PRFs that could be used by individual bats opportunistically. PRFs do not provide sufficient space, shelter, protection, conditions and/or surrounding habitat to be used on a regular basis or by large numbers of bats (i.e. unlikely to be suitable for maternity or hibernation roosts). Alternatively, a tree of sufficient size and age to contain PRFs but with none seen from the ground, or features seen appear to have only very limited roosting potential.
- **Negligible suitability** - trees with negligible features likely to be used by roosting bats.

2.10.6 GLVA surveys were carried out between March and April 2020, which is the optimal period for ground level visual assessments due to the reduction in foliage during winter and early spring, allowing increased visibility of features higher up in the tree, and comprised one survey visit to each tree.

Aerial Inspection of Trees

2.10.7 Any PRFs occurring up to 2 m from ground level will be inspected either from ground level or using a ladder using an endoscope and torch. PRFs above this height will be accessed using rope and harness climbing techniques.

2.10.8 PRF inspections will update the GVLA and record additional characteristics of each feature, including approximate internal cavity dimensions and the type of bat roost the feature had potential to support (i.e. maternity, transitional, summer and/or hibernation). Any bats, or evidence of bat occupation (including staining, smoothing of bark and droppings) will be recorded, and a photograph of each PRF taken for reference and to aid future re-identification of individual features if such were required.

2.10.9 While in the canopy it is often possible to identify features that are not visible from ground level, therefore, any additional PRFs observed that were not identified from the ground level inspection will be recorded and inspected, and included in further survey work as appropriate.

2.10.10 All PRFs that are not 'scoped out' during this exercise, i.e. because close inspection reveals the feature to be unsuitable for roosting bats, will be tagged using numbered arboricultural tags in order to enable longer-term re-identification.

2.10.11 A sample of any bat droppings found during the PRF inspection work will be collected, where possible, and submitted for DNA analysis to confirm species identification (see paragraph 2.10.32).

2.10.12 Each PRF will be inspected twice during the course of the year, with each inspection occurring in a different season, i.e. one in spring/summer (March to August, planned for July/August 2020) and one in autumn/winter (September to February, planned for January/February 2021).

Monitoring for Hibernating Bats

2.10.13 Built structures identified as having high potential to support hibernating bats, based on the preliminary scoping exercise, were subject to the following survey methods in each month of January and February 2020:

- An inspection visit; and
- Up to 14 days of acoustic monitoring (as permitted by access agreements).

2.10.14 Inspection visits were be carried out by a suitably licensed and experienced ecologist, to search for evidence that the structures are being used by bats for hibernation. This survey method primarily focussed on structures that were considered likely to offer stable conditions throughout the winter period (e.g. pillboxes).

2.10.15 Where access to the interior of the structure was available, it was fully inspected for hibernating bats. Any crevices found during these surveys were inspected using an endoscope and a high-powered torch. Where full access to the interior was not possible, e.g. a sealed pillbox, an endoscope, torch and small mirror on a telescopic pole was used to search the interior through the open slit windows, as far as possible.

2.10.16 A BatLogger A+ static bat detector was deployed within each structure where internal access allows, for a up to 14 days in each month. This was set up to record any bat calls continuously from 30 minutes before sunset to 30 minutes after sunrise. Where full physical access was not possible (as in the example of a sealed pillbox), the internal space was monitored by placing the bat detector microphone on a long cable extension through the open slit window. Where the full 14 day recording period could not be completed in 2020 due to land access restrictions, the monitoring exercise will be repeated for that month in 2021.

2.10.17 Recordings were analysed using the specialist software BatExplorer (see paragraph 2.10.33).

External and Internal Building Inspections

2.10.18 Buildings within the survey area will be subject to an external and an internal inspection by suitably licensed and experienced ecologists to further inform their suitability to support roosting bats. In assessing potential to support roosting bats, the external inspections will consider the following factors:

- The presence of potential roost features (PRFs) such as roof voids, soffit boxes with access gaps, spaces between roof tiles and lining felt or boarding, and gaps under bargeboards, roof tiles, hanging tiles, lead flashing and weatherboarding.
- Expected levels of artificial lighting around potential roost entrances.
- Expected levels of disturbance to any potential roosts.
- Quality of habitat for roosting bats at the structure, and the potential for bat foraging and/or commuting routes in the surrounding area, in line with:
  - *High quality* - the exterior of the structure is expected to be unlit by artificial lighting, and there is continuous habitat within 30 m that is well connected to the wider landscape and is likely to be used regularly by commuting and/or foraging bats (e.g. broadleaved woodland, intact or species-rich hedgerows, vegetated streams and water bodies, or other habitats likely to be rich in invertebrate prey).
  - *Moderate quality* - the exterior of the structure is unlit by artificial lighting on at least one aspect, and there is continuous habitat within 100 m that is connected to the wider landscape that could be used by bats for foraging and commuting; and
  - *Low quality* - the exterior of the structure may be lit by artificial lighting on all aspects, and/or it is isolated, with the surrounding habitat suitable only for use by small numbers of commuting and/or foraging bats (any moderate or high quality habitat within 100 m is separated from the structure by a barrier, such as medium to high levels of artificial lighting).

2.10.19 Taking into account all of the factors listed above, each structure will then be categorised according to the level of potential for it to support roosting bats, broadly in line with the categories described in paragraph 2.10.5; i.e. confirmed roosts, high potential suitability, moderate potential suitability, low potential suitability or negligible suitability. Where the building cannot be assessed sufficiently for it to confidently placed into one of these categories (for example due to access restrictions), a conservative assumption will be made regarding the level of potential and the structure will be placed into the highest likely category based on the data that can be gathered.

2.10.20 In addition, the exteriors of buildings near potential roost entrances (e.g. gaps under soffits and hanging tiles) will be examined using binoculars and a powerful torch to look for signs of bats, such as droppings.

2.10.21 Where safe access is available, the interior of structures, including any loft spaces and roof voids will be examined for bats and signs of bats, such as droppings, urine staining, discarded insect remains and any scratching or staining at potential bat access points, using a high-powered torch. Any crevices which cannot be properly examined using a high-powered torch will be inspected using an endoscope. A sample of any bat droppings found during internal building inspections will be collected and submitted for DNA analysis to aid species identification (see paragraph 2.10.32).

2.10.22 External building inspections will be carried out throughout 2020, and will comprise one specific survey visit per building. Internal building inspections have been delayed due to government restrictions and safety concerns relating to Covid-19, therefore, it is proposed that these will take place in autumn/winter 2020 (during the period September to December).

Emergence and Re-entry Surveys

2.10.23 The scope of emergence and re-entry survey work will be informed by findings of the preliminary scoping exercise and GLVA initially, and refined as further results become available from external building inspections and aerial tree inspections.

2.10.24 Built structures and trees will be visited at dusk by teams of ecologists to monitor bat emergence from, or at dawn to monitor bat re-entry to, PRFs. The level of potential a built structure is considered to have (following the inspection work) will directly feed into the minimum level of survey effort applied during emergence and re-entry surveys, as follows:

- *High potential* - a minimum of two emergence surveys and one re-entry survey.
- *Moderate potential* - a minimum of one emergence survey and one re-entry survey; and
- *Low potential* - a minimum of one re-entry survey.

2.10.25 Although this provides the minimum level of survey effort, some structures and trees may be subject to additional survey visits if such is necessary to inform the assessment. In particular, where the presence of a bat roost is confirmed, further survey visits may be required to characterise the roost.

2.10.26 Those structures assessed as offering winter potential and/or night/feeding roost potential only will not be subject to these minimum levels of emergence and re-entry survey effort, as other methods are more appropriate to assess their use by bats (i.e. building inspections).

2.10.27 Trees will only be subject to this method of survey where a PRF is present that cannot be fully inspected. This includes PRFs that extend further into the tree than the reach or an endoscope, for example, as well as PRFs in trees that are not safe to climb (e.g. due to extensive rot).

2.10.28 In locations where there are several trees or built structures in close proximity, all with PRFs offering low potential for roosting bats, a re-entry transect survey method may be applied in place of the standard re-entry survey. This is an adaptation of the standard 'back-tracking survey'. During these survey visits surveyors will walk short transects around the trees/structures taking a maximum of ten minutes to complete a transect circuit incorporating all PRFs. Surveyors will have the freedom to deviate from their defined transect route where they are able to respond to bat behaviour close to sunrise and track individuals back to the roost. The short transect method can be useful for pinpointing small roosts, as bats tend to 'swarm' near the roost entrance before entry.

2.10.29 The emergence survey visits will begin at least 15 minutes before sunset and end 120 minutes after sunset; re-entry survey visits will begin two hours before sunrise and end 15 minutes after. This timing will encompass either the typical emergence periods for UK bat species, or the likely pre-dawn peak foraging period with subsequent re-entry into roosts.

2.10.30 Canon XA20 and XA30 video cameras with infrared capabilities, accompanied by separate powerful infrared light sources, will be used to aid surveyors with observations of PRFs. Bat activity will be recorded using a combination of visual observation and aural full spectrum bat detectors (predominantly Elekon BatLogger M), which enable bats' ultrasonic calls to be heard. All bat calls will be recorded digitally and subsequently analysed using BatExplorer software to aid species identification (see paragraph 2.10.33).

2.10.31 Emergence survey work will be undertaken in the period from May to September 2020 inclusive, while re-entry survey work will focus on the period from June to August 2020 inclusive. All structures and trees with the potential to support maternity roosts will have at least one survey visit undertaken in the early part of the season, prior to August.

Species Identification

2.10.32 A sample of any bat droppings collected during survey work (e.g. building inspections or tree PRF inspections) will be submitted to a suitable laboratory for DNA analysis to confirm the identification of bat species.

2.10.33 Analysis of bat recordings (e.g. those collected from potential hibernation roosts) will be carried out using BatExplorer software with reference to Russ (2012) to aid species identification. Where records cannot be identified to species level during the sound analysis process, due to the overlapping call parameters of some species, records will be identified to genus/species group, for example using the following:

- *Myotis* sp. (bat species in the genus Myotis).

- *Nyctalus* sp. (noctule or Leisler's bat).
- *Pipistrellus* sp. (common pipistrelle or soprano pipistrelle).

2.11 Bat Activity Survey

Survey Area

2.11.1 A bat activity survey will be carried out across the Site in order to identify the species of bats utilising the Site, and the level and type of activity. The specific survey area for each method is shown in Table 2.5. All surveys will be carried out in line with best practice guidelines (e.g. Mitchell-Jones, 2004; Mitchell-Jones & McLeish, 2012; Collins *et al*., 2016), interpreted using professional experience.

Table 2.5: Bat Activity Survey Areas

Survey type	Proposed survey areas (see Figure 2)
Active transects and passive activity monitoring	Site and a 100-500m radius
Woodland sampling	Two woodland locations within the Site

Survey Methods

Active Transects and Passive Monitoring

2.11.2 Eight transects will be designed to incorporate potential bat flight lines and sample a range of habitat types present across the survey area to understand how habitats are being used within the Site, and by which species of bats. Each transect will be no more than 6 km in length and on each survey visit will be walked from sunset to around three hours after sunset. Any bat activity will be recorded using handheld BatLogger M detectors and a note made of the type of activity heard (e.g. foraging, social calls). Recordings will later be analysed using BatExplorer software to aid species identification (see paragraph 2.10.33). Where visible (light levels permitting), observations of bat activity will be noted, as will any environmental conditions which may affect bat activity.

2.11.3 Each of the transects will be visited at dusk by an ecologist once, in each of the months from April to October inclusive. Subject to Covid-19 restrictions, it is currently planned that the survey will be repeated at dawn immediately following the dusk visit during July. Within each month, all transects will be surveyed simultaneously as far as possible to ensure data collected on each transect is comparable. The starting point of the transect will be randomly varied between visits to enable sampling of different parts of the transects at differing periods of time after sunset.

2.11.4 All active bat surveys will be undertaken when there is little or no rain, no excessive wind and the temperature remains above 10°C as, in these weather conditions, bats are unlikely to be deterred from flying.

2.11.5 In order to monitor bat activity throughout the night, passive detectors (BatLogger A+) will be deployed over a minimum period of five consecutive nights per month between April 2020 and October 2020. One device will be employed per transect, allowing monitoring of eight locations across the Site. The passive detectors will record bat echolocation calls continuously from 30 minutes before sunset to 30 minutes after sunrise. Recordings will be analysed using the specialist software BatExplorer (see paragraph 2.10.33).

Woodland Sampling

2.11.6 Bats are typically difficult to detect within woodland using aural detectors, as calls are blocked by the trunks, branches and foliage, preventing them from reaching the detector; and the bat species that specialise in using woodland for roosting and foraging have quiet and often highly directional calls. In addition, many of these species (the *Myotis* group) have call types that are very similar, making it difficult, if not impossible, to identify them, based on detector records alone.

2.11.7 In order to better assess the value to bats of woodland potentially to be affected by the proposed development two blocks of woodland within the Site will be subject to trapping surveys. Woodland sampling will be carried out by a suitable licensed and experienced ecologist in order to identify the species of bats using the Site and to provide supplementary data in relation to the cryptic species present and the breeding status of bat populations using the Site.

2.11.8 Three evening visits will be made to each woodland block, during which harp traps (Austbat, Faunatech) will be erected from sunset until at least 4 hours after sunset. The precise trapping locations will be selected for habitat that appear to provide good foraging opportunities (e.g. adjacent to water or an area with species-rich understorey), or on a potential flightline (e.g. a woodland ride or stream). An AT100 acoustic lure (Binary Acoustic Technology), playing repeated sequences of woodland bat social calls, will be set next to each trap to attract bats. Harp traps will be inspected, and bats removed approximately every 15 minutes. The species, age, sex and reproductive status of each bat captured will be recorded, and the bat released nearby within approximately 15 minutes.

2.11.9 Woodland sampling survey visits will take place in the period from May to September, excluding the peak maternity period when females are likely to be heavily pregnant or with dependant young (typically June to mid-July). One visit will take place in the early part of the season (i.e. in May), and two in the latter part from mid-July onwards. Due to government restrictions and safety concerns relating to Covid-19, and in line with industry guidance, however, no bat trapping will take place in May 2020. It is anticipated that the survey will commence from July 2020, and the early-season survey visit will be rescheduled for May 2021. Trapping surveys will

be undertaken when there is little or no rain, no excessive wind and the temperature remains above 10°C.

Species Identification

2.11.10 A sample of any bat droppings collected during survey work (e.g. trapping surveys) will be submitted to a suitable laboratory for DNA analysis to confirm the identification of bat species.

2.11.11 Analysis of bat recordings (e.g. those collected from active transects and passive monitoring) will be carried out using BatExplorer software with reference to Russ (2012) to aid species identification. Records that cannot be identified to species level due to overlapping call parameters of species will be assigned to genus/species group, as described in paragraph 2.10.33.

2.12 Bird Intertidal/Near Inshore Observation Point Survey

2.12.1 In order to determine the abundance and distribution of key bird species within the area that could potentially be affected by construction/operational activities associated with the proposed development, the programme of intertidal/near shore bird surveys commended in October 2019 (Wood 2019) will be continued to provide data during spring/autumn passage periods, and a second winter season within Stage 2 (2020/2021). These surveys will continue to seek to identify how the birds are utilising the area over the tidal cycle and how their numbers, distribution and activities change over the course of the winter (October to March) and passage periods (April-May and July-September). The surveys will also seek to identify any important locations for roosting/resting waterbirds.

2.12.2 In addition to the distribution surveys, data will also continue to be collected to identify the existing levels and sources of disturbance to birds at the Site. This information will be important to enable the prediction of how key species might react to the activities associated with the construction of the proposed development.

2.12.3 The key survey protocols are:

- Instantaneous scan samples (ISS) undertaken at 60-minute intervals recording species, numbers and behaviour of the key species for population and distribution assessment; and
- Continuous disturbance monitoring where the number of birds of each species will be recorded for each disturbance event, together with the stimuli and level of response to the event.

Survey Area

2.12.4 The survey area, sectors and observation points are illustrated in **Figure 3**.

2.12.5 There is the potential for works associated with the construction of the proposed development to adversely impact birds utilising the intertidal habitats and near-

inshore waters adjacent to the north of the Site. Visual and auditory disturbance (due to noise from machinery and the visual presence of operatives, for example) has the potential to displace birds foraging and roosting on the intertidal habitat and near inshore waters.

2.12.6 The area potentially affected due to disturbance includes all suitable intertidal habitat and inshore waters outwith and within 500 m of the Site boundary (the intertidal/near-shore survey area – **Figure 3**) based on previous experience and Cutts *et al.,* (2013).

2.12.7 The survey area will comprise of all intertidal habitat and near shore waters within 500 m of the Site extending seaward 1 km from the seawall/location of the Observation Points, plus additional areas of the shoreline that may provide further contextual insight into the distribution and abundance data of wintering birds within the intertidal and near shore habitats.

2.12.8 Within the survey area, bird distribution surveys and disturbance monitoring will continue to be carried out from the same six Observation Points (OPs) (two located in each of the three sectors), as used in winter 2019/20 (**Figure 4**). The precise locations of the OPs were determined following an initial site visit (in September 2019) to achieve maximum coverage of the survey area.

Survey Methods

Distribution and Abundance Survey

2.12.9 Four intertidal/near shore distribution and abundance surveys will be completed each month from each OP as follows:

- Spring passage period (year 1): April to May 2020 inclusive.
- Autumn passage period (year 1): July to September 2020 inclusive.
- Winter period (year 2): October 2020 to March 2021 inclusive.

2.12.10 Each survey visit will comprise a six-hour watch undertaken by two ornithologists working simultaneously at adjacent OPs within each sector (24 hours watch from each OP per month).

2.12.11 Each survey will be carried out over a continuous duration of six hours (weather permitting) that will commence on either a high or low tide (i.e. from high tide to low tide; or low tide to high tide, where daylight hours dictate); twice per each month (i.e. two high tide to low tide and two low tide to high tide surveys per month per OP).

2.12.12 During each 6-hour survey, ISS will be undertaken and the species, number and behaviour of all waterbirds present within each Count Sector will be recorded at 60-minute intervals (allowing recording of disturbance activity and responses between each ISS) onto bespoke field recording forms, with surveyors at each OP recording ISSs simultaneously (details recorded on bespoke field maps, 1:25,000 OS

mapping, zoomed-in to allow for greater detailed plotting of feeding/roosting aggregations of waterbirds).

2.12.13 The observer will count from one end of their OP viewshed to another as quickly as possible, plotting flocks on to the survey map, as well as noting their respective activities. The surveyor will also account for the movement of birds, therefore limiting the chances of double counting within and between sectors (by keeping in contact with the neighbouring surveyor).

2.12.14 Bird activity will be recorded using four categories:

- Feeding/foraging.
- Roosting/loafing.
- Preening/bathing; and
- Other (as specified by the observer).

2.12.15 A separate field map will be used for each ISS, onto which will be recorded/plotted all birds within the viewshed of the OP, using the British Trust of Ornithology (BTO) species codes and the activity codes noted above.

2.12.16 At the end of each hour, a separate hourly tally form will be completed, providing the maximum count for each species (foraging, roosting and loafing but excluding birds in flight, commuting through the area) within the surveyors' viewshed.

2.12.17 During the six hour survey, records of any waterbirds utilising the adjacent fields by the OP will also be recorded onto a separate 'Incidental' records form.

2.12.18 There is also the potential for construction works and vessel movements to act as a barrier to the movement of key bird species, primarily in Sector 2, adjacent to the proposed construction area. In order to obtain information on the level and directions of flight movements of brent goose and red-throated diver over the tidal cycle (in Sector 2 only), the flight lines of these species will also be noted on the field recording maps.

Disturbance Monitoring

2.12.19 The survey methods will remain unchanged from those employed in winter 2019/20.

2.12.20 Whenever there is a disturbance event stimulus in between each ISS, disturbance responses will be recorded within each sector on specific disturbance recording forms. A disturbance stimulus is defined as something that has the ability to cause a disturbance response (i.e. one that has the potential to elicit a reaction from the birds present).

2.12.21 The number of birds of each species will be recorded for each disturbance event, as well as the type of stimulus and level of response, as described below.

2.12.22 Disturbance stimuli will be categorised using the following codes:

FR (Firing range);

SB (speed-boat);

SA (sailing boat/other small craft);

VE (other larger vessel);

AC (aircraft);

HC (helicopter);

ML (micro-lights);

PM (para-motors);

WN (walker without dog);

WD (walker with dog in close proximity/on lead),

UD (uncontrolled dog);

JO (jogger/runner);

FI (fisherman);

CY (cyclist);

HR (horse-rider);

VE (any vehicle e.g. car, tractor, quad bike);

TR (tractor or other vehicle reversing warning bleepers);

PDa (disturbance from a predator aerial);

PDg (disturbance from a predator ground);

CN (construction noise);

GS (gunshot);

GC (Gas cannon – bird scaring device);

OT (other – any disturbance stimuli that does not fall into any other category, details specified by observer);

TD (natural response to rising tide (termed as tidal disturbance to aid recording), i.e. birds reacting to the incoming tide and rising water levels with no other disturbance visible); and

UN (unknown disturbance, e.g. when a flock flies/reacts without any known stimulus).

2.12.23 The level of each disturbance response will be defined using the following scale:

- Level 1: no response.
- Level 2: behavioural change (alarm calls, alarm posture, heads up, change in feeding/roosting activity).
- Level 3: movement within zone (i.e. within the same area of mud, feeding or roosting area).
- Level 4: remaining in sector but change of zone, (i.e. different area of intertidal habitat but in the same sector); and
- Level 5: departure of birds from the sector or constant aerial circling.

2.12.24 This system (adopted and successfully used for disturbance surveys at a number of other sites, such as Hinkley Point C NNB and Moorside NNB) has been chosen as it is effective to use in the field, recording the key data required for assessment whist not being overly complicated.

2.12.25 Surveys will be undertaken during suitable weather conditions; avoiding periods of high wind (in excess of Beaufort Scale 5), poor visibility (fog) or heavy rainfall.

2.13 Bird Terrestrial Transect Survey

2.13.1 The numbers of birds utilising the Site will likely vary between winters, dependant on a number of factors including the crop management on-site (the amount of suitable foraging habitat available) and weather conditions in the UK and abroad (on the near-Continent).

2.13.2 In order to take account of between-year changes in species abundance and distribution, best practice guidance recommends that more than one season of winter bird survey be carried out at a Site.

2.13.3 In order to provide a robust baseline to determine the level and type of use of the Site by key species (qualifying interest species of the Dengie and Blackwater Estuary SPA/Ramsar site/SSSIs notably dark-bellied brent geese, other bird SPI and aggregations of 50 or more gulls), a second winter season of terrestrial distribution and abundance survey will therefore be carried out at the Site and surrounds.

Survey Area

2.13.4 A disturbance distance of up to 400 m is outlined for brent geese (a species of high sensitivity to disturbance) in the construction disturbance toolkit (Cutts *et al*., 2013). However, given the nature and large scale of the works, a precautionary distance of 500 m will continue to be used, within which brent geese (and other key species) could be disturbed by the proposed development. The terrestrial survey area will include all areas of suitable habitat (primarily farmland) within the Site and within 500m of its boundary, above MHWS plus additional terrestrial areas that may provide further contextual insight into the distribution and abundance data of wintering birds in the wider area (**Figure 4**).

Survey Methods

Non-breeding Bird, Terrestrial Distribution and Abundance Survey - Diurnal

2.13.5 The survey methods will remain unchanged from those employed in winter 2019/20. Four survey visits (of the entire survey area) will be completed each month from October 2020 to March 2021 inclusive, each visit being undertaken by two surveyors working in tandem.

2.13.6 During each survey visit, the surveyors will use a series of pre-determined transect routes and count all the birds present in the fields from the set observation points as used in 2019/20 (**Figure 4**). Each field/habitat plot has been given a unique number to which all bird sightings will be assigned and recorded. The transect routes and observation points (as identified from the initial site visit in September 2019) were chosen to achieve maximum possible visibility over all areas of potentially suitable habitat for key overwintering bird species, whilst minimising any disturbance.

2.13.7 The numbers, activity (using the four codes a-d, as for the intertidal distribution survey) and location (field number) of any key species present will be noted onto recording forms, as well as the type of habitat/crop they are using. During the surveys, all other species of waterbirds, birds of prey and any potentially important congregations of other farmland bird SPI (such as corn bunting and skylark) will also be recorded.

2.13.8 A full inventory of the habitat and crop types (including growth stage) within each field within the survey area will be completed on each survey visit.

2.13.9 Any instances of disturbance will be recorded and detailed following the intertidal disturbance monitoring protocols.

2.13.10 Surveys will be undertaken during suitable weather conditions; avoiding periods of high wind (in excess of Beaufort Scale 5), poor visibility (fog) or heavy rainfall.

Non-breeding Bird, Terrestrial Distribution and Abundance Survey – Nocturnal

2.13.11 Studies indicate that golden plover and lapwing may occur in areas at night where they are not present during the day (Gillings, 2005). It will therefore be important to

ascertain the level of use by these and other species (such as other qualifying waterbird species) of the Site and night.

2.13.12 A second winter season of once-monthly nocturnal surveys will be undertaken from October 2020 to March 2021 inclusive, during which two surveyors (working together) will walk along a series of pre-determined transect routes and record any golden plover and lapwing (and any other key species) present onto recording sheets, with details of their numbers, location (field identification number), activity and the habitat/crop type they are utilising. Birds will be detected by scanning the fields using high-specification night vision equipment with non-disturbing light sources and/or FLIR BHS-XR Handheld Thermal Imaging Camera dependent on ambient conditions. Each survey visit will be undertaken over two consecutive nights.

2.13.13 The transect routes will be chosen to achieve the maximum level of coverage of habitat most suitable to golden plover and lapwing (primarily early growth-stage winter cereals, but also grassland, ploughed land and stubbles). The routes may differ from those used in winter 2019/20 due to changes in crop management, resulting in different parts of the survey area becoming more (or less) suitable for the key species (i.e. due to the oilseed rape/winter cereal crop rotation employed over much of the area).

2.13.14 All surveys will be undertaken in suitable weather conditions (avoiding periods of high wind, poor visibility and heavy rainfall) and where possible, be carried out during half-full moon phases to improve detection of birds.

2.14 Breeding Bird Survey

2.14.1 In order to establish the importance of the Site to breeding bird species, breeding bird surveys will be undertaken in 2020. Data collected from the survey will be analysed in order to provide a population estimate and distribution for each breeding bird species.

Survey Area

2.14.2 The breeding bird survey area will include all areas of terrestrial habitat (primarily farmland, but also scrub and blocks of woodland/trees) within the Site and a 200 m buffer.

2.14.3 All areas of suitable shoreline habitat within 500 m of the Site (**Figure 1**) will also be surveyed in order to detect species breeding on adjacent shingle ridges, beaches and saltmarsh habitats that potentially support breeding ringed plover, redshank, oystercatcher and terns.

Survey Methods

2.14.4 A generic breeding bird survey will be undertaken within the survey area, employing territory mapping methods, based on those used for the BTO's Common Birds Census (CBC) (Marchant *et al*., 1983; Gilbert *et al*., 1998).

2.14.5 While eight to ten visits are required for CBC sites being monitored over the long-term, where territory mapping is being used for the purpose of assessing potential environmental impacts, it is generally accepted that six visits are sufficient to determine the numbers and distribution of breeding bird territories with reasonable accuracy, in accordance with current best practice.

2.14.6 Six survey visits of the entire survey area commenced in late-March and will run until mid-July, with each visit spaced evenly over the survey period and being separated by a minimum of 10 days.

2.14.7 Transects (no further than 50 m apart) will be walked across all open terrestrial habitats, while all field boundaries and the edges of woodland and scrub edges will also be walked. Shoreline habitats will be viewed from the adjacent seawall, with observers spending periods at suitable view-points to detect breeding shorebirds. Surveys will start within 30 minute of sunrise and continue until midday (at the latest), and in appropriate weather conditions (not during periods of strong wind and/or heavy rain).

2.14.8 On completion of the survey, the recording maps will be analysed to identify clusters of breeding bird registrations in order to identify breeding territories. The presence of a singing/displaying bird, a pair of birds or an adult male or female bird in potential nesting habitat (on a minimum of two survey dates) will all be treated as a breeding territory being present.

2.15 Ditch Breeding Bird Survey

Survey Area

2.15.1 A breeding bird survey specifically focussed on wet ditches will cover the Site and a 500 m radius (**Figure 1**).

Survey Methods

2.15.2 Separate breeding bird survey visits will be undertaken for reed-filled ditches and other reed-fringed water bodies within the survey area to detect breeding bearded tit, pochard and other wetland habitat species, such as marsh harrier, water rail, reed bunting, Cetti's warbler, sedge warbler and reed warbler.

2.15.3 Six survey visits are being carried out in the survey area, running from April to July inclusive, during which a combination of walked transect surveys along ditch-sides, interspersed with watches from observation points will be carried out. The visits will be timed during the survey period to maximise the chances of locating breeding

bearded tit and pochard; based on guidance in Gilbert *et al. (1998).* Three of the visits were undertaken in April-May to detect bearded tit, followed by a further two in June and one in July to locate pochard young. Water rail call playback will also be used in combination with the visual survey where appropriate.

2.16 Great Crested Newt Survey

Survey Area

2.16.1 The great crested newt survey area is defined as the Site and a 500 m buffer (**Figure 1**), in line with current guidance (English Nature, 2001). Water bodies (including ponds, lakes, reservoirs and ditches) will be identified using the MAGIC, satellite imagery, OS mapping and the data collected during the extended Phase 1 habitat survey. The great crested newt survey is designed to classify the habitat suitability of aquatic habitats to support great crested newts and determine presence/likely absence and distribution of great crested newt populations within the survey area.

Survey Methods

2.16.2 Each water body identified during the desk-based assessment and extended Phase 1 habitat surveys will be visited and assessed to determine whether they have the potential to support great crested newt. Key features that will be considered include:

- Presence of aquatic vegetation or other material that could be used for egg laying;
- Low levels of fish activity (e.g. not an intensively managed fishing lake);
- Little or no flow rate;
- Presence of suitable terrestrial habitat or connecting features e.g. mature hedgerows, ditches or woodland, between the water body and the Site; and
- Absence of a significant barrier to movement between the water body and the development area.

2.16.3 All water bodies with the potential to support great crested newts will have a Habitat Suitability Index (HSI) calculated to determine a broad level of suitability of each water body to support great crested newt, based on Oldham *et al*. (2000) and adapted by the Amphibian and Reptile Conservation Trust (ARG, 2010). The HSI is a numerical index, derived by scoring a range of habitat variables, including:

- Location.
- Pond area.
- Pond drying.
- Water quality.

- Shading.
- Presence of water fowl.
- Presence of fish.
- Number of ponds per km in a 1 km radius.
- Terrestrial habitat quality; and
- Macrophyte cover.

2.16.4 Each water body identified as being suitable to support great crested newts will be subject to water sampling in order to determine the presence/likely absence of great crested newt. Water samples to test for eDNA will be taken in accordance with Biggs *et al*. (2014) and analysed by a laboratory which takes part in the Natural England proficiency testing scheme to ensure confidence in the results.

2.16.5 At each water body, 20 sampling points will be identified around the water margin, particularly focussing on areas more likely to be used by great crested newts, such as egg laying sites or more open areas where males will display during the breeding period. Once collected, water samples will be stored in a cool-box to prevent sample degradation before being returned to the laboratory for analysis.

2.16.6 An initial habitat suitability assessment was carried out in March 2020, and the the HSI calculation will be updated during the month of May in line with the standardised approach. Water samples, for eDNA analysis, will be taken before 30 June 2020, avoiding periods of heavy rain and high temperatures where possible.

2.17 Reptile Presence/Likely Absence Survey

Survey Area

2.17.1 The reptile survey area is defined as the Site with an additional 50 m buffer (**Figure 1**), focussed on areas identified as being suitable to support reptiles from a preliminary walkover to assess habitats, and taking into account those areas shown to historically support reptiles from the desktop study. The survey will aim to determine presence/likely absence of reptiles across the reptile survey area, providing some preliminary data on reptile distribution and population size at the same time.

Survey Methods

2.17.2 Seven survey visits will be carried out between April and October 2020, particularly focussing on the months of April, May and September. These surveys will comprise a combination of the following methods (Froglife, 1999; Gent & Gibson, 2003), where the species, age and sex of any reptiles found during the survey will be recorded, where possible:

- *Direct observation* – surveyors will record any reptiles observed basking in the open.
- *Refugia searches* – existing refugia (log piles, rubble piles, rubber matting etc.) will be inspected, and where possible and safe to do so, lifted, with the area below being searched for reptiles; and
- *Inspection of artificial refugia* - artificial refugia measuring 1 m x 0.5 m has been deployed at a minimum density of 10-15 refugia per hectare of suitable habitat. These comprise a combination of roofing felt and corrugated tin. During the survey visits, each refugium will be checked and any the species, age and sex of any reptiles observed basking on top of, or sheltering below, will be recorded.

2.17.3 Artificial refugia were deployed in March, where land access was agreed, and the first three survey visits were completed in April and May 2020. Surveys will be carried out under optimal weather conditions, during periods intermittent or hazy sunshine, little to no rain and when temperatures are warm (Froglife, 1999).

2.18 Otter Survey

Survey Area

2.18.1 The otter survey area is defined as the Site with an additional 500 m buffer (**Figure 1**) upstream and downstream on all water courses. This survey aims to identify the distribution of otter within the survey area.

Survey Methods

2.18.2 Water bodies and water courses (including rivers, streams ponds, lakes, reservoirs and ditches) and will be identified using the MAGIC, satellite imagery, OS mapping and the data collected during an initial walkover to assess the habitats. All water bodies and water courses, and any associated riparian habitats identified through the desktop study and the walkover survey will be visited on two separate occasions. Field surveys will follow methods set out in Chanin (2003). Any otters or signs of otters will be recorded and mapped, including:

- Otter spraints (dung).
- Anal jelly.
- Tracks (footprints).
- Feeding remains (such as shells or fish skeletons).
- Otter slides (into water).
- Holts (underground dens); and
- Couches (above ground sites where otters rest during the day).

2.18.3 Any evidence of invasive species (particularly mink) will be also be recorded.

2.18.4 Terrestrial habitat within 100 m of a water course or water body confirmed as supporting otter will also be surveyed for additional otter signs. Resting sites will be assigned a level of activity in line with Basset and Wynn (2010), as follows.

- *Low* – a feature with limited evidence of otter activity, most likely used as temporary resting sites. Low numbers of spraints, with all being of similar ages.
- *Medium* – a feature with spraints of a range of ages but still in low numbers. Likely to be a key resting site and linked to other key areas and resources within the territory. Unlikely to be a breeding or natal site.
- *High* – a feature with high levels of activity. High numbers of spraints of a range of age classes. Paths, slides and hollows will be present, with high quality habitat directly adjacent. Resource availability at these features will be high.

2.18.5 In conjunction with the water vole survey (section 2.19), two survey visits will be carried out, at least two months apart. The first was completed in April 2020, and the second will take place in August/September 2020.

2.19 Water Vole Survey

Survey Area

2.19.1 The water vole survey area is defined as the Site with an additional 500 m buffer (**Figure 1**) upstream and downstream in order to identify the distribution of water vole within the survey area.

Survey Methods

2.19.2 Water bodies and water courses (including rivers, streams, ponds, lakes, reservoirs and ditches) will be identified using MAGIC, satellite imagery, OS mapping and the data collected during an initial walkover to assess the habitats. Surveys will be carried out in line with the Water Vole Conservation Handbook (Strachan *et al.*, 2011) and the Water Vole Mitigation Handbook (Dean *et al.*, 2016). The banks themselves, and up to 2 m either side of water bodies and water courses, will be systematically searched for water voles and signs of water voles, including:

- Faeces.
- Latrines.
- Feeding stations.
- Burrows (active and disused).
- Footprints.

- Runs or pathways.
- Sightings of water voles; and
- Sounds of individual water voles entering the water.

2.19.3 In addition to searching for signs of water vole, the suitability of each water course and water body will be assessed using key features. This will inform a habitat suitability assessment to evaluate suitability for supporting water vole. Features to be assessed are:

- Bank profile.
- Bank substrate, specifically suitability for burrowing.
- Water depth.
- Likely frequency and height of water level changes relative to bank height.
- Shading.
- Presence and type of bankside and in-channel herbaceous vegetation.
- Width and density of in-channel herbaceous vegetation.
- Levels of disturbance (e.g. habitat management, recreational activity); and
- Connectivity of the water course to the wider landscape (through both terrestrial and aquatic habitat).

2.19.4 Two survey visits will be carried out, at least two months apart. The first was completed in April 2020 to capture the early part of the active season, and the second in the latter part of the season, August/September 2020.

3. SURVEY PROGRAMME

3.1.1 The survey programme to be undertaken during Stage 2 (2020 and additional months of January – March 2021 for overwintering birds and for some bat surveys) is outlined in this document. Additional ecological survey work will be required in 2021, however, it is beyond the scope of this report to provide details of work extending beyond March 2021. Tasks for 2020 and the first three months of 2021 are listed in Table 3.1 and 3.2.

3.1.2 All survey methods outlined within this document have been designed taking account of best practice guidance and professional judgement. Methods will be applied during optimal conditions and at the appropriate time of year. Survey timings are summarised in each individual section with an overview of the proposed programme provided in Table 3.1 and Table 3.2.

Table 3.1: Proposed 2020 Survey Programme

Survey type	Proposed survey programme as set out within this report											
	J	F	M	A	M	J	J	A	S	O	N	D
Desktop study												
Extended Phase 1 habitat survey												
National Vegetation Classification (NVC)												
Ditch habitat survey												
Predictive SYstem for Multimetrics (PSYM) assessment of ponds												
Terrestrial invertebrate survey												
Aquatic macroinvertebrate survey of watercourses												
Badger activity survey												
Badger bait marking study												

Survey type	Proposed survey programme as set out within this report											
	J	F	M	A	M	J	J	A	S	O	N	D
Bat roost identification survey: preliminary scoping of trees and buildings	Completed in December 2019											
Bat roost identification survey: ground level visual assessment for trees												
Bat roost identification survey: potential roost feature (PRF) inspection of trees												
Bat roost identification survey: monitoring for hibernating bats												
Bat roost identification survey: external building inspections												
Bat roost identification survey: internal building inspections												
Bat roost identification survey: emergence and re-entry surveys												

Survey type	Proposed survey programme as set out within this report											
	J	F	M	A	M	J	J	A	S	O	N	D
Bat activity survey: active transects and passive monitoring												
Bat activity survey: woodland sampling												
Bird intertidal/near shore surveys (distribution and abundance)												
Bird intertidal/near shore surveys (disturbance monitoring)												
Bird terrestrial transect surveys (diurnal)												
Bird terrestrial transect surveys (nocturnal)												
Breeding bird survey												
Ditch breeding bird survey												
Great crested newt habitat suitability assessment												

Survey type	Proposed survey programme as set out within this report											
	J	F	M	A	M	J	J	A	S	O	N	D
Great crested newt environmental DNA (eDNA) sampling												
Reptile presence/likely absence survey												
Otter survey presence/likely absence survey												
Water vole presence/likely absence survey												

Table 3.2: Proposed January 2021 to March 2021 Survey Programme

Survey type	Proposed 2021 survey programme as set out within this report											
	J	F	M	A	M	J	J	A	S	O	N	D
Bat roost identification survey: monitoring for hibernating bats												
Bat roost identification survey: potential roost feature (PRF) inspection of trees												
Bird intertidal/near shore surveys (distribution and abundance)												
Bird intertidal/near shore surveys (disturbance monitoring)												
Bird terrestrial transect surveys (diurnal)												
Bird terrestrial transect surveys (nocturnal)												

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APPENDIX A
FIGURES

599000 599500 600000 600500 601000 601500 602000 602500 603000 603500

210500 210000 209500 209000 208500 208000 207500 207000

Shinglehead Point

Mean Low Water

Mean High Water

Bradwell Nuclear Power Station

Electricity Switching Station

Weymarks Farm

Sales Point

Community Settlement

Irrigation Reservoirs

Pp Ho

Bradwell Waterside

Pewet Island

Airfield (disused)

Downhall Farm

Playing Field

War Memi

Curds Grove

East Hall Farm

Eastlands

East Hall

Munkins Farm

Marina

Trusses Road

Peverells

Westwick Farm

Woodyards

Down Westwick

Cattsidge Road

Cemy

Blackberry Grove

Sch

Bradwell on Sea

Bradwell Lodge

Hockley

St Peter's Way

BRADWELL-ON-SEA CP

00 01 02 03 10 09 08 99

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- 50m survey area
- 100m survey area
- 200m survey area
- 500m survey area

0 200 400 600 800 m

Scale at A3: 1:15,000

Bradwell B Nuclear Power Plant Project
Biodiversity Survey and Monitoring Plan
2020/21

Figure 1
The Site boundary plus 50m, 100m, 200m and 500m survey buffers

March 2020

wood.

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599000 600000 601000 602000 603000

210000 209000 208000 207000

Mean Low Water

Mean High Water

Bradwell Nuclear Power Station

Electricity Switching Station

Weymarks Farm

Community Settlement

Sales Point

Irrigation Reservoir

Pp Ho

Chapel of St Peter on the Wall

OTHONA ROMAN FORT

Airfield (disused)

Bradwell Waterside

Pewet Island

Downhall Farm

Playing Field

War Mem

East Hall Farm

Marina

Caravan Park

Eastlands

Trusses Road

Down Hall

Peverells

ROMAN ROAD

East Hall

Munkins Farm

Westwick Farm

Spr

Woodyards

BRADWELL-ON-SEA CP

East End

Down Westwick

Waterside Road

St Peter's Way

Cemy

Blackberry Grove

Sch

Bradwell on Sea

Bradwell Lodge

Hockley

Bacons

Delameres Farm

Bradwell Marshes

Orplands

Kennel

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Woodland sampling locations
- Passive monitoring locations

Active transects

- AT01
- AT02
- AT03
- AT04
- AT05
- AT06
- AT07
- AT08

0 200 400 600 800 m

Scale at A3: 1:15,000

Bradwell B Nuclear Power Plant Project
Biodiversity Survey and Monitoring Plan 2020/21

Figure 2
Bat activity survey areas

May 2020

wood.

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598000 599000 600000 601000 602000 603000 604000

211000 210000 209000 208000 207000 206000

N

River Blackwater

The Nass

Great Cob Island

South Channel

MLW

Mean Low Water

Shinglehead Point

Virley

Pewet Island

Bradwell Waterside

Bradwell Creek

Bradwell Nuclear Power Station

Electricity Switching Station

Weymarks Farm

Airfield (disused)

Downhall Farm

Playing Field

War Memi

Marina

Trussels Road

Down Hall

Caravan Park

East Hall Farm

Eastlands

Munkins Farm

ROMAN ROAD

East Hall

East End

BRADWELL-ON-SEA CP

Down Westwick

Wattwick Farm

Woodyards

Waterside Road

Cemy

Sch

Blackberry Grove

Bradwell on Sea

Bradwell Lodge

Hockley

Bacons

Delameres Farm

Orplands

Kennel Barn

Gravel Pit

Mill End

Gracedale Farm

Sales Point

Tip Head

Community Settlement

Chapel of St Peter on the Wall

OTHONA ROMAN FORT

St Peter's Way

Gunners Creek

Bradwell Marshes

Bradwell Marsh Wind Farm

Glebe Outfall

Glebe Farm

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Terrestrial survey area

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3

0 200 400 600 800 1,000 1,200 m

Scale at A3: 1:20,000

Bradwell B Nuclear Power Plant Project
Biodiversity Survey and Monitoring Plan
2020/21

Figure 3
Inter-tidal / near-shore and terrestrial bird survey areas

May 2020

wood.

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598000 599000 600000 601000 602000 603000 604000

211000 210000 209000 208000 207000 206000

IOP1A IOP1B IOP2A IOP2B IOP3A IOP3B

River Blackwater

The Nass

Great Cob Island

South Channel

Shinglehead Point

Mean Low Water

Bradwell Waterside

Pewet Island

Bradwell Creek

Bradwell Nuclear Power Station

Electricity Switching Station

Weymarks Farm

Airfield (disused)

Downhall Farm

Sales Point

Tip Head

OTHONA ROMAN FORT

East Hall Farm

Caravan Park

Eastlands

Munkins Farm

ROMAN ROAD

East Hall

BRADWELL-ON-SEA CP

East End

Bradwell on Sea

Blackberry Grove

Hockley

Bradwell Lodge

Bacons

Delameres Farm

Waterside Road

Orplands

Kennel Barn

Bradwell Marshes

Bradwell Marsh Wind Farm

Glebe Outfall

Glebe Farm

Gracedale Farm

Mill End

Gravel Pit

Down Westwick

Wattwick Farm

Woodyards

Marina

Playing Field

War Mem

Gunners Creek

St Peter's Way

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Terrestrial Survey, Transect Route
- Intertidal Survey, Observation Points
- Terrestrial survey area

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3

0 200 400 600 800 1,000 1,200 m

Scale at A3: 1:20,000

Bradwell B Nuclear Power Plant Project
Biodiversity Survey and Monitoring Plan
2020/21

Figure 4
Bird transect routes and observation points

May 2020

wood.

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APPENDIX 23B
PHASE 1 HABITAT SURVEY AND MONITORING PLAN –OFF-SITE ASSOCIATED DEVELOPMENTS

Bradwell B Project

Phase 1 Habitat Survey and Monitoring Plan – Off-site Associated Developments

Wood Environment & Infrastructure Solutions UK Limited – August 2020

BBX00510038WOOD02TR

Version P05

Report for

Bradwell Power Generation Company Limited (BRB)

5F, Rex House,

4-12 Lower Regent Street

London

SW1Y 4PE

Main contributors

[redacted]

Issued by

[redacted]

.....

Approved by

[redacted]

.....

Wood

Partnership House

Regent Farm Road

Gosforth

Newcastle upon Tyne NE3 3AF

United Kingdom

Tel +44 (0) 191 272 6100

Doc Ref. 41843-WOOD_XX-XX-RP-OE-0003

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Revision history / Record of comments

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P01	Draft for client	[redacted]	30/10/2019
P02	Draft for stakeholders	[redacted]	14/11/2019
P03	Final Report	[redacted]	15/11/2019
P04	Updated Final Report for Off-site Associated Developments	[redacted]	10/06/2020
P05	Updated report following consultee comments	[redacted]	10/08/2020

CONTENTS

TABLES

APPENDICES

1. INTRODUCTION

1.1 Background

1.1.1 Bradwell Power Generation Company Ltd. (BRB GenCo) proposes to develop a new nuclear power station, called “Bradwell B” (BRB), near Bradwell-on-sea in Essex (hereafter referred to as the Project). The Project would comprise twin UK HPR1000 reactors with a combined electrical capacity of 2,340 MW.

1.1.2 The area of land within which Bradwell B power station would be built is located next to the Blackwater Estuary on the Dengie Peninsula, approximately 15 kilometres (km) east of the town of Maldon, 1 km north-east of the village of Bradwell-on-Sea in the parish of Bradwell-on-Sea within the District of Maldon, Essex. It lies adjacent to the existing Bradwell Nuclear Power Station, which ceased operation in 2002. The power station is being decommissioned by the Nuclear Decommissioning Authority (NDA) and entered the Care and Maintenance phase in 2018.

1.2 Site Context

1.2.1 For the purposes of this Survey and Monitoring Plan (SMP) the land area covered by the Indicative Main Development Site boundary, Potential Temporary Workers Accommodation Site boundary and Potential Expansion Area for Temporary Workers Accommodation Site boundary : central National Grid Reference (NGR) 601000E, 209000N is identified hereafter as the Site (**Figure 1.1**).

1.2.2 In addition to the range of development activities that relate to the Site, there will be a requirement for off-site Associated Development (AD) in order to construct and operate the Project. Such development is expected to include, but may not be limited to, park and ride sites, off-site freight management facilities and potential new or enhanced transport infrastructure (which could include, for example, junction improvements, road widening, new off-line sections of road, including bypasses).

1.2.3 The requirements with respect to the locations and extents of the off-site AD and transport route upgrade requirements are currently being considered.

1.2.4 The description of the Project, including indicative site boundaries, presented in this SMP reflects the Project status at the point that the SMP was issued to consultees to inform workshops held in June 2020, with subsequent updates to take into account workshop feedback and responses from consultees. As the Project progresses, further iterations of the SMP will be required as proposals are refined, in particular, with respect to off-site ADs. The technical scope contained herein remains applicable irrespective of any future boundary changes (should this be required), subject to a review of receptors and spatial scope.

1.2.5

1.3 Purpose of this Document

1.3.1 The purpose of this (SMP) is to set out the methods to be employed for completing a Phase 1 habitat survey, as defined by the JNCC (Ref. 1), within search areas for off-site ADs (i.e. park and ride sites and freight management facilities and transport route upgrades). The primary purpose will be to identify the main habitat types which are present within the search areas for off-site ADs and transport route upgrades. This will ultimately assist in identifying sensitive areas for biodiversity, targeting any necessary Phase 2 surveys (e.g. for further botanical survey and/or for protected and priority species) with the information being used in the selection, design and environmental impact assessment of off-site ADs and transport routes for upgrade. The surveys will also be integral to interpreting the findings of faunal surveys.

2. SURVEY PROPOSALS

2.1 Overview

2.1.1 The study will be undertaken during summer 2020 and will comprise tasks undertaken at two geographic levels:

- Remote sensing of habitats across the study area:
  - Desktop study;
  - Ground truthing exercise (field-based); and
  - Remote sensing analytics (desk-based);
- Site level assessment:
  - Desktop study; and
  - Site walkover.

2.1.2 Further detail on the timings and methods proposed for completing the Phase 1 habitat survey is provided in the following sections.

2.2 Remote Sensing Survey of the Study Area

Desktop study

2.2.1 To maximise the accuracy of the outputs from the desk-based analytics, ground-truthing survey data will be collected (**Section 2.3**), however, this will be targeted following a desk based exercise, to identify the habitat types likely to be present in the study area. The habitat types present in the study area are expected to be dominated by abundant areas of habitat, such as arable land and improved grassland which are readily identified from aerial photography. However, habitats of greater nature conservation value are also expected (such as deciduous woodland, reedbeds and saltmarsh). The habitat types expected to be present in the survey area will therefore be identified in advance of field survey work by reference to the aerial photographs, Magic (Ref. 2) and by reference to habitats that feature in the Local Wildlife Site Selection Criteria (Ref. 3). This desk-based review will facilitate a targeted approach to maximise the potential that these habitat types are captured by the ground-truthing exercise.

Ground-truthing

2.2.2 In order to train the remote sensing algorithms and maximise the accuracy of the outputs from the desk-based processing exercise, ground-truthing data will be collected.

2.2.3 The ground-truthing will comprise two phases.

2.2.4 During the first phase field survey work will aim to sample a minimum of 20 examples of each JNCC Phase 1 habitat type present within the study area (as defined during the desktop study, **Section 2.2.1**).

2.2.5 The habitat types will be assessed in the field according to the approach detailed by the JNCC (Ref. 1.) and captured digitally as either a point or as a polygon with GPS location data, so that the information can be fed directly back into the remote sensing processing task (**Section 2.2.7**). The points or polygons recorded will focus on areas of habitat unequivocally identifiable (i.e avoiding mosaics or boundary features), and be in patch sizes sufficiently large that they exceed the level of accuracy of the GPS.

2.2.6 Ground-truthing will take place in summer 2020. This will be within the standard survey season for Phase 1 habitat survey, when vegetation is growing and habitats are more readily identifiable. Habitat samples will be collected from across the study area, using public rights of way. The second phase of ground-truthing would take place after the remote sensing process and would focus efforts on areas of the study area that the analytics has found difficult to validate.

Remote Sensing Analytics

2.2.7 High resolution satellite imagery will be purchased for the study area and its surrounds. The imagery will be captured to order and so will reflect the habitats present in summer 2020.

2.2.8 A desk-based analytics exercise will then process the imagery using specialist software to generate a Phase 1 habitat survey map of the area in accordance with the habitat categories defined by the JNCC (Ref. 1).

2.2.9 The ground-truthing data collected from within the study area (**Section 2.2.2**) will be fed into the software programme to help train the algorithms and improve the accuracy of the outputs.

2.2.10 Once the habitat classifications have been created, they require validation. The classifications will be inspected against the ground truthing data, satellite images and Ordnance Survey MasterMap data and any segments which have been assigned incorrectly will be reallocated.

2.2.11 The final level of accuracy delivered by the task will be tested statistically and reported alongside the output.

2.2.12 The output will be a map indicating the distribution of habitats, as defined by the JNCC (Ref. 1), within the study area, and an indication of the potential nature conservation value of the habitats identified, with reference to the published list of Priority habitats (Ref. 4) and the Local Wildlife Site Selection Criteria (Ref. 3).

2.3 Site Level Assessment

Desktop Study

2.3.1 For each of the shortlisted off-site ADs, and transport route upgrades, sites a data-gathering exercise will be undertaken to obtain readily available information relating to statutory and non-statutory nature conservation sites, priority habitats and species, and legally protected and controlled species. Minimum search radiuses and data sources are listed in **Table 2.1**.

Table 2.1: Minimum search radiuses and data sources

Type of data	Search radius	Source(s)
International statutory designated sites with ornithological qualifying features	20 km	Multi-Agency Geographic Information for the Countryside website (MAGIC, www.magic.gov.uk) Natural England's designated sites website Essex Wildlife Trust Biological Record Centre
International statutory designated sites with bat-related qualifying features	10 km	MAGIC Natural England's designated sites website Essex Wildlife Trust Biological Record Centre
National statutory designated sites with ornithological or bat-related qualifying features	10 km	MAGIC Natural England's designated sites website Essex Wildlife Trust Biological Record Centre
All other statutory designated sites (national and international)	2 km	MAGIC Natural England's designated sites website Essex Wildlife Trust Biological Record Centre
Non-statutory designated sites	2 km	Essex Wildlife Trust Biological Record Centre

Type of data	Search radius	Source(s)
Priority habitats and ancient woodland	2 km	MAGIC Natural England's Priority Habitat Inventory
Legally protected and notable species (excluding bats and aquatic mammals)	2 km	MAGIC The Essex Recorders Partnership (Essex Field Club) Essex Badger Protection Trust Essex Wildlife Trust Biological Record Centre Natural England's Open Data (Great Crested Newt eDNA and Habitat Suitability Index Survey results for Ponds surveyed for District Level Licensing)
Bats and aquatic mammals (otter and water vole)	5 km	MAGIC The Essex Recorders Partnership (Essex Field Club) Essex Wildlife Trust Biological Record Centre
Water bodies not separated from the Site by major barriers to great crested newt movement (e.g. major roads and rivers)	500 m	1:10,000 Ordnance Survey maps

Site Walkover

2.3.2 Once off-site ADs, and transport route upgrade sites have been identified a walkover survey will be undertaken during which the dominant plant species will be noted in order to appropriately classify the broad habitats present and confirm their nature conservation value, alongside any protected, uncommon or invasive species. Full botanical species lists will not be compiled during this survey.

2.3.3 Additionally, particular features of interest with respect to fauna will also be target noted, and these data will enable surveys for legally protected and notable species to be targeted.

2.3.4 The site walkover survey area will be defined as each Site plus a 100m buffer.

BIBLIOGRAPHY

REF. 1. JNCC, 2010. Handbook for Phase 1 Habitat Survey – a technique for environmental audit.

REF. 2. MAGIC. https://magic.defra.gov.uk/MagicMap.aspx

REF. 3. Essex Local Wildlife Sites Partnership, 2016. Local Wildlife Site Selection Criteria.

REF. 4. JNCC. https://jncc.gov.uk/our-work/uk-bap-priority-habitats/#:~:text=UK%20BAP%20Priority%20Habitats,Action%20Plan%20(UK%20BAP).

APPENDIX A FIGURE

Figure 1.1 The site

599000 599500 600000 600500 601000 601500 602000 602500 603000 603500

210000 209500 209000 208500 208000 207500 207000 206500

N

Mean Low Water

Mean High Water

Pewet Island

Bradwell Waterside

Bradwell Nuclear Power Station

Electricity Switching Station

Airfield (disused)

Downhall Farm

Playing Field

War Meml

Marina

B 1021

Trusses Road

Down Hall

Peveralls

Westwick Farm

Spr

Down Westwick

Woodyards

Waterside Road

East End

ROMAN ROAD

BRADWELL-ON-SEA CP

Cemy

Sch

Bradwell on Sea

Blackberry Grove

Bradwell Lodge

Hockley

Bacons

Delameres Farm

Orplands

Kennel

Curds Grove

Caravan Park

East Hall

East Hall Farm

Eastlands

Munkins Farm

Weymarks Farm

Irrigation Reservoirs

Pp Ho

Community Settlement

Sales Point

Chapel of St Peter on the Wall

OTHONA ROMAN FORT

St Peter's Way

Bradwell Marshes

09

10

08

07

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation

0 100 200 300 400 500 600 700 800 900 m

Scale at A3: 1:15,000

Bradwell B Nuclear Power Plant Project
Phase 1 Habitat Survey and Monitoring Plan
2020

Figure 1.1
The Site

June 2020

wood.

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APPENDIX 23C
BIODIVERSITY DESK STUDY REPORT

Bradwell B Project

Biodiversity Desk Study Report

Wood Environment & Infrastructure Solutions UK Limited – July 2020

BBX00510038WOOD02TR

Version 2.0 Final Issue

Report for

Bradwell Power Generation Company Limited (BRB)

5F, Rex House,

4-12 Lower Regent Street

London

SW1 4PE

Main contributors

[redacted]

Issued by

[redacted] .....

Approved by

[redacted] .....

Wood

Partnership House

Regent Farm Road

Gosforth

Newcastle upon Tyne

NE3 3AF

United Kingdom

Tel +44 (0) 191 272 6100

Doc Ref. 41843-WOOD-XX-XX-RP-OE-0005

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Owner:	Name: [redacted]	Date: 09/06/2020

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Revision	Amendment	By	Date
1.0	Final Draft for comment	[redacted]	09/06/2020
2.0	Final Issue	[redacted]	07/07/2020

CONTENTS

TABLES

APPPENDICES

1. INTRODUCTION

1.1 Background

1.1.1 The applicant proposes to develop a new nuclear power station, called "Bradwell B power station", near Bradwell-on-Sea in Essex (hereafter referred to as the Project). The Project would comprise twin UK HPR1000 reactors with a combined electrical capacity of 2,340MW.

1.1.2 The area of land within which the Project would be built is located next to the Blackwater Estuary on the Dengie Peninsula, approximately 15 kilometres (km) east of the town of Maldon, 1km north-east of the village of Bradwell-on-Sea within the District of Maldon, Essex. It lies adjacent to the existing Bradwell A Power Station, which ceased operation in 2002 and is being decommissioned by the Nuclear Decommissioning Authority (NDA).

1.2 Site Context

1.2.1 The Site is defined as all land within the indicative main development site boundary, indicative temporary workers accommodation site boundary and Potential temporary project-provided accommodation site boundary, and the Indicative Zone for Marine Infrastructure: central National Grid Reference (NGR) 601000E, 209000N **(Figure 1.1, Appendix A**).

1.2.2 In addition to the range of development activities that relate to the Site and that may include, for example, the planned temporary project-provided accommodation, there will be a requirement for off-site Associated Development in order to construct and operate the power station. Such off-site development is expected to include but may not be limited to: park and ride facilities, off-site freight management facilities and potential new or enhanced off-site highways works. The requirements with respect to the locations and extents of the off-site Associated Development requirements are currently being considered and as a result they are not given further consideration in this report at this stage. A further desk study will be undertaken for offside Associated Developments at the appropriate time.

1.3 Purpose of this Document

1.3.1 This report details the methods adopted for, and results of, a data gathering exercise that was undertaken to obtain biodiversity information for the Site. These results will be used, along with the results from other ecological studies, to determine robust and accurate baseline data to inform the Habitat Regulations Assessment (HRA), Preliminary Environmental Information for Stage 2 consultation and the EIA and Environmental Statement (ES) in support of the Development Consent Order (DCO) application.

2. LEGISLATIVE AND POLICY CONTEXT

2.1.1 A number of sites, habitats and species are protected through either statute, or through national or local policy. Details of these are provided in **Box 2.1** and **Box 2.2**. Policies relevant to biodiversity conservation are listed in **Table 2.1**, together with a description of the policies and how they influence the ecological appraisal process. Further details of relevant legislation are provided in **Appendix B**.

Box 2.1: Designated Biodiversity Sites, and Important Habitats and Species

Designated biodiversity sites

- Internationally important sites: Special Areas of Conservation (SACs) and candidate SACs, Special Protection Areas (SPAs) and proposed SPAs, Sites of Community Importance and Ramsar sites.
- Nationally important sites: Sites of Special Scientific Interest (SSSIs) that are not subject to international designations, Marine Conservation Zones (MCZ) and National Nature Reserves (NNRs).
- Local Nature Reserves (LNRs): Statutory sites that are of importance for recreation and education as well as biodiversity. Their level of importance is defined by their other statutory or any non-statutory designation (e.g. if an LNR is also a SSSI but is not an internationally important site, it will be of national importance). If an LNR has no other statutory or non-statutory designation it is treated as being of borough or district level importance for biodiversity (although it may be of greater socio-economic value).
- Non-statutory biodiversity sites: Non-statutory biodiversity sites in Essex are designated at a county level as Local Wildlife Sites (LWS).

Notable habitats and species

Species or habitats of "*principal importance for the conservation of biodiversity*" are those listed by Natural England (NE) pursuant to Section 41 of the Natural Environment and Rural Communities Act 2006 (as amended) (Ref. 2.1). These include those former UK BAP priority habitats and species that occur in England. They are may also be referred to as 'Section 41' or 'S.41' habitats or species.

Other conservation-notable habitats and species include:

- Populations of species or areas of habitat for which European sites are designated.
- Populations of birds meeting the threshold for European importance (1% of the relevant international population).

Box 2.1: Designated Biodiversity Sites, and Important Habitats and Species

- Species listed as being of conservation concern in the relevant UK Red Data Book (RDB) or the Birds of Conservation Concern Amber or Red List (Ref. 2.2).
- Nationally Rare and Nationally Scarce species in the UK, which are species recorded from, respectively, 1-15 and 16-100 hectares (10x10 km squares of the UK national grid).
- Populations of birds comprising at least 1% of the relevant British breeding or wintering population (where data are available).
- Ancient woodland inventory sites (AWIS), which are areas that have been under continuous woodland cover since at least 1600.
- Habitats and species listed within the Essex Local Biodiversity Action Plan (LBAP) (Ref. 2.3).
- Important hedgerows as defined using the habitat criteria in The Hedgerows Regulations 1997 (Ref. 2.4).

Box 2.2: Legally Protected and Controlled Species

Legal protection

Many species of animal and plant receive some degree of legal protection. For the purposes of this study, legal protection refers to:

- Species included on Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981 (as amended) (Ref. 2.5), excluding:
- Species that are only protected in relation to their sale (see Section 9[5] and 13[2]), reflecting that the Project does not include any proposals relating to the sale of species; and
- Species that are listed on Schedule 1 but that are not likely to breed on or near the site, given that this schedule is only applicable while birds are breeding.
- Species included on Schedules 2 and 5 of The Conservation of Habitats and Species Regulations 2017 (Ref. 2.6); and
- Badgers, which are protected under the Protection of Badgers Act 1992 (Ref. 2.7).

Box 2.2: Legally Protected and Controlled Species
Legal control
Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) (Ref. 2.5) lists species of animal that it is an offence to release or allow to escape into the wild and species of plant that it is an offence to plant or otherwise cause to grow in the wild.

Table 2.1: Relevant policy

Policy	Description
National Planning Policy Framework (February 2019) (Ref. 2.8).	Section 15 (paragraph 170), states that: *"Planning policies and decisions should contribute to and enhance the natural and local environment by: protecting and enhancing … sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan)…"* and *"minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures…"* Paragraph 175 states that *"When determining planning applications, local planning authorities should apply the following principles:* *a) if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;* *b) development on land within or outside a Site of Special Scientific Interest, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of Sites of Special Scientific Interest;* *c) development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists; and*

Policy	Description
	d) development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to incorporate biodiversity improvements in and around developments should be encouraged, especially where this can secure measurable net gains for biodiversity."
Overarching National Policy Statement for Energy (EN-1) NPS EN-1 (Ref. 2.9).	Assessment of effects on biodiversity (Paragraphs 5.3.3 – 5.3.7): Effects on internationally, nationally and locally designated sites of ecological conservation importance, on protected species and on habitats and other species of principal importance for biodiversity conservation. The assessment and scheme design shall take account of opportunities to conserve and enhance biodiversity. The Project should aim to avoid significant harm to biodiversity conservation interests, and where significant harm cannot be avoided, appropriate compensation measures should be sought. Designated sites (Paragraphs 5.3.8 – 5.3.10): The assessment should attach appropriate weight to designated sites of international, national and local importance, protected species, habitats and species of principal importance for the conservation of biodiversity and to biodiversity within the wider environment. Potential Special Protection Areas (pSPA) are to be considered in the same way as if they had already been classified. Ramsar sites receive the same protection. Development consent would not normally be granted where the Project is likely to have an adverse effect on a SSSI. An exception should only be made where the benefits (including need) for development at this SSSI clearly outweigh the impacts on the SSSI and on the national network of SSSIs. Marine Conservation Zones (Paragraph 5.3.12): Effects on Marine Conservation Zones (MCZs) (Marine Protected Areas in Scotland), introduced under the Marine and Coastal Access Act 2009. These are areas that have been designated for the purpose of conserving marine flora or fauna, marine habitats or types of marine habitat or features of geological or geomorphological interest. Regional and local sites (Paragraph 5.3.13): Effects on sites of regional and local biodiversity, including local nature reserves and locally designated sites. Ancient Woodland and Veteran Trees (Paragraph 5.3.14): Effects on ancient woodland and veteran trees. Biodiversity within developments (Paragraph 5.3.15):

Policy	Description
	Maximising opportunities for biodiversity enhancement. Habitats and species (Paragraphs 5.3.16 – 5.3.17): Effects on species that receive statutory protection and/or are of principal importance for the conservation of biodiversity. Mitigation (Paragraphs 5.3.18 – 5.3.20): Incorporating appropriate mitigation measures as an integral part of the Project, also ensuring that: • during construction, activities are confined to the minimum areas required for the works; • during construction and operation best practice is followed to ensure that risk of disturbance or damage to species or habitats is minimised, including as a consequence of transport and access arrangements; • habitats are, where practicable, restored after construction works; and • opportunities are taken to enhance existing habitats and, where practicable, create new habitats of value within landscaping proposals.
National Policy Statement for Nuclear Power Generation (EN-6) (NPS EN-6) (Ref. 2.10).	Effects on biodiversity, including the effects on the groundwater regime and its effects on terrestrial or coastal habitats, and other common implications for biodiversity arising from: water discharge, abstraction and quality issues; habitat and species loss; fragmentation or coastal squeeze; disturbance events (noise, light and visual); and air quality'. Baseline studies on nationally and internationally important habitats and species that may be affected as a result of a development should be undertaken to inform the assessment of the cumulative ecological effects. Other possible mitigation options include: variations to building layout to avoid ecologically sensitive areas and on-site measures to protect habitats and species and to avoid or minimise pollution and the disturbance of wildlife.
Maldon District Council (MDC) Local Development Plan (2017) (Ref. 2.11)	Policy N1 Green Infrastructure Network: "*A strategic multi-functional network of green infrastructure will be identified, managed and where possible, enhanced. Open spaces and areas of significant biodiversity or historic interest will be protected. Development which results in the creation, restoration,*

Policy	Description
	enhancement, expansion and interconnection of these sites will be encouraged. *There will be a presumption against any development which may lead to the loss, degradation, fragmentation and/or isolation of existing or proposed green infrastructure.* *Where there is no adverse impact or the adverse impact can be mitigated without loss in value, development proposals which promote the use and enjoyment of the natural environment will be encouraged.* *To preserve and enhance a multi-functional green infrastructure network, including green infrastructure identified in this Plan and any other new green infrastructure, all development should:* *1) Maximise opportunities for the restoration, enhancement and connection of the District's green infrastructure network throughout the lifetime of the development, both on-site and for the wider community;* *2) Maximise opportunities to integrate green infrastructure with other types of land uses and/or design measures to maximise the collective social, economic and environmental benefits;* *3) Seek to meet local standards and address any deficiencies as identified in the Maldon District Green Infrastructure Study and future strategies adopted by the Council; and* *4) Where appropriate, be accompanied by a viable, long-term management plan to the Council's satisfaction.* *The requirement for new green infrastructure associated with developments will be subject to the legal tests (currently set out in Regulation 122 of the Community Infrastructure Levy Regulations 2010) and subject to the proviso that no obligation or policy burden shall threaten the viability of the development."* Policy N2 Natural Environment, Geodiversity and Biodiversity: "*Development proposals which help to improve the condition of existing international, national or local designations will be encouraged.* *All development should seek to deliver net biodiversity and geodiversity gain where possible. Any development which could have an adverse effect on sites with designated features, priority habitats and/ or protected or priority species, either individually or cumulatively, will require an assessment as required by the relevant legislation or national planning guidance.*

Policy	Description
	Where any potential adverse effects to the conservation value or biodiversity value of designated sites are identified, the proposal will not normally be permitted. *In exceptional circumstances where the loss of designated sites is demonstrated to be unavoidable, developers will be required to provide 'like for like' replacement, relocation and/or compensation towards the loss of habitats and be able to demonstrate that such measures are at least of an equal value to the loss on a site by site basis. Any compensatory habitat created should be ecologically functional in advance of the loss.* *If any protected species and/or priority habitats/species or significant local wildlife are found on site, or their habitat may be affected by the proposed development, the proposal must make provision to mitigate any negative biodiversity impacts it may create.* *Where the creation or relocation of habitat is required as part of the mitigation measures, the Council will have to be satisfied that:* *1) There is no net loss of habitats in terms of quantity, quality and connectivity to the local ecological network; and* *2) Any new or replacement habitat is delivered as close as possible to the development site in order to maintain a viable population locally and to avoid incremental and accumulative impact on local ecology.* *Wherever possible, all development proposals should incorporate ecologically sensitive design and features. Where appropriate, development proposals near any watercourses or water bodies should provide a sufficient buffer which will be beneficial from the perspective of minimising the encroachment of development, providing ecological enhancements, and preventing pollution."*

3. METHODS

3.1.1 A data-gathering exercise was undertaken to obtain information relating to statutory and non-statutory nature conservation sites, Habitats of Principal Importance (HPIs) and Species of Principal Importance (SPIs) (**Box 2.1**), and legally protected, notable and controlled species (**Box 2.2**). Sources of information and the search buffers adopted are set out in **Table 3.1**.

Table 3.1: Biodiversity receptors for which records were sought, associated search buffer and sources of data

Biodiversity Receptor	Search Buffer Around the Site*	Sources of Data
International statutory designated sites with ornithological qualifying features.	20km	Multi Agency Geographic Information for the Countryside (MAGIC) (Ref.3.1). Natural England's designated sites website (Ref.3.2). Essex Wildlife Trust Biological Records Centre (EWTBRC, Ref 3.3).
International statutory designated sites with bat-related qualifying features.	10km	MAGIC (Ref.3.1). Natural England's designated sites website (Ref.3.2). EWTBRC (Ref 3.3).
National statutory designated sites with ornithological qualifying features.	10km	MAGIC (Ref.3.1). Natural England's designated sites website (Ref.3.2). EWTBRC (Ref 3.3).
National statutory designated sites with bat-related qualifying features.	10km	MAGIC (Ref.3.1). Natural England's designated sites website (Ref.3.2). EWTBRC (Ref 3.3).
All other statutory designated sites (international and national).	2km	MAGIC (Ref.3.1). Natural England's designated sites website (Ref.3.2). EWTBRC (Ref 3.3).
Non-statutory designated sites.	2km	EWTBRC (Ref 3.3).

Biodiversity Receptor	Search Buffer Around the Site*	Sources of Data
HPIs and ancient woodland.	2km	MAGIC (Ref.3.1). Natural England's Priority Habitat Inventory (Ref 3.4).
Bats and aquatic mammals (otter and water vole).	5km	MAGIC (Ref.3.1). The Essex Recorders Partnership and Essex Field Club (EFC) (Ref. 3.5). EWTBRC (Ref 3.3).
Legally protected and notable species (excluding bats and aquatic mammals).	2km	MAGIC (Ref.3.1). EFC (Ref. 3.5). EWTBRC (Ref 3.3). Natural England's Open Data (Great Crested Newt eDNA and Habitat Suitability Index Survey results for Ponds surveyed for District Level Licensing) (Ref. 3.6).
Wetland Bird Survey (WeBS) core count data for count sectors located wholly or partly within 1km.	1km	British Trust for Ornithology (BTO).
Water bodies not separated from the main development site by major barriers to great crested newt movement (e.g. major roads and rivers).	0.5km	1:10,000 Ordnance Survey maps. Open access aerial imagery (available from MAGIC) (Ref. 3.1).

**The distance around the core search areas of the Indicative Main Development Site, the Potential Temporary Workers Accommodation Area, the Potential Expansion Area for Temporary Workers Accommodation, the Indicative Zone for Marine Infrastructure to which the search was expanded.*

3.1.2 Information was also sought via a review of existing biodiversity survey reports produced to inform other development proposals, both in the wider areas and in relation to previous works covering part of the Site. Relevant reports produced for the conservation aims within the local area have also been considered. The reports

that have been reviewed and the geographical range covered by each are described in **Table 3.2.**

Table 3.2: Other biodiversity survey reports and publications reviewed

Document	Date	Information Available	Geographic Coverage
Ecological Appraisals, Habitats and Botanical Data			
Bradwell extended phase 1 survey report (Ref. 3.7)	2009	Site-sourced habitat survey data. Preliminary assessment of suitability of habitats to support protected species and notable species.	Partial coverage of the Indicative Main Development Site and the Potential Temporary Workers Accommodation Area.
Bradwell National Vegetation Classification report (Ref. 3.8)	2008	National Vegetation Classification (NVC) survey data.	Partial coverage of the Indicative Main Development Site.
Bradwell B preliminary ground investigation: Ecological Appraisal (Ref. 3.9).	2017	Site-sourced habitat survey data. Preliminary assessment of suitability of habitats to support protected species and notable species.	Partial coverage of the Indicative Main Development Site.
Bradwell B preliminary ground investigation: Ecological Appraisal (Ref. 3.10).	2020	Habitat survey data collected through remote sensing and analysed using the 2017 field dataset for ground-truthing. Preliminary assessment of suitability of habitats to support protected and notable species.	Partial coverage of the Indicative Main Development Site.
Mammals			
Bradwell badger survey report (Ref. 3.11).	2008	Badger survey data.	Partial coverage of the Indicative Main Development Site and the Potential Temporary Workers

Document	Date	Information Available	Geographic Coverage
			Accommodation Area.
Bradwell bat survey report (Ref. 3.12).	2008	Bat survey data.	Partial coverage of the Indicative Main Development Site.
Bradwell, Essex: Report on inspection of cottages for bat roosts (Ref. 3.13).	2015	Data from an inspection of three structures, to assess their potential to support roosting bats.	Three built structures within the Indicative Main Development Site: 1& 2 Peartree Cottages, New House and New Bungalow.
The Bungalow, Bradwell. Method Statement: advice for contractors relating to bats (Ref. 3.14).	2017	Bat emergence survey data.	One building within the Indicative Main Development Site: The Bungalow.
Peartree Cottages. Method Statement: advice for contractors relating to bats (Ref. 3.15).	2017	Bat emergence survey data.	One building within the Indicative Main Development Site: 1 & 2 Peartree Cottages.
Bradwell otter survey report (Ref 3.16).	2008	Otter survey data.	Partial coverage of the Indicative Main Development Site.
Essex otter survey 2007 (Ref. 3.17).	2008	Otter survey data.	Covers much of the county of Essex, including part of the Dengie Peninsula.
Essex otter survey 2009-2010 (Ref. 3.18).	2011	Otter survey data.	Covers much of the county of Essex, including part of the Dengie Peninsula.

Document	Date	Information Available	Geographic Coverage
Bradwell water vole survey report (Ref. 3.19).	2008	Water vole survey data.	Partial coverage of the Indicative Main Development Site.
Herpetofauna			
Bradwell great crested newt survey report (Ref. 3.20).	2008	Great crested newt survey data.	Partial coverage of the Indicative Main Development Site.
Bradwell reptile survey report (Ref. 3.21).	2008	Reptile survey data.	Partial coverage of the Indicative Main Development Site.
Ornithology			
Bradwell interim bird report 2007 (Ref. 3.22).	2007	Breeding bird survey data (April-July 2007 inclusive). Intertidal bird survey data (April-July 2007 inclusive).	Partial coverage of the Indicative Main Development Site.
Bradwell second interim bird report, 2007-08 (Ref. 3.23).	2008	Intertidal bird survey data (August 2007 to March 2008 inclusive). Non-breeding daytime (walkover) bird survey data (September 2007 to March 2008 inclusive). Non-breeding nocturnal (walkover) bird survey data (December 2007 to March 2008 inclusive).	Partial coverage of the Indicative Main Development Site.
Bradwell third interim bird report, 2008-09 (Ref. 3.24).	2009	Intertidal bird survey data (April-May 2008 and September 2008 to March 2009 inclusive). Non-breeding daytime (walkover) bird survey data (April-May 2008 and September 2008 to March 2009 inclusive). Non-breeding nocturnal (walkover) bird survey data	Partial coverage of the Indicative Main Development Site.

Document	Date	Information Available	Geographic Coverage
		(April-May 2008 and October 2008 to March 2009 inclusive).	
Bradwell fourth interim bird report, 2008-09 (Ref. 3.25).	2009	Intertidal bird survey data for Observation Points covering the Dengie Flats: September 2008 to August 2009 (inclusive).	Partial coverage of the Indicative Main Development Site.
Bradwell confidential barn owl survey report (Ref. 3.26).	2008	Barn owl survey data.	Partial coverage of the Indicative Main Development Site.
HiDef report to Natural England - Digital video aerial surveys of red-throated diver in the Outer Thames Estuary Special Protection Area 2018 (Ref. 3.27).	2019	Data relating to red throated diver and marine wintering bird distribution and abundance.	Outer Thames Estuary SPA.
Essex Beach-Nesting Birds Group 2019 report (Ref. 3.28).	2019	Data relating to the distribution and abundance of breeding little tern and ringed plover.	Covers much of the county of Essex.
Fish			
Eel management plans for the United Kingdom: Anglian River Basin District, 2010 (Ref. 3.29).	2010	Data regarding European eel populations across the region.	Covers the wider Anglian Region.
Invertebrates			
Bradwell invertebrate survey report (Ref. 3.30).	2009	Invertebrate survey data.	Partial coverage of the Indicative Main Development Site.

4. RESULTS

4.1 Sites Designated for Biodiversity Conservation

4.1.1 Sites designated for their importance to biodiversity conservation have been identified within the relevant search areas for the Site (see **Table 3.1**), with summary details provided in this section. Further detail regarding the definitions for various types of designated sites, and the legislative protection that they receive, is provided in **Appendix B**.

Statutory Designated Sites of Ornithological Importance

4.1.2 **Table 4.1** presents a summary of SPA and Ramsar sites (international designations) within 20km of the Site boundaries, while **Table 4.2** presents national statutory designated sites (SSSIs) with ornithological notified features within 10km (**Figure 4.1 and Figure 4.2, Appendix A**).

Table 4.1: International statutory designated sites with ornithological qualifying features within a 20km radius of the Site

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Blackwater Estuary (Mid-Essex Coast Phase 4) SPA	• Black-tailed godwit, non-breeding: 755 individuals (1987/88-1991/92). • Dark-bellied brent goose, non-breeding: 8,761 individuals (1987/88-1991/92). • Dunlin, non-breeding: 17,743 individuals (1987/88-1991/92). • Grey plover, non-breeding: 2,172 individuals (1987/88-1991/92). • Hen harrier, non-breeding: four individuals (19 individuals across Mid-Essex suite of SPAs) (1987/88-1991/92).	On Site	On Site	0.17 N	On Site

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	• Little tern, breeding: five pairs (73 pairs across Mid-Essex suite of SPAs) (1987-1991). • Pochard, breeding: 39 pairs (1987-1991). • Ringed plover, breeding: 48 pairs (135 pairs across Mid-Essex suite of SPAs) (1987-1991). • Waterbird assemblage, non-breeding: 46,552 individuals (1987/88-1991/92).				
Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar	**Ramsar Criteria 1** Extent and diversity of saltmarsh habitat present. This site, and the four others in the Mid-Essex Coast complex, includes a total of 3,237 ha that represent 70% of	On Site	On Site	0.17 N	On Site

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	the saltmarsh habitat in Essex and 7% of the total area of saltmarsh in Britain. **Ramsar Criteria 2** The invertebrate fauna is well represented and includes at least 16 British Red Data Book species. In descending order of rarity these are: Endangered: a water beetle *Paracymus aeneus*; Vulnerable: scarce emerald damselfly, the flies *Aedes flavescens, Erioptera bivittata, Hybomitra expollicata* and the spiders *Heliophanus auratus* and *Trichopterna cito*; Rare: the beetles *Baris scolopacea*. *Philonthus punctus*, *Graptodytes bilineatus* and *Malachius vulneratus*, the flies *Campsicemus magius* and *Myopites eximia*, the moths *Idaea ochrata* and				

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	Malacosoma castrensis and the spider *Euophrys browningi*. **Ramsar Criteria 3** This site supports a full and representative sequences of saltmarsh plant communities covering the range of variation in Britain. **Ramsar Criteria 5** Waterbird assemblage, non-breeding: 105,061 individuals (1998/99-2002/03). **Ramsar Criteria 6** • Dark-bellied brent goose, non-breeding: 8,689 individuals (1998/99-2002/03).				

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	• Grey plover, non-breeding: 4,215 individuals (1998/99-2002/03). • Dunlin, non-breeding: 27,655 individuals (1998/99-2002/03). • Black-tailed godwit, non-breeding: 2,174 individuals (1998/99-2002/03).				
Dengie (Mid-Essex Coast Phase 1) SPA	• Dark-bellied brent goose, non-breeding: 2,250 individuals (1987/88-1991/92). • Grey plover, non-breeding: 1,752 individuals (1987/88-1991/92). • Hen harrier, non-breeding: five individuals (19 individuals across Mid-Essex suite of SPAs) (1987-1991).	On Site	0.27 N	1.25 NE	On Site

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	• Knot, non-breeding: 7,763 individuals (1987/88-1991/92). • Waterbird assemblage, non-breeding: 27,497 individuals (1987/88-1991/92).				
Dengie (Mid-Essex Coast Phase 1) Ramsar	**Ramsar Criteria 1** Extent and diversity of saltmarsh habitat present. This site and the four others in the Mid-Essex Coast complex, includes a total of 3,237 ha that represent 70% of the saltmarsh habitat in Essex and 7% of the total area of saltmarsh in Britain. **Ramsar Criteria 2** Dengie supports a number of rare plant and animal species. The Dengie has 11 species of nationally scarce plants: sea	On Site	0.27 N	1.25 NE	On Site

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	kale, sea barley, golden samphire, lax flowered sea lavender, perennial glasswort and one flowered glasswort, small cord-grass, shrubby sea-blite, eelgrass and dwarf eelgrass. The invertebrate fauna includes the following Red Data Book species: a weevil *Baris scolopacea*, a horsefly *Atylotus latistriatus* and a jumping spider *Euophrys browningi*. **Ramsar Criteria 3** This site supports a full and representative sequence of saltmarsh plant communities covering the range of variation in Britain.				

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	Ramsar Criteria 5 Waterbird assemblage, non-breeding: 43,828 individuals (1998/99-2002/03). **Ramsar Criteria 6** • Dark-bellied brent goose, non-breeding: 2,000 individuals (1998/99-2002/03). • Grey plover, non-breeding: 4,582 individuals (1998/99-2002/03). • Knot, non-breeding: 14,528 individuals (1998-99-2002/03).				
Outer Thames Estuary SPA	• Common tern, breeding: 532 individuals (peak mean 2011-2015).	1.30 E	4.23 E	4.43 E	2.50 E

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	• Little tern, breeding: 746 individuals (peak mean 2011-2015). • Red-throated diver, non-breeding: 6,466 individuals (peak mean 1989-2006/07).				
Colne Estuary (Mid-Essex Coast Phase 2) SPA	• Dark-bellied brent goose, non-breeding: 5,313 individuals (1987/88-1991/92). • Hen harrier, non-breeding: four individuals (19 individuals across Mid-Essex suite of SPAs) (1987/88-1991/92). • Little tern, breeding: 20 pairs (20 pairs across Mid-Essex suite of SPAs) (1987-1991).	3.10 N	5.35 N	6.03 N	2.75 N

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	• Pochard, breeding: two pairs (15 pairs across Mid-Essex suite of SPAs) (1987-1991). • Redshank, non-breeding: 1,252 individuals (1987/88-1991/92). • Ringed plover, breeding: 135 pairs (across Mid-Essex suite of SPAs) (1987-1991). • Waterbird assemblage: 30,687 individuals (1987/88-1991/92).				
Colne Estuary (Mid-Essex Coast Phase 2) Ramsar	**Ramsar Criteria 1** Extent and diversity of saltmarsh habitat present. This site, and the four others in the Mid-Essex Coast complex, includes a total of 3,237 ha that represent 70% of	3.10 N	5.35 N	6.03 N	2.75 N

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	the saltmarsh habitat in Essex and 7% of the total area of saltmarsh in Britain. **Ramsar Criteria 2** Supports 12 species of nationally scarce plants and at least 38 British Red Data Book invertebrate species. **Ramsar Criteria 3** This site supports a full and representative sequences of saltmarsh plant communities covering the range of variation in Britain. **Ramsar Criteria 5** Waterbird assemblage, non-breeding: 32,041 individuals (1998/99-2002/03).				

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	Ramsar Criteria 6 • Dark-bellied brent goose, non-breeding: 3,165 individuals (1998/99-2002/03). • Redshank, non-breeding: 1,624 individuals (1998/99-2002/03).				
Abberton Reservoir SPA	• Coot, non-breeding: 11,500 individuals (1985/86-1989/90). • Goldeneye, non-breeding: 560 individuals (1985/86-1989/90). • Pochard, non-breeding: 2,400 individuals (1985/86-1989/90).	7.90 N	8.00 N	8.90 N	7.00 N

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	• Pochard, passage: 2,700 individuals (1985-1989). • Teal, non-breeding: 2,200 individuals (1985/86-1989/90). • Wigeon, non-breeding: 8,400 individuals (1985/86-1989/90). • Gadwall, non-breeding: 480 individuals (1985/86-1989/90). • Gadwall, passage: 110 individuals (1985-1989). • Great cormorant, breeding: 360 pairs. • Great crested grebe, non-breeding: 180 individuals (1985/86-1989/90).				

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	• Mute swan, non-breeding: 500 individuals (1985/86-1989/90). • Mute swan, passage: 450 individuals (1985-1989). • Northern shoveler, non-breeding: 480 individuals (1985/86-1989/90). • Northern shoveler, passage: 420 individuals (1985-1989). • Tufted duck, non-breeding: 3,500 individuals (1985/86-1989/90). • Tufted duck, non-breeding: 2,700 individuals (1985-1989). • Waterfowl assemblage, non-breeding: 34,000 individuals (1985/86-1989/90).				

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Abberton Reservoir Ramsar	**Ramsar Criteria 5** Waterfowl assemblage non-breeding: 23,787 individuals (1998/99-2002/03). **Ramsar Criteria 6** • Gadwall, passage: 550 individuals (1998/99-2002/3). • Northern shoveler, passage: 377 individuals (1998/99-2002/3). • Eurasian wigeon, winter: 2,888 individuals (1998/99-2002/3).	7.90 N	8.00 N	8.90 N	7.00 N
Foulness (Mid-Essex Coast Phase 5) SPA	• Avocet, breeding: 26 pairs (1987-1991).	10.70 S	12.00 S	11.30 S	12.50 S

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	• Bar-tailed godwit, non-breeding: 5,213 individuals (1987/88-1991/92). • Common tern, breeding: 186 pairs (across Mid-Essex suite of SPAs) (1987-1991). • Dark-bellied brent goose, non-breeding: 13,276 individuals (1987/88-1991/92). • Grey plover, non-breeding: 2,229 individuals (1987/88-1991/92). • Hen harrier, non-breeding: six individuals (19 individuals across Mid-Essex suite of SPAs) (1987/88-1991/92).				

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	• Knot, non-breeding: 22,151 individuals (1987/88-1991/92). • Little tern, breeding: 31 pairs (73 pairs across Mid-Essex suite of SPAs) (1987-1991). • Oystercatcher, non-breeding: 9,805 individuals (1987/88-1991/92). • Redshank, non-breeding: 1,540 individuals (1987/88-1991/92). • Ringed plover, breeding: 37 pairs (135 pairs across Mid-Essex suite of SPAs) (1987-1991). • Sandwich tern, breeding: 267 pairs (across Mid-Essex suite of SPAs) (1987-1991).				

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	• Waterbird assemblage, non-breeding: 74,791 individuals (1987/88-1991/92).				
Foulness (Mid-Essex Coast Phase 5) Ramsar	**Ramsar Criteria 1** Extent and diversity of saltmarsh habitat present. This site, and the four others in the Mid-Essex Coast complex, includes a total of 3,237 ha that represent 70% of the saltmarsh habitat in Essex and 7% of the total area of saltmarsh in Britain. **Ramsar Criteria 2** Supports a number of nationally rare and nationally scarce plants and British Red Data Book invertebrates.	10.70 S	12.00 S	11.30 S	12.50 S

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	Ramsar Criteria 3 The site contains extensive saltmarsh habitat, with areas supporting full and representative sequences of saltmarsh plant communities covering the range of variation in Britain. **Ramsar Criteria 5** Waterbird assemblage, non-breeding: 82,148 individuals (1998/99-2002/03). **Ramsar Criteria 6** • Dark-bellied brent goose non-breeding: 6,475 individuals (1998/99-2002/03).				

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	• Oystercatcher non-breeding: 14,674 individuals (1998/99-2002/03). • Grey plover non-breeding: 4,343 individuals (1998/99-2002/03). • Redshank passage: 2,586 individuals (1998/99-2002/03). • Knot non-breeding: 22,439 individuals (1998/99-2002/03). • Bar-tailed godwit non-breeding: 4,095 individuals (1998/99-2002/03).				
Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) SPA	• Dark-bellied brent goose, wintering: 5,509 individuals.	11.30 S	11.90 S	11.30 S	13.00 S

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	• Waterbird assemblage non-breeding: 27,021 individuals (1990/91-1994/95).				
Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) Ramsar	**Ramsar Criteria 2** Supports an assemblage of rare, vulnerable or endangered species or subspecies of plant and animal including 13 nationally scarce plant species: slender hare's ear, divided sedge, sea barley, golden-samphire, lax flowered sea-lavender, curved hard-grass, Borrer's saltmarsh grass, stiff saltmarsh grass, spiral tassel weed, one-flowered glasswort, small cord-grass, shrubby sea-blite and sea clover. Several important invertebrate species are also present on the site, including scarce emerald damselfly, the shorefly *Parydroptera discomyzina*, the rare	11.30 S	11.90 S	11.30 S	13.00 S

Designated Site	Qualifying Features*	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	soldier fly *Stratiomys singularior*, the large horsefly *Hybomitra expollicata*, the beetles *Graptodytes bilineatus* and *Malachius vulneratus*, and the ground lackey moth *Malacosoma castrensis* and *Eucosoma catoprana*. **Ramsar Criteria 5** Waterbird assemblage, non-breeding: 16,970 individuals (1998/99-2002/03). **Ramsar Criteria 6** Dark-bellied brent goose, non-breeding: 2,103 individuals (1998/99-2002/03).				

**Ramsar site criteria: Criteria 1 = contains representative, rare, or unique natural wetland type; Criteria 2 = supports vulnerable, endangered, or critically endangered species or threatened ecological communities; Criteria 3 = supports populations of plant or animal species important for maintaining biodiversity; Criteria 5 = regularly supports 20,00 or more waterbirds; and Criteria 6 = regularly supports 1% of the individuals in a population of one species of waterbird.*

Table 4.2: National statutory designated sites with ornithological qualifying features within a 10km radius of the Site

Designated Site	Notified Features	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Blackwater Estuary SSSI	Mud flats, fringed by saltmarsh on the upper shores, support internationally and nationally important numbers of waterfowl which overwinter here. Shingle and shell banks and offshore islands are also a feature of the tidal flats. The surrounding terrestrial habitats; the sea wall, ancient grazing marsh and its associated fleet and ditch systems, plus semi-improved grassland, are also of high conservation interest. This rich mosaic of habitats supports an outstanding assemblage of nationally scarce plants and a nationally important assemblage of rare invertebrates, with	On Site	On Site	0.17 N	On Site

Designated Site	Notified Features	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	16 Red Data Book species and 94 notable and local species. **Notified ornithological features** • Breeding birds: bearded tit, black-headed gull, common tern, cormorant, heron, little tern, pochard, redshank, reed bunting, reed warbler and sedge warbler. • Non-breeding birds: black-tailed godwit, curlew, dark-bellied brent geese, dunlin, gadwall, goldeneye, grey plover, hen harrier, Lapland bunting, merlin, peregrine, redshank, red-throated diver, ringed plover, shelduck, short-eared owl, Slavonian grebe, spotted redshank, teal, twite and wigeon.				

Designated Site	Notified Features	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Dengie SSSI	Dengie is a large and remote area of tidal mudflat and saltmarsh at the eastern end of the Dengie peninsula, between the Blackwater and Crouch Estuaries. The saltmarsh is the largest continuous example of its type in Essex. Foreshore, saltmarsh and beaches support an outstanding assemblage of rare coastal flora. It is a resort for internationally and nationally important wintering populations of wildfowl and waders, and in summer supports a range of breeding coastal birds including rarities. The formation of cockleshell spits and beaches is of geomorphological interest.	On Site	0.27 N	1.25 NE	On Site

Designated Site	Notified Features	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	Notified ornithological features • Breeding birds: bearded tit, little tern, oystercatcher, redshank, reed bunting, reed warbler and ringed plover. • Non-breeding birds: bar-tailed godwit, brent geese, curlew, dunlin, golden plover, grey plover, gulls, hen harrier, heron, knot, merlin oystercatcher, pintail, shelduck, shore lark, short-eared owl, snow bunting, turnstone and wigeon.				
Sandbeach Meadows SSSI	Sandbeach Meadows lies on alluvial deposits at the north eastern end of the Dengie peninsula. The area of grassland is virtually all that remains of the once extensive grazing marshes	1.67 S	2.83 S N	2.24 S	3.52 S

Designated Site	Notified Features	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	which formed the hinterland of the nearby Dengie coastline. The seven fields are sympathetically managed and support a nationally important number of dark-bellied brent geese during the winter. **Notified ornithological features** Non-breeding birds: dark-bellied brent geese.				
Colne Estuary SSSI	The Colne Estuary is comparatively short and branching, with five tidal arms which flow into the main river channel. The estuary is of international importance for wintering brent geese and black-tailed godwit and of national importance for breeding little terns and five other species of wintering waders	3.10 N	5.35 N	6.03 N	2.75 N

Designated Site	Notified Features	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	and wildfowl. The variety of habitats which include mudflat, saltmarsh, grazing marsh, sand and shingle spits, disused gravel pits and reed beds, support outstanding assemblages of invertebrates and plants. Two areas of foreshore at East Mersea are of geological importance. Colne Point and St. Osyth Marsh are of geomorphological interest. **Notified ornithological features** • Breeding birds: bearded tit, little tern, pochard, ringed plover and whinchat. • Non-breeding birds: barn owl, black-tailed godwit, brent geese, dunlin, goldeneye, grey plover, hen harrier,				

Designated Site	Notified Features	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	redshank, ringed plover, sanderling, shelduck and short-eared owl.				
Abberton Reservoir SSSI	A large storage reservoir lying about 4 miles south of Colchester. It is the largest freshwater body in Essex with a water area of approx. 500 hectares (ha), and one of the most important reservoirs in Britain for wildfowl. Around thirty thousand birds visit the reservoir annually, including internationally important members of one species and nationally important members of 12 others. It is also one of a handful of sites in Britain where Cormorants nest inland in trees.	7.90 N	8.00 N	8.90 N	7.00 N

Designated Site	Notified Features	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	Notified ornithological features • Breeding birds: cormorant, redshank, yellow wagtail, bearded tit, little tern, pochard, ringed plover and whinchat. • Non-breeding birds: coot, curlew, gadwall, goldeneye, golden plover, goosander, lapwing, mute swan, pochard, shoveler, tufted duck and wigeon.				

Statutory Designated Sites for Non-ornithological Importance

4.1.3 There are no sites designated specifically for bats within a 10km radius of the Site. All other statutory designated sites (international and national) identified from within a 2km radius of the Site are presented in **Table 4.3** (**Figure 4.3, Appendix A**).

Table 4.3: International and national statutory designated sites (designated primarily for non-ornithological reasons) within a 2km radius of the Site

Designated Site	Designating Features	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Essec Estuaries SAC	This is a typical, undeveloped, coastal plain estuarine system with associated open coast mudflats and sandbanks. The site comprises the major estuaries of the Colne, Blackwater, Crouch and Roach River. There are extensive intertidal mudflats and sandflats in estuaries and at Dengie Flats and Maplin Sands. Glasswort Salicornia spp. saltmarsh forms an integral part of the transition from the extensive and varied intertidal mud and sandflats through to upper salt meadows. Extensive upper saltmarshes remain, including Atlantic salt meadows with floristic features typical of this part of the UK.	On Site	On Site	0.18 N	On Site

Designated Site	Designating Features	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	Qualifying features • H1110 Sandbanks which are slightly covered by sea water all the time. • H1130 Estuaries. • H1140 Mudflats and sandflats not covered by seawater at low tide. • H1310 Salicornia and other annuals colonising mud and sand. • H1320 Spartina swards. • H1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae).				

Designated Site	Designating Features	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	• H1420 Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*).				
Blackwater Estuary NNR	• Archaeological and historical features. • Boat and ancillary equipment. • Infrastructure. • Inter tidal mudflats.	1.51 N	1.51 N	2.08 N	0.55 N
Dengie NNR	• Archaeological and historical features. • Intertidal mud. • Public access and Site Infrastructure.	On Site	0.27 N	1.25 NE	On Site

Designated Site	Designating Features	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
	• Research.				

Non-statutory Designated Sites

4.1.4 There is one site receiving on-statutory designation within a 2km radius of the Site. Full details of this are provided in **Table 4.4**, with the location shown on **Figure 4.4** (**Appendix A**).

Table 4.4: Non-statutory designated sites within a 2km radius of the Site

Designated Site	Reason for Designation	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Bradwell Cemetery LWS	Cemetery supporting unimproved grassland and turf including common knapweed, agrimony and meadow vetchling. The nationally scarce lesser calamint has also been recorded on the site.	2.35 S	1.02 S	0.38 S	1.98 S

4.2 HPIs and Ancient Woodland

4.2.1 Using a combination of desk-based sources and historical field survey data (see **Table 3.1**), 11 HPIs have been identified from within the 2km search area, as summarised in **Table 4.5**. HPIs identified from within the search radius are shown on **Figure 4.4** (**Appendix A**). No records of ancient woodland have been identified.

Table 4.5: Habitats of Principal Importance within 2km of the Site

HPI	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Coastal and floodplain grazing marsh	0.5 W	0.45 SW	0 W (adjacent)	1.25 SW
Coastal saltmarsh	On Site	On Site	0.15 N	On Site
Coastal vegetated shingle	0.02 E	N/A	N/A	1.33 SE
Intertidal mudflats	On Site	On Site	0.15 N	On Site
Reedbeds	On Site	On Site	0.4 N	On Site
Ponds	On Site	On Site	0 E (adjacent)	0.36 S
Arable field margins	On Site	On Site	On Site	0.04 S
Hedgerows	On Site	On Site	0.35 N	0.04 S
Lowland mixed deciduous woodland	On Site	On Site	0 E (adjacent)	0.25 SE

HPI	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Wood-pasture and parkland	0.31 S	1.05 SE	0.43 SE	N/A
Traditional orchards	1.5 SW	1.75 SW	1.15 SW	N/A

N/A indicates that the HPI does not fall within the 2 km search radius for this part of the Site.

4.3 Legally Protected and Otherwise Notable Species

Overview

4.3.1 EWTBRC and EFC provided a number of records of protected and notable species from the relevant search areas. Further records have also been identified as part of the desk study exercise (see **Section 3** for the full list of data sources). The key species and species groups identified are as follows, with further details provided in the remainder of this section:

- vascular plants;
- badger (see confidential **Appendix C**);
- bats;
- otter;
- water vole;
- other notable mammals;
- great crested newt;
- common toad;
- reptiles;
- birds (see also **Appendix D**);
- fish; and

- invertebrates.

4.3.2 The scientific names of all species referred to in this document are provided in **Appendix E** and the full list of records supplied by EWTBRC and EFC is presented in **Appendix F** (which has confidential status due to containing sensitive data).

Vascular Plants

Relevant reports and publications

4.3.3 National Vegetation Classification (NVC) surveys conducted by Wood (formerly Entec) in 2008 (Ref. 3.8) identified notable species of vascular plants which fall within the Main Development Site. These are provided in **Table 4.6**.

Table 4.6: Notable species identified as a result of NVC survey (2008) within the Site

Species	Conservation Status	Habitat
Little mouse-ear	ExRDB (R)	Ephemeral and tall ruderal within hard standing and semi-improved grassland.
Velvet bent grass	ExRDB (R)	Ephemeral and tall ruderal within hard standing and semi-improved grassland.
Field chickweed	ExRDB (R)	Ephemeral and tall ruderal within hard standing.
Prickly saltwort	SPI; NS	Coastal grassland.
Shrubby sea-blite	ExRDB (L); NS	Coastal grassland and sea wall.
Sea barley	SPI; NS	Coastal grassland and sea wall.
Perennial glasswort	ExRDB (L); NS	Saltmarsh.
Bulbous rush	ExRDB (R)	Saltmarsh.

*Key to status (refer to **Box 2.1** and **Box 2.2** for full details): ExRDB = Essex Red Data Book (R = rare; L = listed, but with no further categorisation); SPI = Species of Principal Importance; NS = Nationally Scarce.*

Data supplied by EWTBRC and EFC in 2020

4.3.4 EWTBRC and EFC provided records of 67 of notable vascular plant species from within the 2km search radius around the Site. Of these, 34 were recorded from within the Site boundary. Details are provided in **Table 4.7**.

Table 4.7: Notable vascular plant records from within a 2km radius of the Site

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Annual knawel	SPI	1	1987	On Site	0.36 E	1.07 NE	0.63 S
Babington's orache	ExRDB (R)	22	1987 - 2005	On Site	0.06 W	0.77 N	On Site
Bird's-foot clover	ExRDB (L)	2	1994	N/A	N/A	N/A	1.37 W
Black spleenwort	ExRDB (L)	1	1987	0.59 S	1.31 SE	0.67 SE	N/A
Bluebell	WCA8	4	1998 - 2005	On Site	0.36 E	0.67 SE	0.63 S
Brackish water-crowfoot	ExRDB (L)	11	1984 - 2010	1.13 W	1.15 SW	0.86 W	1.21 NW
Brookweed	ExRDB (L)	2	1992	0.39 W	On Site	0.33 N	0.66 S

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Cat mint	ExRDB (L)	1	2008	1.8 SW	N/A	1.59 S	0.28 S
Changing forget-me-not	ExRDB (R)	8	1994 - 2005	0.13 W	0.06 W	On Site	0.28 S
Curved hard grass	NS; ExRDB (L)	16	1992 - 2005	On Site	0.32 N	0.94 NE	On Site
Distant sedge	ExRDB (L)	1	1984	N/A	N/A	N/A	1.57 N
Dune fescue	ExRDB (L)	3	1996	N/A	N/A	N/A	1.94 N
Dwarf eelgrass	ExRDB (L)	1	1982	0.12 N	N/A	0.06 NE	0.66 E
Early meadow grass	ExRDB (L)	1	2004	0.47 E	N/A	N/A	1.95 SE
Eelgrass	ExRDB (L)	1	1982	0.12 N	N/A	0.06 NE	0.66 E

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
English scurvy grass	ExRDB (R)	20	1987 - 2012	On Site	On Site	On Site	On Site
Field mouse-ear	ExRDB (L)	1	1997	1.69 SE	N/A	N/A	N/A
Flattened meadow grass	ExRDB (L)	1	1997	0.08 N	1.72 NE	N/A	On Site
Fly honeysuckle	ExRDB (L)	1	1998	1.33 S	1.81 S	1.23 S	N/A
Frosted orache	ExRDB (R)	33	1990 - 2016	On Site	0.32 N	1.06 NE	On Site
Galingale	NS; ExRDB (L)	1	1998	0.13 W	0.26 SW	On Site	1.23 S
Golden dock	ExRDB (L)	2	2003 - 2008	0.13 W	0.26 SW	On Site	1.28 S

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Golden samphire	NS; ExRDB (L)	74	1984 - 2016	On Site	On Site	On Site	On Site
Greater tussock-sedge	ExRDB (R)	2	1998 - 2003	0.13 W	0.06 W	On Site	0.28 S
Green winged orchid	NS; ExRDB (L)	4	1992 - 2008	0.47 E	N/A	N/A	1.95 NE
Henbane	ExRDB (L)	1	1984	0.36 S	N/A	N/A	N/A
Large-leaved lime	NS; ExRDB (L)	3	1998 - 2007	1.46 S	1.91 S	1.32 S	N/A
Lax flowered sea lavender	NS; ExRDB (L)	6	1984 - 2016	0.12 N	1.67 SW	1.15 SW	0.66 E
Lesser chickweed	ExRDB (R)	19	1994 - 2010	On Site	0.36 E	1.08 NE	On Site

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Little mouse-ear	ExRDB (L)	1	2003	0.13 W	0.26 SW	On Site	1.23 S
Loose silky bent	NS; ExRDB (L)	1	1987	On Site	0.53 SE	0.28 E	1.46 S
Marram grass	ExRDB (R)	18	1987 - 2016	0.03 E	0.82 NE	1.57 N	On Site
Mousetail	ExRDB (L)	4	1992 - 2010	1.89 SW	N/A	1.59 SW	1.77 N
One-flowered glasswort	NS; ExRDB (L)	11	1983 - 1992	0.08 N	1.43 NW	N/A	On Site
Perennial glasswort	NS; ExRDB (L)	64	1983 - 2016	On Site	On Site	On Site	On Site
Prickly saltwort	SPI; NS	8	1987 - 2016	0.05 N	N/A	N/A	0.66 E

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Pyramidal orchid	ExRDB (L)	3	1995 - 2014	0.83 E	N/A	N/A	1.84 W
Ray's knotgrass	ExRDB (L)	2	2000 - 2004	0.47 E	N/A	N/A	1.95 SE
Rock samphire	ExRDB (L)	5	2006 - 2016	0.47 E	N/A	N/A	1.95 SE
Saltmarsh goosefoot	ExRDB (L)	26	1997 - 2002	N/A	N/A	N/A	1.20 W
Sand cat's-tail	ExRDB (R)	3	1996 - 2016	N/A	N/A	N/A	1.45 W
Sea barley	SPI; NS; ExRDB (L)	1	2015	N/A	N/A	N/A	1.95 NE
Sea clover	NS; ExRDB (L)	41	1987 - 2016	On Site	0.15 E	On Site	On Site
Sea fern-grass	ExRDB (R)	9	1992 - 2016	On Site	0.32 N	0.94 NE	On Site

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Sea mouse-ear	ExRDB (R)	11	1997 - 2005	On Site	0.26 SW	On Site	On Site
Sea spurge	NS; ExRDB (L)	9	1987 - 2016	0.12 N	1.00 NE	1.99 NE	On Site
Sea buckthorn	NS; ExRDB (L)	7	1987 - 2016	On Site	0.21 W	0.55 N	On Site
Sea heath	ExRDB (L)	1	1984	0.47 E	N/A	N/A	1.95 SE
Sea holly	ExRDB (R)	10	1996 - 2016	0.12 N	N/A	N/A	0.66 E
Sea kale	NS; ExRDB (L)	17	1987 - 2016	0.30 N	0.57 NE	1.57 N	On Site
Shrubby sea-blite	NS; ExRDB (L)	192	1984 - 2018	On Site	On Site	On Site	On Site
Small pondweed	ExRDB (L)	1	1984	N/A	N/A	N/A	1.57 N

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Smooth brome	ExRDB (R)	2	1996 - 1997	On Site	N/A	N/A	1.06 SE
Smooth cord-grass	ExRDB (L)	2	1984 - 1993	1.48 SW	1.67 SW	1.15 SW	N/A
Spiral tasselweed	ExRDB (L)	2	1990 - 1998	1.94 NW	1.94 NW	N/A	0.96 W
Stiff saltmarsh grass	NS; ExRDB (L)	43	1982 - 2018	On Site	On Site	On Site	On Site
Unbranched bur-reed	ExRDB (R)	1	1998	On Site	0.36 E	1.08 NE	0.63 S
Upright chickweed	ExRDB (L)	9	1994 - 1998	N/A	N/A	N/A	1.25 W
Velvet bent grass	ExRDB (R)	2	1997 - 1998	On site	N/A	1.59 S	1.22 SE

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Wall-rue	ExRDB (L)	2	1996 - 2005	0.24 S	0.99 SE	0.33 SE	2.01 S
Water avens	ExRDB (R)	2	1999	On Site	0.34 NE	1.08 NE	0.34 S
Water dock	ExRDB (L)	1	1987	N/A	N/A	N/A	1.36 W
Water-soldier	ExRDB (L)	2	1998 - 2000	1.73 SW	N/A	1.53 S	3.16 S
Wild marjoram	ExRDB (L)	1	1996	0.24 S	1.11 SE	0.50 SE	N/A
Yellow horned poppy	ExRDB (R)	38	1984 - 2015	On Site	0.36 E	1.08 NE	On Site
Yellow loosestrife	ExRDB (L)	2	1998 - 1999	On Site	0.34 NE	1.08 NE	0.34 S
Yellow rattle	ExRDB (R)	4	1997 - 2012	On Site	N/A	N/A	1.22 SE

*Key to status (refer to **Box 2.1** and **Box 2.2** for full details): WCA8 = Wildlife and Countryside Act 1981, Schedule 8; SPI = Species of Principal Importance; NS = Nationally Scarce; ExRDB = Essex Red Data Book (R = rare; L = listed, but with no further categorisation). N/A indicates that the record does not fall within the 2km search radius for this part of the Site.*

Records from designated site descriptions

4.3.5 Four additional Essex Red Data Book species are listed in the citation for the Crouch and Roach Estuaries Ramsar site, meeting Criterion 2; '*the wetland supports vulnerable, endangered, or critically endangered species or threatened ecological communities*'. These are:

- slender hare's ear;
- divided sedge;
- Borrer's saltmarsh grass; and
- small cord-grass.

Badger

4.3.6 The location of badger records is confidential and this information should not be made available in the public domain; such records are therefore located within **Appendix C** which has confidential status.

Bats

Relevant reports and publications

4.3.7 A desk-based study carried out in 2008 (Ref. 3.12) identified bat roosts, or evidence indicating potential bat roosts, of at least four species within the search area. The details of these roosts are provided in **Table 4.8** and shown in **Figure 4.5** (**Appendix A**).

4.3.8 Field surveys carried out as part of the 2008 study confirmed that at least four species of bat, namely common and soprano pipistrelle, serotine and *Myotis* sp. used habitats within the Main Development Site. Activity levels recorded were generally low and habitats were noted to offer only limited, suboptimal foraging opportunities.

4.3.9 Eighteen buildings within the Main Development Site were assessed in 2008. One possible bat roost was identified in a large warehouse (**Figure 4.5, Appendix A**). No evidence of roosting was found in the remaining buildings.

4.3.10 Building inspections in 2015 concluded that the following three buildings (locations shown in **Figure 4.5, Appendix A**) had the potential to support roosting bats:

- 1 and 2 Peartree Cottages;
- New House; and
- a shed adjacent to New Bungalow.

4.3.11 Follow up survey work in 2017 confirmed the presence of a single common pipistrelle roosting within Peartree Cottages. The shed adjacent to New Bungalow did not appear to support roosting bats during the survey work.

Table 4.8: Bat roost and potential bat roost records highlighted by Entec (Ref. 3.12)

Species	Details	Year of record	OS Grid Reference	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Pipistrellus sp.	Colony in house.	1983	TM007070	0.23 S	1.04 SE	0.43 SE	1.99 S
Pipistrellus sp.	Colony in house.	1993	TL957105	4.38 NW	4.35 NW	4.70 NW	3.39 NW
Pipistrellus sp.	Grounded bat.	1993	TM005043	2.77 S	3.41 SE	2.83 SE	4.48 S
Pipistrellus sp.	Droppings (Tillingham Church).	2002	TL993038	3.44 SW	3.88 SW	3.30 SW	4.93 S
Common pipistrelle	Colony in barn (<50 bats).	2004-2005	TM023053	2.28 S	3.37 SE	2.72 SE	4.19 SE

Species	Details	Year of record	OS Grid Reference	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Common pipistrelle	Colony in farmhouse (25-50 bats).	2004-2005	TM023076	0.18 S	2.19 SE	2.03 E	1.98 SE
Common pipistrelle	Colony in sheds.	2004-2005	TM015036	3.61 S	4.37 SE	3.74 SE	N/A
Brown long-eared bat	Colony in house.	1984	TL996064	1.01 SW	1.26 S	0.68 S	2.31 S
Brown long-eared bat	Colony in house.	2004-2005	TM009037	3.41 S	4.09 SE	3.49 SE	N/A
Brown long-eared bat	Dead bat.	1989	TM006069	0.27 S	1.04 SE	0.39 SE	2.03 S
Brown long-eared bat	Colony in house.	2004	TM009039	3.22 S	3.89 SE	3.29 SE	4.96 S

Species	Details	Year of record	OS Grid Reference	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Natterer's bat	Colony in house.	1984	TL996064	1.01 SW	1.26 S	0.68 S	2.31 S
Natterer's bat	Droppings in outbuilding.	2004	TM024054	2.23 S	3.36 SE	2.73 SE	4.12 SE
Natterer's bat	Colony in barn.	2004	TM023053	2.28 S	3.37 SE	2.72 SE	4.19 SE
Serotine	Colony in house.	1984	TL996064	1.01 SW	1.26 S	0.68 S	2.31 S

Data supplied by EWTBRC and EFC in 2020

4.3.12 EWTBRC and EFC provided records of at least eight bat species, including records of foraging and commuting bats made within the Main Development Site, the Potential Temporary Workers Accommodation Area, and the Potential Expansion Area for Temporary Workers Accommodation. The data, which is summarised in **Table 4.9**, includes records of bat roosts, albeit none of these are located within the Site.

Table 4.9: Bat records from within a 5km radius of the Site

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
All records							
Bat (species unconfirmed)	Habs Regs; WCA5	174	2002-2016	On Site	On Site	On Site	1.40 S
Pipistrellus sp.	Habs Regs; WCA5; LBAP	19	2009-2017	0.20 S	1.00 S	0.30 S	2.00 S
Common pipistrelle	Habs Regs; WCA5; LBAP	78	1996-2019	On Site	0.25 S	On Site	1.30 S
Soprano pipistrelle	Habs Regs; WCA5; SPI; LBAP	16	2005-2019	On Site	0.65 S	On Site	1.45 SE
Nathusius' pipistrelle	Habs Regs; WCA5	1	2018	1.50 S	2.00 S	1.50 S	3.10 S

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Plecotus sp.	Habs Regs; WCA5	2	2011-2016	3.20 N	4.00 N	4.00 S	2.30 N
Brown long-eared bat	Habs Regs; WCA5; SPI	23	1984-2014	0.28 W	0.30 W	0.10 W	0.95 SW
Myotis sp.	Habs Regs; WCA5	1	2019	3.19 N	4.50 NE	N/A	2.25 N
Daubenton's bat	Habs Regs; WCA5	3	1997-2018	1.50 S	2.00 S	1.50 S	3.10 S
Natterer's bat	Habs Regs; WCA5	9	2012-2018	1.00 S	1.30 S	0.65 S	2.35 S
Noctule	Habs Regs; WCA5; SPI	6	1984-2013	4.00 SW	4.20 NW	3.70 SW	4.20 NW

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Serotine	Habs Regs; WCA5	4	1985-2018	1.50 S	2.00 S	1.50 S	3.10 S
Roost records							
Bat (species unconfirmed)	Habs Regs; WCA5	5	2012-2015	0.22 S	0.97 SE	0.31 SE	1.99 S
Pipistrellus sp.	Habs Regs; WCA5; LBAP	5	2009-2015	0.22 S	0.97 SE	0.31 SE	1.99 S
Common pipistrelle	Habs Regs; WCA5; LBAP	3	2005-2012	0.17 S	0.92 SE	0.26 SE	1.94 S
Plecotus sp.	Habs Regs; WCA5	2	2011-2016	3.17 N	4.09 NE	4.12 SW	2.41 S
Brown long-eared bat	Habs Regs; WCA5; SPI	4	2011-2014	3.01 N	4.08 NE	4.07 SW	2.11 N

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Natterer's bat	Habs Regs; WCA5	3	2014	1.08 SW	1.36 S	0.78 S	2.41 S

*Key to status (refer to **Box 2.1** and **Box 2.2** for full details): Habs Regs = The Conservation of Habitats and Species Regulations 2017; WCA5 = Wildlife and Countryside Act 1981, Schedule 5; SPI = Species of Principal Importance; LBAP = Essex LBAP. N/A indicates that the record does not fall within the 5km search radius for this part of the Site.*

Otter

Relevant reports and publications

4.3.13 Surveys in 2008 (Ref. 3.16) indicated that otter was likely to be absent from the survey area, which was supported by similar negative findings from the Essex Otter Survey 2007 (Ref. 3.17). Otters have, however, been recovering across the county and the Essex Wildlife Trust reported sightings of otter from Bradwell in 2010 (Ref. 3.18).

Data supplied by EWTBRC and EFC in 2020

4.3.14 EWTBRC and EFC provided a single record of an otter, to the north of the River Blackwater. Otter was recorded approximately 4.5km north of the Indicative Zone for Marine Infrastructure. This is beyond the 5km search radius for all other parts of the Site.

Water Vole

Relevant reports and publications

4.3.15 Surveys carried out in 2008 (Ref. 3.19) confirmed that water voles were relatively widespread across the survey area, which covered part of the Main Development Site, although much of the habitat was noted to be suboptimal for water vole due to ditches drying out and becoming encroached by scrub; with the notable exception of habitat within the borrow dyke. Despite this, almost all ditches supported the species and it was concluded that a low population occupied the survey area. Within the context of Essex county, the Dengie Peninsula was concluded to be of county value for water voles and the borrow dyke provided an important dispersal corridor linking the ditch network on Site with that in the wider Essex landscape. The borrow dyke was also deemed critical to the survival of the on-site population, given the lower quality and potentially seasonal habitat provided by inland ditches.

Data supplied by EWTBRC and EFC in 2020

4.3.16 EWTBRC and EFC provided 79 records of water vole, including records from within the Main Development Site itself. Distances to the boundaries of each part of the Site are provided in **Table 4.10**.

Table 4.10: Water vole records from within a 5km radius of the Site

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the Indicative Main Development Site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Water vole	WCA5; SPI; LBAP	79	1996 - 2015	On Site	0.66 SW	0.07 SW	1.3 S

*Key to status (refer to **Box 2.1** and **Box 2.2** for full details): WCA5 = Wildlife and Countryside Act 1981, Schedule 5; SPI = Species of Principal Importance; LBAP = Essex LBAP.*

Other Mammals

Relevant reports and publications

4.3.17 No reports or publications relating specifically to other notable species of mammal have been reviewed as part of this study.

Data supplied by EWTBRC and EFC in 2020

4.3.18 EWTBRC and EFC returned records of four SPIs from within the 2km search radius. **Table 4.11** details the records relating to three of these in the context of the Site.

4.3.19 The fourth species recorded was red squirrel. All records for red squirrel relate to Mersea Island, where the species has recently been reintroduced. As such its range is restricted to the island and there is no potential for red squirrel to utilise habitats within the Site. This species is not considered further as part of the current assessment.

4.3.20 Records were also provided for marine mammals. These have not been considered further as it is beyond the scope of this assessment to consider marine-based receptors.

Table 4.11: Records of other notable mammals from within a 2km radius of the Site

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Harvest mouse	SPI	5	1995 -2011	On Site	1.05 E	0.87 SW	1.10 W
Hedgehog	SPI	11	1993 -2018	On Site	0.96 SE	0.55 E	1.86 S
Brown hare	SPI; LBAP	23	1994 - 2019	On Site	0.15 E	0.13 S	0.05 S

*Key to status (refer to **Box 2.1** and **Box 2.2** for full details): SPI = Species of Principal Importance; LBAP = Essex LBAP.*

Great Crested Newt

Relevant reports and publications

4.3.21 A desk-based study and Habitat Suitability Index (HSI) survey carried out in 2008 (Ref. 3.20) identified seven ponds and three ditches with low suitability to support great crested newt within part of the main development site. Of these, six received subsequent species-specific field survey effort, which concluded the likely absence of great crested newts. In general, the terrestrial and aquatic habitat within the 2008 survey area, now encompassed by the main development site, were considered to be of poor quality for great crested newt.

4.3.22 Natural England's Open Data Geoportal for great crested newt eDNA and HSI survey results for ponds surveyed for 'District Level Licensing' was consulted. No positive records from were returned within the 2km search radius.

Data supplied by EWTBRC and EFC in 2020

4.3.23 Six records of great crested newt provided by EWTBRC and EFC fall within 2km of the Site, details of which are provided in **Table 4.12**. There are no records from within the Site itself.

Table 4.12: Great crested newt records from within a 2km radius of the Site

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Great crested newt	Habs Regs; WCA5; SPI; LBAP	6	2005	0.42 S	1.26 SE	0.6 SE	N/A

*Key to status (refer to **Box 2.1** and **Box 2.2** for full details): Habs Regs = The Conservation of Habitats and Species Regulations 2017; WCA5 = Wildlife and Countryside Act 1981, Schedule 5; SPI = Species of Principal Importance; LBAP = Essex LBAP. N/A indicates that the record does not fall within the 2km search radius for this part of the Site.*

Identification of water bodies

4.3.24 Ten water bodies were identified within the Site boundary and another 17 within a 500 metre (m) radius, that were not separated from the Site by a barrier to amphibian dispersal (see **Figure 4.6, Appendix A**, for water body locations and reference numbers).

- Thirteen ponds within gardens of residential or private properties.
- Two (water body references 24 and 25) located within the woodland belonging to the Othona Community.
- Three (water body references 7, 13 and 26) located where a ditch widens and supports standing water.
- Three (water body references 6, 8 and 9) located within woodland.
- One (water body references 10) located within the Bradwell Quay Yacht Club.
- One (water body references 11) forms part of the water treatment works.
- Three (water body references 1, 2 and 3) located within open pasture and arable habitats.
- One (water body references 27) on the edge of a woodland copse.

4.3.25 The desk-based exercise also identified a network of ditches across the Site, which may provide aquatic habitat with the potential to support breeding great crested newt.

Common Toad

Relevant reports and publications

4.3.26 No reports or publications relating specifically to common toad have been reviewed as part of this study. The amphibian survey work completed in 2008 (Ref. 3.20) was targeted at establishing great crested newt presence or likely absence, however, all other amphibian species incidentally observed were reported. No records of common toad were made as part of that study.

Data supplied by EWTBRC and EFC in 2020

4.3.27 EWTBRC and EFC provided records of the SPI, common toad. All records identified were from north of the River Blackwater, 1.4km west of the Indicative Zone for Marine Infrastructure, which would act as a major barrier to amphibian dispersal, preventing toads from moving between those locations and the Site.

Reptiles

Relevant reports and publications

4.3.28 Surveys carried out in 2008 (Ref. 3.21) confirmed that four species of reptile were present within the Site, as follows:

- grass snake - low population;
- adder - low population;
- slow worm - low population; and
- viviparous lizard - good population.

4.3.29 Key areas of reptile habitat identified were on the sea wall and within semi-improved grassland to the south of the existing Bradwell Power Station.

Data supplied by EWTBRC and EFC in 2020

EWTBRC and EFC provided records of adder, grass snake, slow worm and viviparous lizard. The closest records of slow worm were within Tollesbury Wick Marshes located approximately 1.04km to the west of the Indicative Zone for Marine Infrastructure, which lies on the opposite side of the River Blackwater. Adder, viviparous lizard and grass snake were all recorded within the Site itself, as summarised in **Table 4.13**.

Table 4.13: Records of reptiles from within a 2km radius of the Site

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Adder	WCA5; SPI	13	2001 - 2017	On Site	0.12 W	0.22 N	On Site
Slow worm	WCA5; SPI	11	1994 - 2018	N/A	N/A	N/A	1.04 W
Viviparous lizard	WCA5; SPI	15	1993 - 2012	0.01 E	0.12 W	0.22 N	0.80 S
Grass snake	WCA5; SPI	7	1997 - 2018	0.01 E	N/A	N/A	1.39 E

*Key to status (refer to **Box 2.1** and **Box 2.2** for full details): WCA5 = Wildlife and Countryside Act 1981, Schedule 5; SPI = Species of Principal Importance. N/A indicates that the record does not fall within the 2km search radius for this part of the Site.*

Birds

Bradwell preliminary bird surveys 2007-2008

4.3.30 A 24-month continual programme of bird surveys was undertaken by Entec during 2007-2008 (Ref. 3.22 and Ref. 3.23) for the proposed nuclear new build at Bradwell and comprised of the following (all periods are inclusive).

- Intertidal surveys:
  - April 2007 to March 2008;
  - April and May 2008; and
  - September 2008 and March 2009.
- Daytime field surveys:
  - September 2007 to May 2008; and
  - September 2008 to March 2009.
- Nocturnal field surveys:
  - December 2007 to May 2008; and
  - October 2008 to March 2009.

4.3.31 Details of survey methods can be found in **Appendix D** and a complete peak count record of species recorded during the surveys can be found in **Table D.2** (**Appendix D**). The following conclusions were drawn from the survey data.

- Pewet Island (approximately 1km south-west of the Site):
  - used by potentially important congregations of roosting waders and wildfowl (peak count), including: dark-bellied brent goose (120 birds), dunlin (360), golden plover (3,000), knot (76), lapwing (1,500), oystercatcher (61), redshank (25), ringed plover (46) and shelduck (50); and
  - used as a breeding site by gulls, primarily black-headed gull (120 pairs in 2007) and occasionally by Mediterranean gull.
- Intertidal habitat adjacent to the Site:
  - the intertidal habitat adjacent to the Site (survey count sectors 2-5) was used by low numbers of waders and wildfowl;
  - species regularly recorded foraging on the intertidal habitat included: dark-bellied brent goose, redshank, grey plover, oystercatcher, sanderling,

turnstone, curlew and little egret, with more infrequent use by shelduck, knot and dunlin;

- recording count sector 5 (adjacent to the eastern fringes of the Site) provided the best opportunities (adjacent to the Site) for foraging waders and waterfowl on the intertidal mudflats and shoreline, and roosting sites in the saltmarsh; and
- areas of cockle shell spits along the Dengie peninsular have potential for breeding ringed plover, especially near Sales Point.

- Close inshore waters:
  - the inshore waters adjacent to the Site were regularly used by flocks of resting dark-bellied brent goose and foraging great crested grebe, and to a lesser extent red-breasted merganser;
  - very few red-throated diver were recorded foraging close inshore (i.e. within 500m);
  - large congregations of cormorant (occasionally exceeding 500 birds) were recorded foraging on the sea within 500 m of the high-water mark adjacent to the Site, and also further offshore;
  - regular use of the inshore waters adjacent to the Site by foraging and commuting breeding little tern and common tern; and
  - regular use of the inshore waters adjacent to the Site by commuting waders and wildfowl.
- Farmland within approximately 1km of the Site:
  - regular overwinter use of the farmland within the Site (and up to 1km from its boundary) by foraging and resting dark-bellied brent goose, lapwing, golden plover and curlew during the day; and
  - regular overwinter use of the farmland by foraging lapwing and golden plover at night.

Bradwell B Preliminary Ground Investigation Ecological Appraisal

4.3.32 An ecological appraisal of the Bradwell B Preliminary Ground Investigation (GI) works was undertaken in 2017 (Ref. 3.9). The study area for the appraisal (covering 183ha) overlaps considerably with that of the Site. The appraisal summarised the potential ecological constraints on the GI for different locations in the study area and identified the precautionary working practices that would be implemented to avoid or minimise adverse effects on ecological receptors, also minimising any risk of non-compliance with relevant nature conservation legislation. Results from the Phase 1 habitat survey and subsequent visits made to the study area for the appraisal,

identified the main crop types within the area in winter 2017-2018 to be ploughed land (subsequently sown with crops in spring), oil seed rape, lucerne and winter wheat.

4.3.33 During the breeding season, the waters offshore of Bradwell A power station were used on a regular basis by foraging little tern. Pewet Island supported a regionally important breeding colony of gulls, primarily black-headed gull but also Mediterranean gull. The farmland to the east of the power station supported numbers of breeding corn bunting (present throughout the year) and yellow wagtail that were important in terms of the county (Essex) populations, and the area also supported high numbers of breeding skylark, reed warbler and turtle dove.

4.3.34 During winter, potentially important numbers (in terms of local statutory designated site populations) of brent goose, ringed plover, lapwing, golden plover, redshank, sanderling, turnstone, dunlin and curlew were recorded foraging on intertidal areas between Bradwell Power Station and Sale Point and, or roosting on Pewet Island, with lapwing, golden plover and brent goose also recorded foraging on farmland primarily to the east of the Power Station. Potentially important numbers of cormorant, great crested grebe and red-breasted merganser were foraging close, offshore, together with congregations of resting brent goose at high tide. Hen harrier were recorded occasionally (infrequently) hunting over the farmland and intertidal areas.

4.3.35 Surveys of the mudflats to the south of Sale Point on the Dengie Flats in 2008-2009 revealed that the mudflats were used by important numbers of a wide range of wildfowl and wader species including brent goose, oystercatcher, ringed plover, knot, sanderling, dunlin, curlew, redshank, turnstone and grey plover. Offshore of Sale Point, congregations of red-throated diver and red-breasted merganser were also recorded, as well as commuting little tern in summer.

4.3.36 The Ecological Appraisal detailed that areas of cockle shell spits and saltmarsh along the Dengie Peninsula are utilised by waders as high tide roosts (Ref. 3.9). Species using the roosts include dunlin, ringed plover, grey plover, black-tailed godwit, knot, turnstone, curlew, redshank and spotted redshank. During the spring and summer months, areas of cockle shell spits utilised by breeding ringed plover and have the potential for breeding little tern. The adjacent mudflats are used by wildfowl and waders that appear as notified or qualifying features of the Blackwater Estuary, Dengie and Colne Estuary SPAs, Ramsar sites and SSSIs. During the highest tides, habitat on the landward side of the sea defence or the sea defence itself may be utilised by roosting waders as the saltmarsh becomes inundated by spring tides.

4.3.37 For dark-bellied brent geese, eelgrass remains a preferred food, especially in early winter, with marine algae and saltmarsh plants also important (Ref. 4.1). Saltmarsh grasses and succulents can also be important in late winter and spring when the preferred eelgrass and algae are depleted. The key inland feeding areas are fields of grass, autumn-sown cereals and oilseed rape. Such fields are used for a large proportion of the total feeding time; 87% in one study area in Essex (Ref. 4.2). Areas

for spring sown crops within the study area are ploughed in the autumn, with very limited areas of stubble remaining over winter. The crop mosaic within the study area provide a potential foraging resource (winter wheat and oil seed rape) for brent geese and as such form part of preferred feeding areas within the SPAs and functionally linked land.

4.3.38 Golden plover gather in flocks on cultivated bare earth, stubble, fallow and root crops, earthworm rich permanent pastures, coastal grazing marshes, saltmarshes and mudflats (Ref. 4.3). They frequently associate with lapwings, which they use to indicate rich food sources. Birds appear to prefer to feed on older, earthworm-rich permanent pastures during winter, but are also attracted to newly ploughed land in autumn (Ref. 4.4). In eastern England, where permanent pastures are scarce, the birds forage on sugar beet stubbles and winter cereals. Nocturnal surveys in Eastern England have found that up to 80% of the birds feed at night and often in areas rarely used in the day, such as in fields of oil seed rape (Ref. 4.5). Coastal habitats, ploughed land and flooded gravel pits are preferred for roosting. Given that golden plover will utilise a variety of arable field types, there is potential for them to utilise fields within the Site, albeit there will be a large amount of alternative and more suitable habitat in the surrounding area.

4.3.39 Curlew will feed on earthworms and larval and adult insects taken from adjacent agricultural land. They favour intertidal habitats and curlew densities are strongly correlated with the densities of their preferred ragworm prey in south-east England (Ref. 4.6), where flocks often forage and roost at high water. Curlew utilisation of habitats within the Site are therefore likely to be mainly at high tide periods, primarily for roosting. There are minimal areas of permanent grassland within the study area, it being predominantly arable land given over to wheat and lucerne. Therefore, it is unlikely that the study area would support notable numbers of curlew which are typically associated with grassland foraging habitats.

BTO WeBS data

4.3.40 WeBS core count data' was obtained for the Bradwell B Preliminary Ground Investigation Works (Ref. 3.9) from the British Trust for Ornithology (BTO), for the most recent five-year period available at the time (winter 2011-2012 to winter 2015-2016). This data consisted of the following count sectors combined:

- Bradwell Waterside to Sales Point (WeBS core count sector 25942); and
- North Dengie Flats (25941).

4.3.41 The combined area of these WeBS count sectors covers a much larger area than the coastline bordering the Site, extending approximately 1km to the west (25941) and 5km to the south (25942) of the Site and incorporating parts of both the Dengie and Blackwater Estuary SPAs. **Table D.1** in **Appendix D** shows the peak counts for each WeBS recording season (running from July to June of the following year).

4.3.42 Data for the current five-year period (2014-2019) will be requested from the BTO when available in June 2020 (when the 2019-2020 WeBS year ends). A request for

Low Tide count data has been submitted for Blackwater Estuary (2011-2012 and 2017-2018) and Dengie Flats (2008-2009).

Natural England Outer Thames Estuary SPA aerial survey

4.3.43 An offshore digital video aerial bird survey was carried out by Natural England in 2018 for the Outer Thames Estuary SPA (Ref. 3.27), and relevant results have been summarised.

- Red-throated diver was reported as the most abundant species of the now enlarged Outer Thames Estuary SPA. A population estimate of 22,280 birds was concluded from the 2018 aerial surveys which was 3.5 times greater than the notified population of the original SPA (6,466).
- Cormorant were found to show several density hotspots off Dengie National Nature Reserve (including 2-4 km offshore of the Site) and to the north, offshore from Walton-on-the Naze.
- Great crested grebe favoured the southern Kent coastal area. In the north, a scatter of records occurred around Aldeburgh (in Suffolk) during the second survey. Moderate to high densities of birds were however, recorded approximately 2-4 km offshore of the Site.
- Black-headed gull showed similar patterns in both survey rounds. Very few birds were seen in the north, with concentrations in the south close to the north-east Kent coast and around Southend-on-Sea and off Shoeburyness. Low densities of birds were recorded in that part of the southern survey area that lies 2-4 km offshore of the Site.
- Lesser black backed gull were rarely recorded on the first survey, but numbers strongly increased in the second survey with a widespread, scattered distribution of birds at low density. Low densities of birds were recorded in that part of the southern survey area that lies 2-4km offshore of the Site.

Additional reports and publications: red-throated diver

4.3.44 Results from Natural England's aerial surveys for the Outer Thames Estuary SPA found distribution of red-throated diver was similar in both surveys for the southern zone of the SPA (which encompasses the waters approximately 2km offshore of the Site, south to the north Kent coast), but densities showed a notable increase in waters either side of the shipping lanes and the London Array wind farm. Such distributions and concentrations, where birds are squeezed between areas of human activity, strongly suggests that the birds are undertaking displacement behaviour, while still favouring the area as a whole, they are being pushed away from some localities and clustering as a result (Ref. 3.27). High densities of red-throated diver were identified in the waters, 2-4km offshore of the Project Site. Thanet windfarm (Extension), in consultation with Natural England, amended its potential range of effect to 6.5km (for an area with an estimated peak abundance of 118 birds in March 2018) to reflect the distance at which a level of displacement

significantly greater than zero for red-throated diver could be detected being during the monitoring of the construction phase of the nearby London Array wind farm (Ref. 4.7).

4.3.45 Divers are widely accepted to avoid busy shipping lanes. The actual impacts on this species from construction activities (and therefore vessels) associated with the Proposed Development are currently difficult to accurately quantify; although there are some monitoring results from windfarms within the wider Outer Thames Estuary. At Kentish Flats (Extension) wind farm, red-throated diver occurred in relatively low numbers (2014-15 pre-construction baseline data), but records gathered in boat-based monitoring surveys post-construction (second winter) revealed a significant 76% decrease in encounter rate (0.55 to 0.13) (Ref. 4.8). At Thanet wind farm (which is approximately 8km from the Outer Thames Estuary SPA boundary) construction and operation were associated with reductions of 18% and 27%, respectively, in the numbers of red-throated divers using the site, through the displacement of approximately 18-20 individuals. Given the availability of similar alternative habitat in the wider area, this level of impact was not considered to be ecologically significant (Ref. 4.9).

Additional reports and publications: common tern and little tern

4.3.46 Historical surveys recorded regular use of the inshore waters adjacent to the Site by foraging and commuting common tern. The construction of Kentish Flats wind farm was found to have no evidence of change on common tern populations in the Outer Thames Estuary SPA from baseline data collected pre-construction and operation in 2002 to subsequent annual monitoring surveys up to 2008 (Ref. 4.10).

4.3.47 Little tern have bred most recently on great Cob Island c 2km across the Blackwater estuary from the Site. The current UK population was last estimated as 1,927 pairs (Ref. 4.11) and will be considered in favourable conservation status when numbers are stable or above 2,000 pairs. Whilst general trends suggest the population is gradually declining within Essex, the counties coastline still provides valuable feeding and breeding habitat in south-east England (Ref. 4.12). Blackwater Estuary SPA population was five breeding pairs based on a five-year peak mean from 2010 to 2014 with six pairs recorded in 2018 (Ref. 3.28). The little tern populations are known to be functionally linked across all three SPA sites in Essex and little tern es may appear in any of these three sites in any given year, in 2019, little tern breeding was only recorded on Horsey Island in Hamford Water, with the sites further south around the River Blackwater experiencing low numbers compared to 2018 (when the area produced 6 fledglings) (Ref. 3.28). Little tern populations are known to be functionally linked across all three SPA sites in Essex. The availability of an abundant food supply is critically important for successful breeding, adult fitness and survival and the overall sustainability of the population (Ref. 4.12).

4.3.48 No data was found regarding numbers of foraging little terns within Outer Thames Estuary wind farms, in both Natural England aerial survey records and wind farm ES and EIAs.

Data supplied by EWT and EFC in 2020

4.3.49 EWTBRC and EFC provided 14,693 records of birds for the period 2005 to 2020. The majority of species records have been recorded at the 1km grid square level of accuracy, meaning it is not possible to accurately pinpoint where the species were recorded, albeit it is noted that many of the records fall within sites designated for ornithological interest.

Fish

Relevant reports and publications

4.3.50 Ecological Appraisals undertaken in 2017 (Ref. 3.9) and 2020 (Ref. 3.10) reported two records of the SPI, European eel, occurring within the Main Development Site. No date was provided for these records.

4.3.51 The general trend for the European eel population in the Anglian region, reported as of 2010, was that it appeared to be declining, but that the dataset was generally deficient and may not be reliable (Ref. 3.29).

Data supplied by EWTBRC and EFC in 2020

4.3.52 No records of notable fish species were provided by EWTBRC or EFC.

Invertebrates

Relevant reports and publications

4.3.53 A survey of terrestrial and saltmarsh habitats within part of the Main Development Site was carried out in 2008 (Ref. 3.30). This fieldwork recorded seven SPIs, five Red Data Book and 31 Nationally Scarce invertebrate species. The SPI species recorded were:

- shaded broad-bar;
- latticed heath;
- small square-spot;
- rosy rustic;
- rustic;
- mottled rustic; and
- Campsicnemus magius (a fly).

4.3.54 It was concluded that habitats within statutory designations, incorporating the coastal strip (the borrow-dyke, sea-wall, foreshore and saltmarsh), supported invertebrate assemblages of high biodiversity conservation value. Other habitats

within the Main Development Site, but outside of the designated areas, were of lower value for invertebrate assemblages overall, but patches of scrub habitat and field drains did still support low numbers of notable species.

Data supplied by EWTBRC and EFC in 2020

4.3.55 EWTBRC and EFC provided over 2,000 records of invertebrate species. These are presented in full in Appendix F, with **Table 4.14** summarising those notable species records occurring within the 2km search radius since 2005.

Table 4.14: Notable invertebrate records from within a 2km radius of the Site

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Agrotera nemoralis	SPI; ExRDB (L)	1	2013	1.8 SW		1.59 S	
Atylotus latistriatus	NS, ExRDB (L)	1	2005 - 2018	1.46 S	1.91 S	1.32 S	
Autumnal rustic	SPI	1	2009				1.76 N
Blood-vein	SPI	1	2005 - 2015	1.60 S		1.42 S	
Brown-banded carder bee	SPI, ExRDB (L)	7	2005 - 2011	0.007 S			1.77 SE

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Catoptria verellus	ExRDB (L)	3	2005 - 2016	1.60 S		1.42 S	
Cinnabar	SPI	9	2005 - 2013				1.76 N
Crescent striped	ExRDB (L)	1	2005 - 2009				1.76 N
Dolicharthria punctalis	ExRDB (L)	1	2005 - 2009				1.76 N
Dusky-lemon sallow	SPI	1	2005 - 2009				1.76 N
Great green bush cricket	ExRDB (L)	3	2005 - 2009	1.69 SW	1.92 SW	1.38 SW	1.04 W
Green hairstreak	ExRDB (L)	2	2005 - 2017	1.60 S		1.42 S	

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Hairy dragonfly	ExRDB (L)	1	2005 - 2017				1.76 N
House cricket	ExRDB (L)	2	2010-2013	6.5 NE			
Kent black arches	ExRDB (L)	2	2005 - 2010	1.60 S		1.42 S	
Knot grass	S41	1	2005 - 2015	0.25 E			1.97 SE
L-album wainscot	ExRDB (L)	1	2005 - 2009				1.76 N
Large carder bee	SPI; ExRDB (L)	7	2005 - 2017				1.54 NW
Large tortoiseshell	ExRDB (L)	20	2005 - 2018	1.60 S		1.42 S	
Latticed heath	SPI	12	2005 - 2015	0.17 E		1.47 SQ	1.90 SE

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Lunar yellow underwing	SPI, ExRDB (L)	1	2005 - 2014	1.60 S		1.42 S	
Marbled white	ExRDB (L)	8	2005 - 2012	0.012 E	1.31 S	0.73 S	1.83 SE
Meloe proscarabaeus	SPI	7	2005 - 2012	0.080 N	0.026 SW	On Site	On Site
Mottled rustic	SPI	1	2005 - 2009				1.76 N
Oblique carpet	SPI , ExRDB (L)	2	2005 - 2014	1.60 S		1.42 S	
Pediasia aridella	ExRDB (L)	1	2005 - 2009				1.76 N
Red-necked footman	ExRDB (L)	1	2005 - 2014	1.46 S	1.91 S	1.32 S	

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Rest harrow	SPI, , ExRDB (L)	2	2005 - 2016	1.60 S		1.42 S	
Rosy rustic	SPI	1	2009				1.76 N
Ruddy darter	ExRDB (L)	3	2005 - 2013				1.76 N
Rustic	SPI	1	2009				1.76 N
Scarce emerald damselfly	ExRDB (L)	2	2005 - 2013				1.76 N
Schoenobius gigantella	ExRDB (L)	1	2005 - 2009				1.76 N
Shaded broad-bar	SPI	4	2005 - 2016	1.32 S		1.85 SE	1.76 N

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Shoulder-striped wainscot	SPI	1	2005 - 2009				1.76 N
Shrill carder bee	SPI, ExRDB (L)	12	2005 - 2011	On Site			0.5 e
Small heath	SPI	37	2005 - 2018	On Site	1.35 E	1.07 NE	On Site
Small red-eyed damselfly	ExRDB(L)	1	2005 - 2013				1.76 N
Striped snail	ExRDB(L)	1	2010	On Site			1.74 SE
Wall	S41, ExRDB(L)	3	2017 - 2018	0.13 E			1.84 SE S
Waved black	ExRDB (L)	1	2005 - 2014	1.46 S	1.61 S	1.32 S	

Species	Conservation Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
White admiral	SPI, ExRDB (L)	6	2005 - 2017	1.55 S		1.42 S	
White-letter hairstreak	SPI	12	2005 - 2017	0.12 E	1.91 S	1.33 S	1.83 SE

*Key to status (refer to **Box 2.1** and **Box 2.2** for full details): SPI = Species of Principal Importance; NS = Nationally Scarce; ExRDB = Essex Red Data Book (R = rare; L = listed, but with no further categorisation). N/A indicates that the record does not fall within the 2km search radius for this part of the Site.*

Records from designated site descriptions

4.3.56 The citation for the Blackwater Estuary Ramsar site listed 16 notable invertebrate species, meeting Criterion 2; '*the wetland supports vulnerable, endangered, or critically endangered species or threatened ecological communities*'. These include Essex Red Data Book species:

- a water beetle *Paracymus aeneus*;
- the beetles Baris scolopacea, Philonthus punctus, Graptodytes bilineatus and Malachius vulneratus;
- scarce emerald damselfy;
- the flies Aedes flavescens, Erioptera bivittata, Hybomitra expollicata, Campsicemus magius and Myopites eximia;
- the spiders Heliophanus auratus, Euophrys browningi and Trichopterna cito; and
- the moths Idaea ochrata and Malacosoma castrensis.

4.3.57 A further three notable species are listed under the citation for the Dengie Ramsar site:

- a weevil Baris scolopacea;
- a horsefly Atylotus latistriatus; and
- a jumping spider *Euophrys browningi*.

4.3.58 Within the Crouch and Roach Estuaries Ramsar site citation, four additional notable invertebrate species are listed:

- a shorefly Parydroptera discomyzina;
- a soldier fly Stratiomys singularior;
- a horsefly Hybomitra expollicata; and
- a moth Eucosoma catoprana.

Legally Controlled Species

Relevant reports and publications

4.3.59 During field survey work undertaken in 2017 (Ref. 3.9), incidental observations of non-native, invasive species were recorded. Japanese rose was reported within ornamental planting around the existing Bradwell Nuclear Power Station (Bradwell A) car park and on the coast.

Data supplied by EWTBRC and EFC in 2020

4.3.60 EWTBRC and EFC provided several records of legally controlled species, shown in **Table 4.15**. All except one of the grid references provided for these records was in a four-digit format, therefore an exact location cannot be determined, however, it does identify the grid square, indicating whether the species is likely to occurs within, or outside of the Site boundary.

Table 4.15: Records of legally controlled species from within a 2km radius of the Site

Species	Controlled Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Plants							
Canadian waterweed	WCA9	4	1996 – 2005	0.47 E	N/A	1.59 S	1.95 SE
Curly waterweed	WCA9	4	1998 - 2005	On Site	0.36 E	1.08 NE	0.63 S
Japanese knotweed	WCA9	5	1998	On Site	0.53 SE	0.28 E	1.46 S
Japanese rose	WCA9	9	1996 - 2016	0.16 N	1.00 NE	2.00 NE	On Site
New Zealand pigmyweed	WCA9	4	1998 - 1999	On Site	0.36 E	1.06 NE	0.63 S

Species	Controlled Status	No. of records	Date range of records	Approximate distance (km) and direction from the indicative main development site	Approximate distance (km) and direction from the Potential Temporary Workers Accommodation Area	Approximate distance (km) and direction from Potential Expansion Area for Temporary Workers Accommodation	Approximate distance (km) and direction from Indicative Zone for Marine Infrastructure
Parrot's-feather	WCA9	5	1989 - 2005	0.47 E	N/A	1.59 S	1.95 SE
Animals							
Canada goose	WCA9	24	2013 - 2018	On Site	0.2 NW	0.30 NW	0.50 S
Chinese muntjac	WCA9	19	2008 - 2015	1.29 SW	1.53 SW	0.96 S	1.40 W
Ruddy duck	WCA9	39	2013 - 2018	N/A	N/A	N/A	1.10 W
Slipper limpet	WCA9	5	1997 - 2014	0.16 N	1.00 NE	2.00 NE	On Site
Oak processionary	ExRDB (L)	1	2005 - 2014	1.60 S	1.60 S		

*Key to status (refer to **Box 2.1** and **Box 2.2** for full details): WCA9 = Wildlife and Countryside Act 1981, Schedule 9. N/A indicates that the record does not fall within the 2km search radius for this part of the Site.*

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APPENDIX A
FIGURES

Figure 1.1 The Site

Figure 4.1 Sites of international value with statutory designation primarily for ornithological interest, within and up to a 20 km radius around the Site

Figure 4.2 Sites of national value with statutory designation primarily for ornithological interest, within and up to a 10 km radius around the Site

Figure 4.3 Sites with statutory designation primarily for non-ornithological features, within and up to a 2 km radius around the Site

Figure 4.4 Sites with non-statutory designation and Habitats of Principal Importance, within and up to a 2 km radius around the Site

Figure 4.5 Location of bat roost records, within and up to a 5 km radius around the Site

Figure 4.6 Water bodies identified within and up to a 500 m radius around the Site

598000 599000 600000 601000 602000 603000 604000

211000 210000 209000 208000 207000

N

North Channel
Virley Channel
Little Cob Island
South Channel
Great Cob Island
The Nass
Quarters Spit
River Blackwater
Shinglehead Point
Mean Low Water
Marshes
CP
98
99
00
01
02
03
04
10
11
09
08
07
Bradwell Nuclear Power Station
Electricity Switching Station
Weymarks Farm
Irrigation Reservoirs
Pp Ho
Community Settlement
Chapel of St Peter on the Wall
OTHONA ROMAN FORT
Tip Head
Salet Point
Bradwell Waterside
Pewet Island
Airfield (disused)
Downhall Farm
Playing Field
War Meml
Curds Grove
East Hall Farm
Caravan Park
Eastlands
East Hall
Munkins Farm
ROMAN ROAD
Marina
B1021
Trusses Road
Down Hall
Beveralls
Westwick Farm
Woodyards
Down Westwick
East End
BRADWELL-ON-SEA CP
Bradwell Creek
Waterside Road
Cemy
Blackberry Grove
Sch
Bradwell on Sea
Bradwell Lodge
Hockley
Bacons
Delameres Farm
Orplands
Kennel Barn
Bradwell Marshes
Bradwell Marsh Wind Farm
St Peter's Way
Gunners Creek

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure

0 200 400 600 800 1,000 1,200 m

Scale at A3:1:20,000

BRADWELL B PROJECT
BIODIVERSITY DESK STUDY REPORT

Figure 1.1
The Site

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0377

580000 585000 590000 595000 600000 605000 610000 615000 620000 625000

230000 225000 220000 215000 210000 205000 200000 195000 190000

N

Colne Estuary (Mid-Essex Coast Phase 2) SPA
Colne Estuary (Mid-Essex Coast Phase 2) Ramsar

Abberton Reservoir SPA
Abberton Reservoir Ramsar

Blackwater Estuary (Mid-Essex Coast Phase 4) SPA
Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar

Dengie (Mid-Essex Coast Phase 1) SPA
Dengie (Mid-Essex Coast Phase 1) Ramsar

Outer Thames Estuary SPA

Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) Ramsar
Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) SPA

Foulness (Mid-Essex Coast Phase 5) SPA
Foulness (Mid-Essex Coast Phase 5) Ramsar

Colchester
Braintree
Witham
Maldon
Southminster
Rochford
Thundersley
South Benfleet
Clacton-on-Sea
West Mersea

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- 20km study area
- Ramsar site
- Special Protection Area (SPA)

0 2,000 4,000 6,000 8,000 m

Scale at A3:1:160,000

BRADWELL B PROJECT
BIODIVERSITY DESK STUDY REPORT

Figure 4.1
Sites of international value with statutory designation primarily for ornithological interest, within and up to a 20 km radius around the Site

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0314

590000 595000 600000 605000 610000 615000

220000 215000 210000 205000 200000 195000

N

Abberton Reservoir SSSI

Colne Estuary SSSI

Blackwater Estuary SSSI

Sandbeach Meadows SSSI

Dengie SSSI

Abberton Reservoir

Brightlingsea

A133

A133

Mersea Island

West Mersea

aldon

Ray Sand Channel

Whitaker Channel

Southminster

Bridgemarsh Island

Burnham-On-Crouch

Foulness Sands

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- 10km study area
- Site of Special Scientific Interest (SSSI)

0 1,000 2,000 3,000 4,000 5,000 6,000 m

Scale at A3:1:100,000

BRADWELL B PROJECT
BIODIVERSITY DESK STUDY REPORT

Figure 4.2
Statutory designated sites of national value with ornithological qualifying features within and 10km around the Site

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0315

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- 2km study area
- National Nature Reserve (NNR)
- Special Area of Conservation (SAC)

0 200 400 600 800 1,000 1,200 1,400 1,600 1,800 m

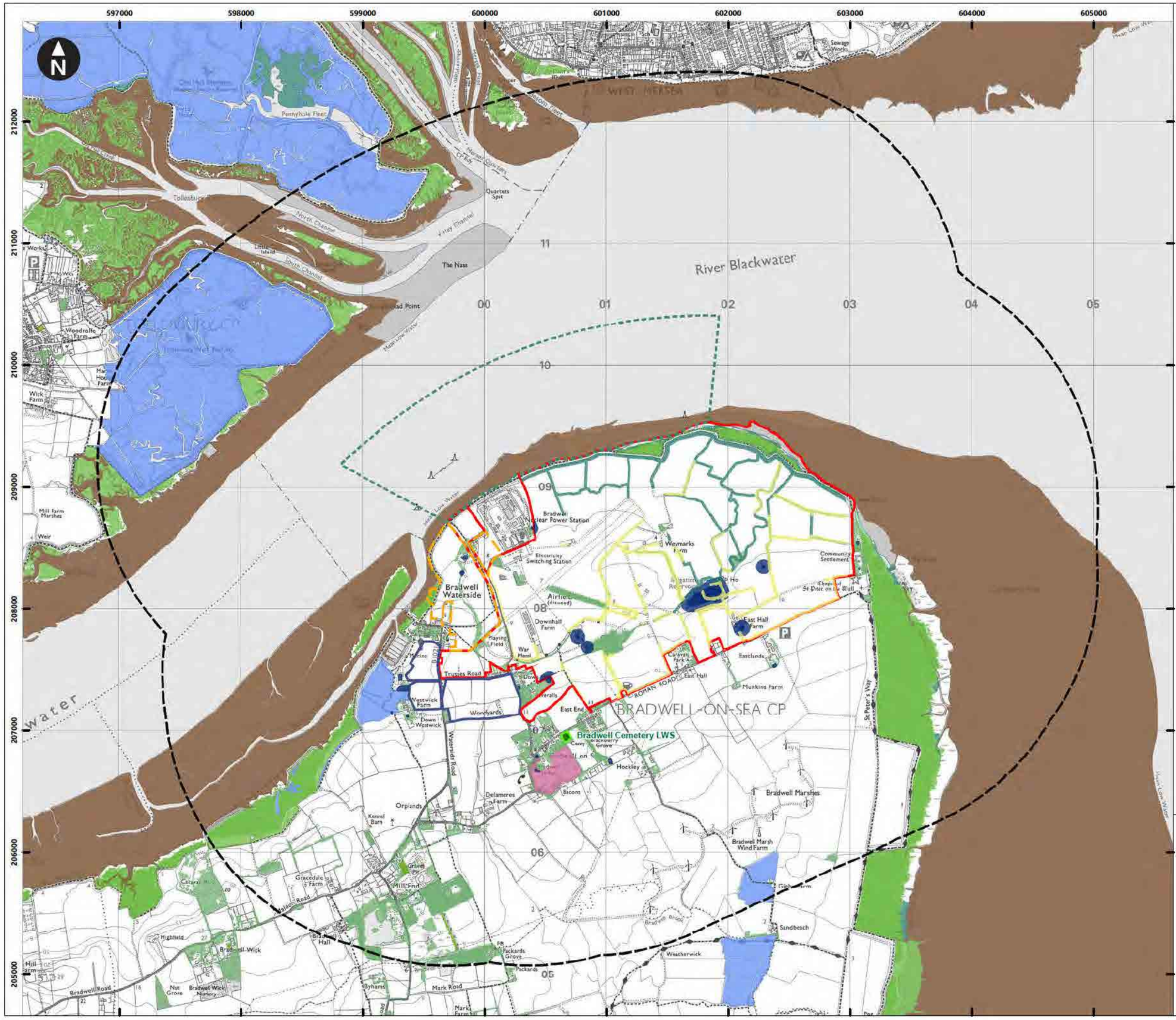
Scale at A3:1:30,000

BRADWELL B PROJECT
BIODIVERSITY DESK STUDY REPORT

Figure 4.3
Sites with statutory designation primarily for non-ornithological features, within and up to a 2 km radius around the Site

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0316



Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- 2km study area
- Local Wildlife Site (LWS)

Habitats of Principal Importance

- Coastal and floodplain grazing marsh
- Coastal saltmarsh
- Coastal vegetated shingle
- Hedgerows
- Inter-tidal mudflats
- Lowland mixed deciduous woodland
- Ponds
- Reedbeds
- Traditional orchard
- Wood-pasture and parkland

0 200 400 600 800 1,000 1,200 1,400 1,600 1,800 m

Scale at A3:1:30,000

BRADWELL B PROJECT
BIODIVERSITY DESK STUDY REPORT

Figure 4.4
Sites with non-statutory designation and Habitats of Principle Importance, within and up to a 2 km radius around the Site

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0317

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure

Bat roosts (by record accuracy)

- 1 m
- 10 m
- 100 m
- 1000 m

0 500 1,000 1,500 2,000 2,500 m

Scale at A3:1:45,000

BRADWELL B PROJECT
BIODIVERSITY DESK STUDY REPORT

Figure 4.5
Bat roost records from within a 5 km radius of the Site

DRAWN: **S.G.**
DATE: **JUN 2020**

41843-WOOD-0378

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- 500m search area
- Ditches
- Standing water bodies

0 200 400 600 800 1,000 m

Scale at A3:1:18,215

BRADWELL B PROJECT
BIODIVERSITY DESK STUDY REPORT

Figure 4.6
Water bodies identified within and up to a 500 m radius around the Site

DRAWN: **S.G.**
DATE: **JUN 2020**

41843-WOOD-0325

NOT PROTECTIVELY MARKED

APPENDIX B
RELEVANT LEGISLATION

Protected sites

This refers to wildlife sites that are afforded legal protection in England by virtue of being listed in the following principle statutes:

- The Wildlife and Countryside Act 1981 (as amended) – sites designated and protected at the national level;
- Conservation of Habitats and Species Regulations 2010 (as amended) – sites designated and protected at the European level.

There are two administrative levels of protection: European and National (in this context, national meaning England). European designated sites are protected at the European AND national level, whilst national designated sites refers to protection solely at the national level.

The various designation acronyms and associated legislation under which they are designated and protected are detailed in **Box B.1**.

Box B.1: Details of Statutory Sites		
Special Area of Conservation	SAC	Designated under the EU Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora, and implemented in the UK through the Conservation of Habitats and Species Regulations 2010 (as amended), and the Conservation (Natural Habitats, & c.) Regulations (Northern Ireland) 1995 (as amended). In 1992 the European Community adopted Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (EC Habitats Directive). In the UK the Directive has been transposed into national laws by means of the Conservation (Natural Habitats, & c.) Regulations 1994 (as amended). The provisions of the Directive require Member States to introduce a range of measures including the protection of habitats and species listed in the Annexes. Each Member State is required to prepare and propose a national list of Sites for evaluation in order to form a European network of Sites of Community Importance (SCIs). Once adopted, these are designated by Member States as Special Areas of Conservation (SACs), and along with Special Protection Areas (SPAs) classified under the EC Birds Directive, form a network of protected areas known as Natura 2000.
Special Protection Area	SPA	Designated under EU Council Directive 79/409/EEC on the Conservation of Wild Birds (the 'old Wild Birds Directive') and Directive 2009/147/EC on the Conservation of Wild Birds (the 'new Wild Birds Directive, which repeals the 'old Wild Birds Directive'), and protected by Article 6 of Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora. These directives are implemented in the UK through the Wildlife & Countryside Act 1981 (as amended), the Conservation of Habitats and Species Regulations 2010 (as amended), the Wildlife (Northern Ireland) Order 1985, the Nature Conservation and Amenity Lands (Northern Ireland) Order 1985 and The Conservation (Natural Habitats, &C.) (Northern Ireland) Regulations 1995 (as amended) and the Offshore Marine Conservation (Natural Habitats & c.) Regulations 2007. The European Community meets its obligations for bird species under the Bern Convention and Bonn Convention by means of the Council Directive 79/409/EEC on the conservation of wild birds (the 'Birds Directive'). The Directive provides a framework for the conservation and management of, and human interactions with, wild birds in Europe. The main provisions of the Directive include the identification and classification of Special Protection Areas for rare or vulnerable species listed in Annex I of the Directive, as

Box B.1: Details of Statutory Sites		
		well as for all regularly occurring migratory species, paying particular attention to the protection of wetlands of international importance (Article 4). Together with Special Areas of Conservation (SACs) designated under the Habitats Directive, SPAs form a network of pan-European protected areas known as Natura 2000.
Ramsar		The Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention or Wetlands Convention) was adopted in Ramsar, Iran in February 1971. The UK ratified the Convention in 1976. In the UK Ramsar sites are generally underpinned by notification of these areas as Sites of Special Scientific Interest (SSSIs) (or Areas of Special Scientific Interest (ASSIs) in Northern Ireland). Ramsar sites therefore receive statutory protection under the Wildlife & Countryside Act 1981 (as amended), and the Nature Conservation and Amenity Lands (Northern Ireland) Order 1985. However, as a matter of policy the Governments in England, Scotland and Wales extend the same protection to listed Ramsar sites in respect of new development as that afforded to SPAs and SACs.
Site of Special Scientific Interest	SSSI	Originally designated under the National Parks and Access to the Countryside Act 1949, subsequently extended such that the Wildlife and Countryside Act (1981)(as amended), the Nature Conservation (Scotland) Act 2004 and the Environment (Northern Ireland) Order 2002 form the primary legislation according to location within the UK. These Sites include the best examples of our natural heritage, wildlife habitats, geological features and landforms. Sites that are internationally important are also designated as SACs and SPAs. The national suites of Sites providing statutory protection for flora, fauna, or geological or physiographical features are designated as Sites of Special Scientific Interest (SSSIs).
National Nature Reserve	NNR	Also originally designated under the National Parks and Access to the Countryside Act 1949 (by the Amenity Lands Act (Northern Ireland) 1965 in Northern Ireland), in practice all NNRs are also SSSIs. It is this underlying designation which gives NNRs their strong legal protection. The majority also have European nature conservation designations. Natural England is the body empowered to declare NNRs in England and manages about two thirds of England's NNRs, whilst the remaining third are managed by organisations approved by Natural England; for example, National Trust, the Forestry Commission, RSPB, many Wildlife Trusts and Local Authorities.

Box B.1: Details of Statutory Sites		
Local Nature Reserve	LNR	Also originally designated under the National Parks and Access to the Countryside Act 1949, responsibility for designation now lies with local authorities in consultation with the statutory authorities. Receives indirect protection via local byelaws which aim to manage access. LNRs are of local, but not necessarily national, importance. LNRs are almost always owned by local authorities, who often pass the management of the LNR onto county Wildlife Trusts or other local environmental bodies. LNRs also often have good public access and facilities.

Protected Species

Many species of animal and plants receive some degree of legal protection through the following statutes:

- The Wildlife and Countryside Act 1981 (as amended) – species protected at the national level;
- Conservation of Habitats and Species Regulations 2010 (as amended) – species protected at the European level.

There are therefore two administrative levels of protection: European and National (in this context, national meaning England). 'European Protected Species' (EPS) are protected at the European AND national level, whilst 'Nationally Protected Species' are protected solely at the National level.

For protected animals, the difference between the levels of protection between species or species groups is subtle. In some cases, the animal AND its habitat where it resides (seeks shelter, refuge, protection and where it breeds) is protected. For other animal species it is only the animal that is protected, and this protection can be full or partial. Therefore understanding the subtle differences in the afforded protection is vital for ensuring that offences are not committed. For the purposes of this study, the specific protection afforded to certain species or species groups are detailed in **Boxes B.2-B.6** inclusive.

Box B.2: Legal Protection Afforded to European Protected Species (e.g. bats, otters, great crested newts)

These species and species groups (including all British bats) are listed in Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 of the Conservation of Habitats and Species Regulations 2010 (as amended). They are afforded full protection under Section 9(4) of the Act and Regulation 41 of the Regulations. These make it an offence, *inter alia*, to:

- Deliberately capture, injure or kill any such animal;
- Deliberately disturb any such animal, including in particular any disturbance which is likely;
  - to impair its ability to survive, breed, or rear or nurture their young;
  - to impair its ability to hibernate or migrate;
  - to affect significantly the local distribution or abundance of that species;
- Damage or destroy a breeding site or resting place of any such animal;

Box B.2: Legal Protection Afforded to European Protected Species (e.g. bats, otters, great crested newts)

- Intentionally or recklessly disturb any of these animals while it is occupying a structure or place that it uses for shelter or protection (for bats this is taken to mean all bat roosts whether bats are present or not); or
- Intentionally or recklessly obstruct access to any place that any of these animals uses for shelter or protection.

In addition, five British bat species are listed on Annex II of the Habitats Directive. These are:

- greater horseshoe bat;
- lesser horseshoe bat;
- Bechstein's bat;
- barbastelle; and
- greater mouse-eared bat.

In certain circumstances where these species are found the Directive requires the designation of Special Areas of Conservation (SACs) by EC member states to ensure that their populations are maintained at a favourable conservation status. Outside SACs, the level of legal protection that these species receive is the same as for other bat species.

Box B.3: Legal Protection Afforded to Water Vole

Water vole is listed on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and is now afforded full protection under Section 9 of this Act. The Act makes it an offence, *inter alia*, to:

- Intentionally or recklessly damage, destroy or obstruct the access to any place that a water vole uses for shelter or protection;
- Intentionally or recklessly disturb a water vole while it is occupying a structure or place that it uses for shelter or protection;
- Intentionally kill, injure or take a water vole.

Box B.4: Legal Protection Afforded to Breeding Birds

With certain exceptions (some species, such as game birds, are exempt in certain circumstances), all wild birds, their nests and eggs are protected by Section 1 of the Wildlife and Countryside Act 1981 (as amended). Therefore, it is an offence, *inter alia*, to:

- Intentionally kill, injure or take any wild bird;
- Intentionally take, damage or destroy the nest of any wild bird while it is in use or being built;
- Intentionally take or destroy the egg of any wild bird.

Bird species listed on Schedule 1 of the Act receive further protection, thus for these species it is also an offence to:

- Intentionally or recklessly disturb any bird while it is nest building, or is at a nest containing eggs or young;
- Intentionally or recklessly disturb the dependent young of any such bird.

Box B.5: Legal Protection Afforded to Reptiles

The four widespread species of reptile that are native to Britain, namely viviparous lizard, slow worm, adder and grass snake, are listed in Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and are afforded limited protection under Section 9 of this Act. This makes it an offence, *inter alia*, to:

- Intentionally kill or injure any of these species.

The other native species of British reptile (sand lizard and smooth snake) receive a higher level of protection under the The Conservation of Habitats and Species Regulations 2017 and (in England and Wales only) the Wildlife and Countryside Act 1981 (as amended). However, the distribution of these species is restricted to only a very few sites.

Box B.6: Legal Protection Afforded to Badger

The Protection of Badgers Act 1992 consolidates previous legislation (including the Badgers Acts 1973 and 1991 Badgers (Further Protection) Act 1991). It makes it an offence to:

- Kill, injure or take a badger;

Box B.6: Legal Protection Afforded to Badger

- Attempt to kill, injure or take a badger; and
- To damage or interfere with a sett.

The 1992 Act defines a badger sett as "*any structure or place which displays signs indicating current use by a badger*".

APPENDIX C
CONFIDENTIAL BADGER DATA

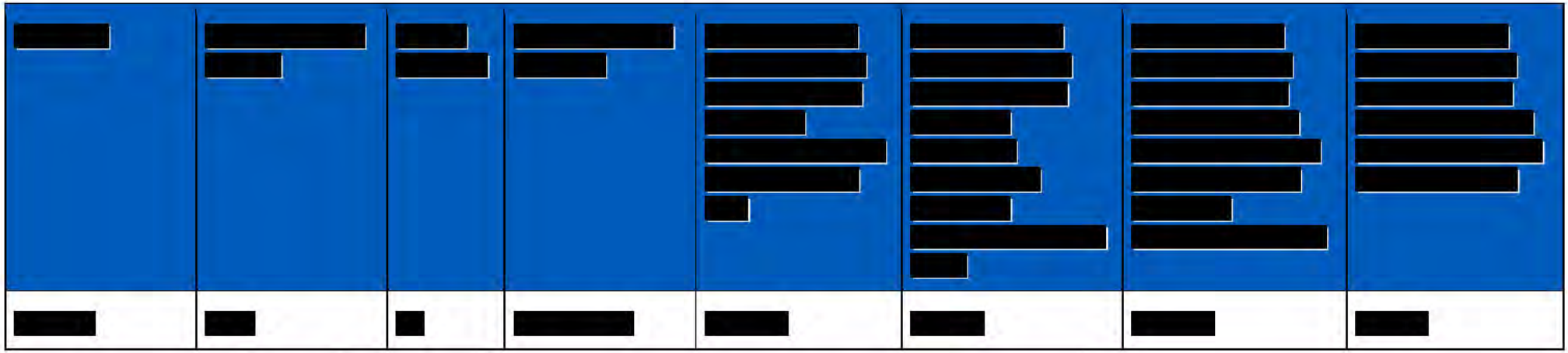
[redacted]

[redacted]

[redacted]

[redacted]

[redacted]



APPENDIX D
ORNITHOLOGY DATA

WeBs data

Table D.1: WeBS core count data: peak counts for count sectors 25941 and 25942 combined

Species	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Avocet	0	0	1	0	0
Bar-tailed godwit	2,360	1,600	550	600	1,400
Black-headed gull	2,020	1,143	1,460	1,080	1,043
Black-tailed godwit	20	0	4	8	1
Brent goose (dark-bellied)	1,793	987	1,116	2,067	1,710
Common tern	22	1	3	6	5
Coot	9	8	9	20	5
Cormorant	19	8	32	14	48
Curlew	120	126	125	450	150
Dunlin	5,700	4,250	2,540	3,360	6,750
Gadwall	0	1	3	3	2
Golden plover	6,900	6,500	5,750	10,200	20,000
Goldeneye	0	0	0	0	0
Great crested grebe	6	1	0	9	0
Greenshank	0	3	0	1	0

Species	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Grey plover	2,000	3,650	4,530	2,880	985
Knot	6,900	13,800	7,500	9,100	12,800
Lapwing	2,010	2,870	317	4,300	1,200
Little egret	32	28	33	50	34
Little grebe	2	4	1	2	2
Little tern	16	0	1	2	2
Mediterranean gull	1	0	2	1	4
Mute swan	2	2	3	7	0
Oystercatcher	2,000	1,300	2,700	2,250	875
Pintail	78	100	31	125	250
Pochard	5	5	3	5	0
Redshank	725	250	300	325	480
Red-throated diver	133	44	4	800	3
Ringed plover	615	33	25	54	75
Ruff	0	0	0	0	0
Sanderling	26	6	9	20	116
Sandwich tern	24	0	5	2	2
Shelduck	160	340	44	347	219
Shoveler	0	5	1	26	1
Spotted redshank	1	0	0	0	0
Teal	32	26	70	330	30

Species	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Tufted duck	1	4	2	0	0
Turnstone	70	92	43	130	50
Water rail	0	1	0	0	0
Whimbrel	19	12	6	17	13
Wigeon	78	140	264	595	175

Entec field surveys 2007-09

Intertidal surveys

The intertidal bird surveys were undertaken from five vantage point locations (VPs), selected to cover all areas of shoreline within 1km of the Preliminary Works Area for the proposed new build at the time. The areas surveyed from each VP are referred to as Count Sectors 1-5 respectively. Count Sectors 2-5 covered the entire coastline adjacent to the Main Development Site.

During each survey day, a series of 45-minute counts were undertaken from each VP by two surveyors working in tandem over an approximate 6-hour period. During each 45-minute count, all waders, wildfowl and seabirds present on or flying over the intertidal area and inshore waters up to 500m from the observer were systematically recorded. In addition to identifying and mapping all species present and recording their numbers, information regarding the activity of the birds (e.g. foraging, roosting, loafing, commuting, etc.), distance from the observer and direction of flight were also recorded. One or two survey days were completed each week over the survey period. A total of 100 hours of survey was completed from each VP from August 2007 to March 2009 inclusive.

Daytime field surveys

In order to identify any significant concentrations of birds that might be using fields adjacent or close to the new build for foraging, loafing or roosting, field-by-field (walkover) surveys were undertaken during the daytime within the proposed permanent site footprint and temporary construction area (and within 1km of its boundaries). These were carried out as instantaneous counts, recording a snapshot of the birds present within each field at the time it was surveyed. The surveys entailed scanning the fields from suitable vantage points and recording the birds within them. Each field was given a unique identification number, which during each survey was logged onto a recording sheet, together with details of the species seen, their numbers and activity (e.g. foraging, loafing, roosting, etc.). The habitat and crop types in each of the fields in which birds were seen were also recorded on each visit. Although all species were recorded during the surveys, particular emphasis was given to qualifying and notified species of the Blackwater Estuary, Dengie or Colne Estuary Ramsar,

SPA and/or SSSIs. A minimum of once monthly survey visits (4-5 surveys per month from December 2007) were completed during the survey periods: September 2007 to May 2008 inclusive and from September 2008 to March 2009 inclusive.

Nocturnal field surveys

In addition to the daytime field surveys, nocturnal walkover surveys were also carried out within approximately 1km of the PWA/SACC. However, due to the limited effectiveness of even the most sensitive night vision equipment, these nocturnal field surveys were primarily aimed at identifying any major concentrations of birds using the upper intertidal and adjacent arable fields at night for feeding, loafing or roosting. The purpose of the surveys was also to identify whether birds were using the upper intertidal areas differently at night when human disturbance was less. These nocturnal field surveys entailed scanning the fields using highly sensitive night vision equipment, from suitable vantage points located along a predetermined route. During each survey, the numbers of each bird species and unique field identification number were recorded, together with the activity of the birds (e.g. foraging, roosting, etc.). All species were recorded, but with particular emphasis on waders and wildfowl. A survey route was chosen to cover a cross-section of all pertinent habitats, including those areas that were considered likely to contain waders and wildfowl, such as the seawall, wet flushes and potential grazing habitat for geese, and taking into account those areas that had so far been productive during the daytime field surveys.

Due to the limited effectiveness of even the most sensitive night vision equipment, which was only really useful with good background light, where possible, nocturnal visits were carried out within a week of full moon to increase the chances of surveyors locating concentrations of birds. Two survey visits (of the entire survey area) were undertaken each month during the survey periods: December 2007 to May 2008 inclusive and from October 2008 to March 2009 inclusive.

Table D.2: Peak counts of species recorded during Entec surveys (2007-2009)

Species	Survey Period	CS1	CS2	CS3	CS4	CS5	Daytime Field Surveys	Nocturnal Field Surveys
Avocet	2008/09	0	0	0	0	0	0	0
Avocet	2007/08	7	0	0	2	0	0	0
Bar-tailed godwit	2008/09	0	0	0	0	0	0	0
Bar-tailed godwit	2007/08	4	0	0	0	0	0	0
Black-tailed godwit	2008/09	0	0	0	0	0	0	0
Black-tailed godwit	2007/08	0	0	0	0	0	0	0
Black-headed gull	2008/09	110	30	550	1,600	300	500	0
Black-headed gull	2007/08	200	600	440	250	161	152	0
Brent goose (dark-bellied)	2008/09	80	65	35	35	51	70	0

Species	Survey Period	CS1	CS2	CS3	CS4	CS5	Daytime Field Surveys	Nocturnal Field Surveys
Brent goose (dark-bellied)	2007/08	120	369	432	420	300	300	0
Common tern	2008/09	9	8	7	0	11	0	0
Common tern	2007/08	11	83	20	21	13	0	0
Cormorant	2008/09	600	500	1,050	0	2	2	0
Cormorant	2007/08	3	55	2	207	1	0	0
Curlew	2008/09	4	2	2	0	1	85	2
Curlew	2007/08	6	1	4	2	1	131	0
Dunlin	2008/09	205	0	0	21	533	0	0
Dunlin	2007/08	360	60	0	16	0	0	0
Gadwall	2008/09	0	0	0	0	0	6	0
Gadwall	2007/08	0	0	0	0	0	0	0

Species	Survey Period	CS1	CS2	CS3	CS4	CS5	Daytime Field Surveys	Nocturnal Field Surveys
Golden plover	2008/09	2	0	0	0	1	609	150
Golden plover	2007/08	3,000	0	0	0	0	1,000	31
Goldeneye	2008/09	0	0	0	0	0	0	0
Goldeneye	2007/08	0	0	0	0	0	0	0
Great crested grebe	2008/09	40	4	204	60	63	2	0
Great crested grebe	2007/08	26	4	2	3	43	0	0
Grey plover	2008/09	3	0	5	3	186	0	0
Grey plover	2007/08	11	1	6	3	1	0	0
Hen harrier	2008/09	0	0	0	0	1	2	0
Hen harrier	2007/08	0	0	0	0	0	1	0

Species	Survey Period	CS1	CS2	CS3	CS4	CS5	Daytime Field Surveys	Nocturnal Field Surveys
Knot	2008/09	0	0	0	0	140	0	0
Knot	2007/08	76	0	0	0	0	0	0
Lapwing	2008/09	800	0	1	0	0	969	141
Lapwing	2007/08	1,500	0	0	0	0	668	71
Lesser black-backed gull	2008/09	25	12	2	0	1	5	0
Lesser black-backed gull	2007/08	11	0	1	3	0	1	0
Little tern	2008/09	10	9	10	0	6	0	0
Little tern	2007/08	53	28	8	7	34	0	0
Mediterranean gull	2008/09	0	0	2	0	1	2	0
Mediterranean gull	2007/08	2	0	0	0	0	0	0

Species	Survey Period	CS1	CS2	CS3	CS4	CS5	Daytime Field Surveys	Nocturnal Field Surveys
Oystercatcher	2008/09	6	2	10	4	4	0	1
Oystercatcher	2007/08	61	3	13	4	3	1	1
Pintail	2008/09	0	0	0	0	0	6	0
Pintail	2007/08	0	0	0	0	0	0	0
Pochard	2008/09	0	0	0	0	0	2	0
Pochard	2007/08	0	0	0	0	0	0	0
Redshank	2008/09	24	1	2	4	9	27	10
Redshank	2007/08	25	10	10	9	13	25	5
Ringed plover	2008/09	15	0	2	11	2	1	1
Ringed plover	2007/08	46	7	3	6	7	0	4
Sanderling	2008/09	0	0	11	14	13	0	0

Species	Survey Period	CS1	CS2	CS3	CS4	CS5	Daytime Field Surveys	Nocturnal Field Surveys
Sanderling	2007/08	0	0	6	13	11	0	0
Shelduck	2008/09	50	0	0	0	0	0	0
Shelduck	2007/08	6	0	0	0	2	2	0
Shoveler	2008/09	0	0	0	0	0	4	0
Shoveler	2007/08	0	0	0	0	0	0	0
Teal	2008/09	0	0	0	0	0	0	6
Teal	2007/08	16	0	0	2	8	0	0
Turnstone	2008/09	10	1	15	15	14	1	1
Turnstone	2007/08	35	0	20	9	1	0	0
Wigeon	2008/09	0	0	0	0	0	1	1
Wigeon	2007/08	7	37	0	2	0	0	0
Whimbrel	2008/09	1	0	1	1	1	0	0
Whimbrel	2007/08	0	0	0	0	0	0	0

NB: The peak count for each recorded in each of the five intertidal survey count sectors (CS1-5) is shown for the two periods (2007/08 and 2008/09) for species which appear as qualifying or notified interest of the statutory sites. Counts of commuting birds recorded during the intertidal surveys have been excluded. For those species for which it is relevant (e.g. lapwing and golden plover), the peak count recorded during the daytime field surveys is also shown (derived from the sum of all counts in the field survey area on a particular date, including those of commuting birds). Counts of birds recorded during the intertidal surveys seen in fields adjacent to the intertidal survey area have been included in the daytime field surveys column. Likewise, records of birds seen in the intertidal survey area during the daytime field surveys have been included under the relevant count sector columns.

Records supplied by EWTBRC and EFC in 2020

Table D.3: Records of notable bird species from within a 2km radius of the Site

Species	Status	No. of Records	Year of Most Recent Record
Arctic skua	RL	9	2018
Arctic tern	AI; AL	21	2018
Avocet	WCA1; AI; AL	145	2018
Barn owl	WCA1	150	2018
Barnacle goose	AI; AL	28	2018
Bar-tailed godwit	AI; AL	88	2018
Bearded tit	WCA1	46	2018
Bee-eater	WCA1	1	2013
Bewick's swan	WCA1; AI; SPI;AL	23	2018
Bittern	WCA1; AI; SPI; AL	16	2018
Black kite	AI	1	2014
Black redstart	WCA1; RL	22	2018
Black tern	WCA1; AI	18	2018
Black-headed gull	AL	219	2018
Black-necked grebe	WCA1; AL	32	2018
Black-tailed godwit	WCA1; SPI; RL	151	2018
Black-throated diver	WCA1; AI; AL	27	2017
Black-winged stilt	AI	9	2018
Bluethroat	WCA1; AI	1	2017
Brambling	WCA1	28	2018

Species	Status	No. of Records	Year of Most Recent Record
Brent goose	SPI; AL	136	2018
Bullfinch	SPI; AL	22	2018
Cetti's warbler	WCA1	104	2018
Common gull	AL	104	2018
Common sandpiper	AL	64	2018
Common scoter	WCA1; SPI; RL	86	2018
Common tern	AI; AL	120	2018
Corn bunting	SPI; RL	108	2018
Corncrake	WCA1; AI; SPI; RL	1	2013
Crane	AI; AL	4	2016
Crossbill	WCA1	4	2018
Cuckoo	SPI; RL	103	2018
Curlew	RL	193	2018
Curlew sandpiper	AL	30	2018
Dartford warbler	WCA1; AI; AL	3	2018
Dotterel	WCA1; AI; RL	1	2015
Dunlin	AL	123	2018
Dunnock	SPI; AL	92	2018
Eider	AL	61	2018
Ferruginous duck	AI	1	2018
Fieldfare	WCA1; RL	87	2018
Firecrest	WCA1	25	2018

Species	Status	No. of Records	Year of Most Recent Record
Fulmar	AL	3	2016
Gadwall	AL	6	2014
Gannet	AL	23	2018
Garganey	WCA1; AL	2	2018
Glaucous gull	AL	5	2017
Glossy ibis	AI	34	2018
Golden oriole	WCA1; RL	2	2013
Golden plover	AI	146	2018
Goldeneye	AL	85	2018
Goshawk	WCA1	4	2017
Grasshopper warbler	SPI; RL	10	2016
Great black-backed Gull	AL	93	2018
Great northern diver	WCA1; AI; AL	93	2018
Great skua	AL	7	2017
Great white egret	AI	44	2018
Green sandpiper	WCA1; AL	82	2018
Greenshank	WCA1; AL	85	2018
Grey partridge	SPI; RL	38	2018
Grey plover	AL	123	2018
Grey wagtail	RL	33	2018
Greylag goose	AL	132	2018

Species	Status	No. of Records	Year of Most Recent Record
Guillemot	AL	22	2018
Hen harrier	WCA1; AI; SPI; RL	114	2018
Herring gull	SPI; RL	177	2018
Hobby	WCA1	112	2018
Honey-buzzard	WCA1; AI; AL	2	2013
Hoopoe	WCA1	1	2014
House martin	AL	64	2018
House sparrow	SPI; RL	105	2018
Iceland gull	AL	2	2017
Kestrel	AL	179	2018
Kingfisher	WCA1; AI; AL	83	2018
Kittiwake	RL	13	2018
Knot	AL	93	2018
Lapland bunting	WCA1; AL	11	2017
Lapwing	SPI; RL	220	2018
Leach's petrel	WCA1; AI; AL	2	2013
Lesser black-backed Gull	AL	129	2018
Lesser kestrel	AI;	1	2017
Lesser redpoll	SPI; RL	14	2018
Linnet	SPI; RL	78	2018
Little egret	AI;	229	2018

Species	Status	No. of Records	Year of Most Recent Record
Little gull	WCA1; AI	28	2018
Little ringed plover	WCA1	32	2018
Little tern	WCA1; AI; AL	86	2018
Long-tailed duck	WCA1; RL	38	2018
Mallard	AL	189	2018
Manx shearwater	AI; AL	3	2017
Marsh harrier	WCA1; AI; AL	247	2018
Marsh tit	SPI; RL	3	2016
Meadow pipit	AL	116	2018
Mediterranean gull	WCA1; AI; AL	28	2017
Merlin	WCA1; AI; RL	110	2018
Mistle thrush	RL	42	2018
Montagu's harrier	WCA1; AI; AL	9	2017
Mute swan	AL	148	2018
Nightingale	RL	31	2018
Osprey	WCA1; AI; AL	41	2018
Oystercatcher	AL	246	2018
Peregrine	WCA1; AI;	151	2014
Pied flycatcher	RL	10	2018
Pink-footed goose	AL	12	2018
Pintail	AL	89	2018
Pochard	RL	92	2018

Species	Status	No. of Records	Year of Most Recent Record
Purple heron	WCA1; AI;	1	2018
Purple sandpiper	WCA1; AL	9	2018
Quail	WCA1; AL	5	2018
Razorbill	AL	1	2016
Red kite	WCA1; AI;	44	2018
Red-backed shrike	WCA1; AI; RL	4	2018
Red-breasted goose	AI	18	2016
Red-footed falcon	AI	1	2018
Red-necked grebe	RL	8	2017
Red-necked phalarope	WCA1; AI; RL	1	2017
Redshank	AL	168	2017
Redstart	AL	13	2018
Red-throated diver	WCA1; AI	65	2018
Redwing	WCA1; RL	54	2018
Reed bunting	SPI; AL	146	2018
Ring ouzel	SPI; RL	28	2018
Ringed plover	RL	122	2017
Ruddy shelduck	AI;	5	2017
Ruff	WCA1; AI; RL	58	2018
Sanderling	AL	75	2018
Sandwich tern	AI; AL	1	2018

Species	Status	No. of Records	Year of Most Recent Record
Scaup	WCA1; RL	30	2018
Shag	AI; RL	45	2018
Shelduck	AL	132	2018
Short-eared owl	AI; AL	113	2018
Shoveler	AL	13	2017
Skylark	SPI; RL	163	2018
Slavonian grebe	WCA1; AI; RL	75	2018
Smew	AI; AL	36	2018
Snipe	AL	74	2018
Snow bunting	WCA1; AL	28	2018
Song thrush	SPI; RL	70	2018
Spoonbill	WCA1; AI; AL	28	2018
Spotted flycatcher	SPI; RL	21	2018
Spotted redshank	AL	57	2018
Starling	SPI; RL	164	2018
Stock dove	AL	99	2018
Swift	AL	57	2018
Tawny owl	AL	24	2018
Teal	AL	173	2018
Temminck's stint	WCA1	2	2014
Tree pipit	SPI; RL	8	2016
Tree sparrow	SPI; RL	13	2018

Species	Status	No. of Records	Year of Most Recent Record
Turnstone	AL	116	2018
Turtle dove	SPI; RL	77	2018
Twite	SPI; RL	3	2008
Velvet scoter	WCA1; RL	24	2018
Water pipit	AL	11	2018
Whimbrel	WCA1; RL	96	2018
Whinchat	RL	61	2018
White stork	AI	1	2016
White-fronted goose	AI; SPI; RL	20	2017
Whooper swan	WCA1; AI; AL	5	2018
Wigeon	AL	34	2017
Willow warbler	AL	45	2018
Wood sandpiper	WCA1; AI; AL	16	2018
Wood warbler	SPI; RL	4	2018
Woodcock	RL	39	2018
Woodlark	WCA1; AI; SPI	4	2018
Wryneck	WCA1	5	2016
Yellow wagtail	SPI; RL	115	2018
Yellowhammer	SPI; RL	89	2018
Yellow-legged gull	AL	17	2018

*Key to status (refer to **Box 2.1** and **Box 2.2** for full details): AI = included on Annex 1 of the Bird Directive 2009 (codified version); WCA1 = listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended); RL = red-listed on Birds of Conservation Concern 4;*

AL = amber-listed on Birds of Conservation Concern 4, SPI = Species of Principal Importance.

APPENDIX E
SCIENTIFIC NAMES OF SPECIES

Table E.1: Vascular plants

Common Name	Scientific Name
Agrimony	*Agrimonia eupatoria*
Annual knawel	*Scleranthus annuus*
Babington's orache	*Atriplex glabriuscula*
Bird's-foot-clover	*Trifolium ornithopodioides*
Black spleenwort	*Asplenium adiantum-nigrum*
Bluebell	*Hyacinthoides non-scripta*
Borrer's saltmarsh grass	*Puccinellia fasciculata*
Brackish water-crowfoot	*Ranunculus baudotii*
Brookweed	*Samolus valerandi*
Bulbous rush	*Juncus bulbosa*
Canadian waterweed	*Elodea canadensis*
Cat mint	*Nepeta cataria*
Changing forget-me-not	*Myosotis discolor*
Common knapweed	*Centaurea nigra*
Curly waterweed	*Lagarosiphon major*
Curved hard-grass	*Parapholis incurva*
Distant sedge	*Carex distans*
Divided sedge	*Carex divisa*
Dune fescue	*Vulpia fasciculata*

Common Name	Scientific Name
Dwarf eelgrass	*Zostera noltei*
Early meadow grass	*Poa infirma*
Eelgrass	*Zostera marina*
English scurvy grass	*Cochlearia anglica*
Field chickweed	*Cerastium arvense*
Field mouse-ear	*Cerastium arvense*
Flattened meadow grass	*Poa compressa*
Fly honeysuckle	*Lonicera xylosteum*
Frosted orache	*Atriplex laciniata*
Galingale	*Cyperus longus*
Golden dock	*Rumex maritimus*
Golden samphire	*Inula crithmoides*
Greater tussock-sedge	*Carex paniculata*
Green winged orchid	*Anacamptis morio*
Henbane	*Hyoscyamus niger*
Japanese knotwed	*Fallopia japonica*
Japanese rose	*Rosa rugosa*
Large leaved lime	*Tilia platyphyllos*
Lax flowered sea lavender	*Limonium humile*
Lesser calamint	*Clinopodium calamintha*
Lesser chickweed	*Stellaria pallida*
Little mouse-ear	*Cerastium semidecandrum*

Common Name	Scientific Name
Loose silky bent	*Apera spica-venti*
Lucerne	*Medicago sativa*
Marram grass	*Ammophila arenaria*
Meadow vetchling	*Lathyrus pratensis*
Mousetail	*Myosurus minimus*
New Zealand pygmyweed	*Crassula helmsii*
One-flowered glasswort	*Salicornia pusilla*
Parrot's feather	*Myriophyllum aquaticum*
Perennial glasswort	*Sarcocornia perennis*
Prickly stalwort	*Salsola kali*
Pyramidal orchid	*Anacamptis pyramidalis*
Ray's knotgrass	*Polygonum oxyspermum*
Rock samphire	*Crithmum maritimum*
Saltmarsh goosefoot	*Chenopodium chenopodioides*
Sand cat's-tail	*Phleum arenarium*
Sea barley	*Hordeum marinum*
Sea buckthorn	*Hippophae rhamnoides*
Sea clover	*Trifolium squamosum*
Sea fern-grass	*Catapodium marinum*
Sea heath	*Frankenia laevis*
Sea holly	*Eryngium maritimum*
Sea kale	*Crambe maritima*

Common Name	Scientific Name
Sea mouse-ear	*Cerastium diffusum*
Sea spurge	*Euphorbia paralias*
Shrubby sea-blite	*Suaeda vera*
Slender hare's ear	*Bupleurum falcatum*
Small cord-grass	*Spartina maritima*
Small pondweed	*Potamogeton berchtoldii*
Smooth brome	*Bromus inermis*
Smooth cord-grass	*Spartina alterniflora*
Spiral tassel weed	*Ruppia cirrhosa*
Stiff saltmarsh grass	*Puccinellia rupestris*
Unbranched bur-reed	*Sparganium emersum*
Upright chickweed	*Moenchia erecta*
Velvet bent grass	*Agrostis canina*
Wall-rue	*Asplenium ruta-muraria*
Water avens	*Geum rivale*
Water dock	*Rumex hydrolapathum*
Water-soldier	*Stratiotes aloides*
Wild marjoram	*Origanum vulgare*
Yellow horned poppy	*Glaucium flavum*
Yellow lossestrife	*Lysimachia vulgaris*
Yellow rattle	*Rhinanthus minor*

Table E.2: Mammals

Common Name	Scientific Name
Badger	*Meles meles*
Bat species	*Chiroptera*
Brown hare	*Lepus europaeus*
Brown long-eared bat	*Plecotus auritus*
Chinese muntjac	*Muntiacus reevesi*
Common pipistrelle	*Pipistrellus pipistrellus*
Daubenton's bat	*Myotis daubentonii*
Harvest mouse	*Micromys minutus*
Hedgehog	*Erinaceus europaeus*
Myotis species	*Myotis sp.*
Nathusius' pipistrelle	*Pipistrellus nathusii*
Natterer's bat	*Myotis natteri*
Noctule	*Nyctalus noctula*
Otter	*Lutra lutra*
Pipistrelle species	*Pipistrellus sp*
Plecotus species	*Plecotus sp.*
Red squirrel	*Sciurus vulgaris*
Serotine	*Eptisicus serotinus*
Soprano pipistrelle	*Pipistrellus pygmaeus*
Water vole	*Arvicola amphibius*

Table E.3: Herpetofauna

Common Name	Scientific Name
Adder	*Vipera berus*
Common toad	*Bufo bufo*
Grass snake	*Natrix natrix*
Great crested newt	*Triturus cristatus*
Slow worm	*Anguis fragilis*
Viviparous lizard	*Zootoca vivipara*

Table E.4: Birds

Common Name	Scientific Name
Arctic skua	*Stercorarius parasiticus*
Arctic tern	*Sterna paradisaea*
Avocet	*Recurvirostra avosetta*
Barn owl	*Tyto alba*
Barnacle goose	*Branta leucopsis*
Bar-tailed godwit	*Limosa lapponica*
Bearded tit	*Panurus biarmicus*
Bee-eater	*Merops apiaster*
Bewick's swan	*Cygnus columbianus*
Bittern	*Botaurus stellaris*
Black kite	*Milvus migrans*
Black redstart	*Phoenicurus ochruros*

Common Name	Scientific Name
Black tern	*Chlidonias niger*
Black-headed gull	*Chroicocephalus ridibundus*
Black-necked grebe	*Podiceps nigricollis*
Black-tailed godwit	*Limosa limosa*
Black-throated diver	*Gavia arctica*
Black-winged stilt	*Himantopus himantopus*
Bluethroat	*Luscinia svecica*
Brambling	*Fringilla montifringilla*
Brent goose	*Branta bernicla*
Bullfinch	*Pyrrhula pyrrhula*
Canada goose	*Branta canadensis*
Cetti's warbler	*Cettia cetti*
Coal tit	*Periparus ater*
Common gull	*Larus canus*
Common sandpiper	*Actitis hypoleucos*
Common scoter	*Melanitta nigra*
Common tern	*Sterna hirundo*
Coot	*Fulica atra*
Cormorant	*Phalacrocorax carbo*
Corn bunting	*Emberiza calandra*
Corncrake	*Crex crex*
Crane	*Grus grus*

Common Name	Scientific Name
Crossbill	*Loxia curvirostra*
Cuckoo	*Cuculus canorus*
Curlew	*Numenius arquata*
Curlew sandpiper	*Calidris ferruginea*
Dark-bellied brent goose	*Branta berincula bernicula*
Dartford warbler	*Sylvia undata*
Dotterel	*Charadrius morinellus*
Dunlin	*Calidris alpina*
Dunnock	*Prunella modularis*
Eider	*Somateria mollissima*
Ferruginous duck	*Aythya nyroca*
Fieldfare	*Turdus pilaris*
Firecrest	*Regulus ignicapilla*
Fulmar	*Fulmarus glacialis*
Gadwall	*Mareca strepera*
Gannet	*Morus bassanus*
Garganey	*Spatula querquedula*
Glaucous gull	*Larus hyperboreus*
Glossy ibis	*Plegadis falcinellus*
Golden oriole	*Oriolus oriolus*
Goldeneye	*Bucephala clangula*
Golden plover	*Pluvialis apricaria*

Common Name	Scientific Name
Goosander	*Mergus merganser*
Goshawk	*Accipiter gentilis*
Grasshopper warbler	*Locustella naevia*
Great black-backed Gull	*Larus marinus*
Great crested grebe	*Podiceps cristatus*
Great northern diver	*Gavia immer*
Great skua	*Stercorarius skua*
Great white egret	*Ardea alba*
Green sandpiper	*Tringa ochropus*
Greenshank	*Tringa nebularia*
Grey heron	*Ardea cinerea*
Grey partridge	*Perdix perdix*
Grey plover	*Pluvialis squatarola*
Grey wagtail	*Motacilla cinerea*
Greylag goose	*Anser anser*
Guillemot	*Uria aalge*
Hen harrier	*Circus cyaneus*
Herring gull	*Larus argentatus*
Hobby	*Falco subbuteo*
Honey-buzzard	*Pernis apivorus*
Hoopoe	*Upupa epops*
House martin	*Delichon urbicum*

Common Name	Scientific Name
House sparrow	*Passer domesticus*
Iceland gull	*Larus glaucoides*
Kestrel	*Falco tinnunculus*
Kingfisher	*Alcedo atthis*
Kittiwake	*Rissa tridactyla*
Knot	*Calidris canutus*
Lapland bunting	*Calcarius lapponicus*
Lapwing	*Vanellus vanellus*
Leach's petrel	*Oceanodroma leucorhoa*
Lesser black-backed Gull	*Larus fuscus*
Little egret	*Egretta garzetta*
Little grebe	*Tachybaptus ruficollis*
Little tern	*Sternula albifrons*
Long-tailed Duck	*Clangula hyemalis*
Mallard	*Anas platyrhynchos*
Manx shearwater	*Puffinus puffinus*
Marsh harrier	*Circus aeruginosus*
Marsh tit	*Poecile palustris*
Meadow pipit	*Anthus pratensis*
Mediterranean gull	*Ichthyaetus melanocephalus*
Merlin	*Falco columbarius*
Mistle thrush	*Turdus viscivorus*

Common Name	Scientific Name
Montagu's harrier	*Circus pygargus*
Mute swan	*Cygnus olor*
Nightingale	*Luscinia megarhynchos*
Osprey	*Pandion haliaetus*
Oystercatcher	*Haematopus ostralegus*
Peregrine	*Falco peregrinus*
Pied flycatcher	*Ficedula hypoleuca*
Pink-footed Goose	*Anser brachyrhynchus*
Pintail	*Anas acuta*
Pochard	*Aythya ferina*
Purple heron	*Ardea purpurea*
Purple sandpiper	*Calidris maritima*
Quail	*Coturnix coturnix*
Razorbill	*Alca torda*
Red kite	*Milvus milvus*
Red-backed shrike	*Lanius collurio*
Red-breasted goose	*Branta ruficollis*
Red-breasted merganser	*Mergus serrator*
Red-footed falcon	*Falco vespertinus*
Red-necked grebe	*Podiceps grisegena*
Red-necked phalarope	*Phalaropus lobatus*
Redshank	*Tringa totanus*

Common Name	Scientific Name
Redstart	*Phoenicurus phoenicurus*
Red-throated diver	*Gavia stellata*
Redwing	*Turdus iliacus*
Reed bunting	*Emberiza schoeniclus*
Reed warbler	*Acrocephalus sciraceus*
Ring ouzel	*Turdus torquatus*
Ringed plover	*Charadrius hiaticula*
Ruddy duck	*Oxyura jamaicensis*
Ruddy shelduck	*Tadorna ferruginea*
Ruff	*Calidris pugnax*
Sanderling	*Calidris alba*
Sandwich tern	*Thalasseus sandvicensis*
Scaup	*Aythya marila*
Sedge warbler	*Acrocephalus schoenobaenus*
Shag	*Phalacrocorax aristotelis*
Shelduck	*Tadorna tadorna*
Shore lark	*Eremophila alpestris*
Short-eared owl	*Asio flammeus*
Shoveler	*Spatula clypeata*
Skylark	*Alauda arvensis*
Slavonian grebe	*Podiceps auritus*
Smew	*Mergellus albellus*

Common Name	Scientific Name
Snipe	*Gallinago gallinago*
Snow bunting	*Plectrophenax nivalis*
Song thrush	*Turdus philomelos*
Spoonbill	*Platalea leucorodia*
Spotted flycatcher	*Muscicapa striata*
Spotted redshank	*Tringa erythropus*
Starling	*Sturnus vulgaris*
Stock dove	*Columba oenas*
Swallow	*Hirundo rustica*
Swift	*Apus apus*
Tawny owl	*Strix aluco*
Teal	*Anas crecca*
Temminck's stint	*Calidris temminckii*
Tree pipit	*Anthus trivialis*
Tree sparrow	*Passer montanus*
Tufted duck	*Aythya fuligula*
Turnstone	*Arenaria interpres*
Turtle dove	*Streptopelia turtur*
Twite	*Linaria flavirostris*
Velvet scoter	*Melanitta fusca*
Water pipit	*Anthus spinoletta*
Water rail	*Rallus aquaticus*

Common Name	Scientific Name
Whimbrel	*Numenius phaeopus*
Whinchat	*Saxicola rubetra*
White stork	*Ciconia ciconia*
White-fronted goose	*Anser albifrons*
Whooper swan	*Cygnus cygnus*
Wigeon	*Mareca penelope*
Willow warbler	*Phylloscopus trochilus*
Wood sandpiper	*Tringa glareola*
Wood warbler	*Phylloscopus sibilatrix*
Woodcock	*Scolopax rusticola*
Woodlark	*Lullula arborea*
Wryneck	*Jynx torquilla*
Yellow wagtail	*Motacilla flava*
Yellowhammer	*Emberiza citrinella*
Yellow-legged gull	*Larus michahellis*

Table E.5: Fish

Common Name	Scientific Name
European eel	Anguilla anguilla

Table E.6: Invertebrates

Common Name	Scientific Name
Autumnal rustic	*Eugnorisma glareosa*
Beetle	*Baris scolopacea*
Beetle	*Graptodytes bilineatus*
Beetle	*Malachius vulneratus*
Beetle	*Meloe proscarabaeus*
Beetle	*Philonthus punctus*
Blood-vein	*Timandra comae*
Brown-banded carder bee	*Bombus humilis*
Cinnabar	*Tyria jacobaeae*
Crescent striped	*Apamea oblonga*
Dusky-lemon sallow	*Cirrhia gilvago*
Emerald damselfly	*Lestes dryas*
European oil beetle	*Meloe proscarabaeus*
Fly	*Aedes flavescens*
Fly	*Atylotus latistriatus*
Fly	*Campsicemus magius*
Fly	*Ctenophora ornata*
Fly	*Erioptera bivittata*
Fly	*Hybomitra expollicata*
Fly	*Myopites eximia*
Grass rivulet	*Perizoma albulata*

Common Name	Scientific Name
Green hairstreak	*Callophrys rubi*
Great green bush cricket	*Tettigonia viridissima*
Ground lackey moth	*Malacosoma castrensis*
Gypsy moth	*Lymantria dispar*
Hairy dragonfly	*Brachytron pratense*
Horsefly	*Atylotus latistriatus*
House cricket	*Acheta domesticus*
Jumping spider	*Euophrys browningi*
Kent black arches	*Meganola albula*
Knot grass	*Acronicta rumicis*
L-album wainscot	*Mythimna l-album*
Large horsefly	*Hybomitra expollicata*
Large carder bee	*Bombus muscorum*
Large tortoiseshell	*Nymphalis polychloros*
Latticed heath	*Chiasmia clathrata*
Lunar yellow underwing	*Noctua orbona*
Marbled white	Melanargia galathea
Moss carder bee	*Bombus muscorum*
Moth	*Agrotera nemoralis*
Moth	*Catoptria verellus*
Moth	*Dolicharthria punctalis*
Moth	*Eucosoma catoprana*

Common Name	Scientific Name
Moth	*Idaea ochrata*
Moth	*Pediasia aridella*
Moth	*Schoenobius gigantella*
Mottled rustic	*Caradrina morpheus*
Oblique carpet	*Orthonama vittata*
Red-necked footman	*Atolmis rubricollis*
Rest harrow	*Aplasta ononaria*
Rosy rustic	*Hydraecia micacea*
Rustic	*Hoplodrina blanda*
Scarce emerald damselfly	*Lestes dryas*
Shaded broad-bar	*Scotopteryx chenopodiata*
Shorefly	*Parydroptera discomyzina*
Shoulder-striped wainscot	*Leucania comma*
Shrill carder bee	*Bombus sylvarum*
Slipper limpet	*Crepidula fornicata*
Small heath	*Coenonympha pamphilus*
Small red-eyed damselfly	*Erythromma viridulum*
Soldier fly	*Stratiomys singularior*
Spider	*Heliophanus auratus*
Spider	*Trichopterna cito*
Striped snail	*Cernuella virgata*
Wall	*Lasiommata megera*

Common Name	Scientific Name
Water beetle	*Paracymus aeneus*
Waved black	*Parascotia fuliginaria*
Weevil	*Baris scolopacea*
White admiral	*Limenitis camilla*
White-letter hairstreak	*Satyrium w-album*

APPENDIX F
CONFIDENTIAL: FULL LIST OF RECORDS PROVIDED BY EWTBRC AND EFC

APPENDIX 23D
BIODIVERSITY PHASE 1 HABITAT SURVEY REPORT

Bradwell B Project

Phase 1 Habitat Survey Report

Wood Environment & Infrastructure Solutions UK Limited – August 2020

BBX00510040WOOD02TR

Version 2.0 Final issue

Report for

Bradwell Power Generation Company Limited (BRB GenCo)

Main contributors

[redacted] .....

Issued by

[redacted] .....

Approved by

[redacted] .....

Wood

Shinfield Park
Shinfield
Reading RG2 9FW
United Kingdom

Doc Ref. BBX00510040WOOD02TR

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CONTENTS

APPPENDICES

1. INTRODUCTION

1.1 Background

1.1.1 Bradwell Power Generation Company Limited (the applicant) proposes to develop a new nuclear power station, referred to as "Bradwell B", near Bradwell-on-Sea in Essex (hereafter referred to as the Project). The Project would comprise twin UK HPR1000 reactors with a combined electrical capacity of 2,340MW.

1.1.2 The area of land within which the Bradwell B power station would be built is located next to the Blackwater Estuary on the Dengie Peninsula, approximately 15 kilometres (km) east of the town of Maldon and 1km north-east of the village of Bradwell-on-Sea within the District of Maldon, Essex. It lies adjacent to the existing Bradwell A Power Station, which ceased operation in 2002 and is being decommissioned by the Nuclear Decommissioning Authority (NDA).

1.2 Site Context

1.1.3 The Phase 1 habitat survey reported herein covers land within the Indicative main development site boundary, Indicative project-provided accommodation site boundary, Potential workers project-provided accommodation expansion site boundary, and the intertidal area within the Indicative Zone for Marine Infrastructure: central National Grid Reference (NGR) 601000E, 209000N (**Figure 1.1**, **Appendix A**). This area is referred to within this report as “the main development site”.

1.1.4 In addition to the range of development activities that relate to the main development site and that may include, for example, the planned project-provided accommodation, there will be a requirement for off-site associated development in order to construct and operate the power station. Such development is expected to include but may not be limited to park and ride facilities, off-site freight management and potential off-site highways works or rail infrastructure. The requirements with respect to the locations and extents of the off-site associated development requirements are currently being considered and as a result they are not addressed further in this report.

1.3 Purpose of this Document

1.1.5 This report details the methods adopted for, and results of, the Phase 1 habitat survey. The results of this survey will be used to inform the requirement for National Vegetation Classification (NVC) survey and the targeted survey of aquatic and terrestrial invertebrates, as well as the evolution of the project design and specification of environmental measures. The results of these ecological studies will be used to determine robust and accurate baseline data to inform the Habitat Regulations Assessment (HRA), Preliminary Environmental Information for Stage 2 consultation and the EIA and Environmental Statement (ES) in support of the Development Consent Order (DCO) application.

2. METHODOLOGY

2.1 Survey Area

2.1.1 The survey encompassed the main development site and an additional 100 metres (m) around all terrestrial aspects where access allowed. The survey area is shown in **Figure 2.1**, **Appendix A**.

2.2 Field Survey

2.2.1 The Site was visited by a Wood Ecologist on 5 and 7 May 2020, with an additional survey visit to capture later flowering plant species on 15 July 2020. During the survey, distinct habitats were identified, and any features of interest recorded and included on a Phase 1 habitat map as a target note (TN) (Ref 2.1), see **Figure 3.1**, **Appendix A**. The standard Phase 1 habitat survey methodology is mainly concerned with vegetation communities, however, any observations concerning notable or protected animal species were recorded and used to inform ongoing protected species surveys. Such observations are not presented in this report.

2.2.2 It should be noted that while the survey has aimed to provide a comprehensive description of the Site, it does not constitute a full botanical survey. Any protected or notable terrestrial habitats identified during the survey were identified for NVC survey, where vegetation communities are characterised.

2.2.3 Access to some parts of the survey area was restricted, primarily due to physical barriers such as water bodies or fencing that could not be safely traversed. Areas without access included the existing Bradwell A power station (part of which falls within the 100m buffer) which was bounded by palisade fencing and a number of fields in the south west of the Site, see **Figure 2.2** (**Appendix A**) for access available at the time of the survey. However, the general habitat types across the entire survey area were still subject to observation, and it is not considered that these minor access issues affected the quality of the survey work.

2.2.4 Aquatic habitats and built structures will be subject to detailed survey work that is currently ongoing and will be reported separately.

Controlled species

2.2.5 Where legally controlled species were identified on the Site, location of the record, and extent of growth (in the case of plant species) were recorded.

2.3 Constraints

2.3.1 This survey represents an ecological picture of the area at the time it was surveyed. Habitats identified during the survey will fluctuate in terms of species composition and abundance, on both a diurnal and seasonal basis. It is also clear that some species, notably those that appear later in the year, would not have been recorded during the survey work, although broad habitat characteristics were apparent.

3. RESULTS

3.1 Site Description

3.1.1 The survey area is generally flat and low lying, being only a few meters above sea level. The primary habitat was intensively farmed arable and ploughed land in spring 2020. Coastal habitats were present along the northern, western and eastern boundary of the survey area, with extensive saltmarsh and strips of coastal grassland beyond the coastal defence embankment (sea wall) and its associated coastal borrow dyke.

3.1.2 Certain coastal habitats and vegetation communities within the survey area are part of qualifying features for internationally important sites, including: the Blackwater Estuary and Dengie Ramsar site and Essex Estuaries SAC; and nationally important sites: the Blackwater Estuary and Dengie SSSI; and the Dengie National Nature Reserve. Further details are provided in the Desk Study Report, Appendix 23C of the Scoping Report.

Indicative main development site

3.1.3 The Indicative main development site covers approximately 500 hectares (ha) and the majority of the Site, extending from the existing Bradwell A power station at its western end, to Sales Point and the Othona Community to the east. It includes coastal habitats to the north and extends south to East End Road in Bradwell-on-Sea.

3.1.4 It was dominated by arable habitat, for which the fields had narrow or no margins and were delineated by dry and wet ditches with or without an associated hedgerow. Small areas of tall ruderal and ephemeral growth existed where farm machinery could not access due the shape created by watercourses. There were a number of small conifer plantations, a plantation and semi-natural broadleaved woodland and areas of trees located close to residential properties. An area of hard standing; a disused World War II runway had been colonised by ephemeral and tall ruderal vegetation and supported small areas of scattered scrub.

3.1.5 Running along the northern boundary on the landward side of the coastal defence embankment, was the coastal borrow dyke; a ditch, which appeared brackish based upon observation of salt deposition along the banks and bankside vegetation. The borrow dyke was dominated by reeds and bounded on both sides by strips of semi-improved grassland.

Indicative project-provided accommodation site

3.1.6 The indicative project-provided accommodation site is approximately 40ha in area and lies to the west of the Indicative Main Development Site and the existing Bradwell A Power Station and extends from the coastline south, to Bradwell Waterside and Bradwell Marina.

3.1.7 This area was dominated by arable habitat with associated boundary features, including wet and dry ditches, hedgerow, and tree lines. Residential properties with associated garden and hard standing areas were present in the north of the area, with a semi-natural broadleaved woodland copse and willow carr. It incorporates the coastal defence embankment and borrow dyke up to Bradwell Marina, which was composed of semi-improved grassland, coastal grassland, saltmarsh habitats and brackish running water habitats.

Potential project-provided accommodation expansion site

3.1.8 The potential project-provided accommodation expansion site extends to approximately 32ha and is located to the south west of the Site, south of Bradwell Waterside and encompassing fields to the east and west of the B1021 Waterside Road. The main habitat types were arable fields and hay meadow, with associated semi-improved grassland margins and hedgerow and treeline boundary features.

Intertidal zones within the area of Indicative Zone for Marine Infrastructure

3.1.9 The Indicative Zone for Marine Infrastructure covers approximately 273ha and incorporates marine habitats in the north of the Dengie Peninsula and the Site. It included small margins of terrestrial habitat along the Blackwater Estuary coastline, specifically saltmarsh and other intertidal communities.

The wider landscape

3.1.10 Throughout the rest of the Dengie Peninsula to the south, arable fields were the dominant habitat type with limited areas of semi-improved neutral grassland (mostly grazing marsh remnants), woodland, tall ruderal vegetation, and scrub. Most of the fields were bounded by ditches, which vary in the amount of water they hold, and there were few hedgerows. This land area was also flat and exposed, being between 0 and 10m Above Ordnance Datum (AOD).

3.2 Habitats

3.2.1 Habitats and target notes recorded during the survey work are shown on the Phase 1 Habitat map (**Figure 3.1**, **Appendix A**). Target notes are described in **Appendix B**.

3.2.2 The extent and coverage of each habitat type is discussed individually in detail in the following sub sections. Scientific names for species mentioned in the text in addition to all other species recorded on the Site and the abundance for which they were recorded, using the DAFOR scale (Dominant, Abundant, Frequent, Occasional or Rare), are provided in **Appendix C**.

Cultivated land

3.2.3 Arable habitat was the most frequently occurring habitat throughout the survey area and the wider landscape. Wheat appeared to be the dominant summer crop, with summer barley, oilseed rape, pea and lucerne cover crops also recorded. Most

fields were large, with limited boundary features and very narrow field margins, usually less than 1m in width. At the time of the survey, a few of the fields were bare ground, having been recently ploughed, but these all supported crops during the second visit, except for one which had been left fallow to accommodate ground investigation works in progress within the indicative main development site (Load Test area). Agricultural weed species were present within crops and included black grass, wild oat, common mallow, poppy, fat-hen and mat forming scented and scentless mayweed, pineapple weed, field bindweed and knotgrass.

3.2.4 Amenity grassland was most frequently recorded surrounding the existing Bradwell A power station, within the 100m buffer and in the north of the potential project-provided accommodation expansion site. It was also associated with residential properties at Weymarks, East Hall and Downhall farms, and at the control tower property within the Indicative Main Development Site and with residential properties at Bradwell-on-Sea, Bradwell Waterside and at Bradwell Marina, all located to the south and west within the 100m buffer. These areas had a short or regularly cut sward, dominated by red fescue and perennial rye-grass, and a high proportion of basal rosette herb species such as daisy, bristly ox-tongue and dandelion and mat forming species such as black medick, white clover and creeping cinquefoil.

3.2.5 Introduced shrub and ephemeral planting occurred only occasionally within the survey area, typically associated with private, residential, and commercial properties within the 100m buffer. It was also recorded in small pockets around the existing Bradwell A Power Station.

Improved and semi-improved grassland

3.2.6 Semi-improved grassland habitats were present across the entire Site, specifically creating marginal habitats surrounding arable fields and woodland parcels, alongside tracks and roads and creating a wide margin (approximately 10m) either side of the coastal borrow dyke along its entire length. Small parcels of semi-improved grassland were also present in the corners and edges of arable fields where, due to their shape, large farm machinery has not been able to access. Two large parcels were recorded in the south-west of the indicative main development site, associated with a former playing field and in the north-west, surrounding the Downhall Beach Estate and the Electricity Switching Station.

3.2.7 This habitat usually supported tall, tussocky grass such as false oat grass and cock's foot, with a high proportion of tall ruderal species, including common nettle, common mallow, cow parsley, alexanders and hogweed, all bound with cleavers or bramble in occasional patches. Barren brome tended to dominate field margins, with abundant wild oat, red fescue and soft brome also recorded throughout. Other grass species recorded frequently were meadow foxtail, smooth meadow grass, annual meadow grass (particularly along roadside verges) and perennial rye-grass.

3.2.8 Field margins also supported a high number of agricultural weed species, with frequent bur chervil, hoary cress, common mallow, poppy, greater plantain, lesser burdock and common nettle with occasional teasel and sea beet particularly towards

the sea wall. Later in the season, bristly ox-tongue was also abundant with frequent prickly lettuce and creeping thistle.

3.2.9 Field margins in the west of the survey area, within the Indicative Temporary Workers Accommodation Site, tended to be wider than those recorded surrounding wheat and barley crops in the east, within the Indicative Main Development Site.

3.2.10 Surrounding woodland habitat, the herb species composition differed slightly, while the same dominating species were recorded, occasional species were garlic mustard, red deadnettle, white deadnettle, herb Robert, cut-leaved crane's-bill and chickweed.

3.2.11 The most species rich field margin was in the south east of the Site, on the southern boundary of the Indicative Main Development Site and alongside the footpath which leads from the Dengie National Nature Reserve carpark to the coastal defence embankment. In addition to those species already recorded within semi-improved grassland, there was occasional black knapweed, common vetch, meadow buttercup, salad burnet, oxeye daisy, sheep's sorrel, wild carrot, red clover, cowslip, lacy phacelia, bur chervil and field speedwell. This diversity is likely due to self-seeding from a wildflower meadow which was historically located to the north of the footpath, recorded during the 2009 Phase 1 Survey work (Ref 3.1).

3.2.12 Improved grassland was not a common habitat within the survey area, being recorded at only four locations. One was in the south of the Indicative Main Development Site, surrounding the two reservoirs (Water bodies 1 and 2, see **Figure 3.2** in **Appendix A**), which was grazed by sheep at the time of the first survey visit in May 2020. The second was located in the south east of the Indicative Main Development Site, surrounding the chapel of St Peter on the Wall (Bse002, see **Figure 3.3** in **Appendix A**), the third and fourth was a hay meadow and horse grazed pasture in the south of the Potential Workers Accommodation Campus Expansion Site neither of which could be closely inspected due to access restrictions.

3.2.13 This habitat was dominated by perennial rye-grass and crested dog's tail, with abundant red fescue with occasional occurrence of other grass species, such as cock's foot and false oat grass. Herb species were present in low numbers and included daisy, dandelion, yarrow and white clover with mats of black medick.

Tall ruderal and short perennial growth

3.2.14 Ruderal growth was evident over the entire Site, typically along field margins, alongside roads and tracks, and on undisturbed and deteriorating areas of hard standing. It was also present where fields have been left fallow, in the north of the potential project-provided accommodation expansion site, alongside the shelterbelt woodland and within the field where GI works were in progress in the indicative main development site. Species composition was similar to that recorded within semi-improved grassland, with common mallow, common nettle and alexanders dominating and one area (TN1) with complete coverage of fat-hen.

3.2.15 Short perennial growth was present on the verges surrounding the existing Bradwell A power station carpark, with a diverse assemblage of herb species, including abundant patches of green alkanet, dove's-foot crane's-bill, yarrow and white clover.

3.2.16 The former WWII runway and the spoil heaps which were created along its edges supported colonising species, with no one species dominating. In addition to those species already recorded within semi-improved grassland, shepherd's purse, white campion, spear thistle, hedge mustard, broad-leaved and clustered dock, large patches of white stonecrop and biting stonecrop were also frequently recorded. Lesser burdock, dove's-foot crane's-bill and spotted medick were recorded occasionally.

Coastland

3.2.17 Coastal grassland habitat was recorded either side of the footpath which runs along the top of the coastal defence embankment, along its entire length, and in locations where extensive terrestrial habitat was present beyond the embankment, on the seaward side. These habitats were dominated by sea couch and red fescue, with frequent soft brome and barren brome, and abundant herb species, including lesser burdock, alexanders, common mallow, teasel, sea beet and occasional scrubby patches of blackthorn and bramble growth.

3.2.18 Coastal grassland habitat gradually transitioned to extensive saltmarsh habitat which extended from the seaward side of the embankment, down and across the intertidal areas of the Blackwater Estuary. The sea wall supported patches of dense growth dominated by shrubby sea-blite (listed as a qualifying feature for the Dengie Ramsar site), sea purslane and sea beet with abundant barren brome, frequent soft brome, bur chervil, hoary cress and field buttercup and rare comfrey. Bee orchid was recorded in one location (TN2) west of the existing Bradwell A Power Station.

3.2.19 Beyond the sea wall were fragmented areas of saltmarsh habitat, some of which fall within the southern extent of the Indicative Zone for Marine Infrastructure and the northern extent of the indicative main development site. Specifically, a large area was located in the centre of the northern extent of the indicative main development site and another to the east of this.

3.2.20 These areas were similar in structure and species composition supporting species which are listed under the qualifying features for the Dengie and Blackwater Estuary Ramsar sites, many of which are considered Nationally Scarce (based on the Red Data List) and/or are listed as Species of Principal Importance in the UK (see Desk Study Report (Appendix 23C)). A clear shrubby sea-blite and sea purslane strip was located along the coastal defence embankment, beyond which was a strip of mud/sand with intertidal channels dominated by glasswort species and cord grasses with patches of greater sea spurrey, grass-leaved orache, spear-leaved orache and occasional saltmarsh rush, golden samphire, lesser sea spurrey, English scurvy grass, sea lavender and thrift. While sea kale, sea barley, yellow horned poppy (TN3), divided sedge and sea holly (TN4) were rarely recorded. Beyond this was a

largely unvegetated strip of shingle, with a raised shell bank or 'spit' near to the water's edge (TN5) which supported no vegetation.

Open water and running water

3.2.21 The survey area was intersected by agricultural drainage ditches, creating boundaries between the arable fields. As part of the aquatic mammal survey, these were assessed as 52 distinct ditch sections (the aquatic mammal survey included a 500m buffer, for which a total of 67 ditch sections were recorded, 52 of which fell within the Phase 1 100m buffer) and assigned an individual reference number (refer to **Figure 3.4**, **Appendix A**). Aquatic mammal survey work is ongoing and detailed descriptions of ditch habitat will be reported separately.

3.2.22 Most (44 ditch sections) were situated within the indicative main development site, with four in the indicative project-provided accommodation site and one within the potential project-provided accommodation expansion site, while the remaining five sections fell within the 100m buffer. This included the entire length of the coastal borrow dyke (D14), which extended across the indicative main development site and the indicative project-provided accommodation site.

3.2.23 Thirty-one ditches supported water at the time of the survey, while the remaining 22 were dry or almost dry: where a small pool of water was collected at only one end. Common reed dominated the wet and almost dry ditch sections and, particularly along the borrow dyke, created marginal 'swamp' habitat. Rush (soft, hard and compact) and sedge species were also recorded to a lesser extent.

3.2.24 Dry ditches generally supported dense herb and tall ruderal growth and in some had developed to support scrub growth, dominated by blackthorn and bramble with occasional gorse and broom patches. Other species recorded in these habitats were rosebay willowherb and yellow flag iris.

3.2.25 The coastal borrow dyke extended the entire length of the north, east and western boundaries of the survey area and were split into seven distinct sections by land bridges. Most of the sections supported brackish, open water, with margins of either tall common reed or shorter rush and sedge species. In a few locations along its length, the reed extended across the entire width and no open water was evident. In the eastern end, it supported a central island of dense scrub growth.

3.2.26 Twenty-one open water bodies were identified within the survey area (see **Figure 3.2**, **Appendix A**). Of these, eight were located within the site itself: six in the indicative main development site and two within the indicative project-provided accommodation site. Water bodies have been further assessed as part of the ongoing great-crested newt scoping survey and will be reported separately.

3.2.27 In general, only Water bodies 1 and 2 were large, approximately 1.1 and 1.4ha in area respectively, acting as irrigation reservoirs in the south of the indicative main development site, north of East Hall Farm. They were located within improved grassland and supported dense marginal vegetation dominated by common reed, with patches of lesser reedmace, saltmarsh rush and sea club rush.

3.2.28 Water body 6, within Curds Grove had dried out at the time of the survey and Water bodies 4 and 8 could not be assessed due to access restrictions.

3.2.29 All other water bodies were small ponds or locations where ditches have widened to cause pooling of water. These water bodies were either filled with reedbed, supporting the same species composition described above, or, where they were located within willow carr or other woodland habitats, the water was stagnant and did not support aquatic vegetation other than water weeds.

Swamp

3.2.30 Where ditch and open water habitats supported tall emergent vegetation and only a low water level, these were considered swamp and were dominated by common reed, with occasional lesser and greater reedmace. This habitat formed the margins of the coastal borrow dyke, along most of its length, and in a few areas, extended across its width, particularly to the north of the Bradwell A power station.

3.2.31 Reed beds were also present to the east of the potential project-provided accommodation expansion site associated with the Sewage Treatment Plant and along approximately 50% of the margins of the Irrigation Reservoirs (Water body 1 and 2), within the indicative main development site.

Scrub

3.2.32 Scattered scrub formed a mosaic with tall ruderal growth in many areas which have been left unmanaged, such as the electricity switching station south of the Bradwell A power station and along the edges of the former WWII runway. Scattered scrub has also been allowed to grow along, and within, some of the drainage ditches, typically, those which meander and therefore prevent access to large farm machinery. Sections of the coastal borrow dyke supported both scattered and dense continuous scrub, specifically at its easternmost end and where it runs north of the Bradwell A power station.

3.2.33 Scattered and dense scrub was present in the residential and former residential areas associated with the Downhall Beach Estate in the north west of the Site. These areas were dominated by hawthorn, elder, field maple and bramble, and extended north toward the sea wall along the Bradwell A power station south western fence line. Dense continuous and scattered scrub then extended along the borrow dyke, which is dry as it runs along the northern boundary of the Power station and continued south along the almost dry ditch which ran along its north eastern boundary.

3.2.34 Scattered and dense continuous scrub habitat was dominated by bramble, with elder, hawthorn and dog rose and self-propagating saplings of a variety of tree species, including silver birch, ash, white beam and field maple, pedunculate oak and sycamore. Gorse and broom were recorded in small patches within scattered scrub habitats in the west of the Site.

Woodland

3.2.35 The extent of woodland habitat was limited across the survey area, with 11 discrete woodland parcels identified. Nine within the indicative main development site, one in the north of the indicative project-provided accommodation site and one within the 100m buffer.

3.2.36 A mixed plantation woodland acting as a shelter belt (TN6), was located between arable fields, extending south from the southern edge of the WWII runway in the indicative main development site. Dominant tree species were Scots pine and pedunculate oak, with frequently occurring sycamore and large-leaved lime along the margins. The understory was well established, with patches of elder, hornbeam and holly and a dense ground cover of ivy, with abundant cleavers, cow parsley, common nettle and patches of bramble. White deadnettle was recorded frequently along the margin, with barren brome and occasional lesser and greater burdock.

3.2.37 One broadleaved semi-natural woodland (TN7), including an elm copse and a small area of willow carr, surrounded the Downhall Beach Estate in the north of the indicative project-provided accommodation site. The elm copse was located to the east of the access track, most of the trees in this area supported dense ivy growth and a dense understory of elder, with tall common nettle, cow parsley and cleavers, this copse extended around a residential property, forming garden. A Leyland cypress tree line bounded the access track with a private area beyond dominated by crack and goat willow with a high diversity of other species including pedunculate oak, weeping willow, Holme oak, horse chestnut, sycamore and alder with cypress and holly. The understory was dense with elder, hawthorn, field maple and bramble, with garden escapes including lilac and forsythia.

3.2.38 There were five broadleaved, semi-natural woodland parcels in the indicative main development site. Curds Grove (TN8) was located in the south and was dominated by pedunculate oak and ash, with frequent sycamore and an understory of elm, elder and holly with bluebell ground cover among cow parsley, common nettle, cleavers and patches of herb Robert and horsetail. While two parcels lay to the southern end of the WWII runway (TN9 and TN10), one was dominated by large, mature poplar and the other sycamore and horse chestnut. One (TN11) was located to the south east corner of the Bradwell A power station, with areas of willow carr and supplementary planting of a range of species. The final location was in the 100m buffer to the east of the indicative main development site. This woodland surrounded the Othona Community (TN12) in the east of the survey area, within the 100m buffer. It was dominated by semi-mature elm with occasional horse chestnut, field maple, hawthorn, and dense ivy growth over the trees. Common nettle and cow parsley dominated the ground flora.

3.2.39 One broadleaved plantation woodland parcel (TN13) was in the east of the indicate main development site within a meander of the ditch D29 (see **Figure 3.4**, **Appendix A**). This area was managed as a holding pen for pheasants, although none were present at the time. Elm was the dominant species, with frequent alder and crack willow along the ditch bank and rare occurrence of pedunculate oak. The

eastern section was mostly recent planting, with tree guards still in situ and trees reaching between 4 and 5m in height. The under storey was sparse, with occasional elder, and the ground flora supported dense common nettle and cleavers.

3.2.40 Three conifer plantation woodlands (TN14) were located in the west of the indicative main development site, south of the Electricity Switching Station. Scots pine was the dominant species, with a sparse under storey of elder and almost no ground flora as a result of a dense needle bed.

Hedgerows

3.2.41 Defunct and intact species poor hedgerows were present across the survey area, typically as boundary features of the arable fields and often associated with a drainage ditch. Hedgerows were mainly recorded bounding fields in the east and south of the indicative main development site, along East End Road. One hedgerow (TN15) extended along the eastern side of the access road leading to the Bradwell A Power Station, and followed the field boundary south and then east, all the way to the northern end of the WWII Runway.

3.2.42 Hedgerow species were mostly dominated by hawthorn, field maple and/or blackthorn with elm, elder, hazel, hornbeam, Norway maple and dog rose also recorded. Saplings and mature standards were also present and included ash, pedunculate oak and sycamore. Laurel hedgerows were recorded in the west, associated with residential and commercial properties in Bradwell Waterside. Ground flora species composition was consistent with that recorded in the semi-improved grassland habitats.

3.2.43 Two recently planted hedgerows, with tree guards still in situ, were located within the restored habitat to the south east and south west of Bradwell A power station, with hawthorn, wayfaring tree, field maple, hazel and dog rose recorded.

Tree lines and scattered trees

3.2.44 Scattered mature and semi-mature trees were present throughout the site. Scattered trees, including white poplar and cherry were recorded around the Bradwell A Power Station complex. A single mature pedunculate oak (TN16) was located in one arable field in the south east of the Main Development Site and a small willow carr (TN17) with several trees surrounded Water body 3 (see **Figure 3.2**, **Appendix A**) in an arable field north of East Hall Farm. Scattered horse chestnut and cedar were associated with residential and other private properties with gardens and were present within the semi-improved grassland in the south west of the indicative main development site (the Playing Field, TN18).

3.2.46 Tree lines were also present across the entire survey area, usually associated with field boundaries and roadside verges, they also lined the southern end of the WWII runway hard standing. A diverse line of semi-mature trees ran along East End Road, all the way to the Dengie National Nature Reserve carpark in the south east of the site, and a tree line extended from the Downhall Beach Estate in the indicative

project-provided accommodation site, along a ditch D58 (see **Figure 3.4**, **Appendix A**) running south.

3.2.47 Three adjacent rows of semi-mature trees were planted to the west of the Bradwell A power station access road, opposite the War Memorial (TN19) and extending the length of the Playing Field (TN18), this extended west along the WWII runway access road, south of Downhall Farm.

3.2.48 Dominating species in tree lines were mature black, white and Lombardy poplar, sycamore, horse chestnut, elm and crack willow with occasional ash, hornbeam, cherry, lime, cherry, pedunculate oak and field maple. Where elm had reached maturity, they were dead (likely affected by Dutch elm disease) and supported lifted and flaking bark. Trees often supported dense ivy growth and features suitable to support roosting bats, for which individual trees are discussed in more detail within the Bat Report.

Built-up areas

3.2.49 Approximately 285 built structures were located within the survey area (see **Figure 3.3**, **Appendix A**), of these, 56 were located within the Site and have been subject to individual external assessments in relation to bats and assigned an individual reference number. This survey work is ongoing and will be reported separately. Specifically, there were 53 in the indicative main development site:

- 11 pill box structures along the sea wall and within or near drainage ditches;
- 19 farm buildings (barn, shed or warehouse style);
- 2 shipping containers;
- 1 building within the Electricity Switching Station;
- 19 residential and associated outbuildings; and
- 1 Portakabin structure.

3.2.50 Three farms: East Hall Farm; Weymarks Farm; and Downhall farm, were located within the Indicative Main Development Site and accounted for most of the built structures which were recorded within the Site.

3.2.51 Three further built structures were identified within the indicative project-provided accommodation site: one pill box (Bnw021) and two residential buildings (Bnw023 and Bnw022).

3.2.52 Due to the high number of built structures within the 100m buffer (approximately 232), each structure was not assessed individually, rather, recording the type and use of buildings overall. In addition to those built structure types already recorded within the Site, those within the 100m buffer also supported commercial activities, including two public houses, two caravan parks, a building at the Sewage Treatment Works and a single chapel; St Peter on the Wall, in the east of the survey area.

3.2.53 A sea wall, constructed of concrete blocks on an artificial clay embankment, ran along the entire northern boundary of the indicative main development site, and extended west along the north western boundary of the indicative project-provided accommodation site, parallel to the coastline of the Blackwater estuary. It supported dense and patchy ruderal herb growth along its length, with growth particularly from the cracks between concrete blocks on the seaward side. Historic concrete pillbox structures were built into the sea wall at regular intervals along its length at ten locations within the survey area.

Bare ground and hard standing

3.2.54 The largest extent of hard standing habitat was formed by the former WWII runway and its associated access roads, this extended across the centre of the indicative main development site, running from the south western corner to the north east, with a single encircling access road. The area was largely undisturbed with occasional passage of farm machinery, as evident by the spoil heaps at several locations, stacks of hay bales and parked machinery.

3.2.55 The poor condition of the hard standing has allowed the growth of colonising plant species throughout the cracks and on the concrete itself, by species which require no or thin soils, such as white and biting stonecrop. Cracks were dominated by soft and barren brome, with occasional broad-leaved dock, bur chervil, white clover, St John's wort, occasional great mullein and tufts of perennial ryegrass, creeping thistle and Yorkshire fog, in addition to those species already recorded within tall ruderal and semi-improved grassland habitats. Saplings were also growing as a result of nearby mature white poplar and pedunculate oak.

3.2.56 Other farm tracks were present, leading from farm buildings at Waymarks Farm and East Hall Farm in the Indicative Main Development Site to their associated arable crops.

3.2.57 The sea wall supported a footpath running along the top of its entire length, which in places was bare ground while others were hard standing. The seaward side of the wall was reinforced with stone blocks with allowed vegetation growth along the cracks.

Controlled species

3.2.58 Japanese rose was the only Schedule 9 species recorded during the surveys, patches were located on the sea wall north of the Bradwell A power station (TN20) and is likely to occur at other locations along the sea wall.

3.2.59 Japanese knotweed, curly waterweed and New Zealand pygmyweed were all identified by the Desk Study Report (Appendix 23C) as occurring on the Site. These species were not identified during the Phase 1 survey; however, they may be detected during ongoing surveys.

4. DISCUSSION

4.1.1 Most of the land that would be lost to the proposed development comprises intensively farmed arable land of low nature conservation importance. This Phase 1 habitat survey therefore provides sufficient baseline information to adequately characterise the majority of land within the Site. However, further information will be required on the quality of some areas of coastal grassland and saltmarsh within and adjacent to the Site in order that the condition and importance of these can be assessed. Some of the habitats within the Site are Habitats of Principal Importance and Essex BAP habitats such as Hedgerows, Cereal Field Margins and Reedbed, so their quality will need to be adequately assessed in order to inform the scope of any compensation and enhancement measures.

5. SUMMARY

5.1.1 The Phase 1 habitat survey has characterised the habitats within and surrounding the site. Read in conjunction with the Desk Study Report, it provides the basis from which to enable a robust assessment of potential effects.

5.1.2 The site primarily comprised arable agricultural land with limited margins and field boundaries that generally consisted of a network of wet and dry ditches and species poor, defunct hedgerows. In some areas the field margins were wider, having been left uncultivated and were well established with typical agricultural 'weed' species, tall ruderal growth, and scattered scrub.

5.1.3 Grassland habitats were limited across the survey area and were largely described as semi-improved grassland with both species poor and species rich areas. Species recorded were mostly common and widespread with only rare occurrences of Nationally Scarce and/or Species of Principal Importance.

5.1.4 The northern boundary of the survey area included estuarine habitats. The coastal defence embankment sloped up to a public footpath that was vegetated on either side by a well-established coastal grassland sward. Parallel to the embankment was a wide and deep ditch that was almost entirely dominated by common reed with some occasional areas of open water.

5.1.5 Saltmarsh habitats were fragmented and occurred at several location beyond the coastal defence embankment. The habitats supported communities and species which are listed as qualifying features for the Dengie and Blackwater Estuary Ramsar sites and supported species which are Nationally Scarce and/or Species of Principal Importance in the UK. Therefore, these habitats will be subject to further assessment in the form of NVC, results for which will be presented in the associated NVC Report.

5.1.6 Open water habitats were present in the form of two large irrigation reservoirs and several smaller woodland and garden type ponds. Dry and wet ditches intersected the entire survey area and were dominated by common reed growth or dense tall ruderal and/or bramble where they were dry or almost dry.

5.1.7 Woodland parcels were of limited size and occurrence within the survey area, with common and widespread species creating the canopy, under storey and ground flora.

5.1.8 Three farms; Downhall Farm, East Hall Farm and Weymarks Farm and their associated agricultural buildings were located within the indicative main development site and accounted for most of the structures within the Site. Buildings are further assessed in relation to their potential to support roosting bats, results for which are presented in the Bat Report.

5.1.9 Remnants of the WWII runway were still apparent in the form of strips of hardstanding (access routes and landing strips) that traverse the site within the

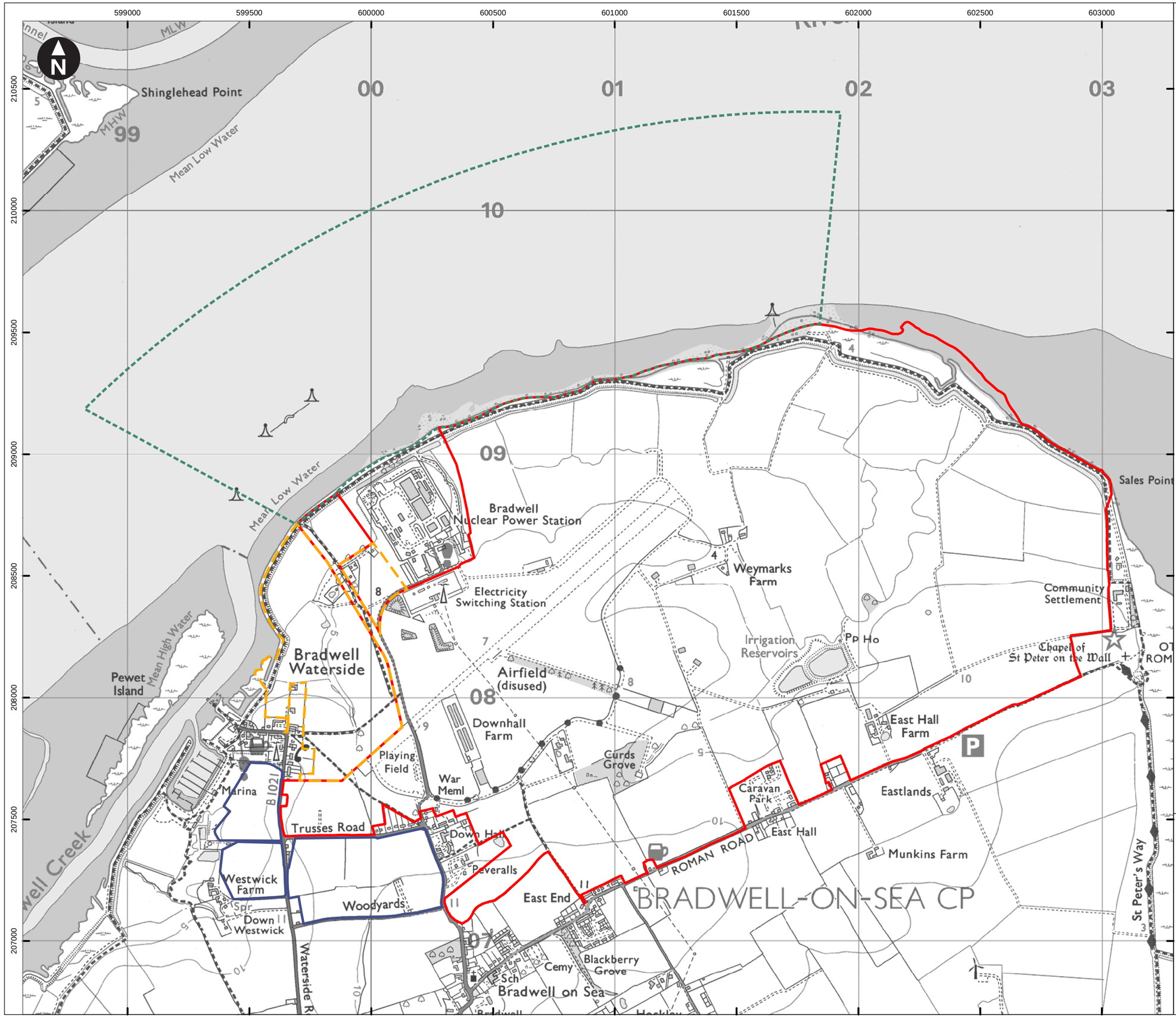
indicative main development site. These areas were largely unvegetated other than with opportunistic growth within the concrete and along the edges.

REFERENCES

Ref. 2.1 Joint Nature Conservation Committee. Handbook for Phase 1 habitat survey – a technique for environmental audit. (Peterborough 2010).

Ref. 3.1 Entec. Bradwell extended phase 1 survey report. 2009

APPENDIX A
FIGURES



Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure

0 200 400 600 800 m

Scale at A3:1:15,000

BRADWELL B PROJECT
PHASE 1 HABITAT SURVEY REPORT

Figure 1.1
The site

DRAWN: **S.G.**
DATE: **JUL 2020**

41843-WOOD-0503

NOT PROTECTIVELY MARKED

599000 599500 600000 600500 601000 601500 602000 602500 603000

210500 210000 209500 209000 208500 208000 207500 207000

Shinglehead Point
MLW
MHW
Mean Low Water
Mean High Water
Low Water
Pewet Island
Bradwell Waterside
Bradwell Nuclear Power Station
Electricity Switching Station
Airfield (disused)
Downhall Farm
Playing Field
War Meml
Marina
B 1021
Trusses Road
Down Hall
Peveralls
Westwick Farm
Down Westwick
Woodyards
Waterside R
Cemy
Sch
Bradwell on Sea
Blackberry Grove
East End
ROMAN ROAD
BRADWELL-ON-SEA CP
Curds Grove
Caravan Park
East Hall
Eastlands
Munkins Farm
East Hall Farm
Weymarks Farm
Irrigation Reservoirs
Pp Ho
Community Settlement
Chapel of St Peter on the Wall
St Peter's Way
Sales Point
Well Creek

00 01 02 03 10 09 08 07 99

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- 100m survey area

0 200 400 600 800 m

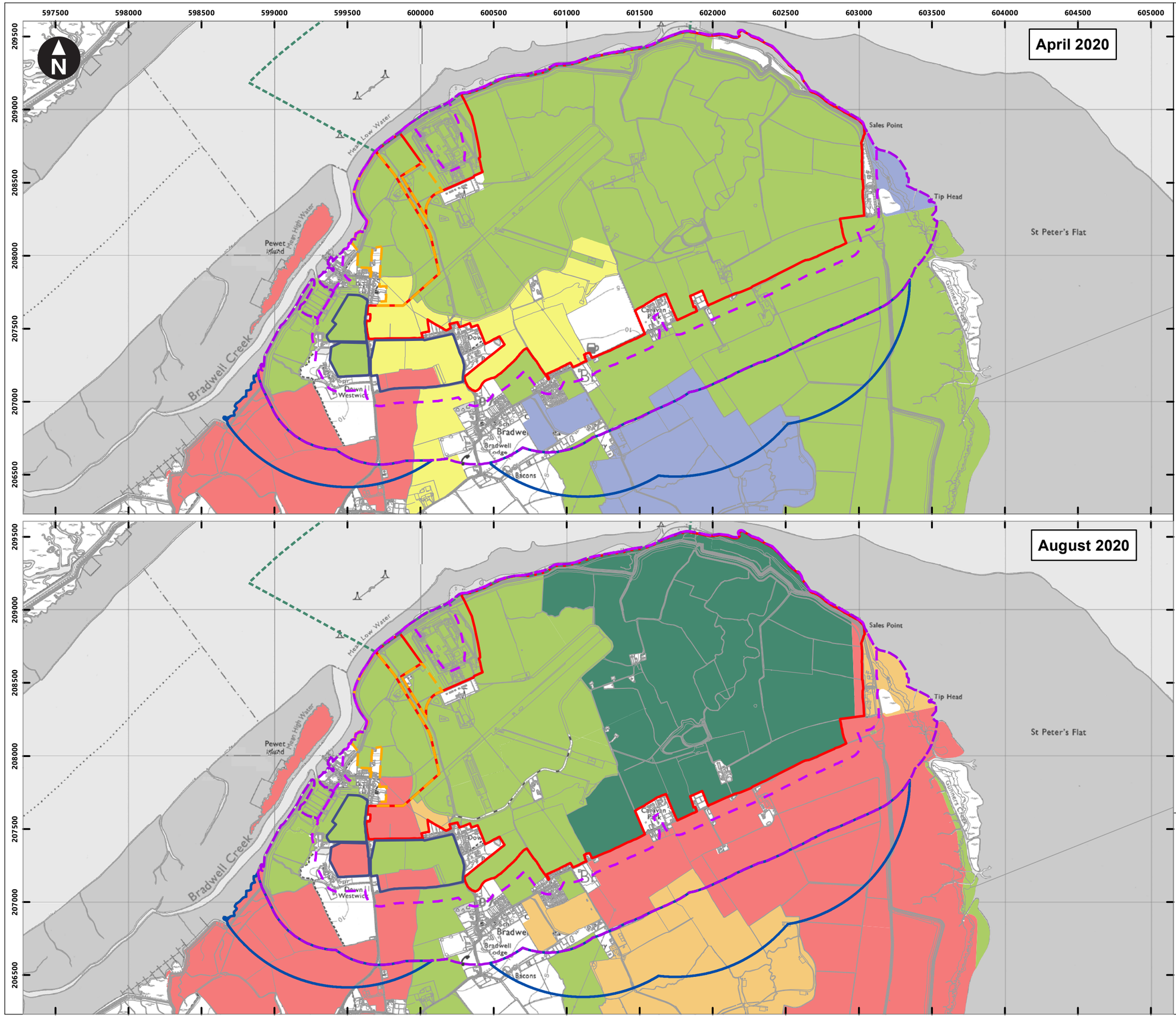
Scale at A3:1:15,000

BRADWELL B PROJECT
PHASE 1 HABITAT SURVEY REPORT

Figure 2.1
The survey area

DRAWN: **S.G.**
DATE: **JUL 2020**

41843-WOOD-0504



Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- 100m survey area
- 500m survey area
- Additional biodiversity survey extent
- Access agreed
- Access agreed under existing license
- Access requested
- Access requested (outstanding)
- Under negotiation
- Access refused

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
PHASE 1 HABITAT SURVEY REPORT

Figure 2.2
Access available for survey

DRAWN: **S.G.**
DATE: **AUG 2020**

41843-WOOD-0516

NOT PROTECTIVELY MARKED

599500
600000
600500
601000
209500
209000
208500
208000
N
Mean Low Water
Bradwell
Nuclear Power Station
Electricity
Switching Station
Bradwell
Waterside
Airfield
(disused)
09
08
8
7
5
20
4
3
2
11
7
14
6

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Indicative Zone for Marine Infrastructure
- 100m survey area
- Target Notes
- A2.2: Scrub- Scattered
- A3.1: Parkland and scattered trees- broad-leaved
- A3.2: Parkland and scattered trees- coniferous
- G2: Running water
- J2.1.2: Intact hedge native species poor
- J2.2.2: Defunct hedge native species poor
- J2.3.2: Hedge and trees native species poor
- J2.6: Dry ditch
- Hardstanding
- A1.1.1: Broadleaved woodland - semi-natural
- A1.2.2: Coniferous woodland - plantation
- A1.3.1: Mixed woodland - semi-natural
- A1.3.2: Mixed woodland - plantation
- A2.1: Scrub- Dense/Continous
- A2.2: Scrub- Scattered
- A3.1: Parkland and scattered trees- broad-leaved
- B1.2: Acid grassland - semi-improved
- B2.2: Neutral grassland - semi-improved
- C3.1: Tall ruderal
- F1: Swamp
- G1: Standing water
- H2.6: Saltmarsh dense continous
- H8.4: Coastal grassland
- J1.1: Arable
- J1.2: Amenity grassland
- J1.4: Introduced shrub
- J3.4: Caravan site
- J3.5: Sea wall
- J3.6: Buildings
- J5: Other habitat
- Hardstanding

0 100 200 300 m

Scale at A3:1:6,000

BRADWELL B PROJECT
PHASE 1 HABITAT SURVEY REPORT

Figure 3.1a
Phase 1 habitat map

DRAWN: **S.G.**
DATE: **JUL 2020**

41843-WOOD-0505

601500
602000
602500
603000
209500
209000
208500
208000
N
Weymarks Farm
Irrigation Reservoirs
Pp Ho
Community Settlement
Chapel of St Peter on the Wall
Sales
10
4
5
12
13
17

Key

- Indicative Main Development Site
- Indicative Zone for Marine Infrastructure
- 100m survey area
- Target Notes
- A2.2: Scrub- Scattered
- G2: Running water
- J2.1.2: Intact hedge native species poor
- J2.2.1: Defunct hedge native species-rich
- J2.2.2: Defunct hedge native species poor
- J2.3.2: Hedge and trees native species poor
- J2.6: Dry ditch
- Hardstanding
- A1.1.1: Broadleaved woodland - semi-natural
- A1.1.2: Broadleaved woodland - plantation
- A2.2: Scrub- Scattered
- A3.1: Parkland and scattered trees-broad-leaved
- B2.2: Neutral grassland - semi-improved
- B4: Improved grassland
- C3.1: Tall ruderal
- F1: Swamp
- G1: Standing water
- H2.6: Saltmarsh dense continous
- H8.4: Coastal grassland
- J1.1: Arable
- J3.5: Sea wall
- J3.6: Buildings
- J5: Other habitat
- Hardstanding

0 100 200 300 m

Scale at A3:1:6,000

BRADWELL B PROJECT
PHASE 1 HABITAT SURVEY REPORT

Figure 3.1b
Phase 1 habitat map

DRAWN: **S.G.**
DATE: **JUL 2020**

41843-WOOD-0505

599500
600000
600500
601000
208500
208000
207500
207000
N
Bradwell Waterside
Electricity Switching Station
Airfield (disused)
Downhall Farm
War Meml
Trusses Road
Down Hall
Peveralls
East End
Blackberry
Westwick Farm
Down Westwick
Woodyard
Key
Indicative Main Development Site
Potential Temporary Workers Accommodation Area
Potential Expansion Area for Temporary Workers Accommodation
100m survey area
Target Notes
A2.2: Scrub- Scattered
A3.1: Parkland and scattered trees- broad-leaved
A3.2: Parkland and scattered trees- coniferous
G2: Running water
J2.1.1: Intact hedge native species-rich
J2.1.2: Intact hedge native species poor
J2.2.2: Defunct hedge native species poor
J2.3.2: Hedge and trees native species poor
J2.4: Fence
J2.6: Dry ditch
Hardstanding
A1.1.1: Broadleaved woodland - semi-natural
A1.1.2: Broadleaved woodland - plantation
A1.2.2: Coniferous woodland - plantation
A1.3.1: Mixed woodland - semi-natural
A1.3.2: Mixed woodland - plantation
A2.1: Scrub- Dense/Continous
A2.2: Scrub- Scattered
A3.1: Parkland and scattered trees- broad-leaved
B1.2: Acid grassland - semi-improved
B2.2: Neutral grassland - semi-improved
B4: Improved grassland
C3.1: Tall ruderal
F1: Swamp
G1: Standing water
H2.6: Saltmarsh dense continous
H8.4: Coastal grassland
J1.1: Arable
J1.2: Amenity grassland
J1.4: Introduced shrub
J3.4: Caravan site
J3.5: Sea wall
J4: Bare ground
J3.6: Buildings
J5: Other habitat
Hardstanding
100 200 300 m
Scale at A3:1:6,000

BRADWELL B PROJECT
PHASE 1 HABITAT SURVEY REPORT

Figure 3.1c
Phase 1 habitat map

DRAWN: **S.G.**
DATE: **JUL 2020**

41843-WOOD-0505

601500
602000
602500
208500
208000
207500
207000
N
Weymarks Farm
Irrigation Reservoirs
PP Ho
Communi
Settlemen
Chapel of St Peter on the W
East Hall Farm
Eastlands
East Hall
Munkins Farm
ROMAN ROAD
BRADWELL-ON-SEA CP
Caravan Park
1
13
15
16
17
SI
10
5

Key

- Indicative Main Development Site
- 100m survey area
- Target Notes
- A2.2: Scrub- Scattered
- A3.1: Parkland and scattered trees- broad-leaved
- A3.2: Parkland and scattered trees- coniferous
- G2: Running water
- J2.1.2: Intact hedge native species poor
- J2.2.1: Defunct hedge native species-rich
- J2.2.2: Defunct hedge native species poor
- J2.3.2: Hedge and trees native species poor
- J2.6: Dry ditch
- Hardstanding
- A1.1.1: Broadleaved woodland - semi-natural
- A1.1.2: Broadleaved woodland - plantation
- A2.2: Scrub- Scattered
- A3.1: Parkland and scattered trees- broad-leaved
- B2.2: Neutral grassland - semi-improved
- B4: Improved grassland
- C3.1: Tall ruderal
- F1: Swamp
- G1: Standing water
- J1.1: Arable
- J1.2: Amenity grassland
- J3.4: Caravan site
- J3.6: Buildings
- J5: Other habitat
- Hardstanding

0 100 200 300 m

Scale at A3:1:6,000

BRADWELL B PROJECT
PHASE 1 HABITAT SURVEY REPORT

Figure 3.1d
Phase 1 habitat map

DRAWN: **S.G.**
DATE: **JUL 2020**

41843-WOOD-0505

599000 599500 600000 600500 601000 601500 602000 602500 603000 603500

210000 209500 209000 208500 208000 207500 207000 206500

N

Mean Low Water

Mean High Water

99 10 09 08 07

Bradwell Nuclear Power Station

W09

Electricity Switching Station

W08

W07

Bradwell Waterside

Pewet Island

Airfield (disused)

Weymarks Farm

Irrigation Reservoirs

Pp Ho

W02

W01

W03

Community Settlement

W25

W24

Sales Point

Chapel of St Peter on the Wall

OTHONA ROMAN FORT

W26

East Hall Farm

W04

Downhall Farm

W05 Curds Grove

W06

Playing Field

War Meml

W10

Marina

W11

B 102

Trusses Road

W12

Caravan Park

W22 East Hall

Eastlands

ROMAN ROAD

Down Hall

W16

W15 Peveralls

Munkins Farm

Westwick Farm

Woodyards

W14

East End

W17

BRADWELL-ON-SEA CP

St Peter's Way

Waterside Road

Cemy

Sch

Blackberry Grove

Bradwell on Sea

Bradwell Lodge

Hockley

Bacons

Delameres Farm

Orplands

Kennel

Bradwell Marshes

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- 100m survey area
- Waterbodies

0 200 400 600 800 m

Scale at A3:1:15,000

BRADWELL B PROJECT
PHASE 1 HABITAT SURVEY REPORT

Figure 3.2
Water bodies within the survey area

DRAWN: **S.G.**
DATE: **JUL 2020**

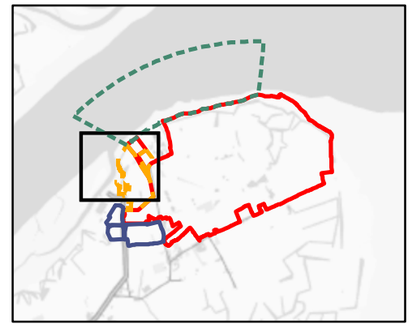
41843-WOOD-0506

599000
599500
600000
208500
208000

Bnw019
Bnw021
Bnw020
Bnw022
Bnw023
Bbw001
Bbw002
Bbw005
Bbw003
Bbw004
Bbw006

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Indicative Zone for Marine Infrastructure
- 100m survey area
- Buildings



0 50 100 150 200 m

Scale at A3:1:4,000

BRADWELL B NUCLEAR
PHASE 1 HABITAT SURVEY REPORT

Figure 3.3a
Built structures within the survey area

DRAWN:
DATE: **JUL 2020**

41843-WOOD-0507

600500

601000

209000

208500

N

Bnw014

Bnw015

Bnw016

Bnw017

Bnw011

Bnw024

Key

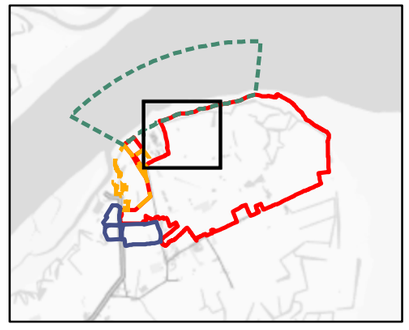
Indicative Main Development Site

Potential Temporary Workers Accommodation Area

Indicative Zone for Marine Infrastructure

100m survey area

Buildings



0 50 100 150 200 m

Scale at A3:1:4,000

BRADWELL B NUCLEAR
PHASE 1 HABITAT SURVEY REPORT

Figure 3.3b
Built structures within the survey area

DRAWN:
DATE: **JUL 2020**

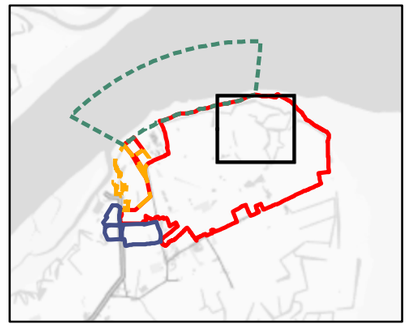
41843-WOOD-0507

NOT PROTECTIVELY MARKED

601500
602000
209500
209000
208500
N
Bne021
Bnw013
Bne020
Bne022
Bne023
Bnw012
Bnw003
Bnw001
Bnw004
Bnw002
Bnw006
Bnw005
Bnw007
Bnw008
Bnw009
Bnw010

Key

- Indicative Main Development Site
- Indicative Zone for Marine Infrastructure
- 100m survey area
- Buildings



0 50 100 150 200 m

Scale at A3:1:4,000

BRADWELL B NUCLEAR
PHASE 1 HABITAT SURVEY REPORT

Figure 3.3c
Built structures within the survey area

DRAWN:
DATE: **JUL 2020**

41843-WOOD-0507

602500

603000

208500

208000

Bne019

Bne022

Bne023

Bne001

Bne018

Bne002

Bne003

Bne012

Bne016

Bne013

BneB17

Bne014

Bne006

Bne015

Bne008

Bne011

Bne007

Bne009

Bne005

Bne004

Bne010

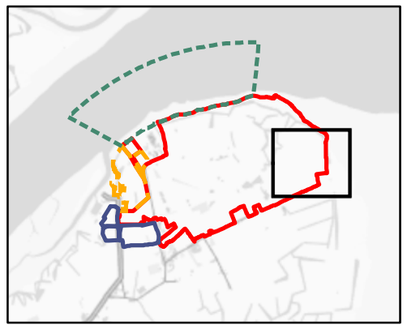
e017

Key

Indicative Main Development Site

100m survey area

Buildings



0 50 100 150 200 m

Scale at A3:1:4,000

BRADWELL B NUCLEAR
PHASE 1 HABITAT SURVEY REPORT

Figure 3.3d
Built structures within the survey area

DRAWN:
DATE: **JUL 2020**

41843-WOOD-0507

NOT PROTECTIVELY MARKED

601500

602000

208000

207500

N

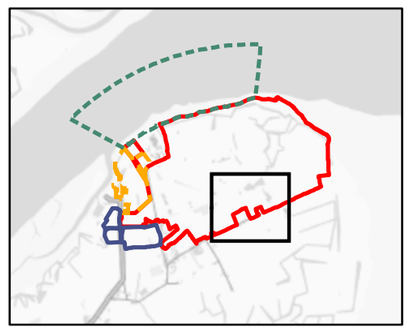
Bsw001
Bsw002
Bsw003
Bsw004
Bsw005
Bsw006
Bsw021
Bsw022
Bsw023
Bsw024
Bsw025
Bsw026
Bsw027
Bsw032
Bse006
Bse007
Bse008
Bse014
Bse015
Bse016
Bse017
Bse018
Bse019
Bse020
Bse021
Bse022
Bse023
Bse024
Bse028
Bse029
Bse030
Bse031
Bse032
Bse033
Bse034

Key

Indicative Main Development Site

100m survey area

Buildings



0 50 100 150 200 m

Scale at A3:1:4,000

BRADWELL B NUCLEAR
PHASE 1 HABITAT SURVEY REPORT

Figure 3.3e
Built structures within the survey area

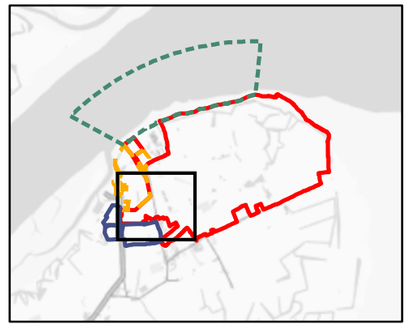
DRAWN:
DATE: **JUL 2020**

41843-WOOD-0507

600000
600500
208000
207500
N
Bbw001
Bbw002
Bbw003
Bbw004
Bsw007
Bsw008
Bsw009
Bsw010
Bsw011
Bsw012
Bsw013
Bsw014
Bsw015
Bsw016
Bsw017
Bsw018
Bsw019
Bsw020
Btr001
Btr002
Btr003
Btr004
Btr005
Btr006
Btr007
Btr008
Btr009
Btr010
Btr011
Btr012
Btr013
Btr014
Btr015
Btr016
41843-WOOD-0507

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- 100m survey area
- Buildings



0 50 100 150 200 m

Scale at A3:1:4,000

BRADWELL B NUCLEAR
PHASE 1 HABITAT SURVEY REPORT

Figure 3.3f
Built structures within the survey area

DRAWN:
DATE: **JUL 2020**

BRB CGN EDF ENERGY

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- 100m survey area
- Dry ditches
- Wet ditches

CONFIDENTIAL

0 200 400 600 800 m

Scale at A3:1:15,000

BRADWELL B PROJECT
PHASE 1 HABITAT SURVEY REPORT

Figure 3.4
Ditches within the survey area

DRAWN: **S.G.**
DATE: **JUL 2020**

41843-WOOD-0508

APPENDIX B
TARGET NOTES

Table B.1 Target Notes

TN	Description
1	Complete cover of fat-hen
2	Location of bee orchid
3	Location of yellow horned poppy
4	Location of sea holly
5	Unvegetated raised shell bank and high tide mark
6	Mixed plantation woodland - shelterbelt
7	Broadleaved semi-natural woodland and willow carr
8	Curds Grove; broadleaved semi-natural woodland
9	Broadleaved semi-natural woodland dominated by poplar
10	Sycamore and horse chestnut broadleaved semi-natural woodland
11	Broadleaved semi-natural woodland, willow carr and supplementary planting
12	Broadleaved semi-natural woodland dominated by elm
13	Elm broadleaved semi-natural woodland surrounding the Othona Community
14	Conifer plantation woodland
15	Defunct hedge native species rich
16	Stand-alone mature pedunculate oak within arable field
17	Willow carr surrounding small pond within arable field
18	Former playing fields
19	RAF War Memorial
20	Location of Japanese rose

APPENDIX C
SPECIES RECORDS

Table C.2 All species recorded, their scientific names, abundance and location (habitat type)

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Agrimony	*Agrimonia eupatoria*	R	Semi-improved grassland, tall ruderal
Alder	*Alnus glutinosa*	O	Broadleaved semi-natural woodland
Alexanders	*Smyrnium olusatrum*	D	Semi-improved grassland, tall ruderal, coastal grassland
Annual meadow grass	*Poa annua*	O	Semi-improved grassland, amenity grassland
Annual mercury	*Mercurialis annua*	O	Broadleaved semi-natural woodland
Annual nettle	*Urtica urens*	O	Broadleaved semi-natural woodland
Annual sea-blite	*Suaeda maritima*	O	Saltmarsh, hard standing (sea wall)
Ash	*Fraxinus excelsior*	F	Broadleaved semi-natural woodland, tree lines
Aspen	*Populus tremula*	R	Broadleaved semi-natural woodland, tree lines
Aubretia	*Aubretia deltoidea*	O	Residential areas
Autumn hawkbit	*Leontodon autumnalis*	O	Semi-improved grassland, amenity grassland
Barren brome	*Anisantha sterilis*	A	Semi-improved grassland, hard standing/tall ruderal, arable, coastal grassland
Bastard cabbage	*Rapistrum rugosum*	F	Semi-improved grassland, tall ruderal, arable

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Beaked hawksbeard	*Crepis vesicaria*	A	Saltmarsh
Bee orchid	*Ophrys apifera*	R	Semi-improved grassland (west of Power Station)
Bird's-foot-trefoil	*Lotus corniculatus*	F	Improved, semi-improved grassland
Biting stonecrop	*Sedum acre*	F	Hard standing
Bittersweet	*Solanum dulcamara*	R	Hedgerows, semi-improved grassland
Black bindweed	*Fagopyrum convulvulus*	O	Hedgerows, arable
Black bryony	*Tamus communis*	O	Hedgerows
Black grass	*Alopecurus myosuroides*	O	Arable
Black horehound	*Ballota nigra*	O	Semi-improved grassland, tall ruderal
Black knapweed	*Centaurea nigra*	F	Semi-improved grassland
Black medick	*Medicago lupulina*	A	Semi-improved grassland, amenity grassland
Black nightshade	*Solanum nigrum*	R	Semi-improved grassland, tall ruderal
Black poplar	*Populus nigra*	O	Tree lines
Blackthorn	*Prunus spinosa*	A	Hedgerows, dense continuous scrub
Bladder campion	*Silene vulgaris*	R	Semi-improved grassland, coastal grassland

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Bluebell	*Hyacinthoidies non-scripta*	O	Broadleaved semi-natural woodland
Bracken	*Pteridium aquilinum*	O	Hedgerows, tall ruderal
Bramble	*Rubus fruticosus agg.*	A	Hard standing/tall ruderal, scattered and dense continuous scrub
Bread wheat	*Triticum aestivum*	D	Arable
Bristly ox-tongue	*Picris echioides*	D	Semi-improved grassland, coastal grassland
Broad-leaved dock	*Rumex obtusifolius*	F	Semi-improved grassland, tall ruderal, hard standing
Broom	*Cytisus scoparius*	R	Dense continuous and scattered scrub
Buck's-horn plantain	*Plantago coronopus*	O	Coastal grassland
Bulbous buttercup	*Ranunculus bulbosus*	O	Coastal grassland
Bulbous rush	*Juncus bulbosus*	O	Running and open water, swamp
Bur chervil	*Anthriscus caucalis*	A	Semi-improved grassland, tall ruderal, arable
Bush vetch	*Vicia sepium*	R	Hedgerows
Butterfly-bush	*Buddleia davidii*	O	Residential areas
Canadian fleabane	*Conyza canadensis*	O	Semi-improved grassland, short ephemeral
Celery-leaved buttercup	*Ranunculus sceleratus*	R	Semi-improved grassland, coastal grassland

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Charlock	*Sinapis arvensis*	O	Tall ruderal, arable
Cherry	*Prunus sp.*	R	Residential areas, tree lines
Cherry plum	*Prunus cerasifera*	R	Residential areas
Chicory	*Cichorium intybus*	R	Semi-improved grassland, improved grassland
Cleavers	*Galium aparine*	A	Broadleaved semi-natural woodland, tall ruderal
Clustered dock	*Rumex conglomeratus*	O	Semi-improved grassland, tall ruderal, hard standing
Cock's foot	*Dactylis glomerata*	A	Semi-improved grassland, coastal grassland, improved grassland
Colt's-foot	*Tussilago farfara*	O	Semi-improved grassland
Comfrey	*Symphytum officinale*	O	Running water (banks), tall ruderal
Common bent	*Agrostis capillaris*	F	Semi-improved grassland
Common catsear	*Hypochaeris radicata*	O	Semi-improved grassland
Common chickweed	*Stellaria media*	F	Semi-improved grassland, short ephemeral
Common club-rush	*Schoenoplectus lacustris*	O	Open water margins and swamp
Common cord-grass	*Spartina anglica*	A	Saltmarsh
Common couch	*Elytrigia repens*	F	Semi-improved grassland, coastal grassland

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Common dog-violet	*Viola riviniana*	R	Semi-improved grassland
Common duckweed	*Lemna minor*	F	Open water
Evening-primrose	*Oenothera biennis*	O	Semi-improved grassland and tall ruderal
Common fleabane	*Pulicaria dysenterica*	O	Semi-improved grassland and tall ruderal
Common glasswort	*Salicornia europaea*	A	Saltmarsh
Common gorse	*Ilex europaeus*	R	Scattered and dense continuous scrub
Common hard-grass	*Parapholis strigosa*	O	Coastal grassland and saltmarsh
Common hawksbeard	*Crepis cappilaris*	O	Semi-improved grassland and tall ruderal
Common knotgrass	*Polygonum aviculare*	F	Arable and semi-improved grassland
Common Lime	*Tilia x vulgaris*	F	Tree lines
Common mallow	*Malva sylvestris*	D	Semi-improved grassland, coastal grassland, hard standing/tall ruderal
Common mouse-ear	*Cerastium fontanum*	F	Semi-improved grassland, short ephemeral
Common nettle	*Urtica dioica*	D	Broadleaved semi-natural woodland (ground flora)
Common orache	*Atriplex patula*	F	Saltmarsh
Common poppy	*Papaver rhoeas*	O	Semi-improved grassland, arable

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Common ragwort	*Senecio jacobaea*	R	Semi-improved grassland, tall ruderal
Common reed	*Phragmites australis*	D	Running water, swamp, open water
Saltmarsh-grass	*Puccinellia maritima*	O	Saltmarsh
Sea lavender	*Limonium vulgare*	F	Saltmarsh
Common sorrel	*Rumex acetosa*	F	Semi-improved grassland
Common storksbill	*Erodium cicutarium*	O	Semi-improved grassland, short ephemeral
Common vetch	*Vicia sativa*	O	Semi-improved grassland, tall ruderal
Common whitlow-grass	*Erophila verna*	O	Semi-improved grassland, amenity, short ephemeral
Compact rush	*Juncus conglomeratus*	R	Open water, swamp, saltmarsh
Cow parsley	*Anthriscus sylvestris*	A	Semi-improved grassland, tall ruderal
Cowslip	*Primula veris*	R	Semi-improved grassland
Crab apple	*Malus sylvestris*	R	Residential gardens
Crack willow	*Salix fragilis*	F	Tree lines, broadleaved semi-natural woodland
Creeping bent	*Agrostis stolonifera*	F	Semi-improved grassland
Creeping buttercup	*Ranunculus repens*	F	Semi-improved grassland, improved grassland

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Creeping cinquefoil	*Potentilla reptans*	F	Improved grassland, semi-improved grassland
Creeping thistle	*Cirsium arvense*	A	Semi-improved grassland, improved grassland, arable
Crested dog's tail	*Cynosurus cristatus*	F	Semi-improved grassland, improved grassland
Cultivated apple	*Malus domestica*	R	Residential gardens
Cultivated cherry	*Prunus avium (cultivars)*	R	Residential gardens
Curled dock	*Rumex crispus*	O	Semi-improved grassland, tall ruderal
Curved hard-grass	*Parapholis incurva*	O	Coastal grassland and saltmarsh
Curly waterweed	*Lagarosiphon major*	n/a	Not recorded during the survey
Cut-leaved crane's-bill	*Geranium dissectum*	R	Semi-improved grassland, coastal grassland
Daisy	*Bellis perennis*	A	Semi-improved grassland, improved grassland, amenity
Dandelion	*Taraxacum agg.*	A	Semi-improved grassland, improved grassland, amenity
Danish scurvy grass	*Cochlearia danica*	R	Saltmarsh
Divided sedge	*Carex divisa*	R	Saltmarsh
Dog rose	*Rosa canina*	F	Scattered and dense continuous scrub, tall ruderal
Dogwood	*Cornus sanguinea*	O	Woodland and hedgerows

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Dove's-foot crane's-bill	*Geranium molle*	O	Semi-improved grassland, short ephemeral
Duke of Argyll's tea plant	*Lycium barbarum*	R	Introduced shrub and residential gardens
Eelgrass	*Zostera spp.*	F	Saltmarsh
Elder	*Sambucus nigra*	A	Woodland, hedgerows and tall ruderal
Elm	*Ulmus procera*	A	Woodland and hedgerows
English scurvy grass	*Cochlearia anglica*	F	Saltmarsh
Equal-leaved knotgrass	*Polygonum arenastrum*	O	Arable
False oat grass	*Arrhenatherum elatius*	D	Semi-improved grassland, coastal grassland
Fat-hen	*Chenopodium album*	A	Arable and tall ruderal
Fennel	*Foeniculum vulgare*	O	Arable, semi-improved grassland and tall ruderal
Feverfew	*Tanacetum parthenium*	O	Semi-improved grassland, arable
Field bindweed	*Convolvulus arvensis*	O	Semi-improved grassland, arable
Field forget-me-not	*Myosotis arvensis*	F	Semi-improved grassland, coastal grassland
Field horsetail	*Equisetum arvense*	A	Semi-improved grassland, arable, tall ruderal
Field maple	*Acer campestre*	F	Woodland and hedgerows

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Field scabious	*Knautia arvensis*	R	Semi-improved grassland
Field speedwell	*Veronica persica*	O	Semi-improved grassland
Flag iris	*Iris pseudocorus*	O	Open water and swamp
Floating sweet-grass	*Glyceria fluitans*	O	Open water
Fool's watercress	*Apium nodiflorum*	O	Open water
Forsythia	*Forsythia x intermedia*	R	Introduced shrub and residential gardens
Foxglove	*Digitalis purpurea*	R	Woodland
Frosted orache	*Atriplex laciniata*	O	Saltmarsh
Garden daffodil	*Narcissus pseudonarcissus major*	O	Residential gardens
Garden grape hyacinth	*Muscari armeniacum*	O	Residential gardens
Garden pansy	*Viola x wittrockiana*	O	Residential gardens
Garden privet	*Ligustrum ovalifolium*	O	Introduced shrub and residential gardens
Garlic mustard	*Alliaria petiolata*	F	Woodlands and hedgerows
Goat willow	*Salix caprea*	F	Woodlands
Goat's-beard	*Tragapogon pratensis*	F	Semi-improved grassland, coastal grassland
Golden-samphire	*Inula crithmoides*	O	Saltmarsh

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Good-King-Henry	*Chenopodium bonus-henricus*	O	Semi-improved grassland, arable, swamp
Grass vetchling	*Lathyrus nissolia*	R	Semi-improved grassland
Grass-leaved orache	*Atriplex littoralis*	O	Saltmarsh
Great bindweed	*Calystegia silvatica*	O	Dense continuous scrub and hedgerow
Great horsetail	*Equisetum telmateia*	A	Arable, tall ruderal
Great lettuce	*Lactuca virosa*	O	Arable, tall ruderal
Great mullein	*Verbascum thapsus*	O	Tall ruderal
Great willowherb	*Epilobium hirsutm*	F	Swamp, running water
Greater burdock	*Arctium lappa*	F	Semi-improved grassland, woodland, arable
Greater celandine	*Chelidonium majus*	R	Open water and swamp
Greater knapweed	*Centaurea scabiosa*	O	Semi-improved grassland
Greater periwinkle	*Vinca major*	O	Semi-improved grassland and scattered scrub
Greater plantain	*Plantago major*	O	Arable
Greater reedmace	*Typha latifolia*	O	Open water margins and swamp
Greater sea-spurrey	*Spergularia media*	R	Saltmarsh

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Greater stitchwort	*Stellaria holostea*	O	Semi-improved grassland and short ephemeral
Green alkanet	*Pentaglottis sempervirens*	O	Semi-improved grassland and tall ruderal
Grey field speedwell	*Veronica polita*	R	Semi-improved grassland
Grey poplar	*Populus x canescens*	F	Woodland and tree lines
Ground ivy	*Glechoma hederacea*	F	Woodland
Groundsel	*Senecio vulgaris*	R	Semi-improved grassland, arable, short perennial
Hairy bittercress	*Cardamine hirsuta*	F	Semi-improved grassland, arable, short perennial
Hairy tare	*Vicia hirsuta*	R	Semi-improved grassland
Hard rush	*Juncus erectus*	F	Open water margins and swamp
Hare's-foot clover	*Trifolium arvense*	R	Coastal grassland
Hart's-tongue fern	*Phyllitis scolopendrium*	O	Woodland, tall ruderal
Hawthorn	*Crataegus monogyna*	D	Woodland and hedgerows
Hazel	*Corylus avellana*	F	Woodland and hedgerows
Hedge bedstraw	*Galium mollugo*	F	Tall ruderal, arable and hedgerows
Hedge bindweed	*Calystegia sepium*	F	Dense continuous scrub and hedgerows

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Hedge mustard	*Sisymbrium officinale*	F	Tall ruderal, arable and hedgerows
Hedgerow crane's-bill	*Geranium pyrenaicum*	R	Tall ruderal, arable and hedgerows
Hemlock	*Conium maculatum*	O	Tall ruderal
Hemp agrimony	*Eupatorium cannabinum*	O	Tall ruderal
Henbit deadnettle	*Lamium amplexicaule*	O	Tall ruderal and semi-improved grassland
Herb bennet	*Geum urbanum*	O	Woodland, hedgerows, and short perennial
Herb Robert	*Geranium robertianum*	O	Woodland, hedgerows, and short perennial
Hoary cress	*Lepidium draba*	D	Semi-improved grassland, coastal grassland, hard standing
Hoary ragwort	*Senecio erucifolius*	R	Semi-improved grassland
Hogweed	*Heracleum sphondylium*	F	Semi-improved grassland and tall ruderal
Holly	*Ulex europaeus*	R	Woodland
Hollyhock	*Alcea rosea*	R	Semi-improved grassland and residential gardens
Holme oak	*Quercus ilex*	R	Woodland and residential gardens
Hop	*Humulus lupulus*	O	Woodland, scrub, and hedgerows
Hornbeam	*Carpinus betulus*	A	Tree lines, broadleaved semi-natural woodland

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Horse chestnut	*Aesculus hippocastanum*	F	Woodland and tree lines
Horse radish	*Armoracia rusticana*	O	Arable and tall ruderal
Hybrid black poplar	*Populus x canadensis*	O	Tree lines and scattered within residential gardens
Ivy	*Hedera helix*	A	Woodland, hedgerow, and scrub
Ivy-leaved speedwell	*Veronica heterifolia*	R	Short perennial (on walls)
Japanese knotweed	*Fallopia japonica*	n/a	Not recorded during the survey
Japanese rose	*Rosa rugosa*	O	Coastal grassland and scrub
Knotted hedge parsley	*Tortilis nodosa*	O	Semi-improved grassland and hedgerows
Laburnum	*Laburnum anagyroides*	R	Treelines and scattered within residential gardens
Lacy phacelia	*Phacelia tanacetifolia*	R	Semi-improved grassland
Lady's bedstraw	*Galium verum*	A	Semi-improved grassland
Laurel	*Laurus nobilis*	F	Hedgerows and residential boundaries
Lesser burdock	*Arctium minus*	O	Woodland and arable
Lesser celandine	*Ranunculus ficaria*	O	Woodland
Lesser chickweed	*Stellaria pallida*	F	Semi-improved and coastal grassland

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Lesser reedmace	*Typha angustifolia*	F	Open water margins and swamp
Lesser sea spurrey	*Spergularia marina*	O	Saltmarsh
Lesser trefoil	*Trifolium dubium*	F	Semi-improved, improved and amenity grassland
Leyland cypress	*Cupressocyparis leylandii*	O	Tree lines and woodland
Lilac	*Syringa vulgaris*	R	Woodland and residential gardens
Little mouse-ear	*Cerastium semidecandrum*	F	Semi-improved grassland and short ephemeral
Lombardy poplar	*Populus nigra italica*	O	Tree lines
Lords and ladies	*Arum maculatum*	O	Woodland
Lucerne	*Medicago sativa*	A	Arable, semi-improved grassland
Meadow barley	*Hordeum secalinum*	O	Semi-improved grassland
Meadow buttercup	*Ranunculus acris*	O	Semi-improved and coastal grassland
Meadow foxtail	*Alopecurus pratensis*	A	Semi-improved grassland
Meadow vetchling	*Lathyrus pratensis*	O	Semi-improved grassland
Milk thistle	*Silybum marianum*	F	Arable and tall ruderal
Monkey flower	*Erythranthe guttata*	R	Open water

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Mugwort	*Artemisia vulgaris*	A	Semi-improved grassland, coastal grassland
Musk mallow	*Malva moschata*	R	Arable, tall ruderal
Narrow-leaved bird's-foot-trefoil	*Lotus glaber*	R	Semi-improved grassland
New Zealand pygmyweed	*Crassula helmsii*	n/a	Not recorded during the survey
Nipplewort	*Lapsana communis*	O	Woodland and hedgerows
Norway maple	*Acer platanoides*	O	Woodland, tree lines and hedgerows
Opium poppy	*Papaver somniferum*	F	Arable and tall ruderal
Orange-ball-tree	*Buddleja globosa*	R	Introduced shrub and residential gardens
Oregon grape	*Mahonia aquifolium*	R	Introduced shrub and residential gardens
Oxeye daisy	*Leucanthemum vulgare*	O	Semi-improved grassland
Oxford ragwort	*Senecio squalidus*	R	Semi-improved grassland, tall ruderal
Pale persicaria	*Persicaria lapathifolia*	O	Short perennial and arable
Pedunculate oak	*Quercus robur*	F	Woodland, tree lines and hedgerows
Perennial rye-grass	*Lolium perenne*	D	Improved grassland, semi-improved grassland, coastal grassland

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Perennial sow thistle	*Sonchus arvensis*	O	Semi-improved grassland and tall ruderal
Perforate St John's wort	*Hypericum perforatum*	F	Semi-improved grassland, hard standing/tall ruderal
Petty spurge	*Euphorbia peplus*	O	Arable and tall ruderal
Pineapple weed	*Matricaria discoidea*	F	Arable and short perennial
Pink oxalis	*Oxalis articulata*	O	Residential gardens
Pot marigold	*Calendula officinalis*	O	Residential gardens
Prickly lettuce	*Lactuca serriola*	O	Semi-improved grassland and tall ruderal
Prickly sow-thistle	*Sonchus asper*	O	Semi-improved grassland and tall ruderal
Primrose	*Primula vulgaris*	O	Semi-improved grassland and short perennial
Procumbent pearlwort	*Sagina procumbens*	F	Short perennial (hard standing and sea wall)
Purple toadflax	*Linaria purpurea*	O	Semi-improved grassland and short perennial
Rape	*Brassica napus*	A	Arable
Red campion	*Silene dioica*	O	Semi-improved grassland and short perennial
Red clover	*Trifolium pratense*	F	Amenity, improved and semi-improved grassland
Red deadnettle	*Lamium purpurea*	O	Semi-improved grassland, woodland, and hedgerow

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Red fescue	*Festuca rubra*	D	Improved, semi-improved and coastal grassland
Red sand-spurrey	*Spergularia rubra*	O	Saltmarsh
Red valerian	*Centranthus ruber*	O	Hedgerows
Redshank	*Persicaria maculosa*	F	Arable and short perennial
Reed canary-grass	*Phalaris arundinacea*	A	Open water margins and swamp
Ribbed melilot	*Melilotus officinalis*	F	Arable and tall ruderal
Ribwort plantain	*Plantago lanceolata*	F	Amenity, improved and semi-improved grassland
Rock samphire	*Crithmum maritimum*	R	Saltmarsh
Rosebay willowherb	*Chamerion angustifolium*	A	Running water and swamp, semi-improved grassland
Rough chervil	*Chaerophyllum temulum*	F	Semi-improved grassland, tall ruderal and hedgerow
Rowan	*Sorbus aucuparia*	R	Woodland and tree lines
Russian-vine	*Fallopia baldschuanica*	O	Introduced shrub and residential gardens
Salad burnet	*Sanguisorba minor*	R	Semi-improved grassland
Salsify	*Tragopogon porrifolius*	R	Semi-improved grassland, coastal grassland

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Saltmarsh rush	*Juncus gerardii*	F	Open water margins, swamp, saltmarsh
Sand cat's tail	*Phleum arenarium*	O	Coastal grassland and saltmarsh
Sand couch	*Elytrigia juncea*	O	Coastal grassland and saltmarsh
Scarlet pimpernel	*Anagallis arvensis*	R	Semi-improved grassland
Scented mayweed	*Matricaria recutita*	A	Semi-improved grassland, arable, short perennial
Scentless mayweed	*Tripleurospermum inodorum*	A	Semi-improved grassland, arable, short perennial
Scots pine	*Pinus sylvestris*	A	Conifer plantation woodland, mixed plantation woodland
Sea arrowgrass	*Triglochin maritima*	O	Saltmarsh
Sea aster	*Aster tripolium*	R	Coastal grassland and saltmarsh
Sea barley	*Hordeum marinum*	R	Coastal grassland and saltmarsh
Sea beet	*Beta vulgaris maritima*	A	Coastal grassland, semi-improved grassland
Sea buckthorn	*Hippophae rhamnoides*	R	Coastal grassland and saltmarsh
Sea clover	*Trifolium squamosum*	R	Coastal grassland
Sea club-rush	*Bolboschoenus maritimus*	F	Open water margins and swamp
Sea couch	*Elytrigia atherica*	A	Coastal grassland

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Sea fern-grass	*Catapodium marinum*	F	Saltmarsh
Sea holly	*Eryngium maritimum*	R	Saltmarsh (one plant north of Othona Community)
Sea kale	*Crambe maritima*	R	Saltmarsh
Sea mayweed	*Tripleurospermum maritimum*	O	Coastal grassland and saltmarsh
Sea mouse-ear	*Cerastium diffusum*	F	Coastal grassland
Sea plantain	*Plantago maritima*	O	Coastal grassland and saltmarsh
Sea purslane	*Atriplex portulacoides*	A	Saltmarsh
Sea sandwort	*Honckenya peploides*	O	Saltmarsh
Sea spurge	*Euphorbia paralias*	O	Saltmarsh
Sea wormwood	*Artemisia maritima*	O	Coastal grassland and saltmarsh
Selfheal	*Prunellavulgaris*	F	Semi-improved and improved grassland
Sheep's fescue	*Festuca ovina*	O	Semi-improved and coastal grassland
Sheep's sorrel	*Rumex acetosella*	F	Semi-improved grassland
Shepherd's purse	*Capsella bursa-pastoris*	A	Arable and short ephemeral
Sherardia	*Sherardia arvensis*	O	Semi-improved grassland,

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Shrubby sea-blite	*Suaeda vera*	D	Saltmarsh
Silver birch	*Betula pendulua*	R	Tree lines
Slender thistle	*Carduus tenuiflorus*	O	Coastal grassland and sea wall
Small cat's tail	*Phleum bertolonii*	O	Semi-improved grassland, arable
Small-flowered crane's-bill	*Geranium pusillum*	R	Semi-improved grassland
Small-leaved lime	*Tilia cordata*	O	Woodland and tree lines
Smooth hawksbeard	*Crepis capillaris*	F	Semi-improved grassland
Smooth meadow grass	*Poa pratensis*	A	Semi-improved grassland
Smooth sow thistle	*Sonchus oleraceus*	F	Semi-improved grassland and coastal grassland
Smooth tare	*Vicia tetrasperma*	R	Semi-improved grassland, scrub
Snowdrop	*Galanthus nivalis*	O	Semi-improved grassland and residential gardens
Soft brome	*Bromus hordeaceus*	A	Semi-improved grassland, tall ruderal, arable
Soft rush	*Juncus effusus*	A	Open water margins and swamp
Spanish bluebell	*Hyacinthoides hispanica*	O	Woodland
Spear thistle	*Cirsium vulgare*	F	Semi-improved grassland, improved grassland

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Spear-leaved orache	*Atriplex prostrata*	O	Saltmarsh
Spindle	*Euonymus europaeus*	R	Woodland
Spiny restharrow	*Ononis spinosa*	R	Semi-improved and coastal grassland
Spotted medick	*Medicago arabica*	F	Amenity grassland, improved grassland, semi-improved grassland
Square-stalked willowherb	*Epilobium tetragonum*	O	Semi-improved grassland, short perennial
Squirrel tail fescue	*Vulpia bromoides*	O	Coastal grassland
Sticky mouse-ear	*Cerastium glomeratum*	F	Coastal grassland
Stiff saltmarsh-grass	*Puccinellia rupestris*	F	Saltmarsh
Stone parsley	*Sison amomum*	O	Arable and tall ruderal
Strawberry clover	*Trifolium fragiferum*	R	Coastal and semi-improved grassland
Summer snowflake	*Leucojum aestivum*	R	Semi-improved grassland and residential gardens
Sun spurge	*Euphorbia helioscopia*	O	Arable, tall ruderal
Sweet Alyssum	*Lobularia maritima*	O	Arable, sea wall, short ephemeral
Sweet vernal grass	*Anthoxanthum odoratum*	O	Semi-improved grassland

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Sweet violet	*Viola odorata*	R	Woodlands and hedgerows
Swine cress	*Coronopus squamatus*	F	Arable and short perennial
Sycamore	*Acer pseudoplatanus*	F	Woodland and tree lines
Tall fescue	*Festuca aruninaceus*	F	Semi-improved and coastal grassland
Tamarisk	*Tamarix gallica*	R	Introduced shrub and residential gardens
Teasel	*Dipsacus fullonum*	F	Semi-improved grassland and tall ruderal
Three-cornered leek	*Allium triquetrum*	O	Woodland and hedgerows
Thrift	*Armeria maritima*	R	Saltmarsh
Thyme-leaved sandwort	*Arenaria serpyllifolia*	O	Saltmarsh
Timothy	*Phleum pratense*	F	Semi-improved and improved grassland, tall ruderal
Two-rowed barley	*Hordeum distichon*	A	Arable
Wall barley	*Hordeum murinum*	O	Arable and semi-improved grassland (verges)
Wall speedwell	*Veronica arvensis*	R	Short ephemeral (walls)
Wallflower	*Erysimum cheiri*	R	Short ephemeral (walls)
Wall-rue	*Asplenium ruta-muraria*	R	Short ephemeral (walls)

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Walnut	*Juglans regia*	R	Residential properties
Wayfaring tree	*Viburnum lantana*	R	Hedgerow
Weeping willow	*Salix sepulcralis 'Chrysocoma'*	O	Woodland and tree lines
Weld	*Reseda luteola*	O	Semi-improved grassland and tall ruderal
White beam	*Sorbus aria*	R	Woodland and hedgerow
White bryony	*Bryonia dioica*	R	Hedgerows and tall ruderal
White campion	*Silene alba*	O	Semi-improved grassland, hard standing, tall ruderal, arable
White clover	*Trifolium repens*	A	Amenity, improved and semi-improved grassland
White deadnettle	*Lamium album*	F	Semi-improved grassland, broadleaved semi-natural woodland
White poplar	*Populus alba*	A	Tree lines, broadleaved semi-natural woodland
White stonecrop	*Sedum album*	F	Hard standing, short ephemeral
White willow	*Salix alba*	o	Tree line, running water and open water
Wild carrot	*Daucus carota*	O	Semi-improved grassland, coastal grassland
Wild oat	*Avena fatua*	A	Semi-improved grassland, arable
Wild onion	*Allium vineale*	R	Arable, amenity (gardens)
Wild radish	*Raphanus raphanistrum*	O	Arable

Common name	Scientific name	Abundance (DAFOR Scale)	Location (habitat type)
Wood dock	*Rumex sanguineus*	O	Mixed and broadleaved semi-natural woodland
Wood spurge	*Euphorbia amygdaloides*	O	Mixed and broadleaved semi-natural woodland
Wych elm	*Ulmus glabra*	F	Mixed and broadleaved semi-natural woodland
Yarrow	*Achillea millefolium*	F	Improved grassland, semi-improved grassland, coastal grassland
Yellow corydalis	*Pseudofumaria lutea*	R	Residential areas
Yellow horned poppy	*Glaucium flavum*	R	Saltmarsh (two small plants on shell beach)
Yellow oat-grass	*Trisetum flavescens*	R	Semi-improved grassland
Yew	*Taxus baccata*	R	Scattered trees and residential areas
Yorkshire fog	*Holcus lanatus*	F	Semi-improved grassland, coastal grassland, improved grassland

APPENDIX 23E
OVERWINTERING BIRD REPORT 2019-2020

Bradwell B Project

Overwintering Bird Report 2019-2020

Wood Environment & Infrastructure Solutions UK Limited – July 2020

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Version P02

Report for

Bradwell Power Generation Company Limited
5F, Rex House,
4-12 Lower Regent Street
London
SW1 4PE

Main contributors

[redacted]

Issued by

[redacted] .....

Approved by

[redacted] .....

Wood

Partnership House
Regent Farm Road
Gosforth
Newcastle upon Tyne NE3 3AF
United Kingdom
Tel +44 (0) 191 272 6100
Doc Ref. 41843-WOOD-XX-XX-RP-OE-0006

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Appendix D: Target Species

1. INTRODUCTION

1.1 Background

1.1.1 Bradwell Power Generation Company Limited (the applicant) proposes to develop a new nuclear power station, called "Bradwell B power station", near Bradwell-on-Sea in Essex (hereafter referred to as the Project). The Project would comprise twin UK HPR1000 reactors with a combined electrical capacity of 2,340MW.

1.1.2 The area of land within which the Project would be built is located next to the Blackwater Estuary on the Dengie Peninsula, approximately 15km east of the town of Maldon, 1km northeast of the village of Bradwell-on-Sea within the District of Maldon, Essex. It lies adjacent to the existing Bradwell A Power Station, which ceased operation in 2002 and is being decommissioned by the Nuclear Decommissioning Authority (NDA).

1.2 Site Context

1.2.1 The Site is defined as all land within the indicative main development site boundary, Potential Temporary Workers Accommodation Area boundary and Potential Expansion Area for Potential Temporary Workers Accommodation boundary: central National Grid Reference (NGR) 601000E, 209000N (**Figure 1.1**).

1.2.2 In addition to the range of development activities that relate to the Site and that may include, for example, the planned temporary project-provided accommodation, there will be a requirement for off-site Associated Development in order to construct and operate the power station. Such off-site development is expected to include but may not be limited to: park and ride facilities, off-site freight management facilities and potential new or enhanced off-site highways works. The requirements with respect to the locations and extents of the off-site Associated Development requirements are currently being considered and as a result they are not given further consideration in this report at this stage. Further ornithological survey work will be undertaken for off-site Associated Developments if required at the appropriate time.

1.3 Purpose of this Document

1.3.1 This purpose of this Overwintering Bird Report is to present the bird survey methods employed and results collected during the period October 2019 to March 2020 inclusive.

1.3.2 The ultimate purpose of these surveys will be to determine a robust and accurate baseline data to inform the Habitat Regulations Assessment (HRA), Preliminary Environmental Information for Stage 2 Consultation and the subsequent EIA and Environmental Statement (ES) in support of the Development Consent Order (DCO) application.

1.3.3 This report is supported by the following Appendices:

- **Appendix A: List of scientific names of all species referred to in this report**;
- **Appendix B: Distribution Figures**;
- **Appendix C: Survey Visit Details**; and
- **Appendix D: Target Species**.

2. SURVEY METHODS

2.1 Intertidal Surveys

2.1.1 In order to determine the abundance and distribution of target and secondary bird species within the area that could potentially be affected by construction or operational activities required for the Project, a programme of intertidal and near shore bird surveys was undertaken that covered the period October 2019 to March 2020, inclusive. The area potentially affected due to disturbance includes all suitable intertidal habitat and inshore waters within the Site boundary and an additional 500m buffer area extending beyond this boundary based upon previous experience from similar projects and Cutts *et. al*. (Ref 2.1). Collectively these spatial areas comprise the intertidal and near-shore survey extent as illustrated in **Figure 2.1**.

2.1.2 The key aim of these surveys was to identify how birds were utilising the area over the tidal cycle and how their numbers, distribution and activities change over the course of the winter period. The surveys also aimed to identify any important locations for roosting or resting water-birds.

2.1.3 In addition to the distribution surveys, data was also collected to identify the existing levels and sources of disturbance to birds at the Site. This information will be important to enable the prediction of how target and secondary species might react to the activities associated with the construction of the Project.

2.1.4 The key survey protocols adopted were as follows:

- instantaneous scan samples (ISS), undertaken at 60-minute intervals, recording: species, numbers and behaviour of target and secondary species for population and distribution assessment; and
- continuous disturbance monitoring, where the number of birds of each species was recorded for each disturbance event, together with the stimuli and level of response to the event.

Survey area

2.1.5 The sectors and observation points applied within the survey area are illustrated in **Figure 2.1**.

2.1.6 There is the potential for works associated with the construction of the Project to adversely impact birds utilising the intertidal habitats and near-inshore waters adjacent to the north of the Site. Visual and auditory disturbance (due to, for example, noise from machinery and the visual presence of operatives) has the potential to displace birds foraging and roosting on the intertidal habitat and near inshore waters.

2.1.7 The survey area included all intertidal habitat and near shore waters within 500m of the Site extending seaward, 1km from the seawall and specific Observation Points,

plus additional areas of the shoreline that may provide further contextual insight into the distribution and abundance data of wintering birds within the intertidal and near shore habitats.

2.1.8 Within the survey area, bird distribution surveys and disturbance monitoring were carried out from six Inter-tidal Observation Points (IOPs) (two located in each of the three sectors (**Figure 2.2**). The precise locations of the IOPs were determined following an initial site visit (in September 2019) in order to achieve maximum coverage of the survey area.

2.1.9 The grid references of the IOPs are as follows:

- IOP 1A: TL 99300 07840;
- IOP 1B: TL 99714 08730;
- IOP 2A: TM 00318 09156;
- IOP 2B: TM 00921 09302;
- IOP 3A: TM 02394 09370; and
- IOP 3B: TM 02987 08939.

Survey methods

Distribution and abundance survey

2.1.10 From October to November 2019 two intertidal and near shore distribution and abundance surveys were completed each month from each IOP. Following feedback from Natural England and the Royal Society for the Protection of Birds (RSPB) this was increased to three survey visits at each IOP for December 2019 and four surveys at each IOP from January 2020 to March 2020.

2.1.11 Each survey visit comprised a six-hour watch undertaken by two ornithologists working simultaneously at adjacent IOPs, within each sector. Therefore, the total number of hours of survey from each IOP was as follows:

- October to November 2019: 12 hours per month;
- December 2019: 18 hours per month; and
- January to March 2020: 24 hours per month.

2.1.12 Each survey was carried out over a continuous duration of six hours (weather permitting), with approximately 70% of surveys commencing at either a high or low tide (i.e. from high tide to low tide; or low tide to high tide, where daylight hours dictated) and approximately 30% of surveys commencing mid-way through the tidal cycle. Details of visit dates are presented in **Appendix C Table C.1**.

2.1.13 During each six hour survey at each IOP, seven instantaneous scan surveys (ISS) were undertaken and the species, number and behaviour of all water-birds present was recorded at 60-minute intervals (allowing recording of disturbance activity and responses between each ISS) onto bespoke field recording forms, with surveyors at each IOP recording ISSs simultaneously (details recorded on bespoke field maps, 1:25,000 OS mapping, zoomed-in to allow for greater detailed plotting of feeding or roosting aggregations of water-birds).

2.1.14 The observer counted from one end of their IOP viewshed to another as quickly as possible, plotting flocks on to the survey map, as well as noting their respective activities. The surveyor also accounted for the movement of birds, therefore limiting the chances of double counting within and between sectors (by keeping in contact with the neighbouring surveyor).

2.1.15 Bird activity was recorded using four categories:

- feeding or foraging;
- roosting or loafing;
- preening or bathing; and
- other (as specified by the observer).

2.1.16 A separate field map was used for each ISS, onto which all birds within the viewshed of the IOP was recorded and plotted, using British Trust of Ornithology (BTO) species codes and the activity codes noted above.

2.1.17 At the end of each hour, a separate hourly tally form was completed, providing the maximum count for each species (foraging, roosting and loafing, but excluding birds in flight, commuting through the area) within the surveyors' viewshed.

2.1.18 During the six hour survey, records of any water-birds utilising the terrestrial fields adjacent to the IOP were also recorded onto a separate 'Incidental' records form.

2.1.19 There is also the potential for construction works and vessel movements to act as a barrier to the movement of target and secondary bird species, primarily in Sector 2, adjacent to the site boundary. In order to obtain information on the level and directions of flight movements of brent goose and red-throated diver over the tidal cycle (in Sector 2 only), the flight lines of these species were also noted on the field recording maps.

2.1.20 Surveys were undertaken during suitable weather conditions; avoiding periods of high wind (in excess of Beaufort Scale 5), poor visibility (fog) or heavy rainfall.

Disturbance monitoring

2.1.21 Whenever there was a disturbance event stimulus in between each ISS, disturbance responses were recorded on specific disturbance recording forms. A disturbance

stimulus was defined as something that has the ability to cause a disturbance response (i.e. one that has the potential to elicit a reaction from the birds present).

2.1.22 The number of birds of each species was recorded for each disturbance event, as well as the type of stimulus and level of response. Disturbance stimuli were categorised using the following codes:

- AC (aircraft);
- BD (bait diggers);
- CN (construction noise);
- CY (cyclist);
- FI (fisherman);
- GS (gunshot);
- FR (Firing range);
- GC (Gas cannon – bird scaring devices);
- HC (helicopter);
- HR (horse-rider);
- JO (jogger);
- KS (kite or wind surfer)
- ML (micro-lights);
- OT (other – any disturbance stimuli that does not fall into any other category, details specified by observer);
- PD (predator-record species);
- PM (para-motors);
- SA (sailing boat or other small craft);
- SB (speed-boat);
- SV (other larger vessel);
- TD (natural response to rising tide (termed as tidal disturbance to aid recording), i.e. birds reacting to the incoming tide and rising water levels with no other disturbance visible);
- TR (tractor or other vehicle reversing warning bleepers);
- UD (uncontrolled dog);
- UN (unknown disturbance, e.g. when a flock flies or reacts without any known stimulus;
- VE (any vehicle e.g. car, tractor, quad bike);
- WD (walker with dog in close proximity or on lead); and
- WN (walker without dog).

2.1.23 The level of each disturbance response was defined using the following scale:

- Level 1: no response;
- Level 2: behavioural change (alarm calls, alarm posture, heads up, change in feeding or roosting activity);
- Level 3: movement within zone (i.e. within the same area of mud, feeding or roosting area);

- Level 4: remaining in sector but change of zone, (i.e. different area of intertidal habitat but in the same sector); and
- Level 5: departure of birds from the sector or constant aerial circling.

2.1.24 This system (adopted and successfully used for disturbance surveys at a number of other sites, such as Hinkley Point C Nuclear New Build (NNB) and Moorside NNB) was chosen as it is effective to use in the field, recording the key data required for assessment whist not being overly complicated.

Target species

2.1.25 All species listed as non-breeding or passage qualifying features of the following Special Protection Areas (SPAs), Ramsar Sites and Sites of Special Scientific Interest (SSSIs) were classified as target species for the intertidal surveys (details of citations or reasons for notification are shown in **Appendix D**):

- Dengie Estuary (Mid-Essex Coat Phase 1) SPA, Ramsar and SSSI;
- Blackwater Estuary (Mid-Essex Coast Phase 4) SPA, Ramsar and SSSI;
- Outer Thames Estuary SPA;
- Colne Estuary (Mid-Essex Coast Phase 2) SPA and Ramsar;
- Foulness (Mid-Essex Coast Phase 5) SPA and Ramsar;
- Abberton Reservoir SPA and Ramsar; and
- Crouch and Roach Estuaries (Mid-Essex Coast Phase 3) SPA and Ramsar.

2.1.26 Any other water-bird species likely to form part of the assemblage qualifications of the above named statutory designated sites were considered to be secondary species including: divers, grebes, cormorant, shag, gulls, water-fowl (swans, geese, ducks), rails (coot etc) and waders.

2.2 Terrestrial Surveys

2.2.1 In order to determine the level and type of use of the farmland and immediate coastal habitats in the survey area a terrestrial distribution and abundance survey was carried out that covered the period October 2019 to March 2020. The purpose of these surveys was to identify how birds, and in particular brent goose, golden plover and lapwing, were utilising the terrestrial survey area and how their numbers, distribution and activities change over the course of the winter. As well as the farmland areas these surveys also encompassed saltmarsh and shoreline habitats.

Survey area

2.2.2 A disturbance distance of up to 400m is outlined for brent geese (a species of high sensitivity to disturbance) in the construction disturbance toolkit (Cutts *et al*, Ref 2.1). However, given the nature and large scale of the proposed construction works, a precautionary distance of 500m was used within which brent geese (and other target and secondary species) may potentially be disturbed by the Project. The terrestrial survey area included all areas of suitable habitat (primarily farmland but also saltmarsh and shoreline) within the Site and within 500m of its boundary, plus additional terrestrial areas that may provide further contextual insight into the distribution and abundance data of wintering birds in the wider area **(Figure 2.3**).

Survey methods

Diurnal terrestrial surveys

2.2.3 From October to November 2019 two diurnal terrestrial surveys were completed each month. Following feedback from Natural England and RSPB this was increased to three survey visits for December 2019 and four surveys from January 2020 to March 2020. Each visit was undertaken by two surveyors working in tandem. Details of visit dates are provided in **Appendix C Table C2**.

2.2.4 During each survey visit, the surveyors used a series of pre-determined transect routes to count all the birds present in the fields from the set observation points (**Figure 2.3**). Each field or habitat plot was given a unique number to which all bird sightings were assigned and recorded. The transect routes and observation points (as identified from the initial site visit in September 2019) were chosen to achieve maximum possible visibility over all areas of potentially suitable habitat for target and secondary overwintering bird species, whilst minimising any disturbance.

2.2.5 The numbers, activity (using the four codes a-d, as for the intertidal distribution survey) and location (field number) of any target and secondary species present were noted onto recording forms, as well as the type of habitat or crop that was present at that location.

2.2.6 A full inventory of the habitat and crop types within each field within the survey area was completed on each survey visit.

2.2.7 Any instances of disturbance were recorded and detailed following the intertidal disturbance monitoring protocols.

2.2.8 Surveys were undertaken during suitable weather conditions; avoiding periods of high wind (in excess of Beaufort Scale 5), poor visibility (fog) or heavy rainfall.

Nocturnal terrestrial surveys

2.2.9 Studies indicate that golden plover and lapwing may occur in areas at night where they are not present during the day (Gillings *et al*, Ref 2.2), therefore sampling

surveys were carried out during the hours of darkness to ascertain the level of use by these and other species (such as other qualifying water-bird species) at this Site.

2.2.10 From October to November 2019 a single nocturnal terrestrial survey was completed each month. Each survey visit was undertaken over two consecutive nights. Details of visits are presented in **Appendix C Table C2**.

2.2.11 Two surveyors (working together) walked along a series of pre-determined transect routes and recorded any golden plover and lapwing (and any other target and secondary species) present onto recording sheets, with details of their numbers, location (field identification number), activity and the habitat or crop type they are utilising.

2.2.12 Birds were detected by scanning the fields using high-specification night vision equipment with non-disturbing light sources or FLIR BHS-XR Handheld Thermal Imaging Camera dependent on ambient conditions.

2.2.13 The transect routes were chosen to achieve the maximum level of coverage of habitat most suitable to golden plover and lapwing (primarily early growth-stage winter cereals, but also grassland, ploughed land and stubbles).

2.2.14 All surveys were undertaken in suitable weather conditions (avoiding periods of high wind, poor visibility and heavy rainfall) and where possible, were carried out during half-full moon phases to improve detection of birds.

Target species

2.2.15 The following species or groups of species were classified as target species for the terrestrial surveys:

- brent goose, golden plover and lapwing;
- all other species listed as non-breeding or passage qualifying features of the following SPAs, Ramsar Sites and SSSIs:
  - Dengie Estuary (Mid-Essex Coat Phase 1) SPA, Ramsar and SSSI;
  - Blackwater Estuary (Mid-Essex Coast Phase 4) SPA, Ramsar and SSSI;
  - Outer Thames Estuary SPA;
  - Colne Estuary (Mid-Essex Coast Phase 2) SPA and Ramsar;
  - Foulness (Mid-Essex Coast Phase 5) SPA and Ramsar;
  - Abberton Reservoir SPA and Ramsar; and
  - Crouch and Roach Estuaries (Mid-Essex Coast Phase 3) SPA and Ramsar.
- counts of 5 and above of Corn bunting; and

- counts of 10 and above of Species of Principal Importance, listed on Section 41 of the Natural Environment and Rural Communities Act 2006 (as amended) (Ref. 2.3) and Birds of Conservation Concern (Ref 2.4) red-listed birds (including: house sparrow, linnet, reed bunting, starling, skylark, yellowhammer).

2.2.16 Any other water-bird species likely to form part of the assemblage qualifications of the above named statutory designated sites were considered secondary species, and included: divers, grebes, cormorant, shag, gulls, water-fowl (swans, geese, ducks), rails (coot etc) and waders.

2.2.17 Additionally, all other schedule 1 Wildlife and Countryside Act 1981 (Ref. 2.5) and Annex I of the Birds Directive (Ref. 2.6) species were considered secondary species.

3. RESULTS

3.1 Intertidal Surveys: ISS

3.1.1 A total of 49 species were recorded, 24 of which were target species. The remaining 24 secondary species recorded were considered to form part of the water-bird assemblage. Monthly peak counts recorded from October 2019 to March 2020 are presented in **Table 3.1.**

Table 3.1: Monthly peak counts recorded during Intertidal surveys

Species	October	November	December	January	February	March	Peak
Target Species							
Bar-tailed godwit	15	0	10	8	10	154	**154**
Black-tailed godwit	1	2	2	0	1	0	**2**
Brent goose*	432	376	690	2034	1,447	1,147	**2,034**
Curlew	150	68	109	92	78	76	**150**
Dunlin	540	400	1,320	1,950	1,130	488	**1,950**
Gadwall	0	4	20	0	0	0	**20**
Golden plover	730	560	930	1,990	820	26	**1,990**
Great-crested grebe	1	6	13	292	4	15	**292**
Grey plover	31	100	85	409	192	476	**476**
Hen Harrier	0	0	0	1	0	1	**1**
Heron	2	1	1	3	6	0	**6**
Knot	14	2,010	1,674	1,050	1,750	999	**2,010**

Species	October	November	December	January	February	March	Peak
Merlin	0	1	0	0	0	0	**1**
Oystercatcher	250	213	219	285	188	178	**285**
Peregrine	0	0	0	2	0	1	**2**
Pochard	0	0	1	0	0	0	**1**
Redshank	232	56	300	30	192	28	**300**
Red-throated diver	1	5	1	15	3	1	**15**
Ringed plover	42	26	30	144	43	9	**144**
Shelduck	30	120	80	74	60	67	**120**
Shoveler	0	0	0	6	0	0	**6**
Teal	60	0	120	185	2	16	**185**
Turnstone	58	77	43	46	80	64	**80**
Wigeon	60	10	120	121	8	4	**121**
Secondary Species							
Avocet	25	30	25	8	0	0	**30**

Species	October	November	December	January	February	March	Peak
Barnacle goose	17	0	0	0	0	0	**17**
Black-headed gull	220	0	42	410	38	25	**410**
Black-throated diver	1	0	0	0	0	0	**1**
Common gull	240	87	146	67	105	3	**240**
Common scoter	6	1	1	0	0	0	**6**
Cormorant	40	25	13	1,480	34	6	**1,480**
Gannet	1	0	0	0	0	0	**1**
Great black-backed gull	3	13	1	2	7	2	**13**
Greylag goose	0	0	0	0	0	4	**4**
Guillemot	0	1	0	1	0	0	**1**
Herring gull	14	0	56	60	102	136	**136**
Lapwing	50	580	400	1,025	996	1	**1,025**
Lesser black-backed gull	1	0	0	1	18	38	**38**

Species	October	November	December	January	February	March	Peak
Little egret	19	5	4	2	3	3	**19**
Little grebe	2	3	3	7	1	3	**7**
Mallard	17	9	66	18	16	6	**66**
Marsh harrier	0	0	0	0	0	2	**2**
Mediterranean gull	1	1	0-	1	0	0	**1**
Red-breasted merganser	0-	8	11	14	5	13	**13**
Sanderling	45	20	19	45	115	51	**115**
Shag	0-	0	1	1	0	1	**1**
Snipe	0	0	0	1	0	0	**1**
Water rail	0	0	3	0	0	0	**3**

** Brent goose also encompasses sub-species dark-bellied and light-bellied.*

3.1.2 The following sub-sections present a review of the population data collected from October 2019-March 2020 for 13 target species (brent goose, curlew, dunlin, golden plover, great-crested grebe, grey plover, knot, oystercatcher, redshank, ringed plover, shelduck, turnstone and wigeon) and six secondary species (black-headed gull, cormorant, herring gull, lapwing, mallard and sanderling), which were recorded during more than 75% of survey visits (15 visits or above) and whose overall peak count was above 20 individuals (species included are highlighted in bold in **Table 3.1**).

3.1.3 Hen harrier was only recorded twice during the intertidal surveys, both observations were incidental records. A female or immature bird was present on the 22 January at Pewet Island and a female was recorded flying south in the same area on 3 March.

3.1.4 The peak winter counts recorded during the intertidal surveys for these species was also compared to the British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS) core count data for the winter periods covering 2014-2015 to 2018-2019, for the Bradwell Estuary and Dengie Flats WeBS sites.

Key species: intertidal surveys

Brent goose

3.1.5 Non-breeding brent geese are a qualifying feature of a number of SPA and Ramsar sites (**Table 3.2**), as well as being a notified feature of the Dengie, Blackwater Estuary and Colne Estuary SSSIs, supporting internationally important numbers, and Sandbeach Meadows SSSI that supports nationally important numbers.

3.1.6 **Table 3.2** presents the peak winter count (1,600) recorded during the intertidal surveys as a proportion of the population of the species at the time of classification for the various SPA and Ramsar sites for which it is a qualifying feature. This ranges from 12% of the Foulness (Mid-Essex Coast Phase 5) SPA population to 80% of the Dengie (Mid-Essex Coast Phase 1) Ramsar.

Table 3.2: Intertidal surveys: brent geese – peak count as a percentage of cited population

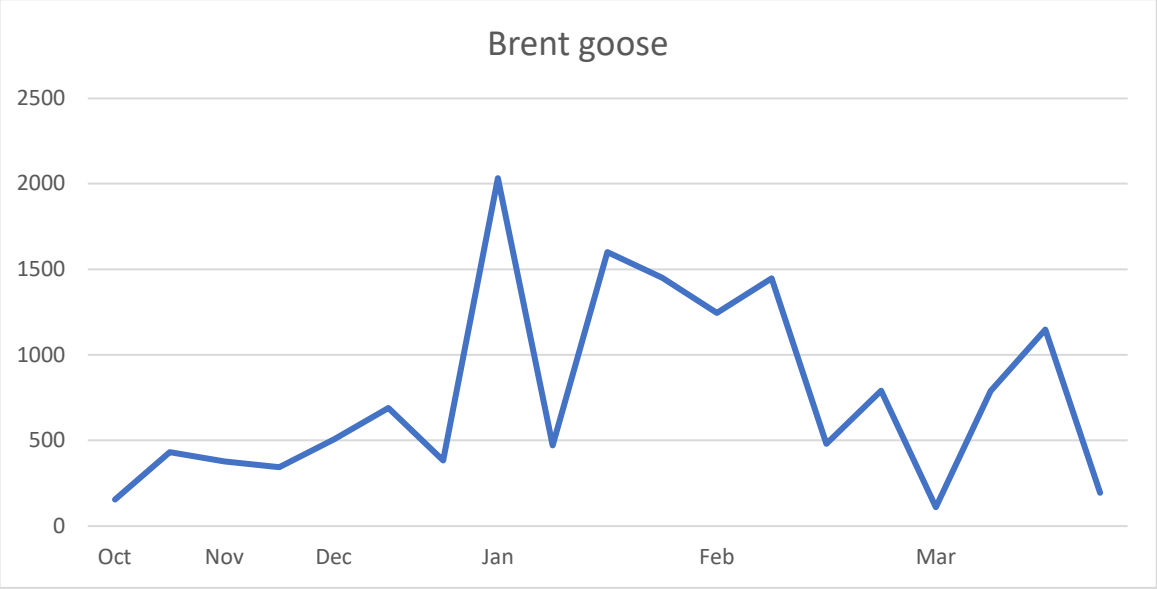
Site	Qualifying features at time of classification	Peak winter count 2019-2020 as SPA %
Dengie (Mid-Estuary Essex Coast Phase 1) SPA	2,250	71
Dengie (Mid-Estuary Essex Coast Phase 1) Ramsar	2,000	80

Site	Qualifying features at time of classification	Peak winter count 2019-2020 as SPA %
Blackwater Estuary (Mid-Essex Coast Phase 4) SPA	8,761	18
Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar	8,689	18

3.1.7 The WeBS five-year peak average (Ref 3.1[1]) between 2014-2015 to 2018-2019 for the Dengie Flats was 4,825 and for the Blackwater Estuary was 8,935. The peak count recorded during intertidal surveys represents 33% and 18% of those averages respectively.

3.1.8 During the intertidal surveys peak numbers of brent geese remained comparatively low from October to December 2019. Numbers peaked in early January 2020 and remained at an elevated level until early February when numbers started to decrease, before a spike in peak numbers was recorded in mid-March (**Figure 3.1**).

Figure 3.1 Intertidal surveys: peak visit count of brent geese October 2019-March 2020



3.1.9 Brent geese were recorded in all three sectors in all tidal conditions, although numbers were lower at high tide and the period covering the one hour either side of low tide. The intertidal mudflats were used for foraging and roosting, with a peak of

[1] Contains Wetland Bird Survey (WeBS) data from Waterbirds in the UK 2018-2019© copyright and database right 2020. WeBS is a partnership jointly funded by the BTO, RSPB and JNCC, in association with WWT, with fieldwork conducted by volunteers.

1,450 birds recorded roosting in Sector 2. Some flocks were recorded as incidental records during the intertidal surveys utilising terrestrial habitats, primarily close to the existing Bradwell nuclear power station site, with a maximum count of 1,600 being recorded from Sector 1, although additional counts of over 1,000 birds were also recorded in this area.

3.1.10 Sector 1 accounted for 39% of the total number of birds recorded overall. Within Sector 1, 66% of all birds were recorded feeding and foraging (**Table 3.3**). The greatest proportion of birds roosting, preening and loafing was recorded within Sector 2 (58%).

Table 3.3: Intertidal surveys: brent geese – peak counts and total number of birds recorded within each sector

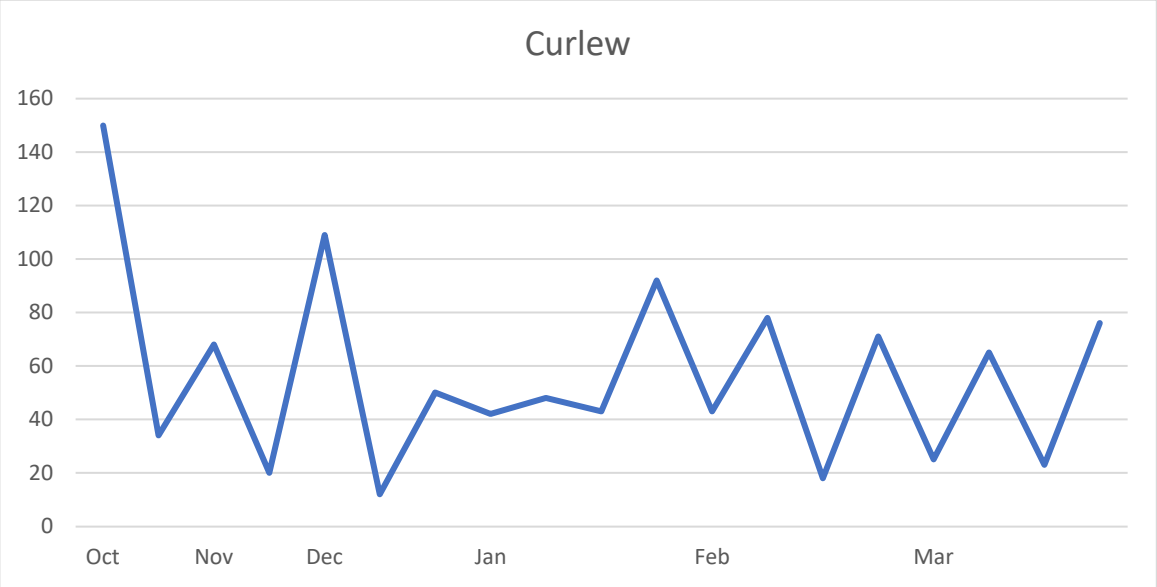
Sector	Peak Count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	1,600	16,106	8,164	24,270
2	1,450	6,900	9,467	16,367
3	1,447	12,245	9,692	21,937

Curlew

3.1.11 Non-breeding curlew are a notified feature of the Dengie SSSI and Blackwater Estuary SSSI with nationally important numbers being present at the latter. The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 520 and for the Blackwater Estuary was 1,544. The peak count recorded during intertidal surveys (150) represents 29% and 10% of those averages respectively.

3.1.12 During the intertidal surveys peak numbers of curlew were recorded in October, followed by a fluctuation in peak counts between approximately 20-110 birds throughout the rest of the survey period (**Figure 3.3**).

Figure 3.3 Intertidal surveys: peak visit count of curlew October 2019-March 2020



3.1.13 Curlew were recorded in all three sectors in all tidal conditions, although numbers were lower at high tide and the period covering one hour either side of low tide (**Appendix B Figure 3.4**). Intertidal areas were used for foraging and roosting, with a peak of 150 birds recorded roosting in Sector 1.

3.1.14 Sector 1 accounted for 68% of the total number of birds recorded overall (**Table 3.4**). Sector 2 accounted for just 4% of all recorded activity. Within Sector 1, 70% of all birds were recorded roosting, preening and loafing. Sector 2 and 3 recorded the greatest proportions of birds feeding and foraging (84 and 87% respectively).

Table 3.4: Intertidal surveys: curlew – peak counts and total number of birds recorded within each sector

Sector	Peak Count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	150	832	1,911	2,743
2	17	129	25	154
3	109	982	148	1,130

Dunlin

3.1.15 Non-breeding dunlin are a qualifying feature of the Blackwater Estuary (Mid-Essex Coast Phase 4) SPA and Ramsar site (**Table 3.5**) and are a notified feature of the

Dengie SSSI and Colne Estuary SSSIs, supporting nationally important numbers and Blackwater Estuary SSSI, supporting internationally significant numbers.

3.1.16 **Table 3.5** presents the peak winter count (1,950) recorded during the intertidal surveys as a proportion of the population of the species at the time of classification for the Blackwater Estuary (Mid-Essex Coast Phase 4) SPA and Ramsar.

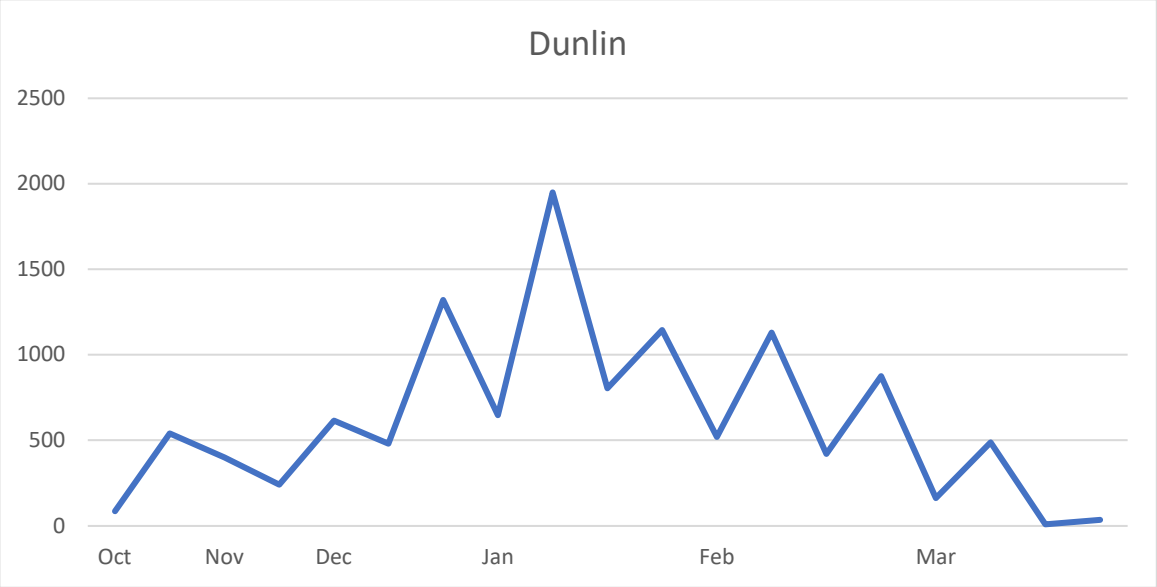
Table 3.5: Intertidal surveys: dunlin – peak count as a percentage of qualifying feature

Site	Qualifying features at time of classification	Peak winter count 2019-2020 as SPA %
Blackwater Estuary (Mid-Essex Coast Phase 4) SPA	17,743	11
Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar	27,655	7

3.1.17 The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 7,537 and for the Blackwater Estuary was 16,653. The peak count recorded during intertidal surveys represents 26% and 12% of those averages respectively.

3.1.18 During the intertidal surveys peak numbers of dunlin increased steadily until early January 2020, and then decreased through the remainder of the survey period (**Figure 3.5**).

Figure 3.5 Intertidal surveys: peak visit count of dunlin October 2019-March 2020



3.1.19 Dunlin were recorded in all three sectors in all tidal conditions although numbers were lower at high tide, and the period covering one hour either side of low tide (**Appendix B Figure 3.6**). Intertidal areas were used for foraging and roosting, with a peak of 1,950 birds recorded roosting in Sector 1.

3.1.20 Sector 1 accounted for 53% of the total number of birds recorded overall (**Table 3.6**). Sector 2 accounted for just 2% of all recorded activity. Within Sector 1, 70% of all birds were recorded roosting, preening and loafing. Sector 2 and 3 recorded the greatest proportions of birds feeding and foraging (97 and 87% respectively).

Table 3.6: Intertidal surveys: dunlin – peak count as a percentage of qualifying feature

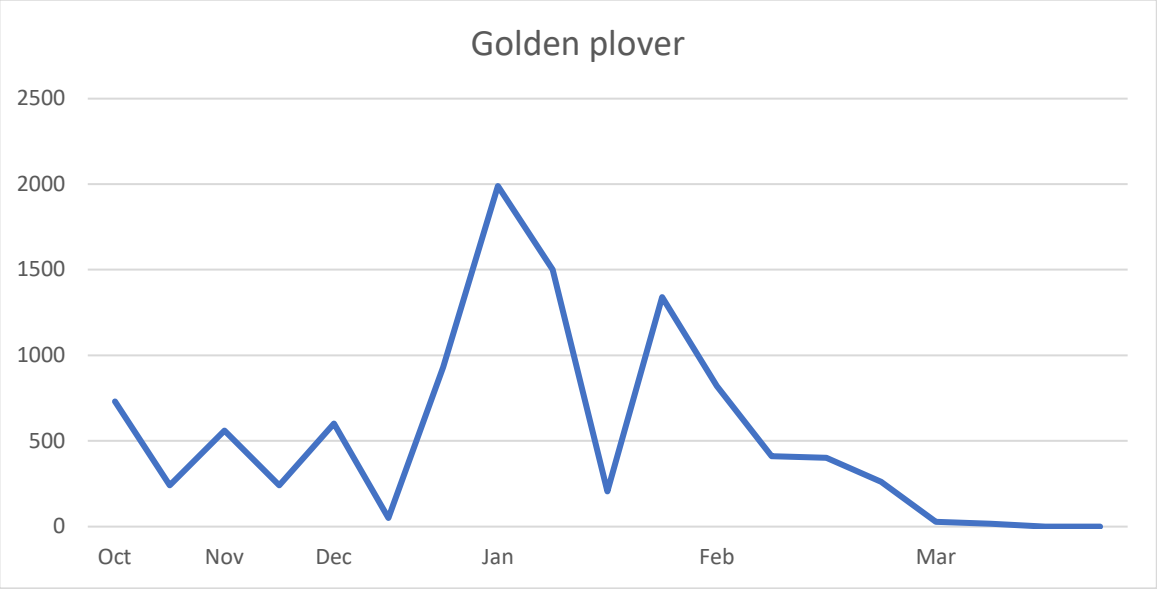
Sector	Peak Count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	1,950	7,856	18,512	26,368
2	45	815	25	840
3	1,130	19,309	2,819	22,128

Golden plover

3.1.21 Non-breeding golden plover are a notified feature of the Dengie and Abberton Reservoir SSSI. The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 12,780 and for the Blackwater Estuary was 9,186. The peak count recorded during intertidal surveys (1,990) represents 16% and 22% of those averages respectively.

3.1.22 During the intertidal surveys peak numbers of golden plover remained steady from October to December 2019 before peaking in January 2020. Numbers then gradually decreased and were comparatively very low by March 2020 (**Figure 3.7**).

Figure 3.7 Intertidal surveys: peak visit count of golden plover October 2019-March 2020



3.1.23 Golden plover were recorded in Sectors 1 and 3, in all tidal conditions, although numbers were lower at high tide, and the period covering one hour either side of low tide (**Appendix B Figure 3.8**). Intertidal areas were used for foraging and roosting, with a peak of 1,950 birds recorded roosting in Sector 1.

3.1.24 Sector 1 accounted for 88% of the total number of birds recorded overall (**Table 3.7**). Within Sector 1, 96% of all birds were recorded roosting, preening and loafing. Levels of feeding and foraging within Sectors 1 and 3 were both low, with a peak of 17% in Sector 3.

Table 3.7: Intertidal surveys: golden plover – peak counts and total number of birds recorded within each sector

Sector	Peak count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	1,990	1,461	32,678	34,139
2	0	0	0	0
3	560	834	4,027	4,861

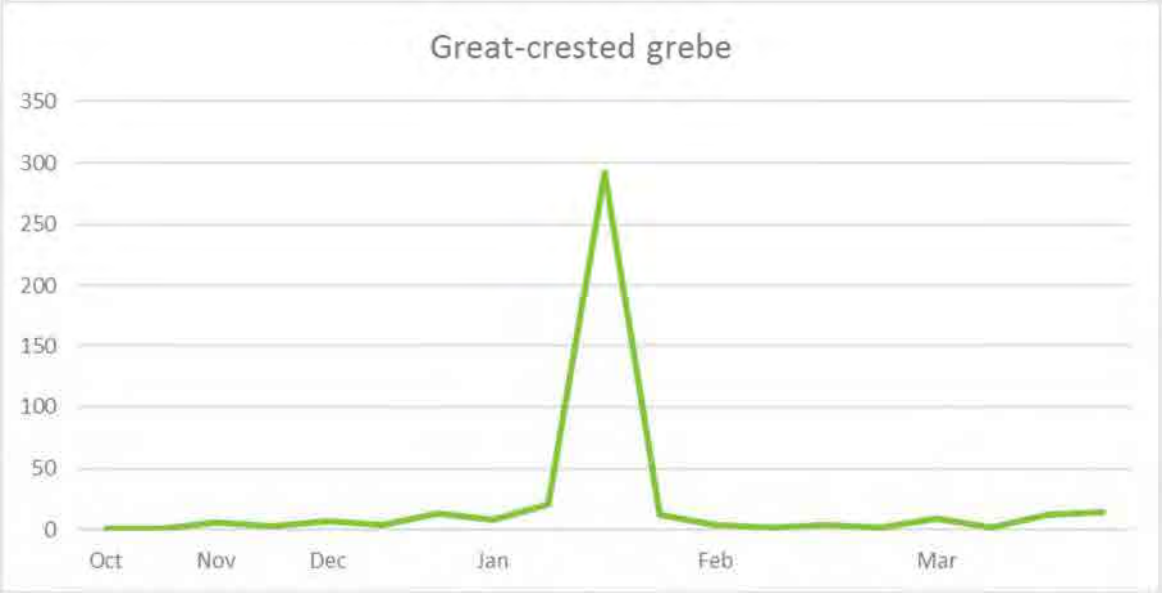
Great-crested grebe

3.1.25 Non-breeding great-crested grebe are a qualifying feature of the Abberton Reservoir SPA. The peak winter count (292) recorded during the intertidal surveys equates to 162% of the SPA population of the species at the time of classification.

3.1.26 The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 21 and for the Blackwater Estuary was 124. The peak count recorded during intertidal surveys (292) represents 1,390% and 235% of those averages respectively.

3.1.27 During the intertidal surveys peak numbers of great-crested grebe remained between one to 21 individuals apart from mid-January when it peaked at 292 birds (**Figure 3.9**).

Figure 3.9 Intertidal surveys: peak visit count of great-crested grebe October 2019-March 2020



3.1.28 Great-crested grebe were recorded in all sectors in all tidal conditions (**Appendix B Figure 3.10**). The peak of 292 related to birds feeding and foraging in the near shore environment in Sector 3.

3.1.29 Sector 3 accounted for 44% of the total number of birds recorded overall (**Table 3.8**). Within Sector 3, 90% of all birds were recorded feeding and foraging in the near shore environment. Levels of roosting, loafing and preening were greatest in Sector 2 (51%).

Table 3.8: Intertidal surveys: golden plover – peak counts and total number of birds recorded within each sector

Sector	Peak count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	15	147	99	246

Sector	Peak count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
2	21	157	165	322
3	292	405	44	449

Grey plover

3.1.30 Non-breeding grey plover are a qualifying feature of a number of SPA and Ramsar sites (**Table 3.9**) as well as being a notified feature of the Dengie SSSI, supporting internationally important numbers, and Blackwater Estuary and Colne Estuary SSSI, supporting nationally important numbers.

3.1.31 **Table 3.9** presents the peak winter count (476) recorded during the ISS as a proportion of the population of the species at the time of classification for the various SPA and Ramsar sites for which it is a qualifying feature. This ranges from 10% of the Dengie (Mid-Essex Coast Phase 1) Ramsar population to 27% of the Dengie (Mid-Essex Coast Phase 1) SPA.

Table 3.9: Intertidal surveys: grey plover – peak count as a percentage of cited population

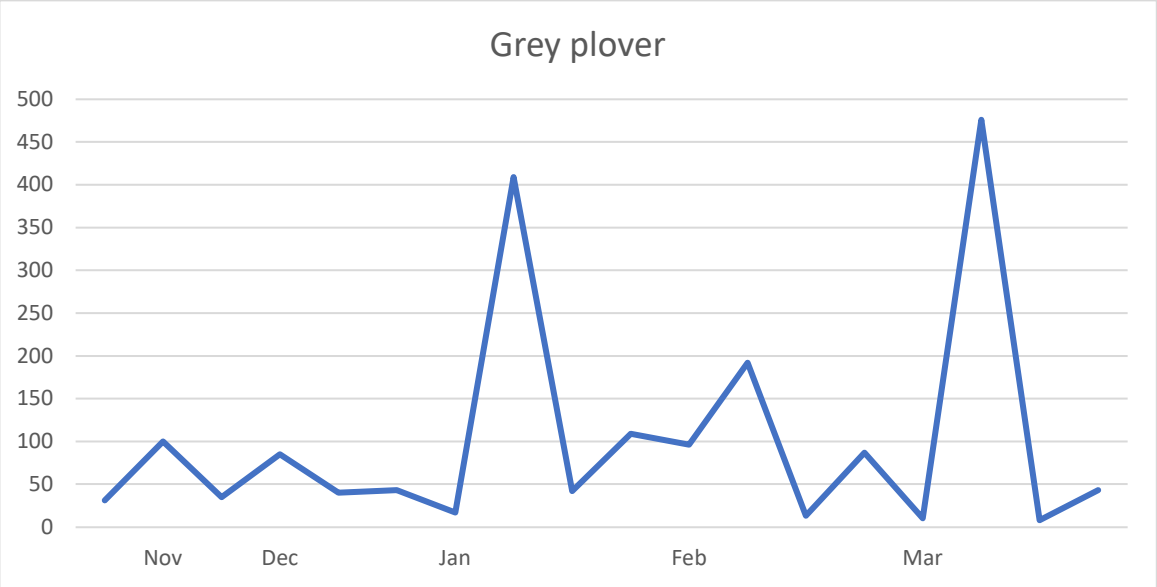
Site	Qualifying features at time of classification	Peak winter count 2019-2020 as % of SPA
Dengie (Mid-Estuary Essex Coast Phase 1) SPA	1,752	27
Dengie (Mid-Estuary Essex Coast Phase 1) Ramsar	4,582	10
Blackwater Estuary (Mid-Essex Coast Phase 4) SPA	2,172	22
Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar	4,215	11

3.1.32 The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 7,066 and for the Blackwater Estuary was 3,797. The peak count recorded during intertidal surveys (476) represents 7% and 13% of those averages respectively.

3.1.33 During the intertidal surveys peak numbers of grey plover remained at a comparatively low level from October to December 2019. Numbers increased in

early January, before dropping back down with a further spike in numbers in mid-March 2020 (**Figure 3.11**).

Figure 3.11 Intertidal surveys: peak visit count of grey plover – October 2019-March 2020



3.1.34 Grey plover were recorded in all sectors in all tidal conditions, although numbers peaked in the four to five hours either side of high tide, with numbers lower at high tide and the period covering one hour either side of low tide (**Appendix B Figure 3.12**). A peak of 476 birds were recorded feeding and foraging in Sector 3.

3.1.35 Sector 3 accounted for 79% of the total number of birds recorded overall (**Table 3.10**). Within Sector 3, 78% of all birds were recorded feeding and foraging. Levels of frosting, loafing and preening were greatest in Sector 1 (72%).

Table 3.10: Intertidal surveys: grey plover – peak counts and total number of birds recorded within each sector

Sector	Peak count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	152	300	756	1,056
2	8	125	14	139
3	476	3,473	990	4,463

Knot

3.1.36 Non-breeding knot are a qualifying feature of a number of SPA and Ramsar sites (**Table 3.11**), as well as being a notified feature of the Dengie SSSI which supports nationally significant numbers.

3.1.37 **Table 3.11** presents the peak winter count (2,010) recorded during the ISS as a proportion of the population of the species at the time of classification for the various SPA and Ramsar sites for which it is a qualifying feature. This ranges from 9% of the Foulness (Mid-Essex Coast Phase 1) SPA and Ramsar population to 26% of the Dengie (Mid-Essex Coast Phase 1) SPA.

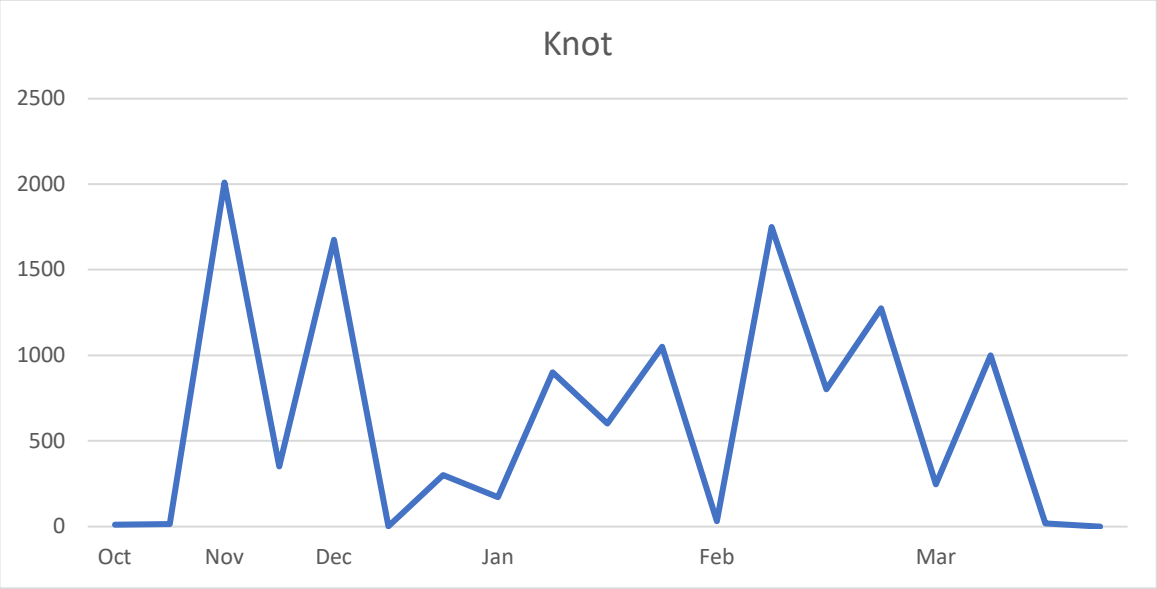
Table 3.11: Intertidal surveys: grey plover – peak count as a percentage of cited population

Site	Qualifying features at time of classification	Peak winter count 2019-2020 as % of SPA
Dengie (Mid-Estuary Essex Coast Phase 1) SPA	7,763	26
Dengie (Mid-Estuary Essex Coast Phase 1) Ramsar	14,528	14

3.1.38 The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 14,079 and for the Blackwater Estuary was 15,062. The peak count recorded during intertidal surveys (2,101) represents 14% and 13% of those averages respectively.

3.1.39 During the ISS peak numbers of knot varied widely, with peaks recorded in November and December 2019 and mid-February 2020 (**Figure 3.13**).

Figure 3.13 Intertidal surveys: peak visit count of knot – October 2019-March 2020



3.1.40 Knot were recorded in Sectors 1 and 3 in all tidal conditions, although numbers peaked four to five hours either side of high tide, (**Appendix B Figure 3.14**). A peak of 2,101 birds were recorded feeding and foraging in Sector 3.

3.1.41 Sector 3 accounted for 79% of the total number of birds recorded overall (**Table 3.12**). Within Sector 3, 93% of all birds were recorded feeding and foraging.

Table 3.12: Intertidal surveys: grey plover – peak counts and total number of birds recorded within each sector

Sector	Peak count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	800	3,514	3,461	7,075
2	0	0	0	0
3	2,010	24,984	1,864	26,848

Oystercatcher

3.1.42 Non-breeding oystercatcher are a qualifying feature of the Foulness (Mid-Essex Coast Phase 5) SPA and Ramsar sites (**Table 3.13**) and are a notified feature of Dengie SSSI.

3.1.43 **Table 3.13** presents the peak winter count (285) recorded during the intertidal surveys as a proportion of the population of the species at the time of classification for Foulness (Mid-Essex Coast Phase 5) SPA and Ramsar.

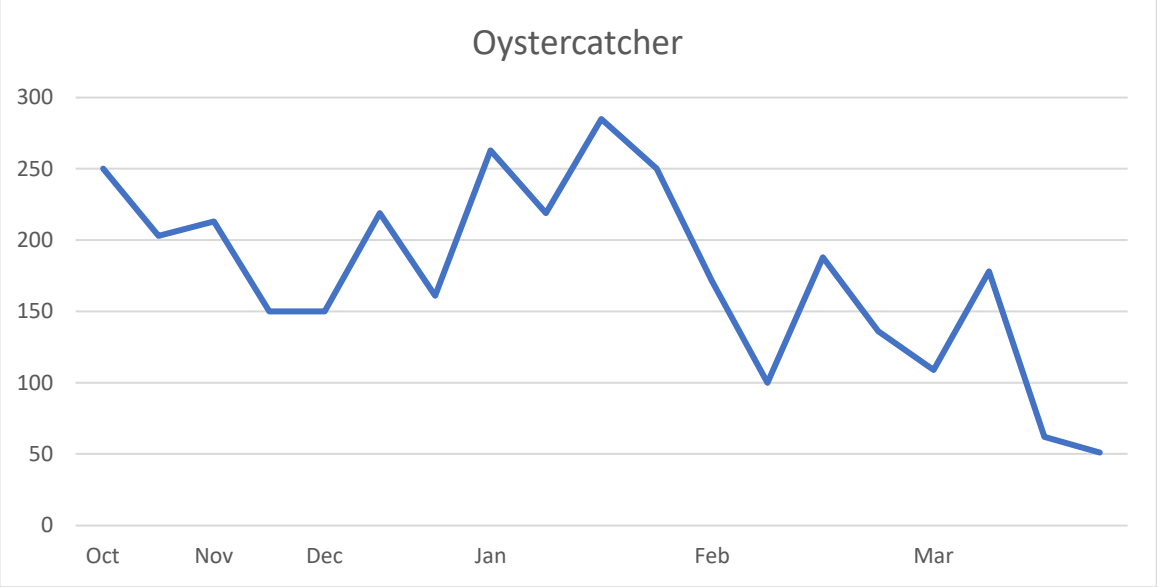
Table 3.13: Intertidal surveys: oystercatcher – peak count as a percentage of qualifying feature

Site	Qualifying feature at time of classification	Peak winter count 2019-2020 as % of SPA
Foulness (Mid-Essex Coast Phase 5) SPA	9,805	3
Foulness (Mid-Essex Coast Phase 5) Ramsar	14,674	2

3.1.44 The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 3,043 and for the Blackwater Estuary was 1,193. The peak count recorded during intertidal surveys (285) represents 9% and 24% of those averages respectively.

3.1.45 During the ISS peak numbers of oystercatcher were recorded by January and gradually decreased during the remainder of the survey period (**Figure 3.15**).

Figure 3.15 Intertidal surveys: peak monthly count of oystercatcher October 2019-March 2020



3.1.46 Oystercatcher were recorded in all sectors in all tidal conditions, although numbers peaked two to three hours either side of high tide, with numbers lower at high tide and the period covering one hour either side of low tide (**Appendix B Figure 3.16**). A peak of 285 birds were recorded roosting in Sector 1.

3.1.47 Sector 1 accounted for 62% of the total number of birds recorded overall (**Table 3.14**). Within Sector 1, 90% of all birds were recorded roosting, preening and loafing. 84% of all birds recorded in Section 3 were observed feeding and foraging.

Table 3.14: Intertidal surveys: oystercatcher – peak counts and total number of birds recorded within each sector

Sector	Peak Count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	285	917	8,461	9,378
2	11	326	97	423
3	263	4,485	853	5,338

Redshank

3.1.48 Non-breeding and passage redshank are a qualifying feature of a number of SPA and Ramsar sites (**Table 3.15**) as well as being a notified feature of the Blackwater Estuary and Colne Estuary SSSI, supporting nationally important numbers.

3.1.49 **Table 3.15** presents the peak winter count (300) recorded during the ISS as a proportion of the population of the species at the time of classification for the various SPA and Ramsar sites for which it is a qualifying feature. This ranges from 12% of the Foulness (Mid-Essex Coast Phase 5) Ramsar population to 24% of the Colne (Mid-Essex Coast Phase 2) SPA.

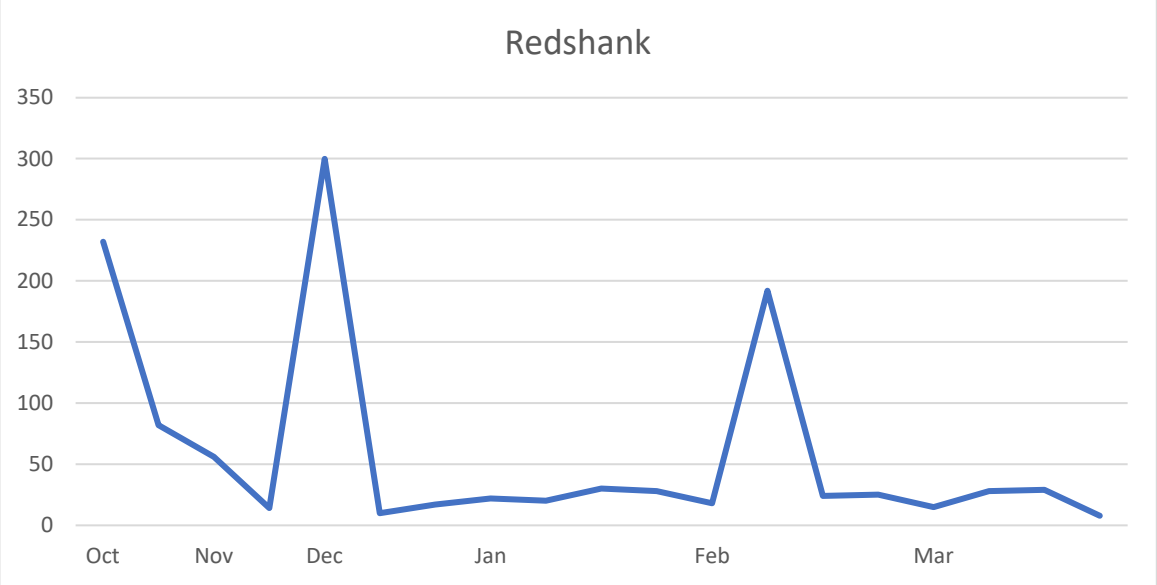
Table 3.15: Intertidal surveys: redshank – peak count as a percentage of qualifying feature

Site	Qualifying feature at time of classification	Peak winter count 2019-2020 as % of SPA
Colne Estuary (Mid-Essex Coast Phase 2) SPA	1,252	24
Colne Estuary (Mid-Essex Coast Phase 2) Ramsar	1,624	18
Foulness (Mid-Essex Coast Phase 5) SPA	1,540	19
Foulness (Mid-Essex Coast Phase 5) Ramsar	2,586	12

3.1.50 The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 541 and for the Blackwater Estuary was 3,099. The peak count recorded during intertidal surveys (300) represents 55% and 10% of those averages respectively.

3.1.51 During the ISS, initial surveys revealed that numbers of redshank were comparatively high but had gradually dropped by late November. Peak numbers were recorded in early December 2019 and mid-February 2020 although numbers remained low from mid-December 2019 onwards (**Figure 3.17**).

Figure 3.17 Intertidal surveys: peak monthly count of redshank October 2019-March 2020



3.1.52 Redshank were recorded in all sectors in all tidal conditions, although numbers peaked three hours either side of high tide, (**Appendix B Figure 3.18**). A peak of 300 birds were recorded roosting in Sector 1.

3.1.53 Sector 1 accounted for 61% of the total number of birds recorded overall (**Table 3.16**). Within Sector 1, 66% of all birds were recorded roosting, preening and loafing. Of all birds recorded in Section 3, 74% were observed feeding and foraging.

Table 3.16: Intertidal surveys: redshank – peak counts and total number of birds recorded within each sector

Sector	Peak Count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	300	981	1,876	2,857

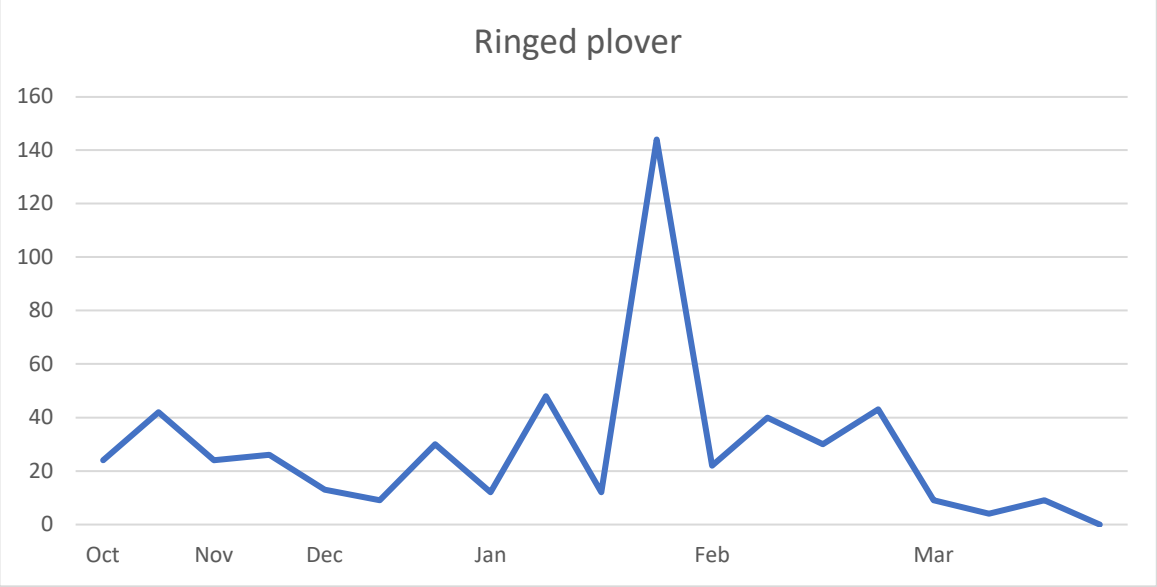
Sector	Peak Count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
2	30	385	38	423
3	60	1,041	374	1,415

Ringed plover

3.1.54 Non-breeding ringed plover are a notified feature of the Blackwater Estuary and Colne Estuary SSSIs with internationally and nationally significant numbers being present. The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 501 and for the Blackwater Estuary was 434. The peak count recorded during intertidal surveys (144) represents 29% and 33% of those averages respectively.

3.1.55 During the ISS, background levels of ringed plover remained consistent whilst peak numbers were recorded in late January (**Figure 3.19**).

Figure 3.19 Intertidal surveys: peak monthly count of ringed plover October 2019-March 2020



3.1.56 Ringed plover were recorded in all sectors in all tidal conditions, although numbers peaked two to three hours either side of high tide, (**Appendix B Figure 3.20**). A peak of 144 birds were recorded roosting in Sector 1.

3.1.57 Sector 3 accounted for 51% of the total number of birds recorded overall, whilst Sector 1 accounted for 45% (**Table 3.17**). Within Sector 3, 83% of all birds were

recorded feeding and foraging. Within Sector 1, 90% of all birds recorded were observed roosting, preening and loafing.

Table 3.17: Intertidal surveys: ringed plover – peak counts and total number of birds recorded within each sector

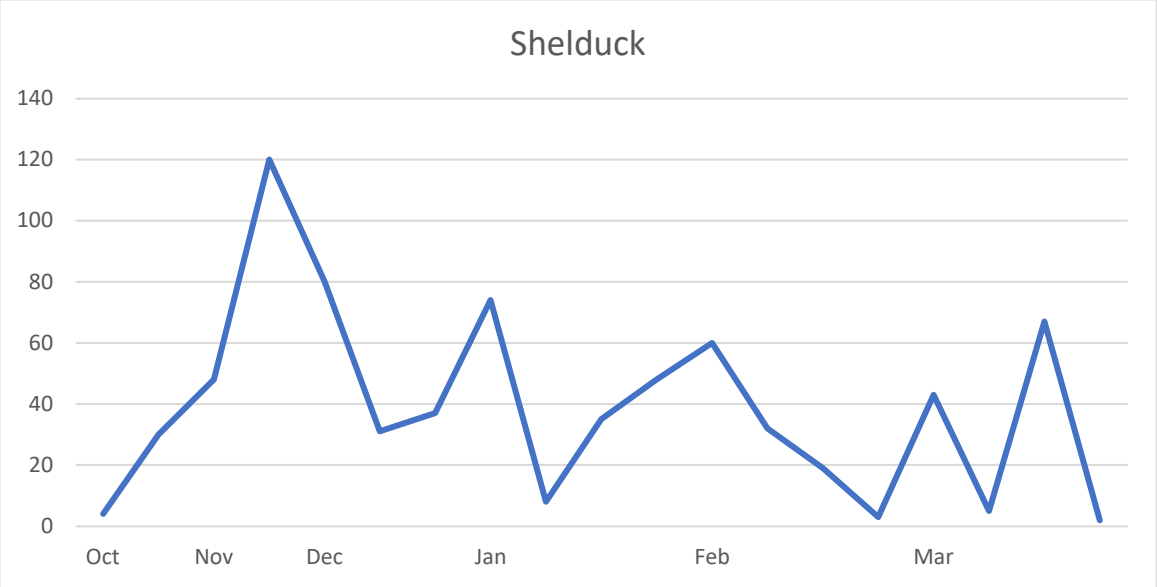
Sector	Peak count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	144	71	611	682
2	16	25	39	64
3	48	647	136	783

Shelduck

3.1.58 Non-breeding shelduck are a notified feature of the Dengie, Blackwater Estuary and Colne Estuary SSSIs with nationally significant numbers being present at all three. The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 229 and for the Blackwater Estuary was 3,187. The peak count recorded during intertidal surveys (120) represents 52% and 4% of those averages respectively.

3.1.59 During the ISS, numbers of shelduck recorded varied throughout the survey period with a peak count occurring in mid-November (**Figure 3.21**).

Figure 3.21 Intertidal surveys: peak monthly count of shelduck October 2019-March 2020



3.1.60 Shelduck were recorded in all sectors in all tidal conditions, although numbers peaked four to five hours either side of high tide (**Appendix B Figure 3.22**). A peak of 120 birds were recorded feeding and foraging in Section 1.

3.1.61 Sector 1 accounted for 97% of the total number of birds recorded overall (**Table 3.18**). Within Sector 1, 55% of all birds were recorded feeding and foraging.

Table 3.18: Intertidal surveys: shelduck – peak counts and total number of birds recorded within each sector

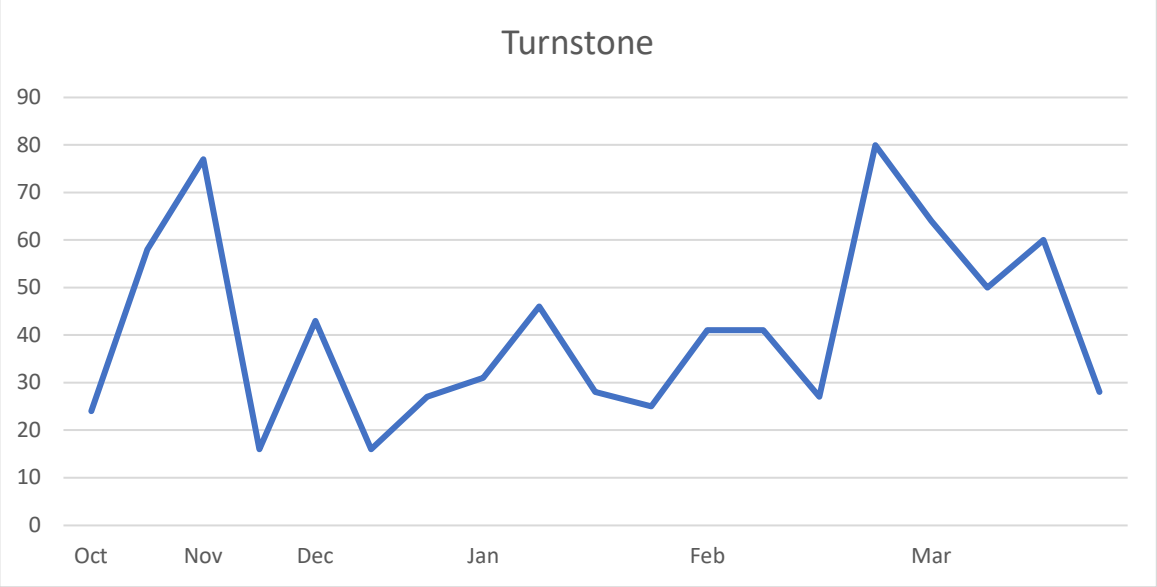
Sector	Peak count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	120	1,528	1,265	2,793
2	9	18	23	41
3	19	27	28	55

Turnstone

3.1.62 Non-breeding turnstone are a notified feature of the Dengie SSSI with nationally significant numbers being present. The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 138 and for the Blackwater Estuary was 716. The peak count recorded during intertidal surveys (80) represents 58% and 11% of those averages respectively.

3.1.63 During the ISS, peak numbers of turnstone were recorded in early November 2019 and late February 2020, with background levels remaining comparatively low in the intervening period (**Figure 3.23**).

Figure 3.23 Intertidal surveys: peak monthly count of turnstone October 2019-March 2020



3.1.64 Turnstone were recorded in all sectors in all tidal conditions, although numbers peaked one to two hours either side of high tide, with numbers lower at high tide and the period covering two hours either side of low tide (**Appendix B Figure 3.24**). A peak of 80 birds were recorded roosting in Sector 1.

3.1.65 Sector 3 accounted for 65% of the total number of birds recorded overall (**Table 3.19**), and within Sector 3, 70% of all birds were recorded feeding and foraging.

Table 3.19: Intertidal surveys: turnstone – peak counts and total number of birds recorded within each sector

Sector	Peak count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	80	229	514	743
2	22	362	17	379
3	77	1,493	626	2,119

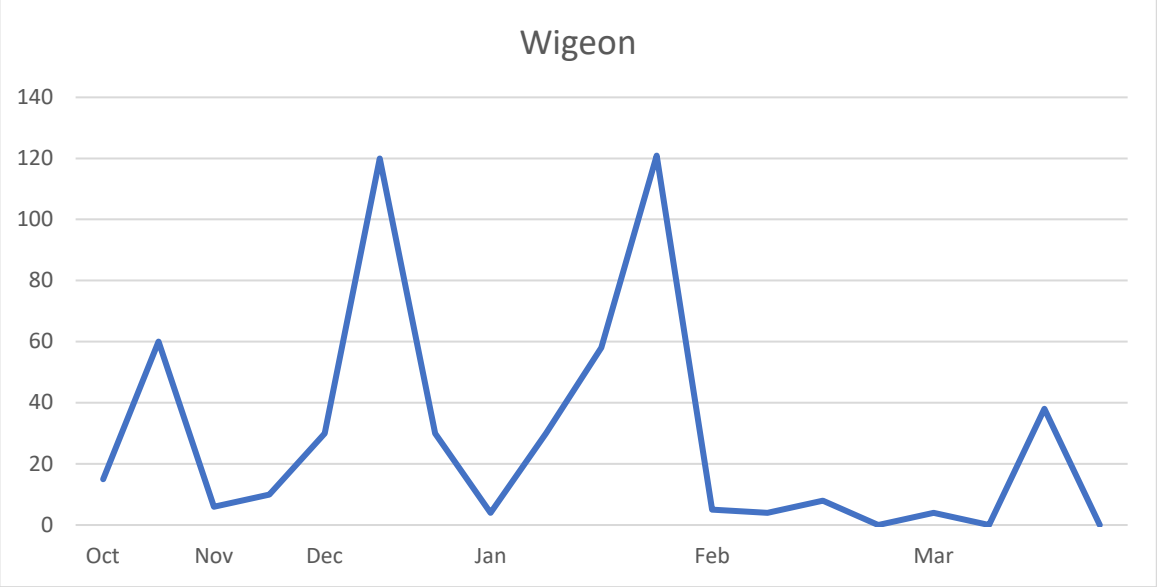
Wigeon

3.1.66 Non-breeding wigeon are a qualifying feature of the Abberton Reservoir SPA and Ramsar sites and are a notified feature of Dengie, Blackwater Estuary and Abberton Reservoir SSSIs with nationally important numbers present at the latter.

3.1.67 The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 464 and for the Blackwater Estuary was 5,285. The peak count recorded during intertidal surveys (121) represents 26% and 2% of those averages respectively.

3.1.68 During the ISS, peak numbers of wigeon were recorded in mid-December 2019 and late February 2020, with background levels otherwise remaining comparatively low (**Figure 3.25**).

Figure 3.25 Intertidal surveys: peak monthly count of wigeon October 2019-March 2020



3.1.69 Wigeon were recorded in Sectors 1 and 3 in all tidal conditions, although numbers peaked four and five hours either side of high tide, with numbers lower during the periods covering two hours either side of high tide and two hours either side of low tide (**Appendix B Figure 3.26**). A peak of 121 birds were recorded roosting in Sector 1.

3.1.70 Sector 1 accounted for 94% of the total number of birds recorded overall (**Table 3.20**). Within Sector 1, 69% of all birds were recorded feeding and foraging.

Table 3.20: Intertidal surveys: wigeon – peak counts and total number of birds recorded within each sector

Sector	Peak count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	121	400	896	1,296
2	0	0	0	0

Sector	Peak count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
3	18	4	85	89

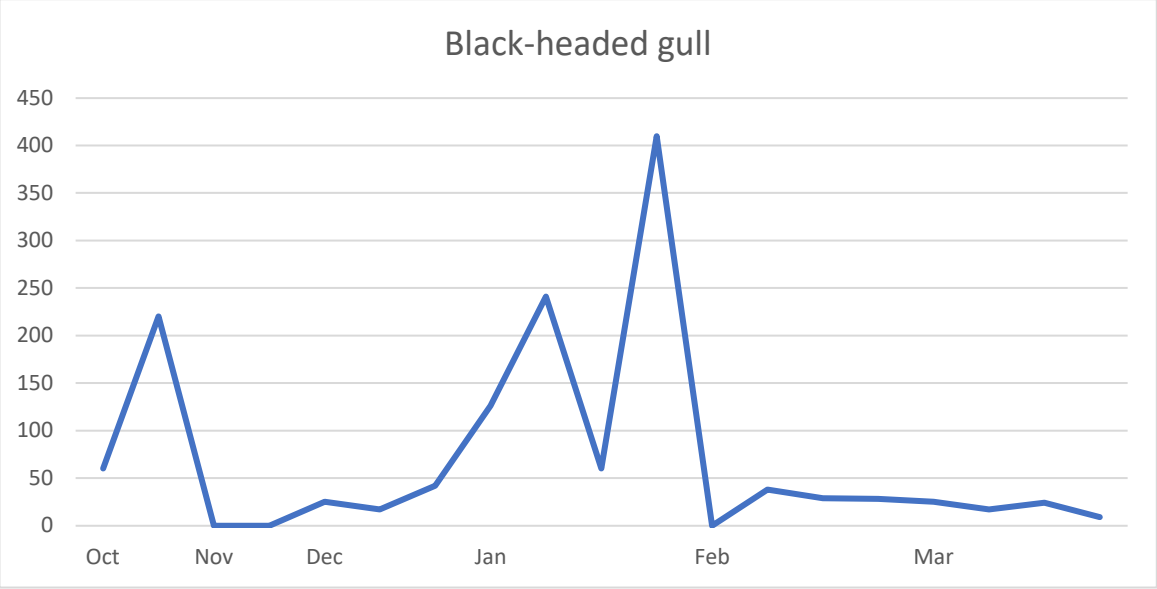
Secondary species

Black-headed gull

3.1.71 The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 969 and for the Blackwater Estuary was 1,269. The peak count recorded during intertidal surveys (410) represents 42% and 32% of those averages respectively.

3.1.72 During the ISS, numbers of black-headed gull gradually increased from November 2019, with peak numbers recorded in late January 2020. Subsequently numbers dropped and remained low for the remainder of the survey period (**Figure 3.27**).

Figure 3.27 Intertidal surveys: black-headed gull peak monthly count of black-headed gull October 2019-March 2020



3.1.73 Black-headed gull were recorded in all sectors in all tidal conditions, although numbers peaked four and five hours either side of high tide, with lower numbers over the period covering two hours either side of low tide (**Figure 3.28**). A peak of 410 birds were recorded feeding and foraging in Sector 2.

3.1.74 Sector 2 accounted for 70% of the total number of birds recorded overall (**Table 3.21**). Within Sector 2, 75% of all birds were recorded feeding and foraging. Sector

1 contained the greatest proportion of roosting, preening and loafing individuals (96%).

Table 3.21: Intertidal surveys: black-headed gull – peak counts and total number of birds recorded within each sector

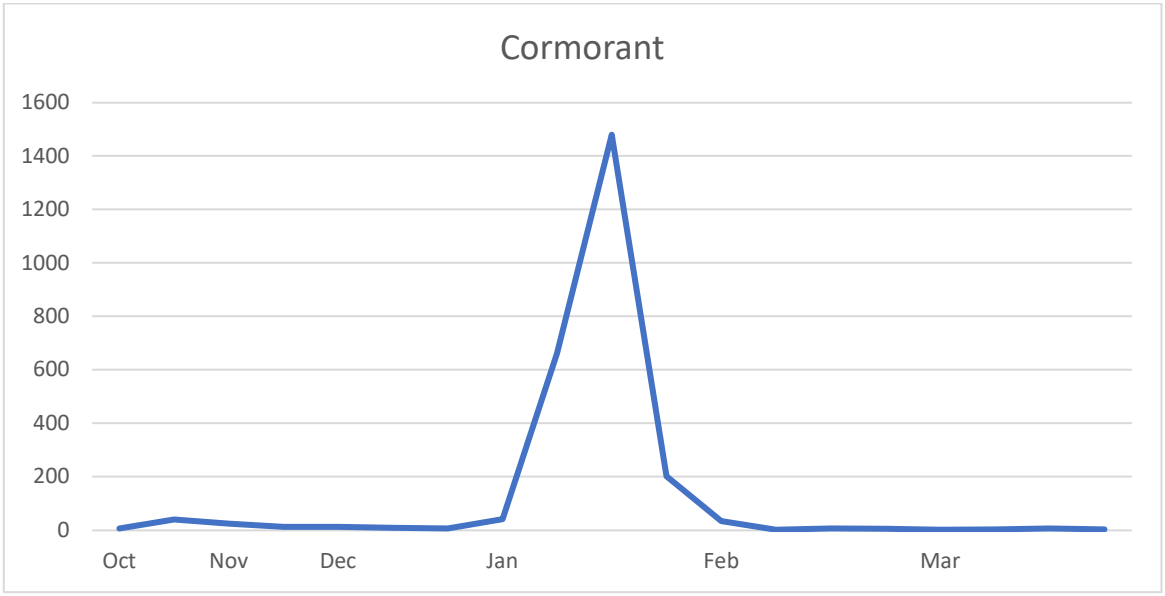
Sector	Peak count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	105	25	542	567
2	410	1,856	634	2,490
3	320	324	173	497

Cormorant

3.1.75 The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 138 and for the Blackwater Estuary was 504. The peak count recorded during intertidal surveys (1,480) represents 294% and 1,072% of those averages respectively.

3.1.76 During the ISS, peak numbers of cormorant remained at a very low level throughout the survey period except for mid-January 2020 where peak numbers increased drastically. Subsequently numbers dropped and remained low for the remainder of the survey period (**Figure 3.29**).

Figure 3.29 Peak monthly count of cormorant October 2019-March 2020



3.1.77 Cormorant were recorded in all sectors in all tidal conditions, although numbers peaked over the period covering one hour either side of high tide (**Appendix B Figure 3.30**). A peak of 1,480 birds were recorded feeding and foraging in Section 1.

3.1.78 Sector 1 accounted for 49% of the total number of birds recorded overall (**Table 3.22**). Within Sector 1, 81% of all birds were recorded feeding and foraging. Similarly, feeding and foraging accounted for the greatest proportion of records in Sectors 2 and 3 also (96 and 99% respectively).

Table 3.22: Intertidal surveys: cormorant – peak counts and total number of birds recorded within each sector

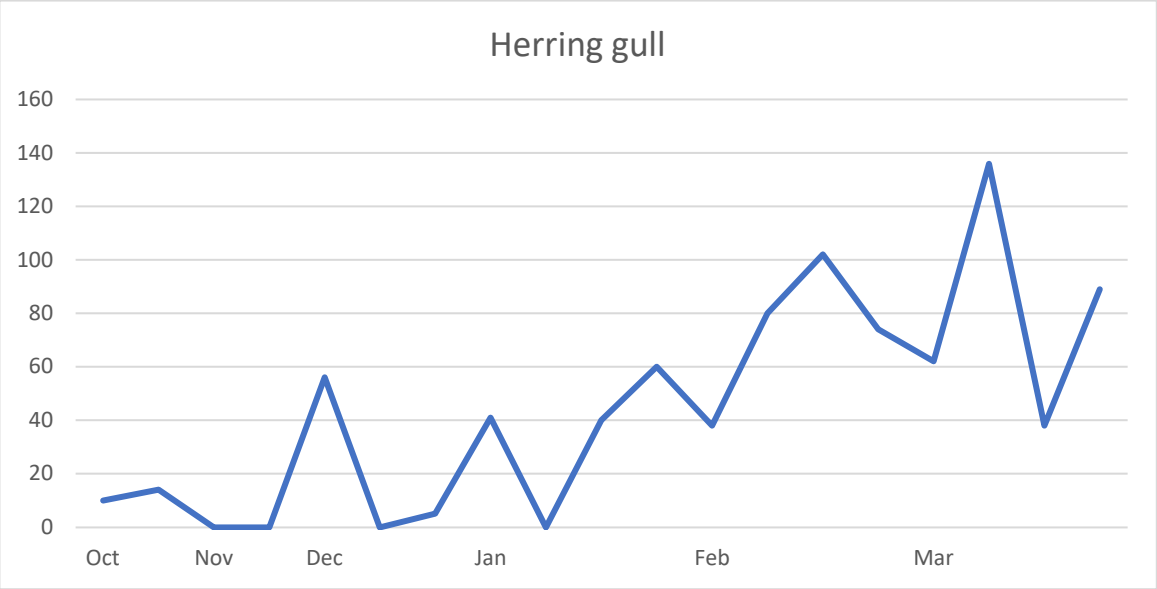
Sector	Peak count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	1,480	3,965	941	4,906
2	1,286	3,235	133	3,368
3	1,000	1,736	23	1,759

Herring gull

3.1.79 The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 279 and for the Blackwater Estuary was 345. The peak count recorded during intertidal surveys (136) represents 49% and 39% of those averages respectively.

3.1.80 During the ISS, peak numbers of herring gull gradually increased throughout the survey period before peaking in mid-March (**Figure 3.31**).

Figure 3.31 Intertidal surveys: peak monthly count of herring gull October 2019-March 2020



3.1.81

3.1.82 Herring gull were recorded in all sectors in all tidal conditions, with lower numbers over the period covering one hour either side of low tide (**Figure 3.32**). A peak of 136 birds were recorded roosting in Sector 1.

3.1.83 Sector 1 accounted for 93% of the total number of birds recorded overall (**Table 3.23**). Within Sector 1, 98% of all birds were recorded roosting, loafing or preening.

Table 3.23: Intertidal surveys: cormorant – peak counts and total number of birds recorded within each sector

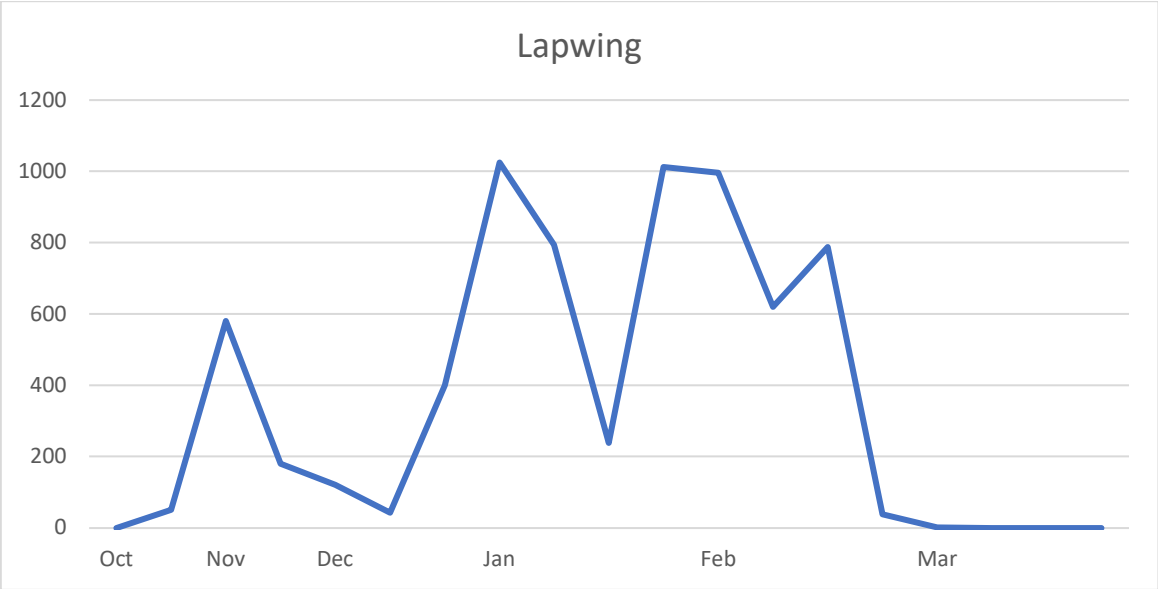
Sector	Peak count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	136	53	3,301	3,354
2	56	15	109	124
3	25	69	74	143

Lapwing

3.1.84 The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 2,355 and for the Blackwater Estuary was 6,878. The peak count recorded during intertidal surveys (1,025) represents 44% and 15% of those averages respectively.

3.1.85 During the ISS peak numbers of lapwing were recorded in January and February 2020. By the end of February, numbers were very low and lapwing were totally absent in March 2020 (**Figure 3.33**).

Figure 3.33 Intertidal surveys: peak monthly count of lapwing October 2019-March 2020



3.1.86 Lapwing were recorded in all sectors (although only a single record in Sector 2 and 3 in Sector 3) in all tidal conditions, although numbers peaked one to two hours either side of high tide, with numbers lower at high tide and the period covering one hour either side of low tide (**Appendix B Figure 3.34**). A peak of 1,025 birds were recorded roosting in Section 1.

3.1.87 Sector 1 accounted for 99% of the total number of birds recorded overall (**Table 3.24**). Within Sector 1, 99% of all birds were recorded roosting, preening and loafing.

Table 3.24: Intertidal surveys: lapwing – peak counts and total number of birds recorded within each sector

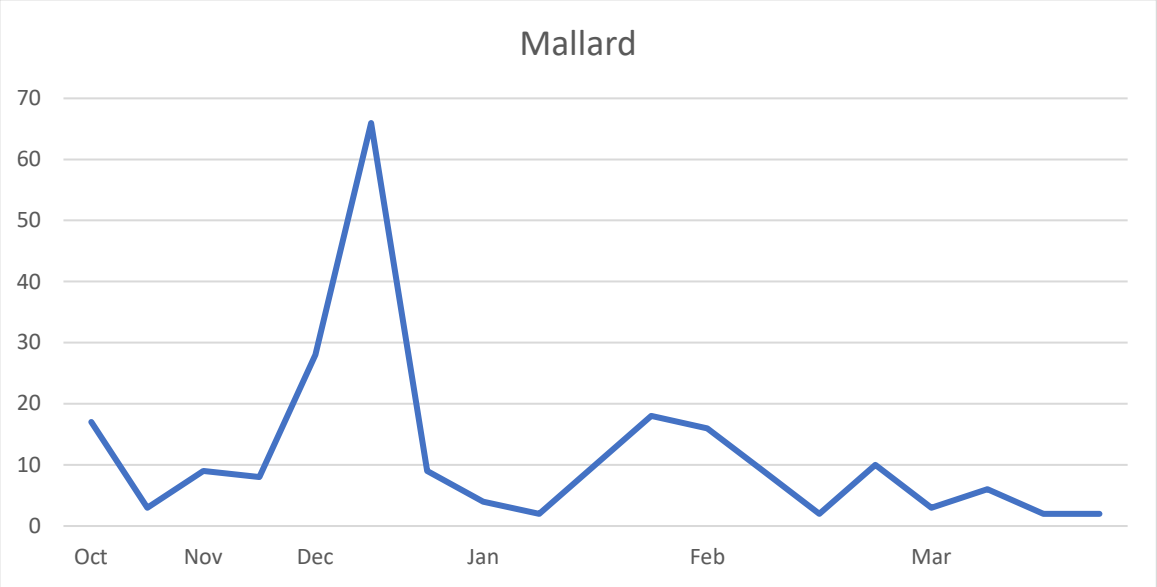
Sector	Peak count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	1,025	278	24,694	24,792
2	2	0	2	2
3	1	2	1	3

Mallard

3.1.88 The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 143 and for the Blackwater Estuary was 479. The peak count recorded during intertidal surveys (66) represents 46% and 14% of those averages respectively.

3.1.89 During the ISS, peak numbers of mallard remained low throughout the survey period except for a peak in mid-December 2019 (**Figure 3.35**).

Figure 3.35 Intertidal surveys: peak monthly count of mallard October 2019-March 2020



3.1.90 Mallard were recorded in all sectors in all tidal conditions, with higher numbers over the period covering two to four hours either side of low tide (**Appendix B Figure 3.36**). A peak of 66 birds were recorded roosting in Sector 1.

3.1.91 Sector 1 accounted for 98% of the total number of birds recorded overall (**Table 3.25**). Within Sector 1, 84% of all birds were recorded roosting, loafing or preening.

Table 3.25: Intertidal surveys: mallard – peak counts and total number of birds recorded within each sector

Sector	Peak count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	66	114	610	724
2	2	0	4	4

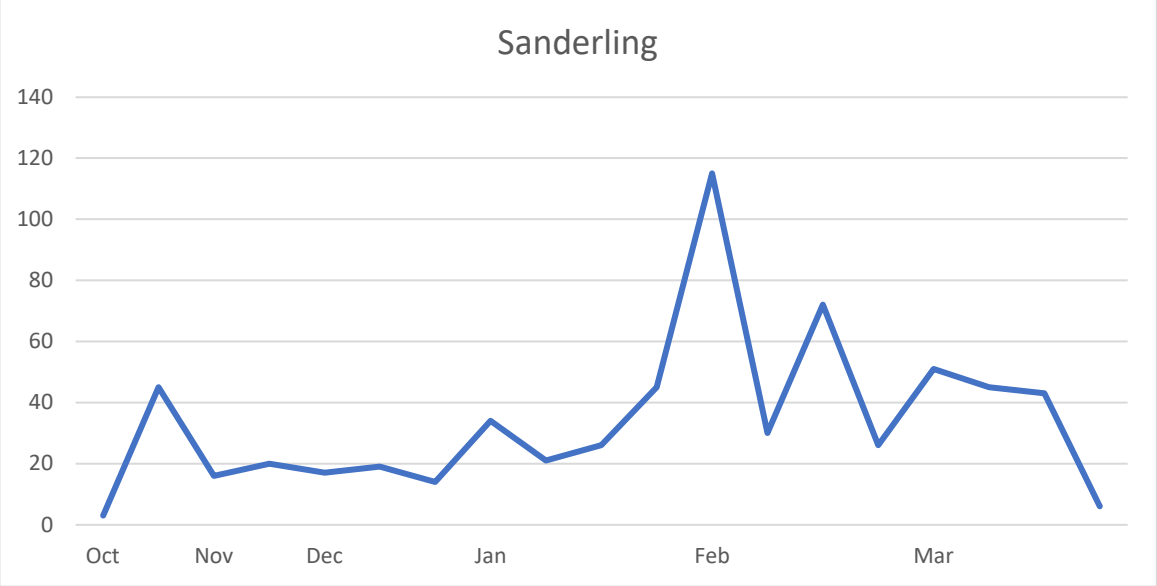
Sector	Peak count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
3	4	2	6	8

Sanderling

3.1.92 The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 170 and for the Blackwater Estuary was 17. The peak count recorded during intertidal surveys (115) represents 68% and 676% of those averages respectively.

3.1.93 During the ISS, peak numbers of sanderling gradually increased, with peak numbers recorded in early February followed by a sharp decline in peak numbers through to the end of the survey period (**Figure 3.37**).

Figure 3.37 Intertidal surveys: peak monthly count of sanderling October 2019-March 2020



3.1.94 Sanderling were recorded in Sectors 2 and 3 in all tidal conditions, although numbers peaked one to two hours either side of high tide, with numbers lower at high tide and the period covering one hour either side of low tide (**Appendix B Figure 3.38**). A peak of 115 birds were recorded roosting in Sector 3.

3.1.95 Sector 3 accounted for 82% of the total number of birds recorded overall (**Table 3.26**). Within Sector 3, 75% of all birds were recorded feeding and foraging. Within Sector 2, 87% of all birds recorded were observed feeding and foraging.

Table 3.26: Intertidal surveys: sanderling – peak counts and total number of birds recorded within each sector

Sector	Peak count	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	0	0	0	0
2	45	305	45	350
3	115	1,212	399	1,611

3.2 Intertidal Surveys: Disturbance Monitoring

3.2.1 **Table 3.27** summarises data relating to the effects of different disturbance stimuli on the 19 target or secondary species recorded in numbers greater than 20 individuals in 75% of survey visits. Where two potential stimuli were noted, bird data have been provided only against the first stimulus that was recorded.

Table 3.27: Summary of background disturbance stimuli and total number of species affected

Background disturbance stimulus	Total number of events	Total number of individual responses	Average number of individual responses
Presence of people (e.g. walkers, dog walkers, cyclists, joggers, fishermen, bait diggers)	864	44,476	51
Boats – small vessels (sailing boats, speed boats and kite surfers)	615	30,404	49
Predators	164	14,892	91
Aircraft (including helicopters)	62	4,185	68
Tidal influence	52	2,456	47
Unknown disturbance events	26	9,164	352
Boats – large vessels	19	874	46

Background disturbance stimulus	Total number of events	Total number of individual responses	Average number of individual responses
Gas cannon	11	5,953	541
Other	2	385	193
Vehicles	1	2	2
Total	**1,816**	**112,791**	

3.2.2 With the exclusion of 'unknown' reasons for disturbance, the most frequent events recorded (>5% of overall total) were associated with:

- the presence of people 48% (e.g. walkers, dog walkers, cyclists, joggers, fishermen, bait diggers);
- boats – small vessels 34% (sailing boats, speed boats and kite surfers); and
- predators 9%.

3.2.3 When considering the total number of birds (103,627) recorded responding to disturbance, the largest numbers (>5% of overall total), and with the exclusion of 'unknown' reasons, were disturbed by:

- the presence of people 43% (e.g. walkers, dog walkers, cyclists, joggers, fishermen, bait diggers);
- boats – small vessels 29% (sailing boats, speed boats and kite surfers);
- predators 14%; and
- gas cannon 6%.

3.2.4 When considering the average number of birds recorded per disturbance event, the largest numbers, with the exclusion of 'unknown' reasons, were disturbed by:

- the operation of the gas cannon (an average of 541 individuals per event);
- predators (91);
- aircraft (68); and
- the presence of people (51).

3.2.5 **Table 3.28** presents the most frequent disturbance responses by species (only those with peak counts recorded in numbers greater than 20 individuals in 80% of

survey visits) across all sectors, for all tidal heights (numbers in bold relate to disturbance stimuli responsible for greatest proportion of individual responses).

3.2.6 Small boats accounted for the greatest proportion of individual responses for ten species (cormorant, curlew, dunlin, golden plover, great-crested grebe, lapwing, mallard, oystercatcher, redshank and shelduck), whilst disturbance stimuli associated with people accounted for the greatest proportion of individual responses for six species (brent goose, black-headed gull, grey plover, ringed plover, sanderling and turnstone).

Table 3.28: Number of individual responses to each stimulus by species

Stimulus	Number of individual responses to each stimulus per species (the percentage relates to breakdown within species and not within stimulus)																	
	Brent goose *	Black-headed gull	Cormorant	Curlew	Dunlin	Golden plover	Great-crested grebe	Grey plover	Knot	Lapwing	Mallard	Oystercatcher	Redshank	Ringed plover	Sanderling	Shelduck	Turnstone	Wigeon
Aircraft	864	0	1	13	355	1040	1	41	530	600	52	465	21	10	30	6	16	**140**
Boats – small vessels	8,253	0	**6,060**	**1,448**	**3,174**	**3,892**	**80**	117	303	**4,150**	**85**	**1,726**	**845**	124	3	**62**	62	20
Boats – large vessels	551	0	0	101	34	0	0	1	0	0	0	181	1	0	0	0	5	0
Gas cannon	3,353	0	0	0	0	1,900	0	0	0	700	0	0	0	0	0	0	0	0
Other	382	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
Presence of people	**35,441**	**50**	1,756	238	1,792	1,510	3	**205**	13	341	32	865	564	**402**	**518**	17	**729**	0
Predators	3,836	0	0	137	2,814	1,704	0	67	1,132	3,705	4	1,219	103	24	54	26	37	30
Tidal influence	398	0	0	61	10	700	0	2	0	200	0	825	42	51	86	0	81	0
Unknown	1,106	0	0	2	1,170	3,550	0	0	**2,000**	1,280	0	4	8	44	0	0	0	0
Vehicles	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Total	54,184	50	7,817	2,000	9,349	14,296	84	433	3,978	10,976	175	5,285	1,587	655	691	111	930	190

* Brent goose also encompasses sub-species dark-bellied and light-bellied.

3.2.7 Sector 1 accounted for 61% of the total number of individual responses recorded overall (**Table 3.29**) (numbers in bold relate to disturbance stimuli responsible for greatest proportion of sector responses). Within Sector 1, the greatest proportion of all individual responses were attributed to small boats (38%). Within Sectors 2 and 3, the greatest proportion of all individual responses were attributed to disturbance events associated with people (82% and 73% respectively). Sector 3 accounted for the least number of individual responses from disturbance events.

Table 3.29: Number of individual responses to each stimulus by sector

Sector	1	2	3
Aircraft	2,104	853	1,228
Boats – small vessels	**26,538**	2,835	1,031
Boats – large vessels	819	55	0
Gas cannon	5,953	0	0
Other	385	0	0
Presence of people	10,423	**21,326**	**12,727**
Predators	12,074	869	1,949
Tidal influence	1,826	76	554
Unknown	9,158	0	6
Vehicles	2	0	0
TOTAL	**69,283**	**26,016**	**17,498**

Disturbance response levels

3.2.8 Category 4 and 5 disturbance responses (Category 4 is where birds moved within an individual sector and Category 5 is where birds left the sector completely) equate most closely to levels considered to be representing significant disturbance.

3.2.9 Overall, a total of 195 level 4 disturbance events occurred and 332 level 5 events, comprising 29% of all recorded disturbance events including those at Level 1

(1,811). **Table 3.30** presents the total number of events and the total number of birds that elicited a level 4 or 5 response to a disturbance stimulus, by sector, for the species detailed in **Table 3.28**.

Table 3.30: Number of level 4 and 5 disturbance events, and number of birds affected, by sector

Sector	Level 4 events			Level 5 events		
	Total number of events recorded	Average number of events per survey*	Total number of individual responses	Total number of events recorded	Average number of events per survey*	Total number of individual responses
1	91	4.8	13,254	122	6.4	18,596
2	70	3.7	1,265	108	5.7	9,485
3	34	1.8	2,349	102	5.4	3,340

* *The average number of events reflects there being 19 visits per sector*.

3.2.10 For the species detailed in **Table 3.28** (numbers here include 'unknown' disturbance events), **Table 3.31** presents:

- the number of individual responses that were caused by all disturbance stimuli and the number of individual level 4 and 5 responses;
- the number of birds eliciting level 4 and 5 responses as a percentage of all disturbed individuals; and
- the disturbance stimuli that most commonly affected each species.

3.2.11 In summary, the five wildfowl species documented in **Table 3.31** are most commonly disturbed by: the presence of boats (small vessels) (great-crested grebe, shelduck and wigeon); the presence of people (brent goose); the presence of predators (shelduck); aircraft (wigeon); and vessel traffic (shelduck).

3.2.12 The 11 wader species documented in **Table 3.31** are most commonly disturbed by: the presence of boats (small vessels) (curlew, dunlin, golden plover, grey plover, lapwing, oystercatcher and redshank); the presence of people (turnstone, golden plover, grey plover, ringed plover and sanderling) and the presence of predators (dunlin, grey plover, knot, lapwing and oystercatcher).

Table 3.31: Analysis of level 4 and 5 disturbance responses, at all tidal conditions

Species	Total number of individual responses (at all levels) caused by all stimuli*	Number of birds showing level 4 responses (% of total number of individual responses)	Number of birds showing level 5 responses (% of total number of indivual responses)	Most common disturbance stimuli (excluding unknown)
Target Species				
Boats – small vessels	**26,538**	2,835	1,031	
Boats – large vessels	819	55	0	
Gas cannon	5,953	0	0	
Brent goose*	54,184	4,868 (9)	14,324 (26)	Presence of people
Curlew	2000	403 (20)	100 (5)	Boats – small vessels
Dunlin	9,349	2,107 (23)	2,063 (22)	Boats – small vessels, Predators
Golden plover	14,296	3,660 (26)	5,111 (36)	Boats – small vessels, Presence of people

Species	Total number of individual responses (at all levels) caused by all stimuli*	Number of birds showing level 4 responses (% of total number of individual responses)	Number of birds showing level 5 responses (% of total number of indivual responses)	Most common disturbance stimuli (excluding unknown)
Great-crested grebe	84	0 (0)	10 (12)	Boats – small vessels
Grey plover	433	36 (8)	98 (23)	Boats – small vessels, presence of people, predators
Knot	3,978	2,000 (50)	1,306 (33)	Predators
Lapwing	10,976	2,109 (19)	5,116 (47)	Boats – small vessels, predators
Oystercatcher	5,285	1,059 (20)	725 (14)	Boats – small vessels, predators
Redshank	1,587	420 (26)	285 (18)	Boats – small vessels
Ringed plover	655	23 (4)	140 (21)	Presence of people
Sanderling	691	29 (4)	84 (12)	Presence of people
Other	385	0	0	

Species	Total number of individual responses (at all levels) caused by all stimuli*	Number of birds showing level 4 responses (% of total number of individual responses)	Number of birds showing level 5 responses (% of total number of indivual responses)	Most common disturbance stimuli (excluding unknown)
Secondary species				
Black-headed gull	50	0 (0)	0(0)	Uncontrolled dogs
Cormorant	7,817	10 (0)	1,896 (24)	Boats – small vessels
Mallard	175	14 (8)	28 (16)	Boats – small vessels

* Brent goose also encompasses sub-species dark-bellied and light-bellied.

3.3 Terrestrial Transect Surveys

3.3.1 A total of 33 target species and 24 secondary species were recorded during the diurnal terrestrial transect surveys. Monthly peak counts recorded from October 2019 to March 2020 are presented in **Table 3.32**.

Table 3.32: Monthly peak counts of birds recorded during diurnal terrestrial surveys

Species	October	November	December	January	February	March	Peak
Target Species							
Bar-tailed godwit	2	0	0	0	0	0	2
Black-tailed godwit	0	0	1	0	0	0	1
Brent goose*	60	0	500	1,790	1,200	185	1,790
Coot	10	13	7	21	45	32	45
Corn bunting	10	28	28	55	46	30	55
Curlew	150	20	52	127	30	8	150
Dunlin	0	0	255	663	297	1	663
Gadwall	0	0	0	8	4	0	8
Golden plover	0	200	923	650	70	0	923
Great-crested grebe	0	0	1	0	66	0	66
Grey plover	20	0	130	12	28	0	130

Species	October	November	December	January	February	March	Peak
Hen harrier	0	0	0	0	0	3	3
Herring gull	0	0	18	125	0	100	125
House sparrow	10	15	60	0	10	20	60
Heron	1	-	1	1	1	0	1
Knot	20	300	68	40	60	0	300
Lapwing	40	380	365	630	100	1	630
Linnet	25	0	20	32	37	35	37
Merlin	0	0	1	1	1	1	1
Mute swan	2	0	2	0	0	0	2
Peregrine	1	1	2	2	1	4	4
Pochard	3	1	1	6	10	13	13
Redshank	60	0	186	24	38	43	186
Reed bunting	0	0	10	12	24	24	24
Ringed plover	0	0	2	0	34	0	34

Species	October	November	December	January	February	March	Peak
Shelduck	0	125	13	68	6	15	125
Short-eared owl	0	0	0	2	0	0	2
Skylark	26	25	52	25	0	36	52
Starling	120	130	150	80	22	58	150
Teal	13	0	72	292	192	78	292
Turnstone	0	1	24	1	3	0	24
Wigeon	2	0	133	118	138	21	138
Woodcock	1	0	0	0	0	0	1
Secondary species							
Avocet	0	0	12	2	0	0	12
Barn owl	0	0	1	1	0	0	1
Bearded tit	0	1	0	0	0	0	1
Black-headed gull	300	150	58	34	46	0	300
Cetti's warbler	0	0	1	0	0	1	1

Species	October	November	December	January	February	March	Peak
Common gull	100	110	275	86	56	14	275
Cormorant	6	2	5	4	1	1	6
Dartford warbler	2	0	1	1	1	0	2
Firecrest	0	0	0	0	1	1	1
Kingfisher	0	0	0	1	0	0	1
Lesser black-backed gull	0	0	0	0	0	30	30
Little egret	15	12	6	4	12	17	17
Little grebe	4	5	2	6	2	7	7
Mallard	24	20	12	18	22	9	24
Marsh harrier	1	0	0	1	0	1	1
Moorhen	3	2	6	2	6	7	7
Oystercatcher	150	0	176	216	85	30	216
Red-breasted merganser	0	0	5	14	2	0	14

Species	October	November	December	January	February	March	Peak
Red kite	0	0	0	0	0	1	1
Sanderling	0	0	18	0	0	0	18
Shoveler	2	7	2	0	0	0	7
Snipe	1	0	0	2	0	0	2
Tufted duck	0	0	0	2	12	18	18
Water rail	0	0	0	0	0	1	1

* Brent goose also encompasses sub-species dark-bellied and light-bellied.

3.3.2 A total of six non-breeding farmland bird species were recorded as target species (i.e. recorded in flocks of 10 or more), corn bunting, house sparrow, linnet, reed bunting, skylark, starling. These species are considered to be typical of farmland in this area of Essex and were widely distributed across the site with corn bunting numbers above 28 individuals in all month except October, peaking at 55 birds in January.

3.3.3 Hen harrier (a qualifying feature of both Dengie and Blackwater Estuary SPAs and Ramsar Sites) was only recorded on a single occasion with three birds (an immature male, adult female and unsexed bird) flying over the saltmarsh southeast of the Bradwell Bird Observatory (plot 123) and heading to roost on 6 March.

3.3.4 In addition to brent goose, golden plover and lapwing, the following sub-sections present a review of the terrestrial population data collected from October 2019-March 2020 for an additional three target species (coot, curlew, redshank) and one secondary species (common gull), which were recorded in more than 75% of survey visits (15 visits or above) and whose overall peak count was above 20 individuals.

3.3.5 The peak winter counts recorded during the Intertidal surveys for these species was considered as a proportion of the BTO WeBS core count data for the winter periods covering 2014-2015 to 2018-2019, for the Bradwell Estuary and Dengie Flats WeBS sites.

Key species: terrestrial transect surveys

Brent goose

3.3.6 Within all appropriate habitats (agricultural land, saltmarsh and shoreline habits), 11,332 brent goose were recorded, with a peak count of 1,790.

3.3.7 **Table 3.33** presents the peak winter count recorded during diurnal terrestrial surveys as a proportion of the population of the species at the time of classification for the various SPA and Ramsar sites for which it is a qualifying feature.

Table 3.33: Diurnal terrestrial surveys: brent geese – peak terrestrial count as a percentage of cited population

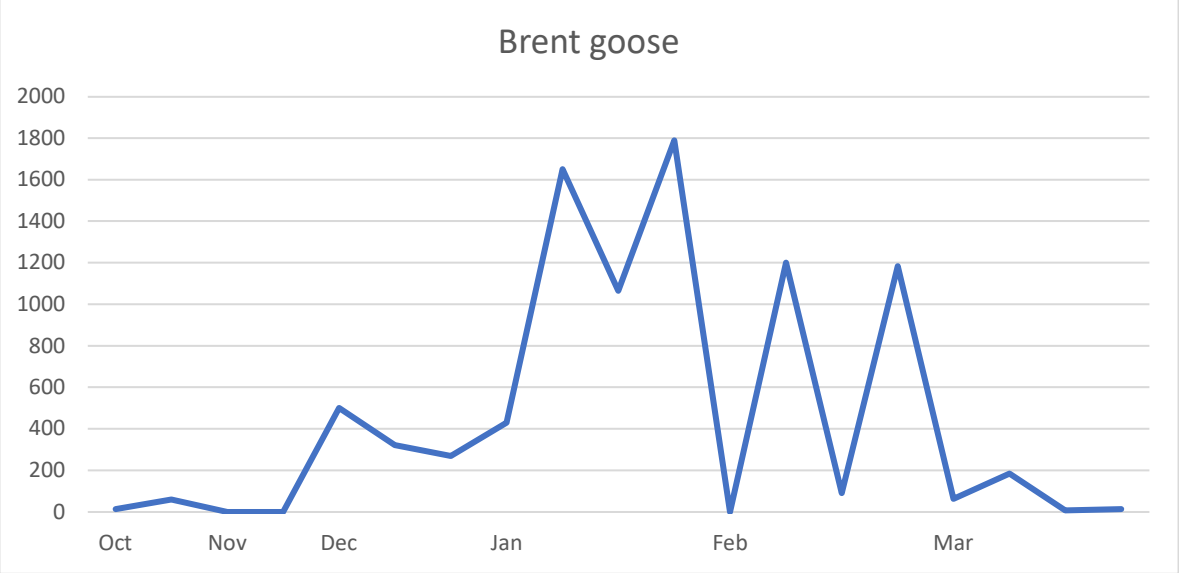
Site	Qualifying features at time of classification	Peak winter count 2019-2020 as % of SPA
Dengie (Mid-Estuary Essex Coast Phase 1) SPA	2,250	80
Dengie (Mid-Estuary Essex Coast Phase 1) Ramsar	2,000	90

Site	Qualifying features at time of classification	Peak winter count 2019-2020 as % of SPA
Blackwater Estuary (Mid-Essex Coast Phase 4) SPA	8,761	20
Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar	8,689	21

3.3.8 The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 4,825 and for the Blackwater Estuary was 8,935. The peak count recorded during intertidal surveys represents 37% and 20% of those averages respectively.

3.3.9 During the diurnal terrestrial surveys peak numbers of brent geese remained comparatively low from October to December 2019, with numbers peaking in January 2020 (**Figure 3.39**).

Figure 3.39 Diurnal terrestrial surveys: peak visit count of brent geese October 2019-March 2020



3.3.10 **Table 3.34** presents details of peak count and total number of individuals by crop or habitat type and the distribution of records is illustrated in **Appendix B Figure 3.40**. Within terrestrial habitats, brent geese showed a clear preference for fields with winter wheat, with almost 100% of all brent geese records in terrestrial habitats related to this crop type. Numbers were also recorded in intertidal habitats, with a peak of 745 on the Dengie Flats.

Table 3.34: Diurnal terrestrial surveys: brent geese – peak counts and total number of birds by crop type or habitat

Field crop type or habitat	Total area (hectares)	Peak count	Total number of individuals
Intertidal	156	745	1,806
Muddy pools	5	8	8
Ploughed	257	1	1
Unimproved grass	10	14	33
Winter wheat	381	1,790	9,484

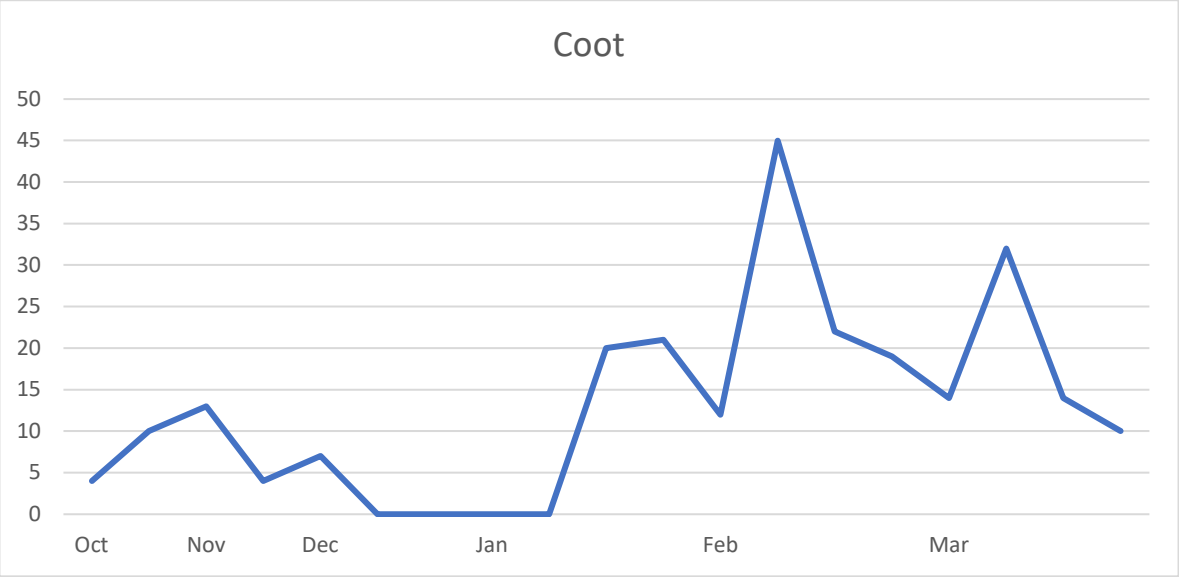
Coot

3.3.11 Within all appropriate habitats, 247 coot were recorded, with a peak count of 45.

3.3.12 The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 9 and for the Blackwater Estuary was 161. The peak count recorded during intertidal surveys represents 500% and 28% of those averages respectively.

3.3.13 During the diurnal terrestrial surveys peak numbers of coot remained comparatively low from October to November 2019, with none present in December 2019 and early January 2020. Numbers peaking in mid-February (**Figure 3.41**).

Figure 3.41 Diurnal terrestrial surveys: peak visit count of coot October 2019-March 2020



3.3.14 All coot observations were associated with the irrigation reservoirs within plot ID 98.

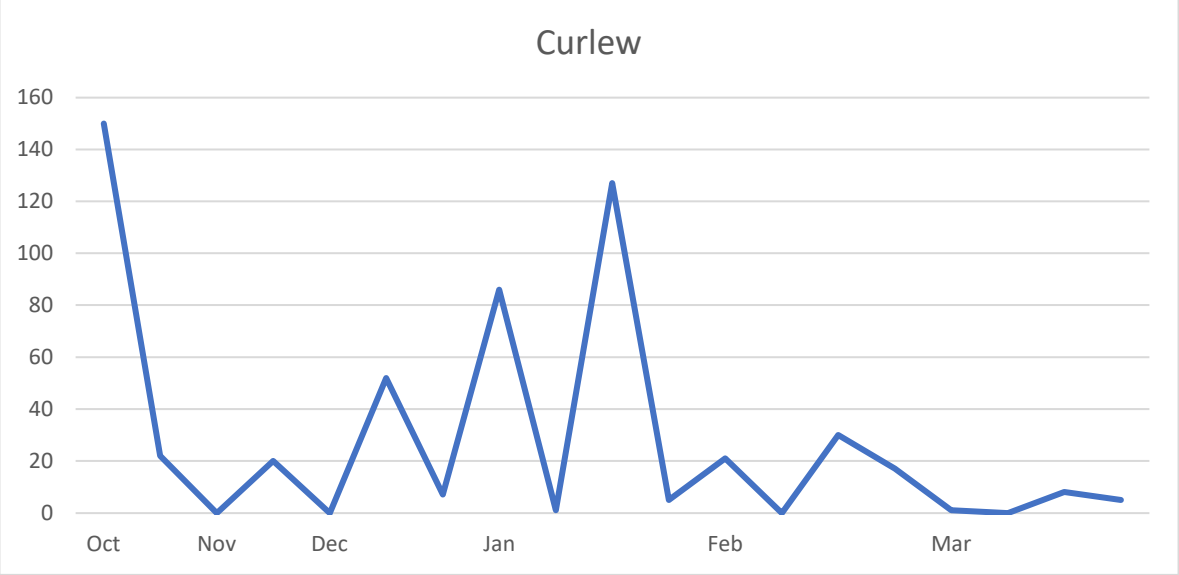
Curlew

3.3.15 Within all appropriate habitats, 675 curlew were recorded, with a peak count of 150.

3.3.16 Non-breeding curlew are a notified feature of Dengie SSSI and Blackwater Estuary SSSI with nationally important numbers being present at the latter. The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 520 and for the Blackwater Estuary was 1,544. The peak count recorded during intertidal surveys (150) represents 29% and 10% of those averages respectively.

3.3.17 During the diurnal terrestrial surveys peak numbers of curlew peaked in October 2019, with erratic numbers throughout the rest of the winter (**Figure 3.42**).

Figure 3.42 Diurnal terrestrial surveys: peak visit count of curlew October 2019-March 2020



3.3.18 During diurnal terrestrial surveys, curlew were predominantly recorded in field plots close to Pewet Island (**Appendix B Figure 3.43**).

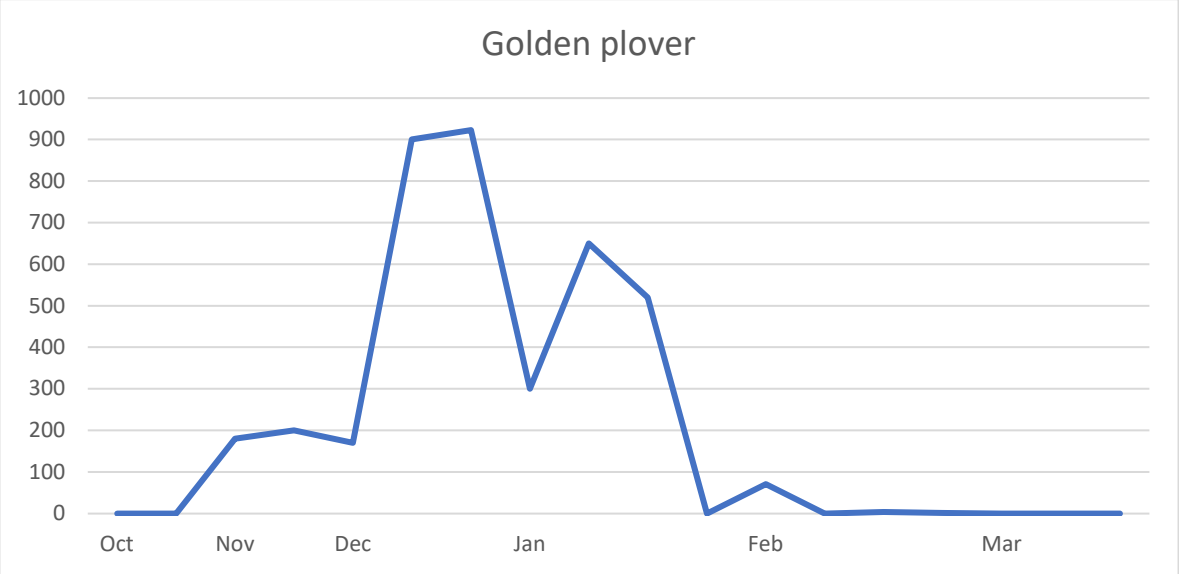
Golden plover

3.3.19 Within all appropriate habitats (agricultural land, saltmarsh and shoreline habits), 4,939 golden plover were recorded, with a peak count of 923.

3.3.20 Non-breeding golden plover are a notified feature of the Dengie and Abberton Reservoir SSSI. The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 12,780 and for the Blackwater Estuary was 9,186. The peak count recorded during intertidal surveys (1,990) represents 7% and 10% of those averages respectively.

3.3.21 During the diurnal terrestrial surveys peak numbers of golden plover peaked in December 2019, being absent in October 2019 and March 2020 (**Figure 3.44**).

Figure 3.44 Diurnal terrestrial surveys: peak visit count of golden plover October 2019-March 2020



3.3.22 **Table 3.35** presents details of peak count and total number of individuals by crop type and the distribution of records is illustrated in **Appendix B Figure 3.45**. As with brent geese, golden plover showed a preference for fields with winter wheat, with 89% of all golden plover records in terrestrial habitats related to this crop type. A peak field count of 200 golden plover was also recorded on ploughed land and high numbers were regularly record on the intertidal habitats, with a peak of 923 recorded on Pewet Island and 650 on the Dengie saltmarsh.

Table 3.35: Diurnal terrestrial surveys: golden plover – peak counts and total number of birds by crop type or habitat

Field crop type or habitat	Total area of crop or habitat (hectares)	Peak Count	Total number of individuals
Intertidal	156	923	3,072
Ploughed	257	200	200
Winter wheat	381	1,175	1,556

3.3.23 During nocturnal surveys, a total of 230 birds were recorded, with a peak count of 50 in February 2020.

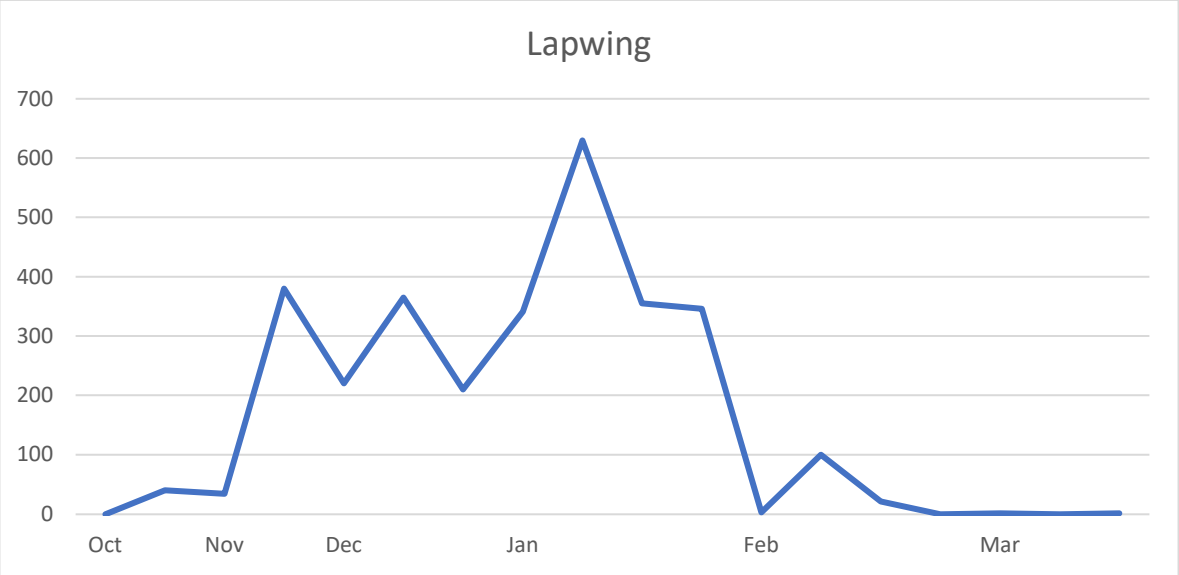
Lapwing

3.3.24 Within all appropriate habitats (agricultural land, saltmarsh and shoreline habits), 4,405 lapwing were recorded, with a peak count of 865.

3.3.25 The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 2,355 and for the Blackwater Estuary was 6,878. The peak count recorded during intertidal surveys (1,025) represents 37% and 13% of those averages respectively.

3.3.26 Lapwing were recorded from late October onwards with numbers slowly building up to a peak of 630 birds in January 2019 (**Figure 3.46**).

Figure 3.46 Diurnal terrestrial surveys: peak visit count of lapwing October 2019-March 2020



3.3.27 **Table 3.36** presents details of peak count and total number of individuals by crop type and the distribution of records is illustrated in **Appendix B Figure 3.47**. As with brent geese and golden plover, lapwing showed a preference for fields with winter wheat, with 73% of all lapwing records in terrestrial habitats related to this crop type. A peak field count of 332 lapwing was also recorded on ploughed land and high numbers were regularly record on the intertidal habitats, with a peak of 630 recorded on Pewet Island.

Table 3.36: Diurnal terrestrial surveys: lapwing – peak counts and total number of birds by crop type or habitat

Field crop type or habitat	Total area (hectares)	Peak count	Total number of individuals
Intertidal	156	630	2,470
Muddy pools	5	1	1
Oil seed rape and winter beans	8	54	65
Ploughed	257	332	507
Unimproved grassland	10	3	1
Winter wheat	381	865	1,558

3.3.28 During nocturnal surveys, a total of 230 birds were recorded, with a peak count of 50 in February 2020.

Redshank

3.3.29 Within all appropriate habitats (agricultural land, saltmarsh and shoreline habits), 608 redshank were recorded, with a peak count of 186.

3.3.30 **Table 3.37** presents the peak winter count recorded during the diurnal terrestrial surveys as a proportion of the population of the species at the time of classification for the various SPA and Ramsar sites for which it is a qualifying feature. This ranges from 12% of the Foulness (Mid-Essex Coast Phase 5) Ramsar population to 24% of the Colne (Mid-Essex Coast Phase 2) SPA.

Table 3.37: Intertidal surveys: redshank – peak count as a percentage of cited population

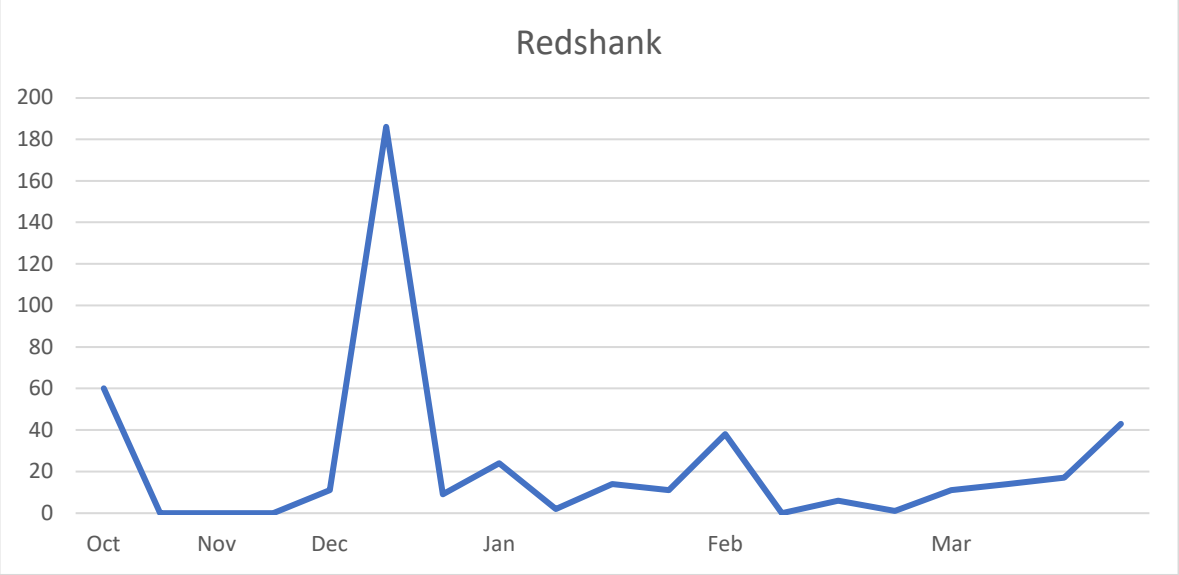
Site	Qualifying feature at time of classification	Peak winter count 2019-2020 as a % of SPA
Colne Estuary (Mid-Essex Coast Phase 2) SPA	1,252	15
Colne Estuary (Mid-Essex Coast Phase 2) Ramsar	1,624	11

Site	Qualifying feature at time of classification	Peak winter count 2019-2020 as a % of SPA
Foulness (Mid-Essex Coast Phase 5) SPA	1,540	12
Foulness (Mid-Essex Coast Phase 5) Ramsar	2,586	7

3.3.31 The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 541 and for the Blackwater Estuary was 3,099. The peak count recorded during intertidal surveys represents 34% and 6% of those averages respectively.

3.3.32 Redshank were recorded from late October onwards with numbers peaking in December before dropping back to previous levels (**Figure 3.48**).

Figure 3.48 Diurnal terrestrial surveys: peak visit count of redshank October 2019-March 2020



3.3.33 **Table 3.38** presents details of peak count and total number of individuals by crop type and the distribution of records is illustrated in **Appendix B Figure 3.49**. The majority of records were observed on intertidal habitats.

Table 3.38: Diurnal terrestrial surveys: redshank – peak counts and total number of birds by crop type or habitat

Field crop type or habitat	Total area (hectares)	Peak count	Total number of individuals
Intertidal	156	186	596
Muddy pools	5	1	4
Winter wheat	381	5	8

Secondary species

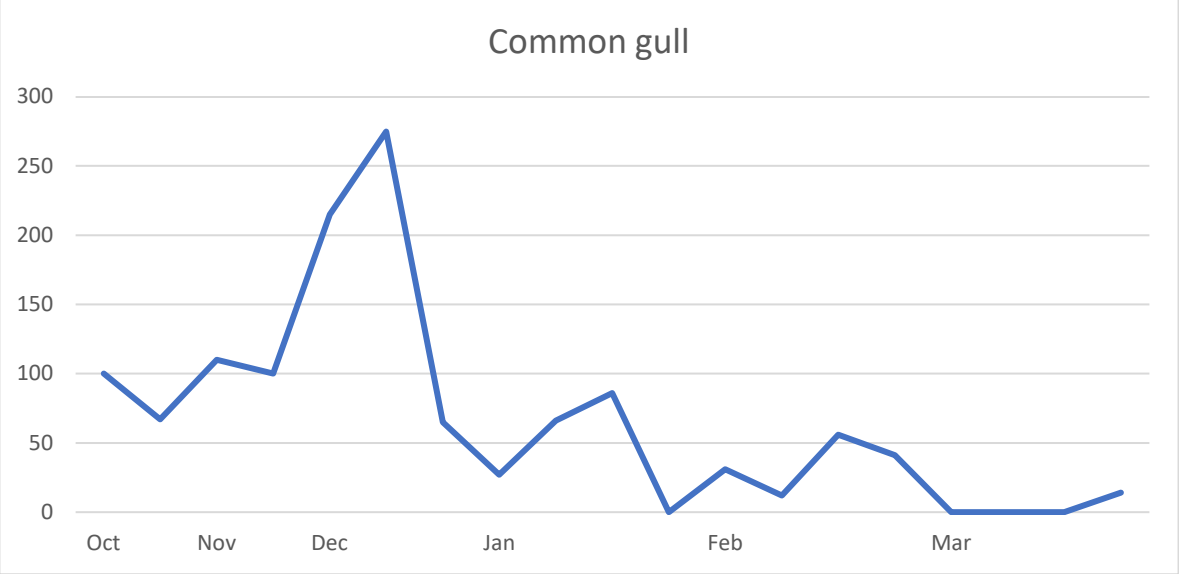
Common gull

3.3.34 Within all appropriate habitats (agricultural land, saltmarsh and shoreline habits), 2,501 common gull were recorded, with a peak count of 275.

3.3.35 The WeBS five-year peak average between 2014-2015 to 2018-2019 for the Dengie Flats was 516 and for the Blackwater Estuary was 214. The peak count recorded during intertidal surveys represents 53% and 128% of those averages respectively.

3.3.36 Common gull were recorded from late October onwards with numbers peaking in December before decreasing for the remainder of the winter period (**Figure 3.50**).

Figure 3.50 Diurnal terrestrial surveys: peak visit count of common gull October 2019-March 2020



3.3.37 **Table 3.39** presents details of peak count and total number of individuals by crop type and the distribution of records is illustrated in **Appendix B Figure 3.51**. Common gull showed a preference for fields with winter wheat, with 68% of all common gull records in terrestrial habitats related to this crop type. A peak field count of 100 common gull was also recorded on ploughed land.

Table 3.39: Diurnal terrestrial surveys: common gull – peak counts and total number of birds by crop type or habitat

Field crop type or habitat	Total area (hectares)	Peak count	Total number of individuals
Improved grassland	7	31	55
Intertidal	156	43	63
Legumes	35	10	10
Oil seed rape	33	25	25
Ploughed		100	493
Reservoir	7	86	175
Scrub	3	10	10
Winter wheat	381	275	1,670

4. SUMMARY

4.1 Intertidal Surveys

4.1.1 For the 13 target species (brent goose, curlew, dunlin, golden plover, great-crested grebe, grey plover, knot, oystercatcher, redshank, ringed plover, shelduck, turnstone and wigeon) and six secondary species (black-headed gull, cormorant, herring gull, lapwing, mallard and sanderling), analysed, Sector 1 accounted for the greatest numbers of individuals recorded, amounting to 55% compared to 35% for Sector 3 and 9% for Sector 2 (**Table 4.1**).

4.1.2 Sector 1 also accounted for the greatest number of individuals recorded roosting, loafing and preening whilst Sector 3 accounted for the greatest number of individuals recorded feeding and foraging.

Table 4.1: Intertidal surveys: peak counts and total number of birds recorded within each sector

Sector	Feeding and foraging	Roosting, preening and loafing	Total number birds overall
1	38,777	109,292	148,069
2	14,653	10,837	25,490
3	73,284	22,362	95,646

4.1.3 Sector 1 supported the greatest total number of individuals for 12 species (**Table 4.2**). Sector 3 supported the greatest number of individuals for six species, whilst Sector 2 supported the greatest number of individuals for just one species (black-headed gull). Golden plover, knot and wigeon were absent from Sector 2 throughout the survey period whilst sanderling was absent from Sector 1.

Table 4.2: Intertidal surveys: total number of birds recorded within each sector

Species	Sector 1	Sector 2	Sector 3
Target Species			
Brent goose	24,270	16,367	21,937
Curlew	2,743	154	1,130
Dunlin	26,368	840	22,128

Species	Sector 1	Sector 2	Sector 3
Golden plover	34,139	0	4,871
Great-crested grebe	246	322	449
Grey plover	1,056	139	4,463
Knot	6,975	0	26,848
Oystercatcher	9,378	423	5,338
Redshank	2,857	423	1,415
Ringed plover	682	64	783
Shelduck	2,793	41	55
Turnstone	743	379	2,119
Wigeon	1,296	0	89
Secondary Species			
Black-headed gull	567	2,490	497
Cormorant	4,906	3,368	1,759
Herring gull	3,354	124	143
Lapwing	24,972	2	3
Mallard	724	4	8

4.1.4 There were two incidental records of hen harrier during the intertidal surveys, both from the Pewet Island area.

4.2 Disturbance

4.2.1 Across all recorded tidal heights and in all sectors, and excluding 'unknown' stimulus, the operation of the gas cannon affected the largest numbers of birds per disturbance event (an average of 541 individuals per event). The presence of predators was the stimulus that affected the second largest numbers of birds per event (an average of 91 individuals). The presence of predators was followed by aircraft (68 individuals per event) and human disturbance (affecting an average of

51 individuals per event, although this disturbance stimuli was the most frequently recorded with 864 events noted across the survey period.

4.2.2 The greatest number of disturbance events occurred in Sector 1, with the greatest proportion within Sector 1 due to small boat movements in and out of Bradwell Waterside Marina. Within Sectors 2 and 3 the greatest proportion of all individual responses were attributed to disturbance events associated with people.

4.2.3 The highest levels of response were those that resulted in birds moving either within an individual sector, leaving the sector completely or undertaking continuous aerial circling (categorised as Level 4 and 5 disturbance responses). These responses occurred in 29% of all recorded disturbance events, totalling 195 level 4 responses and 322 level 5 responses. As noted earlier, these level 4 and 5 events are more likely to be documented by the observer as they are easier to detect.

4.3 Terrestrial Surveys

4.3.1 For the three main target species (brent goose, golden plover and lapwing) distribution was closely correlated to fields of winter wheat. All three species were present in low numbers from late October, with golden plover peaking in December, whilst brent goose and lapwing numbers peaked in January.

4.3.2 A further 54 additional target and secondary species were recorded utilising the terrestrial habitats within the survey area over the survey period, but the low peak numbers and the limited number of visits when they were recorded meant that the majority were not considered for further analysis, excepting common gull, coot, curlew and redshank.

4.3.3 The six non-breeding farmland bird species recorded as target species were widely distributed across the site and typical of the farmland mosaic present on site.

4.3.4 Hen harrier was only recorded on a single occasion with three birds crossing the saltmarsh to the southeast of the survey area to roost in March.

4.4 Survey Continuation

4.4.1 Overwinter bird surveys will recommence in October 2020 and run until March 2021 following the methods outlined in this document. As detailed within the Biodiversity SMP (Ref 4.1), the overwintering birds surveys form part of a suite of surveys which also encompass the breeding and passage periods and once complete the survey programme will provide two years of ornithological data collection.

5. REFERENCES

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Ref 2.2 Gillings, S., Fuller, R.J. & Sutherland, W. 2005. Diurnal studies do not predict nocturnal habitat choice and site selection of European Golden Plovers *Pluvialis apricaria* and Northern Lapwings Vanellus vanellus. Auk pp. 1249 – 1260

Ref. 2.3 Parliament of the United Kingdom, Natural Environment and Rural Communities Act 2006 (NERC Act) (London 2006).

Ref. 2.4 Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD. 2015. Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–746.

Ref. 2.5 Parliament of the United Kingdom, Wildlife and Countryside Act 1981 (as amended) (WCA) (London, 1981).

Ref 2.6 Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (codified version)

Ref 3.1 Frost, T.M., Calbrade, N.A., Birtles, G.A., Mellan, H.J., Hall, C., Robinson, A.E., Wotton, S.R., Balmer, D.E. and Austin, G.E. 2020. Waterbirds in the UK 2018/19: The Wetland Bird Survey. BTO/RSPB/JNCC. Thetford.

Ref 4.1 Wood 2020. Bradwell B Biodiversity Survey and Monitoring Plan. WOOD-XX-XX-RP-OE-0004

APPENDIX A
SCIENTIFIC NAMES

Species common name	Species latin name
Avocet	*Recurvirostra avosetta*
Barn owl	*Tyto alba*
Bar-tailed godwit	*Limosa lapponica*
Bearded tit	*Panurus biarmicus*
Black-headed gull	*Chroicocephalus ridibundus*
Black-tailed godwit	*Limosa limosa*
Black-throated diver	*Gavia arctica*
Brambling	*Fringilla montifringilla*
Brent goose	*Branta bernicla*
Cetti's warbler	*Cettia cetti*
Common gull	*Larus canus*
Common sandpiper	*Actitis hypoleucos*
Common scoter	*Melanitta nigra*
Common tern	*Sterna hirundo*
Coot	*Fulica atra*
Cormorant	*Phalacrocorax carbo*
Corn bunting	*Emberiza calandra*
Curlew	*Numenius arquata*
Dartford warbler	*Sylvia undata*
Dunlin	*Calidris alpina*
Dunnock	*Prunella modularis*
Fieldfare	*Turdus pilaris*

Species common name	Species latin name
Firecrest	*Regulus ignicapilla*
Gadwall	*Mareca strepera*
Gannet	*Morus bassanus*
Golden plover	*Pluvialis apricaria*
Goldeneye	*Bucephala clangula*
Goosander	*Mergus merganser*
Great black-backed gull	*Larus marinus*
Great crested grebe	*Podiceps cristatus*
Grey heron	*Ardea cinerea*
Grey plover	*Pluvialis squatarola*
Greylag goose	*Anser anser*
Guillemot	*Uria aalge*
Hen harrier	*Circus cyaneus*
Herring gull	*Larus argentatus*
House sparrow	*Passer domesticus*
Kingfisher	*Alcedo atthis*
Knot	*Calidris canutus*
Lapwing	*Vanellus vanellus*
Lesser black-backed gull	*Larus fuscus*
Linnet	*Linaria cannabina*
Little egret	*Egretta garzetta*

Species common name	Species latin name
Little grebe	*Tachybaptus ruficollis*
Little tern	*Sternula albifrons*
Mallard	*Anas platyrhynchos*
Marsh harrier	*Circus aeruginosus*
Mediterranean gull	*Ichthyaetus melanocephalus*
Merlin	*Falco columbarius*
Mistle thrush	*Turdus viscivorus*
Mute swan	*Cygnus olor*
Oystercatcher	*Haematopus ostralegus*
Peregrine	*Falco peregrinus*
Pintail	*Anas acuta*
Pochard	*Aythya ferina*
Red kite	*Milvus milvus*
Red-breasted merganser	*Mergus serrator*
Redshank	*Tringa totanus*
Red-throated diver	*Gavia stellata*
Reed bunting	*Emberiza schoeniclus*
Ringed plover	*Charadrius hiaticula*
Sanderling	*Calidris alba*
Sandwich tern	*Thalasseus sandvicensis*
Shag	*Phalacrocorax aristotelis*

Species common name	Species latin name
Shelduck	*Tadorna tadorna*
Short-eared owl	*Asio flammeus*
Shoveler	*Spatula clypeata*
Skylark	*Alauda arvensis*
Snipe	*Gallinago gallinago*
Song thrush	*Turdus philomelos*
Spotted redshank	*Tringa erythropus*
Starling	*Sturnus vulgaris*
Teal	*Anas crecca*
Tufted duck	*Aythya fuligula*
Turnstone	*Arenaria interpres*
Twite	*Linaria flavirostris*
Water rail	*Rallus aquaticus*
White-fronted goose	*Anser albifrons*
Wigeon	*Mareca penelope*
Woodcock	*Scolopax rusticola*
Yellow wagtail	*Motacilla flava*
Yellowhammer	*Emberiza citrinella*

APPENDIX B
DISTRIBUTION FIGURES

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure

0 200 400 600 800 m

Scale at A3:1:15,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 1.1
The Site

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0387

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000

211000 210500 210000 209500 209000 208500 208000 207500 207000 206500

N

Quarters Spit
North Channel
Virley Channel
Little Cob Island
Great Cob Island
South Channel
MLW
The Nass
Shinglehead Point
Mean Low Water
River Blackwater
11
98
99
00
01
02
03
04
10
09
08
07

IOP2B
IOP2A
IOP3A
IOP3B
IOP1B
IOP1A

Sales Point
Bradwell Nuclear Power Station
Weymarks Farm
Electricity Switching Station
Community Settlement
Tip Head
Irrigation Reservoirs
Pp Ho
Chapel of St Peter on the Wall
OTHONA ROMAN FORT
Bradwell Waterside
Power Island
Mean High Water
Airfield (disused)
Downhall Farm
East Hall Farm
Playing Field
War Mead
Cords Grove
Marina
Caravan Park
Eastlands
Trusses Road
Down Hall
Beverells
ROMAN ROAD
East Hall
Munkins Farm
Gunners Creek
Bradwell Creek
Westwick Farm
Woodyards
East End
BRADWELL-ON-SEA CP
St Peter's Way
Spr
Down Westwick
Waterside Road
Cemy
Blackberry Grove
Sch
Bradwell on Sea
Bradwell Lodge
Hockley
Bacons
Delameres Farm
Orplands
Kennel Barn
Bradwell Marshes
Bradwell Marsh

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3

0 100 200 300 400 500 600 700 800 900 1,000 1,100 1,200 m

Scale at A3:1:20,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 2.1
Inter-tidal and near shore survey area

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0352

NOT PROTECTIVELY MARKED

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Field plot
- Terrestrial survey area
- Terrestrial survey, transect routes

0 200 400 600 800 1,000 1,200 m

Scale at A3:1:20,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 2.2
Terrestial survey area

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0353

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A
IOP1B
IOP2A
IOP2B
IOP3A
IOP3B

Bradwell Waterside
Bradwell Nuclear Power Station
Weymarks Farm
Electricity Switching Station
Airfield (disused)
Downfall Farm
Cinder Groves
Playing Field
War Mem
Marina
Trusses Road
Westwick Farm
Woodyards
Pewet Island
Bradwell Creek
Mean Low Water
Saxon Shore Way
Sales Point
Tip Head
OTHONA ROMAN FORT
St Peter's Flat
Gunners Creek
St Peter's Way
East Hall Farm
Caravan Park
East Hall
Eastlands
Munkins Farm
ROMAN ROAD
East End
BRADWELL-ON-SEA CP

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.2
Inter-tidal survey: brent geese distribution October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0354

NOT PROTECTIVELY MARKED

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A IOP1B IOP2A IOP2B IOP3A IOP3B

Bradwell Waterside

Bradwell Nuclear Power Station

BRADWELL-ON-SEA CP

St Peter's Flat

OTHONA ROMAN FORT

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.4
Inter-tidal survey: curlew distribution October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0355

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A
IOP1B
IOP2A
IOP2B
IOP3A
IOP3B

Bradwell Waterside
Bradwell Nuclear Power Station
Weymarks Farm
Electricity Switching Station
Airfield (disused)
Downhall Farm
East Hall Farm
Eastlands
Caravan Park
East Hall
Munkins Farm
East End
ROMAN ROAD
BRADWELL-ON-SEA CP
Sales Point
Tip Head
OTHONA ROMAN FORT
St Peter's Flat
St Peter's Way
Gunners Creek
Pewet Island
Bradwell Creek
Mean Low Water

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.6
Inter-tidal survey: dunlin distribution October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0356

NOT PROTECTIVELY MARKED

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A
IOP1B
IOP2A
IOP2B
IOP3A
IOP3B

Bradwell Waterside
Bradwell Nuclear Power Station
Weymarks Farm
Electricity Switching Station
Community Settlement
Irrigation Reservoirs
Airfield (disused)
Downhall Farm
Playing Field
War Mem
Caravan Park
East Hall Farm
Eastlands
Munkins Farm
East Hall
East End
ROMAN ROAD
Trusses Road
Marina
Woodyards
Westwick Farm
Sluice
Beverells
Sales Point
Tip Head
OTHONA ROMAN FORT
St Peter's Flat
St Peter's Way
Gunners Creek
Pewet Island
Bradwell Creek
Mean Low Water
Mean High Water
BRADWELL-ON-SEA CP

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.8
Inter-tidal survey: golden plover distribution
October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0357

NOT PROTECTIVELY MARKED

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A
IOP1B
IOP2A
IOP2B
IOP3A
IOP3B

Bradwell Waterside
Bradwell Nuclear Power Station
Weymarks Farm
Electricity Switching Station
Community Settlement
Irrigation Reservoirs
Airfield (disused)
Downhall Farm
Sports Field
War Memorial
Caravan Park
East Hall Farm
Eastlands
Munkins Farm
East End
Trusses Road
Woodyards
Marina
Pewet Island
Bradwell Creek
Mean Low Water
Sales Point
Tip Head
OTHONA ROMAN FORT
St Peter's Flat
St Peter's Way
Gunners Creek
ROMAN ROAD
BRADWELL-ON-SEA CP

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.10
Inter-tidal survey: great-crested grebe distribution
October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0358

NOT PROTECTIVELY MARKED

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A
IOP1B
IOP2A
IOP2B
IOP3A
IOP3B

Bradwell Waterside
Bradwell Nuclear Power Station
Weymarks Farm
Electricity Switching Station
Community Settlement
Irrigation Reservoirs
Airfield (disused)
Downfall Farm
Cindy Grove
Playing Field
War Mem
Marina
Trusses Road
Caravan Park
East Hall Farm
East Hall
Eastlands
Munkins Farm
ROMAN ROAD
East End
Bevenalls
Westwick Farm
Woodyards
Pewet Island
Mean Low Water
Bradwell Creek
Sales Point
Tip Head
OTHONA ROMAN FORT
St Peter's Flat
St Peter's Way
Gunners Creek
BRADWELL-ON-SEA CP

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.12
Inter-tidal survey: grey plover distribution October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0359

NOT PROTECTIVELY MARKED

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A
IOP1B
IOP2A
IOP2B
IOP3A
IOP3B

Bradwell Waterside
Bradwell Nuclear Power Station
Weymarks Farm
Airfield (disused)
Downhall Farm
East Hall Farm
Eastlands
Caravan Park
East Hall
Munkins Farm
East End
ROMAN ROAD
BRADWELL-ON-SEA CP
Sales Point
Tip Head
OTHONA ROMAN FORT
St Peter's Flat
St Peter's Way
Gunners Creek
Bradwell Creek
Power Island
Mean Low Water

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.14
Inter-tidal survey: knot distribution October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0360

NOT PROTECTIVELY MARKED

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A
IOP1B
IOP2A
IOP2B
IOP3A
IOP3B

BRADWELL-ON-SEA CP

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.16
Inter-tidal survey: oystercatcher distribution
October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0361

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A
IOP1B
IOP2A
IOP2B
IOP3A
IOP3B

Bradwell Waterside
Bradwell Nuclear Power Station
Weymarks Farm
Airfield (disused)
Downhall Farm
East Hall Farm
Caravan Park
Eastlands
Munkins Farm
East End
ROMAN ROAD
BRADWELL-ON-SEA CP
OTHONA ROMAN FORT
Tip Head
Sales Point
St Peter's Flat
St Peter's Way
Gunners Creek
Bradwell Creek
Mean Low Water

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.18
Inter-tidal survey: redshank distribution October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0362

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A
IOP1B
IOP2A
IOP2B
IOP3A
IOP3B

Bradwell Waterside
Bradwell Nuclear Power Station
Weymarks Farm
Electricity Switching Station
Airfield (disused)
Downhall Farm
Cindy Grove
Playing Field
War Memorial
Marina
Trusses Road
Westwick Farm
Woodyards
Bevenalls
East End
Caravan Park
East Hall
East Hall Farm
Eastlands
Munkins Farm
ROMAN ROAD
BRADWELL-ON-SEA CP
Community Settlement
Irrigation Reservoirs
Tip Head
Sales Point
OTHONA ROMAN FORT
St Peter's Flat
St Peter's Way
Gunners Creek
Bradwell Creek
Power Island
Mean Low Water
Mean High Water
Marshes

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.20
Inter-tidal survey: ringed plover distribution
October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0363

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A
IOP1B
IOP2A
IOP2B
IOP3A
IOP3B

BRADWELL-ON-SEA CP

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.22
Inter-tidal survey: shelduck distribution October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0364

NOT PROTECTIVELY MARKED

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A
IOP1B
IOP2A
IOP2B
IOP3A
IOP3B

Bradwell Waterside
Bradwell Nuclear Power Station
Weymarks Farm
Electricity Switching Station
Community Settlement
Tip Head
OTHONA ROMAN FORT
St Peter's Flat
Sales Point
Pewet Island
Marina
Trusses Road
Caravan Park
East Hall
Eastlands
Munkins Farm
ROMAN ROAD
East End
BRADWELL-ON-SEA CP
St Peter's Way
Gunners Creek
Mean Low Water

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.24
Inter-tidal survey: turnstone distribution October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0365

NOT PROTECTIVELY MARKED

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A
IOP1B
IOP2A
IOP2B
IOP3A
IOP3B

Bradwell Waterside
Bradwell Nuclear Power Station
Weymarks Farm
Airfield (disused)
Downhall Farm
East Hall Farm
Eastlands
Caravan Park
East Hall
Munkins Farm
East End
ROMAN ROAD
BRADWELL-ON-SEA CP
Sales Point
Tip Head
OTHONA ROMAN FORT
St Peter's Flat
St Peter's Way
Gunners Creek
Trusses Road
Woodyards
Mean Low Water

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.26
Inter-tidal survey: wigeon distribution October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0366

NOT PROTECTIVELY MARKED

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A
IOP1B
IOP2A
IOP2B
IOP3A
IOP3B

Bradwell Waterside
Bradwell Nuclear Power Station
Weymarks Farm
Electricity Switching Station
Airfield (disused)
Downhall Farm
Sales Point
Tip Head
OTHONA ROMAN FORT
St Peter's Flat
East Hall Farm
Eastlands
Caravan Park
East Hall
Munkins Farm
ROMAN ROAD
East End
St Peter's Way
Gunners Creek
Pewet Island
Bradwell Creek
Marina
Trusses Road
Westwick Farm
Woodyards
Playing Field
BRADWELL-ON-SEA CP

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.28
Inter-tidal survey: black-headed gull distribution
October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0367

NOT PROTECTIVELY MARKED

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A
IOP1B
IOP2A
IOP2B
IOP3A
IOP3B

Bradwell Waterside
Bradwell Nuclear Power Station
Weymarks Farm
Airfield (disused)
Downhall Farm
East Hall Farm
Eastlands
Caravan Park
East Hall
Munkins Farm
East End
BRADWELL-ON-SEA CP
ROMAN ROAD
OTHONA ROMAN FORT
Tip Head
Sales Point
St Peter's Flat
St Peter's Way
Gunners Creek
Power Island
Bradwell Creek
Mean Low Water

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.30
Inter-tidal survey: cormorant distribution October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0368

NOT PROTECTIVELY MARKED

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A
IOP1B
IOP2A
IOP2B
IOP3A
IOP3B

Bradwell Waterside
Bradwell Nuclear Power Station
Weymarks Farm
Electricity Switching Station
Airfield (disused)
Downhall Farm
Cindy Grove
Playing Field
War Memorial
Marina
Trusses Road
Westwick Farm
Woodyards
Bevenalls
Caravan Park
East Hall
East Hall Farm
Eastlands
Munkins Farm
ROMAN ROAD
East End
BRADWELL-ON-SEA CP
Sales Point
Tip Head
OTHONA ROMAN FORT
St Peter's Flat
St Peter's Way
Gunners Creek
Pewet Island
Bradwell Creek
Mean Low Water
Mean High Water
Community Settlement
Irrigation Reservoirs
Church of St Peter on the Wall

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.32
Inter-tidal survey: herring gull distribution October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0369

NOT PROTECTIVELY MARKED

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A
IOP1B
IOP2A
IOP2B
IOP3A
IOP3B

Bradwell Waterside
Bradwell Nuclear Power Station
Electricity Switching Station
Weymarks Farm
Community Settlement
Irrigation Reservoirs
Fp Ho
Airfield (disused)
Downhall Farm
Cricket Ground
Playing Field
War Mem
Marina
Trusses Road
Caravan Park
East Hall Farm
East Hall
Eastlands
Munkins Farm
ROMAN ROAD
East End
Bevenalls
Woodyards
Westwick Farm
Spr
Down
Pewet Island
Bradwell Creek
Sales Point
Tip Head
OTHONA ROMAN FORT
St Peter's Flat
St Peter's Way
Gunners Creek
Mean Low Water
Mean High Water
BRADWELL-ON-SEA CP
Marshes

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.34
Inter-tidal survey: lapwing distribution October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0370

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A
IOP1B
IOP2A
IOP2B
IOP3A
IOP3B

Bradwell Waterside
Bradwell Nuclear Power Station
Weymarks Farm
Electricity Switching Station
Community Settlement
Irrigation Reservoirs
Airfield (disused)
Downhall Farm
Sales Point
Tip Head
OTHONA ROMAN FORT
St Peter's Flat
East Hall Farm
Caravan Park
Eastlands
East Hall
Munkins Farm
ROMAN ROAD
East End
BRADWELL-ON-SEA CP
St Peter's Way
Gunners Creek
Trusses Road
Woodyards
Westwick Farm
Bevenalls
Playing Field
War Memorial
Mill Hill
Pewet Island
Bradwell Creek
Mean Low Water
Mean High Water
Marina
Church of St Peter on the Wall

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.36
Inter-tidal survey: mallard distribution October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0371

598000 598500 599000 599500 600000 600500 601000 601500 602000 602500 603000 603500 604000 604500 605000 605500

210000 209500 209000 208500 208000 207500

IOP1A
IOP1B
IOP2A
IOP2B
IOP3A
IOP3B

Bradwell Waterside
Bradwell Nuclear Power Station
Weymarks Farm
Electricity Switching Station
Community Settlement
Irrigation Reservoirs
Airfield (disused)
Downhall Farm
Sluice Point
Tip Head
OTHONA ROMAN FORT
St Peter's Flat
East Hall Farm
Caravan Park
Eastlands
East Hall
Munkins Farm
ROMAN ROAD
St Peter's Way
Gunners Creek
Trusses Road
Woodyards
Westwick Farm
East End
BRADWELL-ON-SEA CP
Power Island
Marina
Playing Field
War Mem
Church of St Peter on the Wall
Mean Low Water
Mean High Water

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Inter-tidal survey, observation points

Inter-tidal / near-shore survey area

- Sector 1
- Sector 2
- Sector 3
- Feeding and foraging records
- Roosting, loafing and preening records

0 200 400 600 800 1,000 1,200 1,400 m

Scale at A3:1:25,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.38
Inter-tidal survey: sanderling distribution October 2019 - March 2020

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0372

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Field plot
- Terrestrial survey area
- Brent goose

0 200 400 600 800 1,000 1,200 m

Scale at A3:1:20,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.40
Diurnal terrestrial survey: brent goose

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0379

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Field plot
- Terrestrial survey area
- Curlew

0 200 400 600 800 1,000 1,200 m

Scale at A3:1:20,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.43
Diurnal terrestrial survey: curlew

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0380

NOT PROTECTIVELY MARKED

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Field plot
- Terrestrial survey area
- Golden plover

0 200 400 600 800 1,000 1,200 m

Scale at A3:1:20,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.45
Diurnal terrestrial survey: golden plover

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0381

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Field plot
- Terrestrial survey area
- Lapwing

0 200 400 600 800 1,000 1,200 m

Scale at A3:1:20,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.47
Diurnal terrestrial survey: lapwing

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0382

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Field plot
- Terrestrial survey area
- Redshank

0 200 400 600 800 1,000 1,200 m

Scale at A3:1:20,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.49
Diurnal terrestrial survey: redshank

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0383

Key

- Indicative Main Development Site
- Potential Temporary Workers Accommodation Area
- Potential Expansion Area for Temporary Workers Accommodation
- Indicative Zone for Marine Infrastructure
- Field plot
- Terrestrial survey area
- Common gull

0 200 400 600 800 1,000 1,200 m

Scale at A3:1:20,000

BRADWELL B PROJECT
OVERWINTERING BRID REPORT 2019 - 2020

Figure 3.51
Diurnal terrestrial survey: common gull

DRAWN: **S.G.**
DATE: **MAY 2020**

41843-WOOD-0384

NOT PROTECTIVELY MARKED

APPENDIX C
VISIT DETAILS

Table C.1. Intertidal surveys

Visit No.	Date	High tide 1	High tide 2	Survey type	Intertidal sector	Start	Tidal state at start of survey	Finish		Surveyor	Surveyor
1	02-Oct-19	03:32	15:45	Intertidal	1	10:00	L	16:00	06:00	Mike Raven	Max Collins
1	03-Oct-19	04:12	16:26	Intertidal	2	11:00	L	17:00	06:00	Chris Dennis	Max Collins
1	04-Oct-19	04:52	17:08	Intertidal	3	11:00	L	17:00	06:00	Chris Dennis	Max Collins
2	22-Oct-19	06:34	19:26	Intertidal	1	09:30	M out	15:30	06:00	Mike Raven	Max Collins
2	23-Oct-19	07:50	20:57	Intertidal	2	09:00	H	15:00	06:00	Mike Raven	Max Collins
2	24-Oct-19	09:24	22:16	Intertidal	3	10:15	H	16:15	06:00	Rob Werran	Max Collins
3	13-Nov-19	00:34	12:45	Intertidal	1	08:15	M in	14:15	06:00	Mike Raven	Craig Brookes
3	14-Nov-19	01:08	13:22	Intertidal	2	09:00	M in	15:00	06:00	Craig Brookes	Rob Werran
0	15-Nov-19	01:43	13:59	Intertidal	3	08:10	L	14:10	06:00	Craig Brookes	Rob Werran
4	19-Nov-19	04:24	17:06	Intertidal	1	09:10	L	15:10	06:00	Rob Werran	Max Collins
4	20-Nov-19	05:20	18:15	Intertidal	2	11:30	L	15:30	04:00	Rob Werran	Max Collins
4	21-Nov-19	06:30	19:37	Intertidal	3	10:00	M out	16:00	06:00	Mike Raven	Rob Werran
5	03-Dec-19	02:57	15:23	Intertidal	1	09:30	L	15:30	06:00	Chris Dennis	Mike Raven
5	03-Dec-19	02:57	15:23	Intertidal	2	09:30	L	15:30	06:00	Paul Rowntree	Duncan Priddle
5	04-Dec-19	04:52	17:43	Intertidal	3	09:30	L	15:30	06:00	Paul Rowntree	Duncan Priddle

Visit No.	Date	High tide 1	High tide 2	Survey type	Intertidal sector	Start	Tidal state at start of survey	Finish		Surveyor	Surveyor
6	05-Dec-19	05:45	18:51	Intertidal	1	08:00	M out	14:00	06:00	Paul Rowntree	Duncan Priddle
6	06-Dec-19	06:55	20:07	Intertidal	2	08:00	H	14:00	06:00	Paul Rowntree	Duncan Priddle
6	10-Dec-19	11:01	23:28	Intertidal	3	08:00	M in	14:00	06:00	Dave Andrews	Chris Dennis
7	17-Dec-19	03:27	16:04	Intertidal	1	09:30	L	15:30	06:00	Rob Werran	Craig Brookes
7	18-Dec-19	04:14	16:58	Intertidal	2	09:30	L	15:30	06:00	Rob Werran	Craig Brookes
7	18-Dec-19	04:14	16:58	Intertidal	3	09:30	L	15:30	06:00	Rachel Coombes	Chris Dennis
8	07-Jan-20	09:31	22:10	Intertidal	1	10:00	H	16:00	06:00	Mike Raven	Rachel Coombes
8	08-Jan-20	10:29	22:59	Intertidal	2	09:00	H	15:00	06:00	Mike Raven	Rachel Coombes
8	09-Jan-20	11:19	23:44	Intertidal	3	09:00	M in	15:00	06:00	Rob Werran	Rachel Coombes
9	15-Jan-20	03:16	15:53	Intertidal	1	09:30	L	15:30	06:00	Rob Werran	Dave Andrews
9	16-Jan-20	04:01	16:42	Intertidal	2	09:30	L	15:30	06:00	Rob Werran	Dave Andrews
9	17-Jan-20	04:48	17:34	Intertidal	3	08:40	M out	14:40	06:00	Rob Werran	Dave Andrews
10	22-Jan-20	10:27	22:57	Intertidal	1	09:30	H	15:30	06:00	Rachel Coombes	Dave Andrews
10	23-Jan-20	11:22	23:46	Intertidal	2	09:30	H	15:30	06:00	Rachel Coombes	Dave Andrews
10	24-Jan-20		12:10	Intertidal	3	08:30	M in	14:30	06:00	Rachel Coombes	Dave Andrews

Visit No.	Date	High tide 1	High tide 2	Survey type	Intertidal sector	Start	Tidal state at start of survey	Finish		Surveyor	Surveyor
11	27-Jan-20	01:42	14:08	Intertidal	1	09:15	L	15:15	06:00	Rachel Coombes	Dave Andrews
11	28-Jan-20	02:14	14:42	Intertidal	2	09:30	L	15:30	06:00	Rachel Coombes	Dave Andrews
11	29-Jan-20	02:45	15:16	Intertidal	3	10:00	L	16:00	06:00	Rachel Coombes	Dave Andrews
12	04-Feb-20	07:10	20:11	Intertidal	1	08:15	H	14:15	06:00	Rob Werran	Dave Andrews
12	05-Feb-20	08:41	21:29	Intertidal	2	08:30	H	14:30	06:00	Rob Werran	Dave Andrews
12	06-Feb-20	09:58	22:29	Intertidal	3	09:30	H	15:30	06:00	Rob Werran	Dave Andrews
13	11-Feb-20	01:34	14:06	Intertidal	1	09:00	L	15:00	06:00	Craig Brookes	Rachel Coombes
13	12-Feb-20	02:10	14:51	Intertidal	2	10:00	M in	16:00	06:00	Craig Brookes	Rachel Coombes
13	12-Feb-20	02:18	14:51	Intertidal	3	10:00	M in	16:00	06:00	Mike Raven	Chris Dennis
14	18-Feb-20	07:40	20:30	Intertidal	1	07:30	H	13:30	06:00	Rachel Coombes	Dave Andrews
14	19-Feb-20	09:05	21:42	Intertidal	2	08:15	H	14:15	06:00	Rachel Coombes	Dave Andrews
14	20-Feb-20	10:13	22:42	Intertidal	3	08:15	M in	14:15	06:00	Rachel Coombes	Dave Andrews
15	25-Feb-20	01:22	13:46	Intertidal	1	08:00	L	14:00	06:00	Rachel Coombes	Dave Andrews

Visit No.	Date	High tide 1	High tide 2	Survey type	Intertidal sector	Start	Tidal state at start of survey	Finish		Surveyor	Surveyor
15	26-Feb-20	01:51	14:18	Intertidal	2	09:00	L	15:00	06:00	Rachel Coombes	Dave Andrews
15	27-Feb-20	02:20	14:48	Intertidal	3	10:45	M in	16:45	06:00	Rachel Coombes	Dave Andrews
16	03-Mar-20	05:25	18:01	Intertidal	1	08:00	M out	14:00	06:00	Rachel Coombes	Dave Andrews
16	04-Mar-20	06:29	19:11	Intertidal	2	07:30	H	13:30	06:00	Rachel Coombes	Dave Andrews
16	05-Mar-20	07:59	20:45	Intertidal	3	07:30	H	11:30	04:00	Rachel Coombes	Dave Andrews
17	11-Mar-20	01:16	13:47	Intertidal	1	09:00	L	15:00	06:00	Rachel Coombes	Mike Raven
17	12-Mar-20	01:59	14:30	Intertidal	2	09:00	L	15:00	06:00	Rachel Coombes	Connor MacKenzie
17	13-Mar-20	02:42	15:13	Intertidal	3	09:30	L	15:30	06:00	Rachel Coombes	Connor MacKenzie
18	17-Mar-20	05:50	18:30	Intertidal	1	09:00	M out	15:00	06:00	Rob Werran	Dave Andrews
18	18-Mar-20	07:14	20:00	Intertidal	2	09:00	H	15:00	06:00	Rob Werran	Dave Andrews
18	19-Mar-20	08:44	21:19	Intertidal	3	08:15	H	14:15	06:00	Rachel Coombes	Dave Andrews
19	24-Mar-20	00:26	12:48	Intertidal	1	13:00	H	18:00	05:00	Rachel Coombes	Dave Andrews

Visit No.	Date	High tide 1	High tide 2	Survey type	Intertidal sector	Start	Tidal state at start of survey	Finish		Surveyor	Surveyor
19	25-Mar-20	00:57	13:20	Intertidal	2	08:00	L	14:00	06:00	Rachel Coombes	Dave Andrews
19	26-Mar-20	01:26	13:51	Intertidal	3	09:00	M in	15:00	06:00	Rachel Coombes	Dave Andrews

Table C.2 Terrestrial surveys

Visit No.	Date	High tide 1	High tide 2	Survey type	Start	Finish		Surveyor	Surveyor
1	01-Oct-19	02:49	15:03	Terrestrial (daytime)	09:00	15:00	06:00	Mike Raven	Max Collins
2	22-Oct-19	06:34	19:26	Terrestrial (nocturnal)	18:20	21:30	03:10	Mike Raven	Max Collins
2	24-Oct-19	09:24	22:16	Terrestrial (nocturnal)	18:30	21:30	03:00	Rob Werran	Max Collins
2	25-Oct-19	10:38	23:17	Terrestrial (daytime)	10:15	16:30	06:15	Rob Werran	Max Collins
3	12-Nov-19		12:10	Terrestrial (daytime)	09:00	15:00	06:00	Mike Raven	Craig Brookes
4	19-Nov-19	04:24	17:06	Terrestrial (nocturnal)	18:00	21:15	03:15	Rob Werran	Max Collins
4	20-Nov-19	05:20	18:15	Terrestrial (nocturnal)	17:00	20:00	03:00	Ro	Max Collins
4	22-Nov-19	07:56	20:52	Terrestrial (daytime)	08:00	15:00	07:00	Mike Raven	Rob Werran

Visit No.	Date	High tide 1	High tide 2	Survey type	Start	Finish		Surveyor	Surveyor
5	03-Dec-19	02:57	15:23	Terrestrial (nocturnal)	16:30	20:00	03:30	Chris Dennis	Mike Raven
5	04-Dec-19	04:52	17:43	Terrestrial (daytime)	09:30	15:30	06:00	Chris Dennis	Mike Raven
5	04-Dec-19	04:52	17:43	Terrestrial (nocturnal)	16:30	20:00	03:30	Chris Dennis	Mike Raven
6	11-Dec-19		11:42	Terrestrial (daytime)	09:00	15:00	06:00	Dave Andrews	Chris Dennis
7	17-Dec-19	03:27	16:04	Terrestrial (daytime)	09:30	15:30	06:00	Rachel Coombes	Chris Dennis
8	10-Jan-20		12:05	Terrestrial (daytime)	08:45	14:45	06:00	Rob Werran	Rachel Coombes
9	14-Jan-20	2:32	15:06	Terrestrial (daytime)	08:45	14:45	06:00	Rob Werran	Dave Andrews
9	15-Jan-20	3:16	15:53	Terrestrial (nocturnal)	17:15	1930	06:45	Rob Werran	Dave Andrews
9	16-Jan-20	4:01	16:42	Terrestrial (nocturnal)	17:00	1930	07:00	Rob Werran	Dave Andrews
10	21-Jan-20	09:24	22:02	Terrestrial (daytime)	09:00	15:30	06:30	Rachel Coombes	Dave Andrews
11	30-Jan-20	3:16	15:49	Terrestrial (daytime)	10:00	16:00	06:00	Rachel Coombes	Dave Andrews
12	05-Feb-20	08:41	21:29	Terrestrial (nocturnal)	19:00	2200	05:00	Rob Werran	Dave Andrews

Visit No.	Date	High tide 1	High tide 2	Survey type	Start	Finish		Surveyor	Surveyor
12	06-Feb-20	09:58	22:29	Terrestrial (nocturnal)	19:30	2300	04:30	Rob Werran	Dave Andrews
12	07-Feb-20	10:56	23:20	Terrestrial (daytime)	08:30	14:30	06:00	Rob Werran	Dave Andrews
13	13-Feb-20	3:01	15:35	Terrestrial (daytime)	08:00	15:00	07:00	Mike Raven	Rachel Coombes
14	21-Feb-20	11:09	23:32	Terrestrial (daytime)	08:00	14:00	06:00	Rachel Coombes	Dave Andrews
15	28-Feb-20	2:51	15:20	Terrestrial (daytime)	08:00	12:00	04:00	Rachel Coombes	Dave Andrews
16	06-Mar-20	0929	2200	Terrestrial (daytime)	07:30	13:30	06:00	Rachel Coombes	Dave Andrews
17	10-Mar-20	0:31	13:02	Terrestrial (daytime)	10:30	16:30	06:00	Rachel Coombes	Mike Raven
18	17-Mar-20	06:15	19:09	Terrestrial (nocturnal)	19:15	2130	04:45	Rob Werran	Dave Andrews
18	18-Mar-20	07:40	20:30	Terrestrial (nocturnal)			00:00	Rob Werran	Dave Andrews
18	20-Mar-20	09:54	22:21	Terrestrial (daytime)	07:30	13:30	06:00	Rachel Coombes	Dave Andrews
19	27-Mar-20	1:56	14:21	Terrestrial (daytime)	07:30	13:30	06:00	Rachel Coombes	Dave Andrews

APPENDIX D
TARGET SPECIES

Table D.1 Qualifying features of SPA and Ramsar Sites within 20km

Site	Distance to BRB	Qualifying features
Dengie (Mid-Estuary Essex Coast Phase 1) SPA and Ramsar	0km	SPA: • dark-bellied brent goose non-breeding: 2,250 inds (1987-1988 to 1991-1992); • grey plover non-breeding: 1,752 (1987-1988 to 1991-1992); • hen harrier non-breeding: 5 inds (19 inds across Mid-Essex suite of SPAs) (1987-1991); • knot non-breeding: 7,763 inds (1987-1988 to 1991-1992); and • waterbird assemblage, non-breeding: 27,497 inds (1987-1988 to 1991-1992). Ramsar: • dark-bellied brent goose non-breeding: 2,000 inds (1998-1999 to 2002-2003); • grey plover non-breeding: 4,582 inds (1998-1999 to 2002-2003); • knot non-breeding: 14,528 inds (1998-1999 to 2002-2003); and • waterbird assemblage, non-breeding: 43,828 inds (1998-1999 to 2002-2003)
Blackwater Estuary (Mid-Essex Coast Phase 4) SPA and Ramsar	0km	SPA: • black-tailed godwit non-breeding: 755 inds (1987-1988 to 1991-1992); • dark-bellied brent goose non-breeding: 8,761 inds (1987-1988 to 1991-1992); • dunlin non-breeding: 17,743 inds (1987-1988 to 1991-1992); • grey plover non-breeding: 2,172 inds (1987-1988 to 1991-1992); • hen harrier non-breeding: 4 inds (19 across Mid-Essex suite of SPAs) (1987-1988 to 1991-1992); • little tern breeding: 5 pairs (73 pairs across Mid-Essec Coast suite of SPAs) (1987-1991); • pochard breeding: 39 pairs (1987-1991); • ringed plover breeding: 48 pairs (135 pairs across Mid-Essec Coast suite of SPAs) (1987-1991); and • waterbird assemblage, non-breeding: 46,552 inds (1987-1988 to 1991-1992). Ramsar • dark-bellied brent goose non-breeding: 8,689 inds (1998-1999 to 2002-2003); • grey plover non-breeding: 4,215 inds (1998-1999 to 2002-2003); • dunlin non-breeding: 27,655 inds (1998-1999 to 2002-2003); • black-tailed godwit non-breeding2,174 inds (1998-1999 to 2002-2003); and • waterbird assemblage non-breeding: 105,061 inds (1998-1999 to 2002-2003).
Outer Thames Estuary SPA	1.3km	• common tern breeding: 532 inds (2011-2015); • little tern breeding: 746 inds (2011-2015); and • red-throated diver non-breeding: 6,466 inds (1989 to 2006-2007).
Colne Estuary (Mid-Essex Coast Phase 2) SPA and Ramsar	2.7km	SPA: • dark-bellied brent goose non-breeding: 5,313 inds (1987-1988 to 1991-1992);

Site	Distance to BRB	Qualifying features
		• hen harrier non-breeding: 4 inds (19 inds across Mid-Essex suite of SPAs) (1987-1988 to 1991-1992); • little tern breeding: 20 pairs (73 pairs across Mid-Essex suite of SPAs) (1987-1991); • pochard breeding: 2 pairs (15 pairs across Mid-Essex suite of SPAs) (1987-1991); • redshank non-breeding: 1,252 (1987-1988 to 1991-1992); • ringed plover breeding: 135 pairs (across Mid-Essec Coast suite of SPAs) (1987-1991); and • waterbird assemblage: 30,687 inds (1987-1988 to 1991-1992). Ramsar: • dark-bellied brent goose non-breeding: 3,165 inds (1998-1999 to 2002-2003); • redshank non-breeding: 1,624 inds (1998-1999 to 2002-2003); and • waterbird assemblage non-breeding: 32,041 inds (1998-1999 to 2002-2003).
Abberton Reservoir SPA and Ramsar	7km	SPA • common coot non-breeding: 11,500 inds (1985-1986 to 1989-1990); • common goldeneye non-breeding: 560 inds (1985-1986 to 1989-1990); • common pochard non-breeding: 2,400 inds (1985-1986 to 1989-1990); • common pochard passage: 2,700 inds (1985-1986 to 1989-1990); • eurasian teal non-breeding: 2,200 inds (1985-1986 to 1989-1990); • eurasian wigeon non-breeding: 8,400 inds (1985-1986 to 1989-1990); • gadwall non-breeding: 480 inds (1985-1986 to 1989-1990); • gadwall passage: 110 inds (1985-1989); • great cormorant breeding: 360 pairs (1991); • great-crested grebe non-breeding: 180 inds (1985-1986 to 1989-1990); • mute swan non-breeding: 500 inds (1985-1986 to 1989-1990); • mute swan passage: 450 inds (1985-1989); • northern shoveler non-breeding: 480 inds (1985-1986 to 1989-1990); • northern shoveler passage: 420 inds (1985-1989); • tufted duck non-breeding: 3,500 inds (1985-1986 to 1989-1990); • tufted duck Non-breeding: 2,700 inds (1985-1989); and • waterbird assemblage: 34,000 inds (1985-1986 to 1989-1990). Ramsar • gadwall passage: 550 (1998-1999 to 2002-2003); • northern shoveler passage: 377 inds (1998-1999 to 2002-2003); and • wigeon non-breeding: 2,888 inds (1998-1999 to 2002-2003).
Foulness (Mid-Essex Coast Phase 5) SPA and Ramsar	10.7km	SPA • avocet breeding: 26 pairs (1987-1991); • bar-tailed godwit non-breeding: 5,213 inds (1987-1988 to 1991-1992); • common tern breeding: 186 pairs (across Mid-Essex suite of SPAs) (1987-1991);

Site	Distance to BRB	Qualifying features
		• dark-bellied brent goose non-breeding: 13276 inds (1987-1988 to 1991-1992); • grey plover non-breeding: 2,229 inds (1987-1988 to 1991-1992); • hen harrier non-breeding: 6 inds (19 inds across Mid-Essex suite of SPAs) (1987-1988 to 1991-1992); • knot non-breeding: 22,151 inds (1987-1988 to 1991-1992); • little tern breeding: 31 pairs (73 pairs across Mid-Essex suite of SPAs) (1987-1991); • oystercatcher non-breeding: 9,805 inds (1987-1988 to 1991-1992); • redshank non-breeding: 1,540 inds (1987-1988 to 1991-1992); • ringed plover breeding: 37 pairs (135 pairs across Mid-Essex suite of SPAs) (1987-1991); • sandwich tern breeding: 267 pairs (across Mid-Essex suite of SPAs) (1987-1991); and • waterbird assemblage non-breeding: 74,791 inds (1987-1988 to 1991-1992). Ramsar • dark-bellied brent goose non-breeding: 6,475 inds (1998-1999 to 2002-2003); • oystercatcher non-breeding: 14,674 inds (1998-1999 to 2002-2003); • grey plover non-breeding: 4,343 inds (1998-1999 to 2002-2003); • redshank passage: 2,586 inds (1998-1999 to 2002-2003); • knot non-breeding: 22,439 inds (1998-1999 to 2002-2003); • bar-tailed godwit non-breeding: 4,095 inds (1998-1999 to 2002-2003); and • waterbird assemblage non-breeding: 82,148 inds (1998-1999 to 2002-2003).
Crouch and Roach Estuaries (Mid-Essex Coast Phase 3) SPA and Ramsar	11.3km	SPA • dark-bellied brent goose non-breeding: 5,509 inds (1989-1990 to 1993-1994); and • waterbird assemblage non-breeding: 27,021 inds (1990-1991 to 1994-1995). Ramsar • dark-bellied brent goose non-breeding: 2,103 inds (1998-1999 to 2002-2003); and • waterbird assemblage non-breeding: 16,970 inds (1998-1999 to 2002-2003).

Table D.2 Qualifying features of SSSI sites within 10km

Site	Distance to BRB	Notified features
Dengie SSSI	0km	Dengie is a large and remote area of tidal mudflat and saltmarsh at the eastern end of the Dengie peninsula, between the Blackwater and Crouch Estuaries. The saltmarsh is the largest continuous example of its type in Essex. Foreshore, saltmarsh and beaches support an outstanding assemblage of rare coastal flora. It is a resort for internationally and nationally important wintering populations of wildfowl and waders, and in summer supports a range of breeding coastal birds including rarities. The formation of cockleshell spits and beaches is of geomorphological interest.

Site	Distance to BRB	Notified features
		Notified ornithological features • Breeding birds: bearded tit, little tern, oystercatcher, redshank, reed bunting, reed warbler, ringed plover; and • Non-breeding birds: bar-tailed godwit, brent geese, curlew, dunlin, golden plover, grey plover, gulls, hen harrier, heron, knot, merlin oystercatcher, pintail, shelduck, shore lark, short-eared owl, snow bunting, turnstone, wigeon.
Blackwater Estuary SSSI	0km	Its mud flats, fringed by saltmarsh on the upper shores, support internationally and nationally important numbers of waterfowl which overwinter here. Shingle and shell banks and offshore islands are also a feature of the tidal flats. The surrounding terrestrial habitats - the sea wall, ancient grazing marsh and its associated fleet and ditch systems, plus semi-improved grassland - are also of high conservation interest. This rich mosaic of habitats supports an outstanding assemblage of nationally scarce plants and a nationally important assemblage of rare invertebrates, with 16 Red Data Book species and 94 notable and local species. **Notified ornithological features:** • Breeding birds: bearded tit, black-headed gull, common tern, cormorant, heron, little tern, pochard, redshank, reed bunting, reed warbler, sedge warbler; and • Non-breeding birds: black-tailed godwit, curlew, Dark-bellied brent geese, dunlin, gadwall, goldeneye, grey plover, hen harrier, Lapland bunting, merlin, peregrine, redshank, red-throated diver, ringed plover, shelduck, short-eared owl, slavonian grebe, spotted redshank, teal, twite, wigeon.
Sandbeach Meadows SSSI	1.6km	Sandbeach Meadows lie on alluvial deposits at the north-eastern end of the Dengie peninsula. The area of grassland is virtually all that remains of the once extensive grazing marshes which formed the hinterland of the nearby Dengie coastline. The seven fields are sympathetically managed and support nationally important number of dark-bellied brent geese during the winter. **Notified ornithological features** • Non-breeding birds: dark-bellied brent geese, white-fronted geese and wigeon.
Colne Estuary SSSI	2.7km	The Colne Estuary is comparatively short and branching, with five tidal arms which flow into the main river channel. The estuary is of international importance for wintering Brent Geese and Black-tailed Godwit and of national importance for breeding Little Terns and five other species of wintering waders and wildfowl. The variety of habitats which include mudflat, saltmarsh, grazing marsh, sand and shingle spits, disused gravel pits and reed beds, support outstanding assemblages of invertebrates and plants. Two areas of foreshore at East Mersea are of geological importance. Colne Point and St. Osyth Marsh are of geomorphological interest. **Notified ornithological features** • Breeding birds: bearded tit, little tern, pochard, ringed plover, whinchat; and • Non-breeding birds: barn owl, black-tailed godwit, brent geese, dunlin, goldeneye, grey plover, hen harrier, redshank, ringed plover, sanderling, shelduck, short-eared owl.
Abberton Reservoir SSSI		Abberton Reservoir is a large storage reservoir lying about four miles south of Colchester. It is the largest freshwater body in Essex with a water area of about 500 ha, and one of the most important reservoirs in Britain for wildfowl. About thirty thousand birds visit the reservoir annually including internationally important members of one species and nationally important members of twelve others. It is also one of a handful of sites in Britain where Cormorants nest inland in trees. **Notified ornithological features**

Site	Distance to BRB	Notified features
		• Breeding birds: cormorant, redshank, yellow wagtail; and • Non-breeding birds: coot, curlew, gadwall, goldeneye, golden plover, goosander, lapwing, mute swan, pochard, shoveler, tufted duck, wigeon.