Longfield Solar Farm

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9. Water Environment

9.1 Introduction

9.1.1 This chapter assesses the potential impacts and effects of the Scheme on surface waterbodies (e.g. rivers, streams, ditches, canals, lakes and ponds) including water quality, hydromorphology, flood risk, drainage and water resources during construction, operation, and decommissioning. It also considers potential effects on hydrogeology, with land quality and ground condition issues discussed in ***Chapter 16: Other Environmental Topics*** **[6.1]**.

9.1.2 The chapter is supported by information presented in the following Environmental Statement chapters, figures and appendices, and it cross-refers to these where appropriate:

a. *Chapter 2: The Scheme* [EN010118/APP6.1]*;*

b. *Chapter 8: Ecology* [EN010118/APP6.1]*;*

c. *Chapter 16: Other Environmental Topics* [EN010118/APP6.1] including Ground Conditions;

d. *Outline Construction and Environmental Management Plan (OCEMP)* [EN010118/APP/7.10]*;*

e. *Outline Operational Environmental Management Plan (OEMP)* [EN010118/APP/7.11];

f. *Appendix 8D: Aquatic Ecology Report* [EN010118/APP6.2]*;*

g. *Appendix 9A: Flood Risk Assessment (FRA)* [EN010118/APP6.2]*;*

h. *Appendix 9B: Water Framework Directive Assessment* [EN010118/APP6.2]*;*

i. *Appendix 9C: SuDS Strategy* [EN010118/APP6.2]*;* and

j. *Appendix 9D Bulls Lodge Substation Extension: Drainage Strategy* [EN010118/APP6.2].

9.1.3 This chapter is supported by the following figures:

a. ***Figure 9-1***: Water Resource Features and Attributes;

b. ***Figure 9-2***: Fluvial Flood Zones; and

c. ***Figure 9-3***: Surface Water Flood Risk.

9.2 Legislation and Planning Policy

9.2.1 Legislation, planning policy, and guidance relating to the water environment, and pertinent to the Order limits comprises:

Legislation

9.2.2 The main legislation (as amended, where appropriate) relevant to the Scheme include the following:

a. Environment Act 2021 (Ref 9-1);
b. Water Act 2014 (Ref 9-1);
c. Flood and Water Management Act 2010 (Ref 9-2);
d. Environmental Protection Act 1990 (Ref 9-4);
e. Land Drainage Act 1991 (Ref 9-5);
f. Water Resources Act 1991 (Ref 9-6);
g. Salmon and Freshwater Fisheries Act 1975 (Ref 9-7);
h. Reservoirs Act 1975 (Ref 9-8);
i. Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref 9-9);
j. Environmental Damage (Prevention and Remediation) (England) Regulations 2015 (Ref 9-10);
k. Environmental Permitting (England and Wales) Regulations 2016 (Ref 9-11);
l. Eels (England and Wales) Regulations 2009 (Ref 9-12);
m. Control of Pollution (Oil Storage) (England) Regulations 2001 (Ref 9-13);
n. Water Resources Act (Amendment) (England and Wales) Regulations 2009 (Ref 9-14);
o. Floods and Water (Amendment etc.) (EU Exit) Regulations 2019 (Ref 9-15);
p. Control of Substances Hazardous to Health Regulations 2002 (Ref 9-16);
q. Anti-Pollution Works Regulations 1999 (Ref 9-17); and
r. Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 (Ref 9-18).

National Planning and Related Water Policy

National Policy Statements

9.2.3 The following planning policies from relevant National Policy Statements (NPS) have been taken into account as part of identifying the assessment methodology, receptor selection/sensitivity, potential significant environmental effects, and mitigation:

a. National Policy Statement for Energy (NPS EN-1) (Ref 9-19), with particular reference to section 5.15 (water quality and resources) paragraph 5.15.3 sets out what an Environmental Statement (ES), should describe, to include: the existing water quality, the existing water resources, the physical characteristics of the water environment and any impacts of the Scheme on water bodies or protected areas under the Water Framework Directive (WFD) and source protections zones (SPZs) around potable groundwater abstractions.
b. Additionally, paragraph 4.8.6 states that applicants for new energy infrastructure must take into account the potential impacts of climate

change, including the most up to date UK climate change projections, and adopt appropriate mitigation or adaptation measures for the lifetime of the proposed infrastructure.

c. Paragraphs 5.15.4–5.15.7 outline the decision-making process with regards to water quality and resources. Impacts on the water environment will need to be given more weight where a project would have an adverse effect on the achievement of environmental objectives established under the WFD. Within paragraphs 5.15.8-5.15.10 it is stated that whether mitigation measures over and above those included within an application are needed should be considered by the Secretary of State.

d. In addition, section 5.7 relates to flood risk. It sets out, for instance the minimum requirements for flood risk assessments (e.g. they should be proportionate to the risk and appropriate to the scale, nature and location of the project (paragraph 5.7.5)). As part of the decision making, the Secretary of State should be satisfied on a number of points, to include that the application is supported by an appropriate flood risk assessment.

e. National Policy Statement for Renewable Energy (NPS EN-3) (Ref 9-20). Although this technology specific NPS does not make specific reference to solar developments it is considered an important and relevant policy document for the assessment in this chapter of the ES. In the context of renewable energy infrastructure, it highlights the importance of considering potential impacts on water quality, water resources and flood risk, and taking into account climate change.

f. Paragraph 2.4.1 of the National Policy Statement for Electricity Networks Infrastructure (NPS EN-5), (Ref 9-21) sets out that applications should demonstrate the extent of vulnerability of the proposed development and as appropriate how resilient it would be to flooding. It refers to section 4.8 of EN-1 which advises that the resilience of a project to climate change should be assessed in the ES and that future increased risk of flooding would be covered in a Flood Risk Assessment (FRA). The FRA for the Scheme is included in Appendix 9A [**EN010118/APP6.2**] and summarised within this chapter.

Draft National Policy Statements

9.2.4 Revised Draft National Policy Statements were released by the UK Government for consultation in September 2021.

9.2.5 Certain relevant sections of text in NPS EN-1 have been revised in the draft that has been published. This includes some of the text in section 15.5 (water quality and resources) which is section 15.6 in the revised draft. For instance, paragraph 5.16.3 states that where possible, applicants are encouraged to manage surface water during construction by treating surface water runoff from exposed topsoil prior to discharging. Similarly, there are some changes in the flood risk section (section 5.7 in the current policy at 5.8 in the revised draft), to include additional text on the ‘minimum requirements’ for flood risk assessments.

9.2.6 Notably, the revised draft National Policy Statement for Renewable Energy (NPS EN-3, Ref 9-22) includes a specific section on solar developments. With regard to the Water Environment, the following is provided for (see paragraph 2.50.7):

a. A Flood Risk Assessment may accompany an applicant's assessment, and this will need to consider the impact of drainage;

b. Where access tracks are needed, permeable tracks should be used, and localised Sustainable Drainage Systems (SuDS) should be used to control runoff;

c. Given the temporary nature of solar farms, sites should be configured or selected to avoid the need to impact on existing drainage systems and watercourses; and

d. Culverting existing watercourses/drainage ditches should be avoided. When this is unavoidable, it should be demonstrated that no reasonable alternatives exist and where necessary it will only be for the construction period.

9.2.7 In addition, the same draft NPS also provides, in terms of decision-making, that water management is a critical component of site design for ground mount solar plants.

National Planning Policy Framework

9.2.8 The National Planning Policy Framework (NPPF, 2021) (Ref 9-23) has three overarching objectives to contribute to the achievement of sustainable development, one of which is the environmental objective. This objective is to "*to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy*" (Paragraph 8c). In addition, the NPPF contains a number of statements which are relevant to water quality. These include:

a. "*Strategic policies should set out an overall strategy for the pattern, scale and quality of development, and make sufficient provision for: …(d) conservation and enhancement of the natural, built and historic environment…".* This includes landscapes and green infrastructure, and planning measures to address climate change mitigation and adaptation (paragraph 20d);

b. *"Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts…"*(paragraph 153)*; and*

c. *"Planning policies and decisions should contribute to and enhance the natural and local environment by: … (e) 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. Development should, wherever*

possible, help to improve local environmental conditions such as water quality, taking into account relevant information such as river basin management plans …" (paragraph 174e).

9.2.9 The requirements of the NPPF have been taken into account by the assessment, with particular regard given to potential impacts in relation to flood risk and water quality.

National Planning Practice Guidance

9.2.10 National Planning Practice Guidance (NPPG) (Ref 9-24) is a web-based resource that, with reference to the Flood Risk and Coastal Change guidance (published 2014) (Ref 9-25), advises on how to take account of and address the risks associated with flooding and costal change in the planning process.

9.2.11 It outlines a number of main steps to be followed which are designed to ensure that if there are better sites in terms of flood risk, or a proposed development cannot be made safe, it should not be permitted: assess flood risk; avoid flood risk; and manage and mitigate flood risk. The guidance states that developers and applicants need to consider flood risk to and from the development site and it is likely to be in their own best interests to do this as early as possible. In addition, the guidance provides detail on the application of the Sequential Test and the Exception Test (see ***Appendix 9A: Flood Risk Assessment (FRA)***).

A Green Future: Our 25 Year Plan to Improve the Environment

9.2.12 In 2018 Defra published 'A Green Future: Our 25 Year Plan to Improve the Environment' (Ref 9-26) setting out the UK Government's goals for improving the environment within a generation and leaving it in a better state than we found it. The plan covers the provision of clean air and water; protection and enhancement of habitats, wildlife and biosecurity; reducing the risk from environmental hazards and mitigating and adapting to climate change; using resources more sustainably and efficiently, minimising waste and managing exposure to chemicals; and enhancing beauty, heritage and engagement with the natural environment.

9.2.13 With regards to the water environment, the Plan includes specific goals to reduce the environmental impact of water abstraction, meet the objectives of River Basin Management Plans under the Water Framework Directive, reduce leakage from water mains, improve the quality of bathing waters, restore protected freshwater sites to a favourable condition, and do more to protect communities and businesses from the impact of flooding, coastal erosion and drought. The foundation of the Plan incorporates a natural capital approach with the aspiring goal that there should always be a net gain in biodiversity from new development.

Future Water, The Government's Water Strategy for England

9.2.14 The Government's Future Water strategy (Ref 9-27), published in June 2011, sets out the Government's long-term vision for water and the framework for water management in England. It aims to permit the supply of secured water supplies whilst ensuring an improved and protected water environment. Future Water brings together the issues of water demand, water supply, water quality in the natural environment, surface water drainage and river/coastal flooding

into a single coherent long-term strategy, in the context of the need to reduce greenhouse gas emissions.

9.2.15 The strategy also considers the issue of charging for water. The water environment and water quality have great economic, biodiversity, amenity and recreational value, playing an important role in many aspects of modern day society, and thus the functions provided must be sustainably managed to ensure they remain available to future generations without compromising environmental quality.

Sustainable Drainage Systems Guidance

9.2.16 Planning policy encourages developers to include Sustainable Drainage Systems (SuDS) in their proposals where practicable.

9.2.17 Defra published guidance on the use, design and construction of SuDS in Non-Statutory Technical Standards for SuDS (Ref 9-28).

9.2.18 Industry good practice guidance on the planning for and design of SuDS is also provided by CIRIA C753 The SuDS Manual (Ref 9-29) and Design Manual for Roads and Bridges (DMRB) CD532 Vegetated Drainage Systems for Highways Runoff (Ref 9-30).

9.2.19 Consideration is also given to The Building Regulations 2010 Approved Document H Drainage and Waste Disposal (Ref 9-31) and Water UK: Sewerage Sector Guidance (Ref 9-32).

Regional Planning Policy

9.2.20 At a regional level, water management is coordinated in England through eight River Basin Management Plans (RBMPs). River Basin Management Plans (RBMPs) are prepared by the Environment Agency for six-year cycles and set out how organisations, stakeholders, and communities will work together to improve the water environment. The most recent plans were published in 2015 (the second cycle) and will remain in place until after 2021. The waterbodies within the study area fall under the Essex Combined Management Catchment within the Anglian RBMP (Ref 9-33).

Local Planning Policy

Chelmsford Local Plan 2013-2036

9.2.21 The western extent of the Order limits is adjacent to Waltham Road / Boreham Road which falls within the Chelmsford City Council area. The Chelmsford Local Plan 2013-2036 (Ref 9-34) was adopted by Chelmsford City Council on 27 May 2020 and relevant planning policies include:

a. S2: Addressing Climate Change and Flood Risk – new development will be encouraged where, for instance, it reduces greenhouse gas emissions; promotes efficient use of natural resources such as water; encourages design and construction techniques which contribute to climate change mitigation and adaptation; minimises impact on flooding (from all sources); and provides opportunity for green infrastructure such as new habitat creation;

b. DM18: Flooding/SuDS (Sustainable drainage systems):

i. Planning permission for all types of development will only be granted where it can be demonstrated that the site is safe from all types of flooding, either because of existing site conditions or through flood risk management from the development, now and for the lifetime of the development; and it does not worsen flood risk elsewhere.

ii. Development within areas of flood risk will be required to provide a safe means of escape or suitably manage risk through some other means; manage surface water run-off so that the run-off rate is no greater than the run-off prior to development taking place or, if the site is previously developed, development reduces run-off rates and volumes as far as is reasonably practical; and locate the most vulnerable development in areas of lowest flood risk unless there are overriding reasons for not doing so.

iii. All major developments will be required to incorporate water management measures to reduce surface water runoff and ensure that is does not increase flood risk elsewhere. The principal method to do so should be the use of SuDS. Surface water runoff should be managed to ensure that there is no increase in surface water flow rate run off. As well as providing water management measures, where possible, SuDS systems should be multifunctional to deliver benefits for the built, natural and historic environment.

iv. Surface water connections to the public sewerage network should only be made where it can be demonstrated that there are no feasible alternatives (this applies to new developments and redevelopments) and where there is no detriment to existing users.

c. DM19: Renewable and Low Carbon energy - planning permission will be granted for renewable or low carbon energy developments provided that, for instance, they can demonstrate no adverse effect on the natural environment including designated sites.

Braintree District Council Local Plan (Section 1 – Adopted February 2021) and Publication Draft Local Plan (2017)

9.2.22 Braintree District Council's Local Plan will set out their strategy for future development and growth up to 2033 (Ref 9-35). The draft plan was submitted to the Planning Inspectorate in October 2017 and Section 1 was adopted in February 2021, with the Examination of Section 2 took place in Summer 2021. The full adoption of the Local plan is expected over Winter 2021/2022. Relevant policies include those summarised below:

a. Section 1 - Adopted Policy SP1: Presumption in Favour of Sustainable Development – when considering development proposals the local planning authorities will take a positive approach that reflects the presumption in favour of sustainable development contained in the National Planning Policy Framework;

b. Section 2 – Emerging Policy LPP 67: Natural Environment and Green Infrastructure - Development proposals must take available measures to ensure the protection, and where possible, the enhancement of the natural environment, habitats, biodiversity and geodiversity of the District. This will include, where appropriate, protection from pollution and excessive use of water. It is expected that all development proposals, where appropriate, contribute towards the delivery of new

Green Infrastructure which develops and enhances a network of multi-functional spaces and natural features throughout the District;

c. Section 2 - Emerging Policy LPP70: Protection, Enhancement and Management of Biodiversity - development proposals shall provide for the protection of biodiversity and the mitigation or compensation of any adverse impacts. For example, such enhancement could include watercourse improvements to benefit biodiversity and improve water quality, habitat creation, wildlife links (including as part of green or blue infrastructure), and building design which creates wildlife habitat. The Council will require development to be in compliance with and contribute positively towards delivering the aims and objectives of the Anglian River Basin Management Plan.

d. Section 2 - Emerging Policy LPP 73: Protecting and Enhancing Natural Resources, Minimising Pollution and Safeguarding from Hazards - proposals for all new developments should ensure no deterioration to water quality.

e. Section 2 - Emerging Policy LPP 76: Renewable Energy Schemes - proposals for renewable energy schemes will be encouraged where the benefit in terms of low carbon energy generating potential does not result, individually or cumulatively, in serious harm to or loss of for example watercourse engineering or hydrological impact. Renewable energy schemes should not result in pollution to water.

f. Section 2 - Emerging Policy LPP 78: Flooding Risk and Surface Water Drainage:

    i. The Council will ensure that all proposals will be located to avoid the risk of flooding and where development must be located in an area of higher flood risk, development must be designed to be flood resilient and resistant and safe for its users for the lifetime of the development taking climate change and the vulnerability of the residents into account. Development will take climate change into account in accordance with the most up to date analysis of flood risk and will not increase flood risk elsewhere.

    ii. Development shall be located on Flood Zone 1 or areas with the lowest probability of flooding, taking climate change into account. Any proposals for new development (except water compatible uses) within Flood Zones 2 and 3a will be required to provide sufficient evidence for the Council to assess whether the requirements of the sequential test and exception test have been satisfied, taking climate change into account. Inappropriate development will be steered away from flood zones and site specific Flood Risk Assessment will be submitted which meet the requirements of the NPPF and Planning Practice Guidance

    iii. Retain at least an 8m wide undeveloped buffer strip alongside Main Rivers and explore opportunities for riverside restoration. Any proposed development within 8m of a main river watercourse will require an environmental permit from the Environment Agency.

    iv. Retain at least a 3m buffer strip on at least one side of an Ordinary watercourse. Any development that could impact the

flow within an ordinary watercourse will require consent from Essex County Council (as Lead Local Flood Authority (LLFA)).

v. All new development within Flood Zone 2 and 3 must not result in a net loss of flood storage capacity. Where possible opportunities should be sought to achieve an increase in the provision of floodplain storage.

vi. For developments located in areas at risk of fluvial flooding, safe access/egress must be provided for new development (as per a specified order of preference).

vii. All new development in Flood zones 2 and 3 should not adversely affect flood routing and thereby increase flood risk elsewhere. Opportunities should be sought within the site design to make a space for water.

g. Section 2 - Emerging Policy LPP 79: Surface Water Management Plan:

i. Developments will need to be in compliance with and contribute positively towards delivering the aims and objectives of the Braintree and Witham Surface Water Management Plan.

ii. Developments located in Critical Drainage Areas (CDAs), Local Flood Risk Zones (LFRZs) and for redevelopments of more than one property or area greater than 0.1 hectare should seek betterment to a greenfield runoff rate.

iii. All developments in Critical Drainage Areas (excluding minor housing extensions less than 50 m^2) which relate to a net increase in impermeable area are to include at least one 'at source' SuDS measure (e.g. water butt, permeable surface). This is to assist in reducing the peak volume of discharge from the site.

h. Section 2 - Emerging LPP 80: Sustainable Urban Drainage Systems:

i. All new development of 10 dwellings or more and major commercial development, car parks and hard standings will incorporate SuDs appropriate to the nature of the site. Such systems shall provide optimum water runoff rates and volumes taking into account relevant local or national standards and the impact of the WFD on flood risk issues, unless it can be clearly demonstrated that they are impracticable

ii. Surface water should be managed as close to its source as possible and on the surface where practicable to do so. Measures such as rainwater recycling, green roofs, water butts and permeable surfaces will be encouraged incorporating measures to prevent pollution where appropriate.

iii. Opportunities shall be taken to integrate sustainable drainage within the development, creating amenity and enhancing biodiversity.

iv. Only where there is a significant risk of pollution to the water environment, inappropriate soil conditions and/or engineering difficulties, should alternative methods of drainage be considered. It will be necessary to demonstrate why it is not achievable.

v. SuDS design should be an integral part of the design and clear details of proposed SuDS together with how they will be managed and maintained will be required as part of any planning application.

Braintree District Council Core Strategy (2011)

9.2.23 The Core Strategy (Ref 9-36) sets out the vision, objectives and strategy for the development of the District up to 2026 and was adopted in September 2011. Relevant policies relating to the water environment are listed below, where the updated policies are not yet adopted within Section 2 of Braintree District Council's Local Plan:

a. Policy CS8 Natural Environment and Biodiversity:

i. All development proposals will take account of the potential impacts of climate change and ensure the protection and enhancement of the natural environment, habitats and biodiversity and geo-diversity of the District. This will include where appropriate protection from excessive use of water and other resources.

ii. The Council will minimise exposure of people and property to the risks of flooding by following the national guidance. In particular the sequential test will be applied to avoid new development being located in areas of flood risk. Where a site lies partially in the flood zone the Sequential Approach will also be rigorously applied and only water compatible or essential infrastructure uses will be permitted in areas demonstrated to be at risk. SUDS will be used wherever possible to reduce flood risk, promote groundwater recharge, enhance biodiversity and provide amenity benefit, unless, following an adequate assessment, soil conditions and/or engineering feasibility dictate otherwise.

iii. It must be ensured that the capacity of waste water treatment and foul sewerage infrastructure is not exceeded and that opportunities to improve water quality in all watercourses and water bodies will be taken where possible in order to prevent the deterioration in current water quality standards and meet the objectives of the WFD.

iv. Developers must engage in discussions with water and sewerage providers at the earliest opportunity to provide evidence with their planning application that there is capacity for their proposals.

Essex County Council SuDS Guidance

9.2.24 Essex County Council is the LLFA covering the Scheme area, and in February 2020 they produced a Supplementary Planning Guidance (SPG) document 'Sustainable Drainage Systems: Design Guide' (Ref 9-37). This guide is primarily intended for use by developers, designers and consultants who are seeking guidance on the LLFAs standards for the design of sustainable surface water drainage in Essex.

9.2.25 It provides guidance on the planning, design and delivery of attractive and high-quality SuDS schemes which should offer multiple benefits to the

environment and community. Essex County Council will refer to the Guide when consulted on any application relating to sustainable drainage. The SuDS philosophy and concepts are based upon and derived from the CIRIA SuDS Manual C753 (Ref 9-30), and the Design Guide seeks to complement SuDS Manual, and both should be incorporated into any SuDS proposals for the development.

9.3 Assessment Assumptions and Limitations

The Scheme Parameters Assessed

9.3.1 This chapter assesses the potential effects resulting from the Illustrative Concept Design at **Figure 2-5** of this ES [**EN010118/APP/6.2**], to allow an assessment of a specific, deliverable Scheme and calculation of the drainage metrics, which requires a definitive design. The Concept Design presents a realistic layout in accordance with the Design Principles, within the Rochdale Envelope.

9.3.2 A review of the Concept Design against the Design Principles confirmed that constructing and operating the Scheme in other ways allowed by the Design Principles would not result in a greater impact to the water environment than the Concept Design.

9.3.3 The assessment has been based on the following parameters set out in the Design Principles:

a. The cable route connection to the Bulls Lodge Substation requires a maximum three watercourse crossings of Boreham Brook. These will be installed using underground methods such as horizontal directional drilling techniques beneath the watercourse, thus avoiding trenching or disturbance of the watercourse bed and banks. The cable would be a minimum 1.5m below the watercourse bed in order to prevent risk of any scour exposing the cable.

b. There will be a minimum buffer of 10m around watercourses (measured from the water/channel edge under normal flows) within which there will be no built development. However, for main rivers the Environment Agency may stipulate 8m measured from the landward toe of any bank that itself may be set back from the edge of the channel under normal flows. To accommodate potential uncertainty in the local position of banks (that will vary) the buffer for main rivers has been increased to 10m. In practice, this only affects the relatively short reach of the River Ter which passes through the Order limits. There will also be a 5m buffer from ponds within which there would be no built development, as described in the Outline Construction Environmental Management Plan (OCEMP) presented in **[EN010118/APP/7.10]**. This will minimise construction activities (e.g. for the installation of solar PV Panels) within 8m of surface watercourses (and 10m of main rivers) and 5m of ponds, other than where there is a need for crossing of a watercourse (for cabling installation or access tracks) or temporary discharge of treated construction site runoff. Works to enhance watercourses will require direct works to the channel and banks, although given the aim of these works and their small-scale and ‘soft-engineering’ nature, construction impacts would be minimal. Overall, the purpose of this buffer reduces the

risk of any pollutants entering the watercourse directly, whilst also providing space for mitigation measures (e.g. fabric silt fences) should they be required.

c. Provision of access tracks across the Order limits will require extension of or improvement to several existing culverts of ephemeral agricultural ditches (currently used as farm access crossings). The maximum extension of these culverts (and therefore the Design Principles) is assumed to be 2m as a precautionary worst case, and they would be designed where possible to reduce any alteration of watercourse alignment and would have a sunken bed to allow a naturalised bed substrate to develop in order to maintain ecological continuum.

d. Cranham Road will be widened to accommodate access to the Scheme during construction and operation will require a 1.55m extension of the highway in the vicinity of an existing culvert of Boreham Brook, within the existing highway boundary. The principles of the road widening requirements have been agreed with Essex County Council. The Design Principle is that the maximum extension required for the culvert would be no more than 1.55m. As per the access track culverts, it is assumed that a sunken bed would be provided to allow a naturalised bed to develop.

9.3.4 Any scheme built out within the maximum areas on the Works Plans and in accordance with the Design Principles would result in effects no worse than those assessed in this chapter.

Limitations

9.3.5 There are limitations in respect of the assessment undertaken for the purpose of this chapter:

a. A request for water resources data (e.g. licensed abstractions, Water Activity Permit locations, pollution incident locations), WFD information and water quality and flow data was requested from the Environment Agency to inform the desk study in November 2020. A response had not been received at the time of submitting this ES despite re-submitting the request in August 2021 and October 2021. As such, the assessment is based on water environment and WFD information that is publicly available online, supplemented by observations from site visits. It has not been possible to take into consideration any more recent data that the Environment Agency may hold in the baseline, or details of any WFD investigations that might have been undertaken. However, it is considered that sufficient data has been gathered to undertake a robust assessment.

b. Removal of productive arable farmland within the Order limits to accommodate the Scheme will reduce water quality risk to watercourses associated with diffuse agricultural chemicals and possibly reduce soil erosion and need for local abstractions for irrigation, thereby providing a beneficial impact. However, there is limited data on the existing conditions and activities, therefore no detailed assessment of this potential benefit has been undertaken.

9.4 Stakeholder Engagement

9.4.1 Consultation undertaken in relation to the Water Environment is outlined in **Table 9-1**. This includes feedback throughout the scoping, informal consultation, and statutory consultation phases.

Table 9-1: Main matters raised during consultation

Consultee	Main matter raised	How has the concern been addressed	Location of response in chapter
Matters raised from the Scoping Report			
PINS	In relation to impacts from increased surface water run-off during operation, the Inspectorate considers that impacts on water quality as a result of soil erosion should be assessed in the ES where significant effects are likely. The Applicant should append a draft/ outline copy of the Surface Water Drainage Strategy to the ES and/ or demonstrate how its delivery will be secured through the DCO.	Refer to ***Appendix 9C: SuDS Strategy*** **[EN010118/APP.6.2].** Section 4 of that document sets out an outline drainage strategy and delivery of this will be secured under the DCO. An impact assessment of potential effects of operational runoff on the water environment, taking account of the SuDs Strategy is provided in section 9.8.	A summary of the proposed drainage arrangements is included in section 9.6. Refer to ***Appendix 9C SuDS Strategy*** **[EN010118/APP.6.2]** for further details. Impacts related to operational runoff are assessed in section 9.8.
PINS	The Flood Risk, Drainage and Surface Water chapter of the Scoping Report mentions allowances for climate change but does not elaborate on how or which ones will be applied. The ES and FRA should use the latest climate change projections in their assessments and explain how they have been applied. Effort should be made to agree the approach with the relevant consultation bodies.	Climate change allowances are outlined in ***Appendix 9A: FRA*** **[EN010118/APP.6.2]** and have been taken account of in determination of potential flood risk to and from the site. The assessment outcomes are summarised within this chapter, see section 9.8.	The FRA is provided within ***Appendix 9A: FRA*** **[EN010118/APP.6.2]**, and summarised within this chapter (see Section 9.6 Baseline and 9.8 Assessment of Likely Impacts and Effects)
PINS	If the Proposed Development has the potential to impact upon any WFD waterbodies then a WFD assessment should also be submitted as part of the Application as either an Appendix or a separate assessment report. This report should be used to inform the ES assessment.	Refer to ***Appendix 9B: WFD Assessment*** **[EN010118/APP.6.2].**	Refer to Section 9.5 Assessment Methodology for summary of WFD methodology. Refer to ***Appendix 9B WFD Assessment*** for further detail and outcomes of the assessment.
PINS	The Inspectorate notes that the list of receptors sensitive to impacts from flood risk, drainage and surface water identified in paragraph 9.7.1 of the Scoping Report does not include ecological features or cultural heritage assets. However, a number of	An FRA has been produced to assess flood risk from all sources (e.g. fluvial, surface water, groundwater or from artificial sources) ***Appendix 9A: FRA***. This indicates that flood risk is not increased on or off-	Water environment receptors have been identified in section 9.6 Baseline Conditions, and effects assessed in Section 9.8 Assessment of Likely Impacts and Effects.

	ecological and cultural heritage assets are present within/around the Proposed Development site (e.g. ancient woodland). The ES should assess flood risk, drainage and surface water impacts to ecological and heritage receptors where significant effects are likely to occur. Where these assessments are presented in other aspect Chapters, the ES should include appropriate cross-reference and explanation.	site, and therefore no ecological and heritage receptors will be significantly impacted by flooding relating to the Scheme.	Ecological receptors are identified in ***Chapter 8: Ecology*** **[EN010118/APP.6.1],** and heritage receptors in ***Chapter 7: Cultural Heritage*** **[EN010118/APP.6.1]**. However, the FRA indicates that flood risk is not increased on or off-site, and therefore no ecological and heritage receptors will be significantly impacted.
PINS	Section 9.5 of the Scoping Report is entitled 'Potential Effects and Mitigation' however, no mitigation measures are described in that section. Paragraph 9.6.8 suggests that Sustainable Drainage System (SuDS) will be used but no details regarding their design have been provided at this stage. The ES should include a full description and efficacy assessment of all proposed mitigation measures relevant to the Flood Risk, Drainage and Surface Water assessment and demonstrate how the delivery of such measures is secured through the DCO or other legal mechanism. Effort should be made to agree the necessary mitigation measures with relevant consultation bodies.	Refer to **Appendix 9C: *SuDS Strategy***. Section 4 of that document sets out an outline drainage strategy and delivery of this will be secured by a Requirement **under the DCO.** The outline drainage strategy details the proposed surface water drainage approach and SuDS provision. The impact of the SuDS strategy is considered within this ES chapter in section 9.8. Further embedded design mitigation details are provided in this chapter. (see section 9.7). Consultation was undertaken with Essex County Council as LLFA on 14/12/21 to discuss the drainage strategy, as well as other relevant issues.	A summary of the proposed drainage arrangements is included in Section 9.6. Refer to ***Appendix 9C: SuDS Strategy*** for further details. The impact of the drainage strategy is considered within Section 9.8 Assessment of Likely Impacts and Effects within this chapter.
PINS	Appropriate buffer zone distances between the Proposed Development (excluding any crossings or similar infrastructure) and watercourses should be defined in the ES, with reference to how this is secured through the DCO. The Applicant should make effort to agree these details with relevant consultation bodies.	There will be a minimum buffer of 8m around watercourses (measured from the water/channel edge under normal flows) within which there will be no built development. However, for main rivers a 10m buffer measured from the centre line of the watercourse as marked on Ordnance Survey mapping has been allowed for. A minimum buffer of 5m around all ponds is proposed. This is secured via the outline design principles under the DCO. Consultation was undertaken with Essex County Council as LLFA on	Refer to section 9.6 of this chapter - Embedded Design Mitigation.

		14/12/to discuss the drainage strategy, as well as other relevant issues.	
Anglian Water	Reference is made to a flood risk assessment being prepared for the above development. The Scoping Report identifies the principal risk of flooding from the project being surface water flooding, at this stage it is unclear whether there is a requirement for a connection(s) to the public sewerage network for the above site or as part of the construction phase.	Refer to ***Appendix 9A: FRA.*** This considers flood risk from all sources. Operational foul drainage will be collected in a cess pit. The cesspit will be managed, maintained, inspected and drained by a licensed courier who will then dispose of the waste offsite. Construction and decommissioning foul waste will similarly be collected and disposed of offsite by a licensed courier. There is therefore no need to connect to the public sewerage system.	Refer to ***Appendix 9A: FRA***, and summarised within this chapter (see Section 9.6 and 9.8)
Anglian Water	Anglian Water is responsible for managing the risks of flooding from surface water, foul water or combined water sewer systems. Consideration should be given to all potential sources of flooding including sewer flooding as part of the Environmental Statement and related flood risk assessment.	Refer to ***Appendix 9A: FRA.*** This considers flood risk from all sources including sewer flooding.	Refer to ***Appendix 9A: FRA***, and summarised within this chapter (see Section 9.6 and 9.8)
Anglian Water	On 1st April 2020, new sewerage adoption arrangements came into effect through the publication of a suite of documents known as Sewerage Section Guidance produced UK Water on behalf of the water industry for the approval of Ofwat.	Noted. There is no requirement for connection to the sewers for this development. Foul drainage will be collected in a cess pit. The cesspit will be managed, maintained, inspected and drained by a licensed courier who will then dispose of the waste offsite.	Not applicable.
Environment Agency	Considering the very large site area, and the relatively small areas of Flood Zones 2 and 3 within the site boundary, the Sequential Approach should be applied to the siting of the development, and the Flood Risk Assessment should show that the solar panels will all be located within Flood Zone 1 wherever possible. The watercourses will not need to be hydraulically modelled, providing that all the solar panels are	Refer to ***Appendix 9A: FRA*** and this includes consideration of the Sequential Test**.** Solar PV Panels are located within Flood Zone 1 only.	Refer to ***Appendix 9A: FRA***, and summarised within this chapter (see Section 9.6 and 9.8)

	located within Flood Zone 1.		
Environment Agency	We recommend that solar panels and their infrastructure are not located within Flood Zones 2 and 3 because there is potential for flood velocity and flood storage volumes to be affected by the panel support structures (legs and any associated bases) and any related infrastructure and buildings. Should flood velocity slow as a result of this, there is the possibility of flood water backing up and increasing flood risk elsewhere, especially upstream.	Refer to ***Appendix 9A: FRA*** Solar PV Panels, Solar Stations and Balance of Solar System (BoSS) are only located within Flood Zone 1.	Refer to ***Appendix 9A: FRA***, and summarised within this chapter (see Section 9.6 and 9.8)
Environment Agency	If any solar panels are to be located in Flood Zones 2 or 3 then hydraulic modelling of the river will be required as the flood zones are only indicatively modelled in this location. This is to ensure that none of the proposed structures lie within Flood Zone 3b Functional Floodplain, and to determine the flood risk to the site, and the required volumes and levels of compensatory flood storage required. The FRA will need to show how the development will be safe in the event of a flood and not increase flood risk to others.	Refer to ***Appendix 9A: FRA*** Solar PV Panels are located within Flood Zone 1 only.	Refer to ***Appendix 9A: FRA***, and summarised within this chapter (see Section 9.6 and 9.8)
Environment Agency	There is a risk of debris being caught up in the solar panel support structures or solar panels themselves as a result of flooding. The possibility of the solar panels becoming dislodged by flood water should also be investigated as they could pose a blockage risk downstream, especially to culverts.	Refer to ***Appendix 9A: FRA***	Refer to ***Appendix 9A: FRA***, and summarised within this chapter (see Section 9.6 and 9.8)
Environment Agency	The applicant may need an environmental permit for flood risk activities if they want to do work in, under, over or within 8 metres (m) from a fluvial main river and from any flood defence structure or culvert. The Rivers Ter and Boreham	Noted, and requirements for an environmental permit are outlined within this ES Chapter, see Section 9.7. Please also note that Boreham Brook is only a Main River downstream of the Order limits and not within the Order limits	Flood Risk Activity Permits are discussed in Section 9.7.

	Brook are designated as Main Rivers. Anyone carrying out these activities without a permit where one is required, is breaking the law.	itself. A buffer of 10m has been provided around main rivers except where crossings are required.	
Environment Agency	As with any development the Environment Agency wish to see open watercourses retained and bankside habitats enhanced and buffered with natural vegetation. Ponds and any standing water should also be protected and enhanced. Natural water features should not be shaded or negatively impacted by the proposals. Siting of battery units should be carefully designed to prevent risk to watercourse pollution and consequent harm to fish and aquatic life.	Buffers around ponds and watercourses have been included in the Scheme design. Cable crossings of Boreham Brook will be installed below the bed, to maintain an open watercourse. Access track crossings of ephemeral drainage ditches are required but use existing culverts. The battery units are sited away from watercourses and will be provided with pollution control measures, including management of firefighting water.	Refer to section 9.7 Embedded Design Mitigation of this chapter**,** as well as ***Appendix 9C: SuDS Strategy* [6.2]**, and **ES *Chapter 8: Ecology***.
Environment Agency	The CEMP also needs to reduce any potential polluting impacts (e.g. run off containing silt/sediment or oil pollution arising from a spill) in addition to nuisances. The CEMP should also include a pollution incident response plan.	Measures for protecting the water environment from pollution during construction are outlined in this chapter and in the ***Outline Construction Environmental Management Plan* (CEMP) [EN010118/APP/7.10]**, including a pollution incident response plan.	Refer to section 9.7 Embedded Design Mitigation of this chapter and ***Appendix 2A Outline Construction Environmental Management Plan.***
Environment Agency	Battery storage will be provided. Consideration must be given to how a fire and any resulting firefighting run off would be managed to prevent pollution. We recommend that discussions take place with the local fire and rescue service on potential firefighting strategies used on battery storage installations which will help inform development of a pollution incident response plan. Guidance on pollutant containment systems can be found in the CIRIA publication “Containment systems for the prevention of pollution C736F.”	An outline drainage strategy is provided within ***Appendix 9C: SuDS Strategy*** detailing the approach to managing firewater runoff. Consultation with the ECC Fire and Rescue department has been undertaken during development of the strategy.	Refer to section 9.7 Embedded Design Mitigation for drainage proposals, which are described in more detail in ***Appendix 9C SuDS Strategy*.** An Outline ***Battery Safety Management Plan* [EN010118/APP/7.6]** has also been developed for the Scheme.
Terling and Fairstead Parish Council	Identified pollution at Great Leighs should be noted.	Noted, and this is outside the 1 km study area (see section 9.4 below), upstream of the Order limits along the River Ter. A	Not applicable.

		list of all pollution incidents for the last five years has been requested from the Environment Agency but has not been received at the time of writing to confirm this. Water resources data was originally requested in November 2020 and resubmitted in August and October 2021.	
Terling and Fairstead Parish Council	The applicant's attention is drawn to the occasional use of Terling Ford and Paulk Lane Ford for summer bathing.	Noted	Refer to section 9.6 Baseline Conditions
Terling and Fairstead Parish Council	Potential effects during construction, operation and decommissioning phases are identified but mitigation is not discussed.	Mitigation measures for environmental effects on the water environment are outlined in section 9.6 Embedded Design Mitigation and taken into account in the assessment of effects (section 9.7)	Refer to section 9.7 Embedded Design Mitigation
Terling and Fairstead Parish Council	The adverse impacts of flooding at construction could be significant but the mitigation suggested seems ineffective.	Mitigation measures for environmental effects on the water environment are outlined in section 9.6 Embedded Design Mitigation and taken into account in the assessment of effects (Section 9.7). Specific flood risk measures are discussed in further detail in ***Appendix 9A:FRA*** Given these embedded mitigation measures, no significant effects have been identified.	Refer to section 9.7 Embedded Design Mitigation and ***Appendix 9A: FRA***
Terling and Fairstead Parish Council	Refers to the impacts on flood risk from increased run off from new impervious areas across the site. It is positive that this is recognised. The significance of rainfall will require the applicant's response in the EIA. Will there be any containment lagoons to ensure the surface water drainage systems and natural absorption will not become over charged especially at times of high-water table. Has snow loading been considered in the management of drainage?	***Appendix 9C: SuDS Strategy*** has been included in the DCO and includes an outline drainage strategy detailing how runoff will be appropriately managed. Section 4 of that document sets out an Outline Drainage Strategy and delivery of this will be secured by a Requirement under the DCO.	A summary of the proposed drainage arrangements is included in section 9.6. Refer to the ***Appendix 9C: SuDS Strategy*** for further details.
Matters raised during Statutory Consultation (1st June 2021 – 13th July 2021)			

Braintree District Council, Essex Country Council	We would strongly support the provision of new pond creations, adjacent to re-wilded scrub and grassland areas. This is because it is a relatively declining habitat mosaic and would provide significant benefits for declining bird species (e.g. Turtle Dove), whilst also providing benefits for amphibians, reptiles and invertebrate species.	Details of the new and restored ponds can be found in the **Landscape and Ecology Management Plan [EN010118/APP/7.13]**.	Refer to **ES *Chapter 8: Ecology***.
Chelmsford City Council	The FRA is sound. 9.6.78 of the PEI Report states that CCC SFRA was not available for Boreham Tributary. It is unclear whether this evidence is missing or if the consultant simply could not access it, but it needs to be taken into account. CCC would be happy to provide a copy of the Level 1 and Level 2 SFRA.	The SFRA has been taken into account in ***Appendix 9A: FRA***.	Refer to ***Appendix 9A: FRA***
Essex County Council	It is recommended that a sustainable urban drainage system (SuDS) is used to manage surface water runoff from the site to avoid the potential impacts including channelised flows, soil erosion, sediment built up and soil compaction during the construction phase.	***Appendix 9C: SuDS Strategy*** has been included in the DCO and includes an outline drainage strategy using SuDS.	A summary of the proposed drainage arrangements is included in section 9.7. Refer to ***Appendix 9C: SuDS Strategy*** for further details.
Essex County Council	The LLFA recommends the preparation of a Drainage Strategy and Land Management Strategy to support the submission of a DCO application.	***Appendix 9C:SuDS Strategy*** and **Outline Landscape** and **Ecology Management Plan** has been included as part of the application. The former includes the outline drainage strategy which, in addition to the Outline Landscape and Ecology Management Plan, will be delivered by Requirements under the DCO. Consultation was undertaken with Essex County Council as LLFA on 14/12/21	A summary of the proposed drainage arrangements is included in section 9.6. Refer to ***Appendix 9C: SuDS Strategy*** for further details.
Essex County Council	Appropriate buffer zones around existing ponds and watercourses are required to minimise any potential impacts on existing drainage features. The minimum buffer zone is 8m	There will be a minimum buffer of 8m around watercourses (measured from the water/channel edge under normal flows) within which there will be no built development. However, for main rivers a	Refer to section 9.7 Embedded Design Mitigation.

	as measured from the top of the bank.	10m buffer measured from the centre line of the watercourse as marked on Ordnance Survey mapping has been allowed for. A minimum buffer of 5m around all ponds is proposed. This is secured via the outline design principles under the DCO.	
Natural England	The proposed scheme boundary is immediately adjacent to the River Ter Site of Special Scientific Interest (SSSI) notified for its fluvial geomorphology. It is important the Scheme does not interfere with the natural process of the river.	Noted, whilst a section of approximately 100m of the River Ter adjacent to the upstream SSSI section of the River Ter is included in the Order limits this land is included for habitat enhancement only, and there is no physical development planned adjacent to the River Ter and no vehicle or cable crossings are required.	Refer to section 9.6 Baseline Conditions
Natural England	We note the aquatic macroinvertebrate survey of the River Ter has been undertaken and that no macroinvertebrates of conservation importance were identified. No White-clawed Crayfish were found during the surveys however suitable habitat was present.	Noted. Details of the survey are provided in ***Chapter 8: Ecology*.**	Details of the aquatic ecology baseline are summarised in Section 9.6 with full details in ***Chapter 8: Ecology.***
Natural England	We support the inclusion of chapter 9 of the Report to assess the potential effects of the scheme on the water environment. We welcome that this includes consideration of the ecological potential of waterbodies and other sensitive ecological receptors such as the River Ter SSSI, great crested newt ponds and potential impacts on water-dependent species including fish, macroinvertebrates, macrophytes and riparian mammals. Natural England is satisfied that this generally meets NPS requirements to protect the water environment and dependent habitats and species.	Noted. Updated details of the water environment baseline are provided in Section 9.6.	Details of the aquatic ecology baseline are summarised in Section 9.6 with full details in ***Chapter 8: Ecology*.**
Environment Agency	Although currently the majority of the new climate change allowances have not exceeded the current	Given all PV panel installations are in Flood Zone 1 no further	Refer to ***Appendix 9A: FRA***

	extent of the existing flood zone 2 (where modelled), given the scale of this NSIP we feel it is appropriate to request the applicant to model the River Ter; designated main river, and the Boreham Brook including the non-main element upstream of it in order to incorporate the new climate change allowances. Peak river flow allowances: the Upper end allowance should be applied for Essential Infrastructure. For the River Ter (north end of the site) this may affect a very small proportion of PV installations. For the ordinary watercourse (Southern end of the site) upstream of the main River Boreham Brook, the extent of the floodplain is more unknown and therefore should be modelled to identify if any of the proposed PV installations would be located in the flood plain.	modelling has been undertaken. It is considered that fluvial modelling of both the River Ter and Boreham Brook is not required as it is reasonable to assume fluvial flood levels would not reflect an increase in flood level, in the order of magnitude that the PV panels sit above the estimated Flood Zone 2 levels. Additionally, both the SFRAs indicate Flood Zone 2 as a proxy for the 65% climate change extent, with the revised climate change allowances now only requiring 38% for design purposes; the fluvial design extent level would be less, providing a greater depth difference to the PV panels. Refer to ***Appendix 9A: FRA*** where this is discussed in more detail.	
Environment Agency	We consider it essential that a FRA considers the implications of the H++ scenario and the approach that could be taken to manage this risk. The H++ scenario (a requirement for FRAs that look at "safety critical" elements of infrastructure proposals) is currently found in the document "Adapting to climate change: guidance for risk management authorities".	Previously the H++ Scenario would be applied to infrastructure projects of this scale; however the current allowance for design purposes for the Order limits is now the Higher Central allowance of 38% (for Essential Infrastructure). H++ still applies to sea level rise, although this specific area of the UK is not considered to be impacted by sea level rise, and so H++ is not considered further.	Refer to ***Appendix 9A: FRA***
Environment Agency	If the applicant does not undertake modelling ahead of the DCO submission then they should be able to justify why modelling is not required.	Given all PV panel installations are in Flood Zone 1 no further modelling has been undertaken. Justification and plans to support the approach have been provided in ***Appendix 9A Flood Risk Assessment***, with further detail also given in an earlier response in this table.	Refer to ***Appendix 9A Flood Risk Assessment***
Environment Agency	The FRA has not shown the built development in relation to the Flood Zones	The updated FRA is available in ***Appendix 9A: FRA.*** Also refer to **Figure**	Refer to ***Appendix 9A: FRA*** and **Figure**

	therefore this will need to be updated within the FRA before it can be concluded that hydraulic modelling is not required at this time.	**9.2** Fluvial Flood Zones which shows built development in relation to flood zones.	**9.2 Fluvial Flood Zones.**
Environment Agency	Appendix A of the FRA shows the layout of the development. It should also have a map showing built development in relation to the flood zones (including climate change, for the lifetime of development and beyond, as a sensitivity test).	The updated FRA is available in ***Appendix 9A: FRA.*** Refer to **Figure 9.2** Fluvial Flood Zones which also shows built development in relation to flood zones.	Refer to ***Appendix 9A: FRA*** and **Figure 9.2 Fluvial Flood Zones.**
Environment Agency	The applicant may need an environmental permit for flood risk activities if they want to do work in, under, over or within 8 metres (m) from a fluvial main river and from any flood defence structure or culvert. The Rivers Ter and Boreham Brook are designated as Main Rivers.	Noted, and requirements for an environmental permit are outlined within this ES chapter, see Section 9.1. Please also note that Boreham Brook is only a Main River downstream of Brick House Farm. A buffer of 10m has been provided around main rivers (measured from the centre line of the watercourse as shown on OS Mastermap) except where crossings are required.	Flood Risk Activity Permits are discussed in Section 9.7.
Environment Agency	We wish to see a soil strategy to improve and rest soils on the site from agricultural use and ensure restoration of structure and texture whilst preventing erosion compaction and loss of fine sediment into the watercourses. This will be especially important in the construction phase when work on bare ground could cause serious damage to soils and watercourse habitats.	Measures for protecting the water environment from pollution (including runoff of fine sediment during construction) are outlined in this chapter and in the ***Outline Construction Environmental Management Plan*** **(OCEMP) [EN010118/APP/7.10]**. The ***Outline Operational Environmental Management Plan*** **(OEMP)** includes details of how soils will be managed during the operation of the Scheme **[EN010118/APP/7.10]**.	Refer to section 9.7 Embedded Design Mitigation of this chapter and ***OCEMP*** **[EN010118/APP/7.10] and OEMP [EN010118/APP/7.10].**

9.5 Assessment Methodology

Study Area

9.5.1 For the purposes of this assessment, a general study area of approximately 1km around the Order limits has been considered in order to identify water bodies that are hydrologically connected to the Order limits and potential works associated with the Scheme that could cause direct impacts.

9.5.2 Given that watercourses flow, water quality and flood risk impacts may propagate downstream, where relevant the assessment will also consider a

wider study area to as far downstream as a potential impact may influence the quality or quantity of the water body (which in this case is typically for a few kilometres). Professional judgement has been applied to identify the extent to which such features are considered within the assessment.

Sources of Information

Desktop Research

9.5.3 The water environment baseline conditions have been determined by a desk study of available information, and various other online data sources including:

a. Online Ordnance Survey (OS) maps viewed to identify any surface water bodies within 1km of the Scheme as well as general topography and land uses (Ref 9-39);

b. Online aerial photography (Ref 9-40);

c. Meteorological Office website for general climate information for the study area (Ref 9-41);

d. National Rivers Flow Archive website (Ref 9-42);

e. Part 1: Anglian River Basin District River Basin Management Plan (Ref 9-34);

f. Environment Agency Catchment Data Explorer website (Ref 9-43);

g. Environment Agency Water Quality Archive website (Ref 9-44);

h. Defra's Multi-agency geographical information for the countryside website (MAGIC) map (Ref 9-45);

i. British Geological Survey (BGS) Geoindex website (Ref 9-46);

j. Natural England website for designated sites (Ref 9-47);

k. Environment Agency Public Registers website – Discharges to Water and Groundwater (Ref 9-48);

l. Environment Agency Water Abstraction Licenses (England) Map Viewer (Ref 9-49);

m. Environment Agency Fish and Ecology Data Viewer (Ref 9-50);

n. Flood Map for Planning (rivers and sea) (Ref 9-51); and

o. Long-term Flood Risk Planning (Ref 9-52).

9.5.4 In addition, further information and data have been obtained directly from Chelmsford City Council and Braintree District Council regarding Private Water Supplies (PWS). Data has also been requested from the Environment Agency as outlined above, but had not been received at the time of writing.

Site Surveys

9.5.5 An initial site walkover survey was undertaken by a water scientist and hydromorphologist on 16th February 2021 to assess watercourse quality and condition. An additional walkover of the proposed cable route to the Bulls Lodge Substation Extension was undertaken on 13th September 2021. Potential watercourse crossing locations for access tracks were also surveyed on this visit.

Impact Assessment Methodology

Source-Pathway-Receptor Approach

9.5.6 Based on professional judgement and experience of other similar schemes, a qualitative assessment of the likely significant effects on surface water quality and water resources has been undertaken.

9.5.7 The predominantly qualitative assessment of the likely significant effects has considered the construction, operation, and decommissioning phases, as well as cumulative effects with other developments. It is based on a source-pathway-receptor approach. For an impact on the water environment to exist the following is required:

a. An impact source (e.g. such as the release of polluting chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or the loss or damage to all or part of a water body);

b. A receptor that is sensitive to that impact (i.e. waterbodies and the services they support); and

c. A pathway by which the two are linked.

9.5.8 The first stage in applying the source-pathway-receptor approach is to identify the causes or 'sources' of potential impact from a development. The sources have been identified through a review of the details of the Scheme, including the size and nature of the development, potential construction methodologies and timescales.

9.5.9 The next step in the model is to undertake a review of the potential receptors, that is, the water environment receptors themselves that have the potential to be affected. Waterbodies, including their attributes, have been identified through desk study and site survey

9.5.10 The last stage of the model is, therefore, to determine if there is a viable exposure pathway or a 'mechanism' linking the source to the receptor. This has been undertaken in the context of local conditions relative to water receptors within the study area, such as topography, geology, climatic conditions and the nature of the impact (e.g. the mobility of a liquid pollutant or the proximity to works that may physically impact a water body).

Assessment of Surface Water Runoff for the Operational Phase

9.5.11 During operation, surface water runoff from the Scheme may contain pollutants derived from impermeable surfaces (e.g. inert particulates, litter, hydrocarbons, metals, nutrients and de-icing salts). This mixture of pollutants is collectively known as ‘urban diffuse pollutants,’ and although each pollutant may itself not be present in harmful concentrations, the combined effects over the long term can cause chronic adverse impacts. Changes in impermeable surfaced area within the Order limits may lead to increases in the rate and quantities of these pollutants being runoff to receiving watercourses. An assessment is therefore needed to determine the potential risk to the receiving waterbodies and to inform the development of suitable treatment measures.

9.5.12 The appropriateness of the surface water drainage measures in terms of providing adequate treatment of diffuse pollutants has been assessed with

reference to the Simple Index Assessment method described in the SuDS Manual (Ref 9-30). The Simple Index Approach follows three steps:

a. Step 1 – Determine suitable pollution hazard indices for the land use(s);

b. Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index (for three key types of pollutants - total suspended solids, heavy metals and hydrocarbons). Only 50% efficiency should be applied to second, third etc. treatment train components; and

c. Step 3 – If the discharge is to a water body protected for drinking water, consider a more precautionary approach.

9.5.13 The SuDS Manual (Ref 9-30) only provides a limited number of land use types so these have been chosen as the most suitable for the components of the Scheme. Where more than one pollution hazard category applies to a component of the Scheme, the worst pollution hazard has been selected.

Hydromorphology

9.5.14 Potential hydromorphological impacts have been qualitatively appraised based on a desk study, a site walkover and a review of the proposed development that may affect the physical form of water bodies.

9.5.15 Consideration has been given to how the Scheme is likely to impact upon the WFD objectives for the relevant watercourses within ***Appendix 9B: WFD Assessment*** Effects are described according to the method for determining effect significance (see below).

Flood Risk Assessment

9.5.16 A site-specific FRA has been prepared for the Scheme. This is presented within ***Appendix 9A: FRA.*** The FRA has been prepared in accordance with the requirements of the NPPF (Ref 9-24) and the accompanying NPPG (Ref 9-25), regional and local policy, and taking into account future climate change. It includes a full review of the flood risk to the Scheme, and identifies preventative measures to mitigate flood risk from all sources, if necessary. ***Appendix 9A: FRA*** also demonstrates how the Sequential Test and Exception Test have been met. The baseline flood risk as determined within the FRA is summarised in Section 9.6 of this chapter, and findings of the assessment summarised in Section 9.8.

Water Framework Directive Assessment

9.5.17 Proposed developments having the potential to impact on current or predicted WFD status are required to assess their compliance against the objectives defined for potentially affected water bodies. As part of its role, the Environment Agency must consider whether proposals for new developments have the potential to:

a. Cause a deterioration of a water body from its current status or potential; and/or

a. Prevent future attainment of Good status (or potential where not already achieved).

9.5.18 The following guidance on how to undertake WFD assessments have been used to inform this assessment:

a. Environment Agency Advice Note - Water Framework Directive Risk Assessment: How to assess the risk of your activity' (Ref 9-53); and

b. The Planning Inspectorate Advice Note 18: The Water Framework Directive' (Ref 9-54).

9.5.19 The assessment has been undertaken in three stages. The first stage is 'screening', the aim of which is to identify the Scheme components that could affect WFD status and 'screen out' aspects of the project that do not require any further consideration. The second stage is 'scoping', whereby WFD receptors that are potentially at risk are identified and it is determined how the risk will be assessed. Finally, and if required, stage 3 involves a full impact assessment, and potentially, consideration of the criteria in Article 4(7) of the Directive, if required. Article 4(7) sets out the conditions that must be met to justify derogation of the Directive.

Matters Scoped Out of the Assessment

9.5.20 Any assessment of potential impact on public potable water supply from the impact assessment has not been scoped into the assessment. The study area is split between two water supply companies, namely Anglian Water and Essex and Suffolk Water. All water companies are required by the Government to produce a Water Resources Management Plan (WRMP) to show how they plan to maintain a secure supply of water to all their customers over the next 25 years. The Scheme boundary is within Anglian Water's South Essex Water Resource Zone (WRZ) within their WRMP (Ref 9-55) and East and Suffolk Water's Essex WRZ (Ref 9-56).

9.5.21 During construction it is envisaged that a temporary potable water supply will be provided, using bottled water, water cooler type supply or similar. Water for construction will similarly not use a mains supply but would be transported to site, using intermediate bulk containers or similar. As there will not be a new formal supply required, assessment of water supply during construction has not been considered further.

9.5.22 The Scheme will contain solar PV technology and no residential usage of water required in the long term, with water demand only required to provide for an estimated eight operation workers on the site. This will have a very minor impact on local potable mains water supplies. Therefore, the assessment of potable water supply during operation has not been considered further.

9.5.23 The River Chelmer is within the study area by virtue of the inclusion of Wheeler's Hill and Cranham Road in the Order limits to accommodate carriageway improvements along these roads for HGV access to the Scheme. Wheeler's Hill marks the catchment divide between the Ter and Chelmer catchments, and given the distance between the River Chelmer (or its tributaries) and any road improvements required by the Scheme (>800m) it is considered that this watercourse can be scoped out of further assessment with no reasonable pathway to impact having been identified. As such, it has not been considered further within the chapter.

Significance Criteria

9.5.24 As outlined in ***Chapter 5 EIA Methodology*** **[EN010118/APP/6.1]**, the evaluation of the significance of an effect is important; it is the significance that determines the resources that should be deployed in avoiding or mitigating a significant adverse effect, or conversely, the actual value of a beneficial effect.

9.5.25 The significance of effects for the water environment will be determined using the principles of the guidance and criteria set out in the Design Manual for Roads and Bridges (DMRB) LA113 Road Drainage and the Water Environment (Ref 9-57) and DMRB LA104 Environmental Assessment and Monitoring (Ref 9-58) adapted for this assessment to take account of hydromorphology. Although these assessment criteria were developed for road infrastructure projects, this method is suitable for use on any development project and it provides a robust and well tested method for predicting the significance of effects. The methodology also considers advice set out in Department of Transport TAG Unit A3, Environmental Impact Appraisal (Ref 9-59). The criteria that will be used to determine receptors importance is presented in **Table 9-2**.

9.5.26 Whilst other disciplines may consider 'receptor sensitivity', 'receptor importance' is considered here. This is because when considering the water environment, the availability of dilution means that there can be a difference in the sensitivity and importance of a water body. For example, a small drainage ditch of low conservation value and biodiversity with limited other socio-economic attributes, is very sensitive to impacts, whereas an important regional scale watercourse, that may have conservation interest of international and national significance and support a wider range of important socio-economic uses, is less sensitive by virtue of its ability to assimilate discharges and physical effects. Irrespective of importance, all controlled waters in England are protected by law from being polluted.

9.5.27 There are three stages to the assessment of effects on the water environment:

a. A level of importance (low to very high) is assigned to the water resource receptor based on a combination of attributes (such as the size of the watercourses, WFD designation, water supply and other uses, biodiversity, and recreation etc.) and on receptors to flood risk based on the vulnerability of the receptor to flooding;

b. The magnitude of potential and residual impact (classed as negligible, minor, moderate or major adverse / beneficial) is determined based on the criteria listed in Table 9-3 and the assessor's professional judgment. Embedded or standard mitigation measures are taken into account in the initial assessment, but any other mitigation is not considered until the assessment of residual effects; and

c. A comparison of the importance of the resource and magnitude of the impact (for both potential and residual impacts) results in an assessment of the overall significance of the effect on the receptor using the matrix presented in Table 9-4. The significance of each identified effect (both potential and residual) is classed as very large, large, moderate, slight or neutral and either beneficial or adverse significance.

Table 9-2. Criteria to Determine Receptor Importance, adapted from DMRB LA113 (Ref 9-57) and TAG Unit A3 (Ref 9-59) [1]

Importance	General criteria	Surface Water	Groundwater	Hydromorphology[2]	Flood Risk
Very High	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.	EC Designated Salmonid / Cyprinid fishery; Watercourse having a WFD classification as shown in a River Basin Management Plan (RBMP) and Q95 ≥ 1.0m^3/s; site protected / designated under EC or UK habitat legislation (SAC, SPA, SSSI, WPZ, Ramsar site. Critical social or economic uses (e.g. public water supply and navigation).	Source Protection Zone (SPZ) 1; Principal aquifer providing a regionally important resource and/or supporting a site protected under EC and UK legislation; Groundwater locally supports GWDTE; Water abstraction: >1,000m^3/day	Unmodified, near to or pristine conditions, with well-developed and diverse geomorphic forms and processes characteristic of river and lake type.	Essential Infrastructure or highly vulnerable development.
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance.	Watercourse having a WFD classification as shown in a River Basin Management Plan (RBMP) and Q95 < 1.0m^3/s; Major Cyprinid Fishery; Species protected under EC or UK habitat legislation. Critical social or economic uses (e.g. water supply and navigation). Important social or economic uses such as water supply, navigation or mineral extraction.	Principal Aquifer providing locally important source supporting rover ecosystem; SPZ2; Groundwater supports GWDTE; Water abstraction: 500-1,000m^3/day.	Conforms closely to natural, unaltered state and will often exhibit well-developed and diverse geomorphic forms and processes characteristic of river and lake type. Deviates from natural conditions due to direct and/or indirect channel, floodplain, bank modifications and/or catchment development pressures.	More vulnerable development.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value or is of regional importance.	Watercourse detailed in the Digital River Network but not having a WFD classification as shown in a RBMP. May be designated as a local wildlife site (LWS) and support a small / limited population of protected species. Limited social or economic uses.	Secondary Aquifer providing water for agricultural or industrial use with limited connection to surface water SPZ 3; Water abstraction: 50-499m^3/day.	Shows signs of previous alteration and/or minor flow / water level regulation but still retains some natural features or may be recovering towards conditions indicative of the higher category.	Less vulnerable development.
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance.	Surface water sewer, agricultural drainage ditch; non-aquifer WFD Class 'Poor' or undesignated in its own right. Low aquatic fauna and flora biodiversity and no protected	Generally Unproductive strata. Water abstraction: <50m^3/day	Substantially modified by past land use, previous engineering works or flow / water level regulation. Watercourses likely to possess an artificial cross-section (e.g. trapezoidal) and	Water compatible development.

Importance	General criteria	Surface Water	Groundwater	Hydromorphology[2]	Flood Risk
		species. Minimal economic or social uses.		will probably be deficient in bedforms and bankside vegetation. Watercourses may also be realigned or channelised with hard bank protection, or culverted and enclosed. May be significantly impounded or abstracted for water resources use. Could be impacted by navigation, with associated high degree of flow regulation and bank protection, and probable strategic need for maintenance dredging. Artificial and minor drains and ditches will fall into this category.	
Negligible	The receptor is resistant to change and is of little environmental value	Not applicable.	Not applicable.	Not applicable.	Not applicable.

Note 1: Professional judgement is applied when assigning an importance category to all water features. The WFD status of a watercourse is not an overriding factor and, in many instances, it may be appropriate to upgrade a watercourse which is currently at poor or moderate status to a category of higher importance to reflect its overall value in terms of other attributes and WFD targets for the watercourse. Likewise, a watercourse may be below Good Ecological Status, this does not mean that a poorer quality discharge can be emitted. All controlled waters are protected from pollution under the Environmental Permitting (England and Wales) Regulations 2016 and the Water Resources Act 1991 (as amended), and future WFD targets also need to be considered.

Note 2: Based on the water body 'Reach Conservation Status' presently being adopted for a major infrastructure project (and developed originally by Atkins) and developed from Environment Agency conservation status guidance (Ref 9-60, Ref 9-61) as LA113 (Ref 9-57) does not provide any criteria for morphology.

9.5.28 It is worth noting that the importance of waterbodies has been determined taking account of any relevant ecological nature conservation designation, but also aquatic protected species that may be present. Current information on the potential for aquatic protected species to be present is described in ***Chapter 8: Ecology***, of this ES [**EN010118/APP/6.1**].

9.5.29 The magnitude of impact has been determined based on the criteria in **Table 9-3** taking into account the likelihood of the effect occurring. The likelihood of an effect occurring is based on a scale of certain, likely or unlikely. Likelihood has been considered in the case of the assessment of potential impacts to water bodies only, as likelihood is inherently included within the flood risk assessment.

Table 9-3 Magnitude of Impact Criteria, adapted from DMRB LA113 (Ref 9-57)

Magnitude of Impact	*Description*	*Examples*
Major Adverse	Results in a loss of attribute and/ or quality and integrity of the attribute.	Surface water: Loss or extensive change to a fishery. Loss of regionally important public water supply. Loss or extensive change to a designated nature conservation site. Reduction in water body WFD classification Groundwater: Loss of, or extensive change to, an aquifer. Loss of regionally important water supply. Loss of, or extensive change to groundwater dependent terrestrial ecosystem (GWDTE) or baseflow contribution to protected surface water bodies. Reduction in water body WFD classification. Loss or significant damage to major structures through subsidence or similar effects. Flood Risk: Increase in peak flood level >100 mm.
Moderate Adverse	Results in impact on integrity of attribute, or loss of part of attribute.	Surface water: Partial loss in productivity of a fishery. Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies. Contribution to reduction in water body WFD classification Groundwater: Partial loss or change to an aquifer. Degradation or regionally important public water supply or loss of significant commercial/industrial/agricultural supplies. Partial loss of the integrity of GWDTE. Contribution to reduction in water body WFD classification. Damage to major structures through subsidence or similar effects or loss of minor structures. Flood Risk:

Magnitude of Impact	*Description*	*Examples*
		Increase in peak flood level > 50mm
Minor Adverse	Results in some measurable change in attribute's quality or vulnerability.	Surface water: Minor effects on water supplies. Groundwater: Minor effects on an aquifer, GWDTEs, abstractions and structures. Flood Risk: Increase in peak flood level >10mm
Negligible	Results in impact on attribute, but of insufficient magnitude to affect the use or integrity.	Surface / Groundwater: The proposed project is unlikely to affect the integrity of the water environment. Flood Risk: Negligible change to peak flood level (≤ +/- 10mm).
Minor Beneficial	Results in some beneficial impact on attribute or a reduced risk of negative impact occurring.	Surface Water: Contribution to minor improvement in water quality, but insufficient to raise WFD classification. Groundwater: Reduction of groundwater hazards to existing structures. Reductions in waterlogging and groundwater flooding. Flood Risk: Creation of flood storage and decrease in peak flood level (>10 mm).
Moderate beneficial	Results in moderate improvement of attribute quality.	Surface Water: Contribution to improvement in waterbody WFD classification. Groundwater: Contribution to improvement in water body WFD classification. Improvement in water body catchment abstraction management Strategy (CAMS) (or equivalent) classification. Support to significant improvements in damaged GWDTE. Flood Risk: Creation of flood storage and decrease in peak flood level (>50 mm).
Major beneficial	Results in major improvement of attribute quality	Surface Water: Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring to a watercourse. Improvement in water body WFD classification. Groundwater: Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. Recharge of an aquifer. Improvement in water body WFD classification. Flood Risk: Creation of flood storage and decrease in peak flood level (>100 mm).

Magnitude of Impact	*Description*	*Examples*
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.	

9.5.30 The following significance categories have been used for both potential and residual effects:

a. **Negligible**: An imperceptible effect or no effect to a water resource receptor;

b. **Beneficial**: A beneficial / positive effect on the quality of a water resource receptor; or

c. **Adverse**: A detrimental / negative effect on the quality of a water resources receptor.

9.5.31 In the context of this assessment, an effect can be temporary or permanent, with effects quantified temporally as being short-term (0-5 years), medium term (6-10 years) and long-term (>10 years).

9.5.32 At a spatial level, 'local' effects are those affecting the Scheme within the Order limits and neighbouring receptors within the study area, while effects upon receptors beyond the vicinity of the study area are considered to be at a 'regional' level. Effects which affect different parts of the country, or England as a whole, are considered being at a 'national' level.

9.5.33 The importance of the receptor (**Table 9-2**) and the magnitude of impact (**Table 9-3**) are determined independently from each other and are then used to determine the overall significance of effects (**Table 9-4**). Options for mitigation will be considered and secured where possible to avoid, minimise and reduce adverse impacts, particularly where significant effects may have otherwise occurred. The residual effects of the Scheme with identified mitigation in place will then be reported. Effects of moderate or greater are considered significant in planning terms.

Table 9-4: Matrix for Assessment of Significance (adapted from DMRB LA 104, Ref 9-58)

Importance of Receptor	*Magnitude of Impact*				
	Major	**Moderate**	**Minor**	**Negligible**	**No change**
Very High	Very Large	Large or Very Large	Moderate or Large	Slight	Neutral
High	Large or Very Large	Moderate or Large	Slight or Moderate	Slight	Neutral
Medium	Moderate or Large	Moderate	Slight	Neutral or Slight	Neutral
Low	Slight or Moderate	Slight	Neutral or Slight	Neutral or Slight	Neutral
Negligible	Slight	Neutral or Slight	Neutral or Slight	Neutral	Neutral

9.6 Baseline Conditions

9.6.1 This section provides a description of the current Scheme baseline and identifies the sensitive receptors and their individual importance (value). The waterbodies within the study area fall under the Essex Combined Management Catchment within the Anglian RBMP (Ref 9-34).

9.6.2 Where relevant, waterbodies and their attributes have been presented in a series of figures that support this chapter. ***Figure 9-1*** presents surface and groundwater bodies, ***Figure 9-2*** shows Environment Agency Flood Zones, and ***Figure 9-3*** shows Surface Water Flood Risk.

Existing Baseline

Topography, Land Use and Rainfall

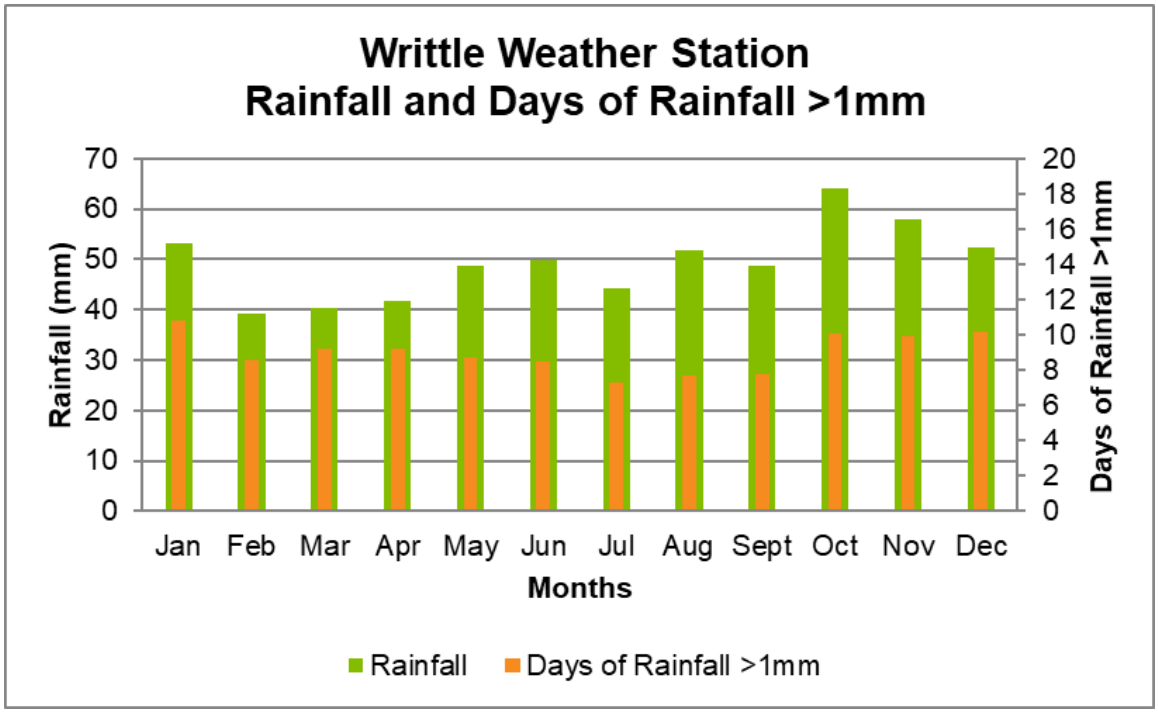
9.6.3 The topography of the study area is shaped by the River Ter catchment, which flows west to east through the northern extent of the Scheme (see ***Figure 9-1: Water Resources Features and Attributes***). The land rises gently from the Ter valley bottom to the north and south-west. The river in the valley bottom within the Order limits is between approximately 20m and 30m above ordnance datum (AOD), rising to around 65m AOD at the northern study area boundary and 45m AOD at the south-western boundary. To the east of the Order limits the River Ter changes course to flow south towards Hatfield Peverel. As such the land to the south-east of the Order limits falls in elevation towards the river, with this part of the Scheme boundary to the east of Toppinghoehall Wood being at approximately 40m AOD. Land also falls in elevation to the south-west of the Order limits along the Boreham Tributary watercourse and towards the Bulls Lodge Substation, which is at 30m AOD. The western arm of the Scheme boundary from Russell Green and extending along Cranham Road and Wheeler's Hill generally rises in elevation towards 65m AOD at Wheeler's Farm, and this marks the watershed divide between the River Ter catchment within which the Scheme is located, and the River Chelmer catchment to the west.

9.6.4 The land use within the study area is generally a mosaic of arable fields and woodland with several small ponds and springs scattered across the site, with some larger still-water waterbodies present to the south and south-west between Russell Green and Boreham. These are beyond the Order limits and generally follow the course of the Boreham Tributary (see ***Figure 9-1: Water Resources Features and Attributes***). There is a Hanson Aggregates sand and gravel quarry immediately west of the Scheme and to the north of the Order limits (Bulls Lodge Quarry), west of Waltham Road, where there are several large waterbodies formed from the quarrying activity. This quarry site includes the disused Boreham Airfield. The A12 and a railway line are located immediately south of the Order limits beyond Bulls Lodge, with the villages of Hatfield Peverel and Boreham to the south of the A12. The village of Fuller Street is approximately 350m north of the northern Order limits, Terling is approximately 1.3km to the east of the northern extent of the Order limits. Numerous minor roads and tracks cross the Scheme area including within the Order limits.

9.6.5 Based on the Meteorological Office website (Ref 9-41), the nearest weather station is located at Writtle (TL 68040 06608), approximately 10km south-east

of the Order limits. Using data from this weather station, it is estimated that the study area experiences an average of approximately 590mm of rainfall per year, with it raining more than 1mm on approximately 108 days per year (see Plate 9-1), which are both low in the UK context (i.e. the west of the UK experiences over 800 mm typically per year). This is relevant to the whole study area.

Plate 9-1 Total Rainfall and Days of Rainfall >1mm at Writtle Weather Station (Source: Met Office, Ref 9-41)



Surface Water Bodies

9.6.6 The Order limits are located within the Anglian River Basin District, Essex Combined Management Catchment and Chelmer Operational Catchment. (Ref 9-43). There are three WFD designated watercourses within the study area; the River Ter, River Chelmer and Boreham Tributary (also known as Boreham Brook), as shown on ***Figure 9-1*** (please refer throughout the baseline section). Although these are the WFD reporting reaches, WFD principles and objectives apply to all tributaries of these watercourses.

9.6.7 It is worth noting that the WFD classifications presented herein refer to the Cycle 2 classifications, dated to 2015. Under the WFD, the Environment Agency is obligated to review and update RBMPs every six years, so Cycle 3 RBMPs are due to be published in 2021 (not yet published at the time of writing in December 2021).

9.6.8 It is also important to note that, within Cycle 2, the monitoring and assessment of Chemical Status in surface waterbodies has changed to include 2019 data. This is based on new priority substances and stricter standards than had been applied previously and had been used for the 2015 RBMP classifications. The Environment Agency now measures the presence of more persistent chemical substances in waterways that are considered to more accurately represent the environment and chemical habitat quality.

9.6.9 The introduction of these standards has meant that no surface waterbodies within the potential zone of influence of the Scheme now meet the criteria for achieving 'Good' Chemical Status, and the chemical status of these water bodies appears to have dropped from 'Good' in 2015 to 'Fail' in 2019. This is due to failing on the newly introduced substances and does not mean that water quality has deteriorated over this period.

River Ter

9.6.10 The River Ter is a Main River and rises at Porter's Hall (NGR TL 67949 23746), some 10km north-west of the Scheme boundary. It flows in a generally south-westerly direction to meet the River Chelmer to the south of Hatfield Peverel (NGR TL 79459 08983), approximately 9.75km downstream of the Order limits. Its overall length is 31.3km and it drains a catchment area of 79.5km^2. Within the north section of the Order limits, an approximate length of 120m crosses the Order limits between NGR TL 74677 15439 and TL 74762 15477 (see ***Figure 9-1***) to the south of the hamlet of Fuller Street and west of Sandy Wood. The watercourse then continues east to Terling and then flows south to meet the River Chelmer to the south of Hatfield Peverel.

9.6.11 The River Ter designated WFD waterbody (ID: GB105037033940) is at Moderate Ecological Status and Fail Chemical Status. It is not achieving Good Status due to phosphates being at Moderate status. The Environment Agency have identified sewage discharge, poor nutrient management, poor livestock management and transport drainage as key catchment pressures (Ref 9-43). This WFD waterbody had an Overall Water Body objective of Moderate in 2015, which it is at. It does not have a higher objective due to an unfavourable balance of costs and benefits.

9.6.12 A stretch of the River Ter from shortly upstream of the Order limits (south of Fuller Street) to downstream at Terling village, was observed during the site walkover. The watercourse has a single thread channel of around 3m width and a meandering planform, although is modified in places beneath numerous road crossings in the area and around agricultural land. During the site visit there was a gliding, uniform flow. The watercourse has a gravel bed which in places is covered by fine sediment. Lateral bank erosion was observed in places, as well as numerous woody debris features. The floodplain through this section is relatively narrow with hillsides rising away steeply from the channel. The floodplain was not well connected to the channel for much of the reach, with the channel being over-deep in places. Several springs rise either side of the channel and drain in via small first order tributaries, and several drains also flow into the watercourse through this section. Photos of watercourses are included within ***Appendix 9B: WFD Assessment.***

9.6.13 Approximately 900m downstream of the Order limits there is a tufa spring on the right riverbank, shortly upstream of Ridley Hall. Tufa (or travertine) is a form of calcium carbonate and in certain situations is deposited within springs or streams over limestone or chalk geology. Tufa forms over a variety of surfaces such as rocks, tree roots as well as some plants (e.g. mosses or liverworts) (Ref 9-62).

9.6.14 The river is generally shaded throughout the section within and adjacent to the Order limits by an abundance of trees along the banks consisting mostly of

white willow (*Salix alba*), other willow species (species of Salix), alder (*Alnus glutinosa*) with occasional hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), elm (a species of *Ulmus*) and field maple (*Acer campestre*). Flora on the often-shaded banks included hop (*Humulus lupulus*), ramsons (*Allium ursinum*), common nettle (*Urtica dioica*) and creeping thistle (*Cirsium arvense*).

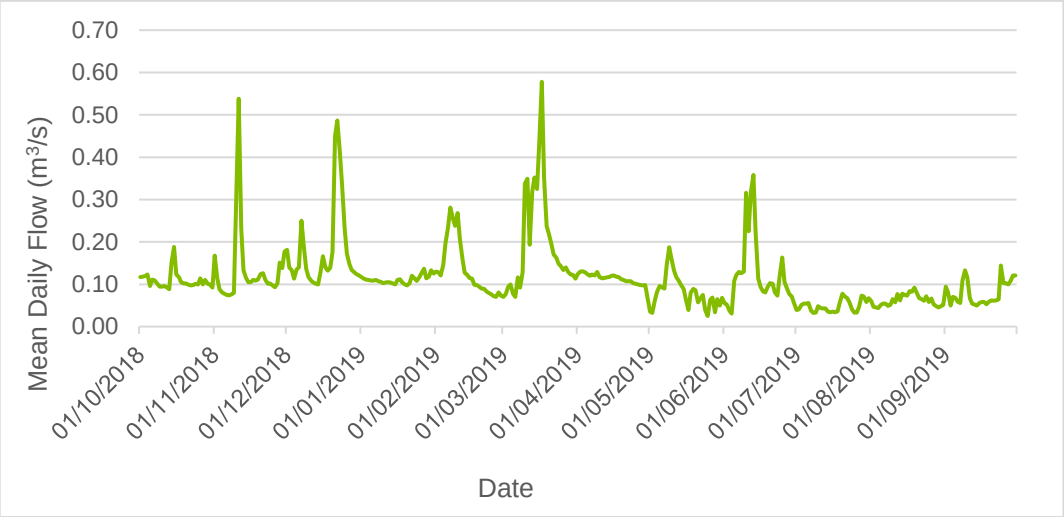
9.6.15 Marginal and emergent species along the River Ter included; hemp agrimony (*Eupatorium cannabinum*), pendulous sedge (*Carex pendula*), great willowherb (*Epilobium hirsutum*), gipsywort (*Lycopus europaeus*), water pepper (*Persicaria hydropiper*), lesser water-parsnip (*Berula erecta*), bulrush (*Typha latifolia*) and water mint (*Mentha aquatica*). Water starwort (*Callitriche palustris*) was occasionally noted submerged in the river. No other submerged or floating aquatic macrophytes were observed.

9.6.16 A significant tributary of the River Ter (labelled T1 on ***Figure 9-1: Water Resources Features and Attributes***) rises immediately east of the Order limits near Roll's Farm (NGR TL 76011 14018). It is approximately 1.4km in length and flows north-east through a gentle valley towards Terling, where it flows parallel to Church Road and meets the River Ter downstream of the village to the west of Terling Place at NGR TL 77108 14645.

9.6.17 The tributary was observed along its entire length on the site walkover and is approximately 1-2m in width, is artificially straight (showing signs of previous alteration) and has steep, incised banks in places. There is some gravel on the bed, but fine sediment had accumulated in places. Some sections of the watercourse had buffer zones from agricultural runoff, but this varied in width along the tributary. In-channel vegetation is choking the bed in places, and some sections are heavily shaded by overhanging deciduous vegetation. Several field drains connect to this tributary of Ter Brook along its length.

9.6.18 The nearest gauging station for the River Ter on the National River Flow archive is at Crabb's Bridge (Ref 9-42) to the south-west of Hatfield Peverel, and approximately 7.25km downstream of the Order limits (NGR TL7864510753). The channel has been modified at the monitoring station into a concrete trapezoidal flumed section to enable accurate discharge measurement, and the site has been monitored between 1932 and 2019. Annual mean flow at this station is 0.297 cubic metres per second (m^3/s), with a maximum daily flow of 7.97m^3/s registered on 1st February 1979. The flow that is exceeded 95% of the time (Q95) is 0.034 m^3/s. The daily mean flow for the period 01st October 2018 to 31st September 2019 is shown in Plate 9-2.

Plate 9-2 Mean daily flow for the River Ter at the Crabb's Bridge Gauging Station (Source: National River Flow Archive, Ref 9-42)



9.6.19 According to the Terling and Fairstead Parish Council, Terling Ford (TL 76795 15104) and Paulk Hall Lane Ford (TL 73143 15686) which both cross the River Ter have occasional recreational use for summer bathing. Paulk Hall Lane Ford is approximately 1.9km upstream of the Order limits, while Terling Ford is approximately 3km downstream of the Order limits.

Boreham Tributary

9.6.20 The western extent of the Order limits falls within the catchment of Boreham Brook, which is WFD designated as the Boreham Tributary catchment (ID: GB105037033910). This watercourse rises from a small pond north of Drakes Lane (TL 73669 13337). It flows in a south-easterly direction through the quarried area alongside Boreham Road and Waltham Road, north of Boreham village. The watercourse flows into the Order limits briefly at Porter's Grove, to the south of the quarry ponds. It then changes to a westerly course to the north of the A12 and flows past Brick House Farm and the Bulls Lodge substation on its southern side. A tributary joins the watercourse between Brick House Farm and Bulls Lodge at TL 74630 10006, and the watercourse then flows south beneath the A12. From this point it becomes a WFD designated waterbody (WFD ID GB105037033910). It flows around the southern extent of Boreham village and then south-east to meet the River Chelmer adjacent to Church Road (TL 76283 08599). The confluence with the River Chelmer is approximately 4km downstream of the Order limits. The length of the WFD designated reach is 2.68km, and it drains a catchment of 17.3km^2 (Ref 9-41). Upstream of Brick House Farm, Boreham Tributary is an ordinary watercourse, while it becomes Main River south of Brick House Farm.

9.6.21 The Catchment Data Explorer website (Ref 9-43) indicates that the WFD Boreham Tributary watercourse is at Moderate Ecological Status (for the 2019 classification having been at Good Status under the 2016 classification) and Fail Chemical Status. The WFD water body has an objective of Good in 2015 listed on Catchment Data Explorer (Ref 9-43).

9.6.22 The watercourse was observed between Porter's Grove and the A12 during the site walkover. It is a single thread channel which appears artificially straight in places. Around Porter's Grove it is around 1-2m wide and had a depth of

around 0.3m in low flow conditions at the time of the site visit. Here, the channel had a clean gravel bed and was well connected to the floodplain. This section of the channel is surrounded by woodland with tree trunks rising from the banks in places, and several woody debris features were present giving some flow diversity. Further downstream between Porter's Grove and Brick House Farm the channel is more visibly modified. It is over-deep in places with very straight uniform banks. The channel is partly tree-lined with specimens exhibiting similar age and character suggesting they were planted when the channel was modified. Continuing past Brick House Farm, the channel shape becomes less defined with some over-wide sections. It is not expected that the channel would have typically had large meanders or bends, but the extremely straight nature of the channel suggests that it was previously straightened into the planform observed today, and the trees would have helped minimise any change in planform. Fine sediment has accumulated on the bed through this section and flow velocities are reduced. Fine sediment is likely to be derived, at least in part, from the adjacent arable fields which slope down towards the watercourse, as well as from the lower channel gradient in this reach of the watercourse.

9.6.23 There are no gauging stations listed for this watercourse on the National River Flow Archive website (Ref 9-42).

River Chelmer

9.6.24 The River Chelmer flows through the western extent of the study area in a north to south direction (see ***Figure 9-1: Water Resource Features and Attributes***) but does not cross into the Order limits, being approximately 875m from the Order limits at its closest. The River Chelmer is a Main River and rises at Rowney Wood near Debden, some 25km northwest of the Scheme as the crow flies. From the study area the river continues south through Chelmsford before taking an easterly course to meet the River Blackwater at Maldon.

9.6.25 The River Chelmer within the study area is WFD designated as the 'Chelmer (Gt. Easton – R. Can)' waterbody (ID: GB105037033950). It is at Moderate Ecological Status and Fail Chemical Status. The Environment Agency have identified physical modifications, transport drainage, sewage discharge and poor nutrient management as key catchment pressures (Ref 9-43). This WFD waterbody had an overall waterbody objective of Moderate by 2015. It does not have a higher objective due to being disproportionately expensive and technically infeasible.

9.6.26 The River Chelmer is within the study area by virtue of the inclusion of Wheeler's Hill and Cranham Road in the Order limits to accommodate carriageway improvements along these roads for HGV access to the Scheme. Wheeler's Hill marks the catchment divide between the Ter and Chelmer catchments, and given the distance between the River Chelmer (or its tributaries) and any road improvements required by the Scheme (>800m) it is considered that this watercourse can be scoped out of further assessment with no reasonable pathway to impact having been identified. As such, it has not been considered further within the chapter.

Other Surface Water Bodies

9.6.27 In addition to the WFD designated River Ter and Boreham Tributary, there are several undesignated tributaries of these waterbodies present within the Order limits. These are predominantly unnamed agricultural ditches, drains and springs, some of which provide connectivity between the Scheme, the River Ter and Boreham Tributary. These various watercourses are shown on ***Figure 9-1: Water Resource Features and Attributes*** (labelled as T1, T2 etc). These are generally very straight, heavily modified watercourses, and around 1-2m wide.

9.6.28 There are also numerous ponds and still waters located across the Scheme area along with a collection of former gravel pits to the west of the Order limits associated with quarrying activity (e.g. Bulls Lodge quarry) (see ***Figure 9-1: Water Resource Features and Attributes***).

9.6.29 A total of 97 ponds have been identified within 500m of the Order limits refer to ***Chapter 8: Ecology* [6.1] *and Appendix 8D: Aquatic Ecology Survey Report;*** 23 of these are located within the Order limits. Ecological value of these ponds is detailed later in the baseline. The largest ponds are the former gravel pits, with the largest to the west of Brent Hall Lodge being approximately 5.3ha in area. These former gravel pits are all located west of Waltham Road and outside of the Order limits. Three of these waterbodies situated to the south of Wallace's Lane are part of the Boreham Mere fishery, owned by the Chelmsford Angling Association. Information available on the Chelmsford Angling Association website (Ref 9-63) indicates that species contained within the ponds include tench (*Tinca tinca*), bream (*Abramis brama*), perch (*Perca fluviatilis*), carp (*Cyprinus carpio*), pike (*Esox lucius*), rudd (*Scardinius erythrophthalmus*), roach (*Rutilus rutilus*) and eel (*Anguilla anguilla*).

9.6.30 There is an irrigation reservoir of 0.8ha area located 650m north-east of the Order limits adjacent to the River Ter. The remainder of the ponds across the study area are predominantly small, isolated waterbodies. There are notable clusters around Scarlett's Farm (centred on NGR TL 74657 14419), Ringer's Wood (centred on NGR TL 75655 13582), Bird's Farm (centred on TL 74542 13420) and Toppinghoehall Wood (centred on NGR TL 76385 12173). Refer to ***Figure 1*** within ***Appendix 8D: Aquatic Ecology of the ES [6.2]*** for pond location details.

Water Quality

9.6.31 Water quality data for the River Ter and Boreham Tributary has been obtained from the Environment Agency's Water Quality Archive website (Ref 9-44) and is summarised in **Table 9-5** and **Table 9-6** respectively, with WFD standards provided for comparison in **Table 9-7**.

9.6.32 The River Ter monitoring location is at Crabb's Bridge (NGR TL 78870 10688, Station ID: AN-TE0107), approximately 7.25km downstream of the Order limits. The data in **Table 9-5** is based on 17 samples obtained between May 2019 and September 2021. This is the most recent data available.

9.6.33 The Boreham Brook monitoring location is adjacent to a pumping station near Boreham Hall Cottages (NGR TL 75409 09224, ID: AN-CH0276),

approximately 3km downstream of the Order limits. The data in **Table 9-6** is based on 12 samples obtained between January 2016 and April 2017. This is the most recent data available.

Table 9-2 Summary of Environment Agency Water Quality data for the River Ter (based on 17 samples)

Determinands	*Units*	*Average*	*Max*	*Min*	*90th%ile*	*10th%ile*	*Std Dev*
pH	pH Units	8.08	8.21	7.78	8.19	7.93	0.11
Temperature of Water	°C	11.6	17.2	5.0	15.2	7.3	3.5
Conductivity at 25°C	µs/cm	935	1010	804	998	874	57
Biochemical Oxygen Demand (BOD): 5 Day ATU	mg/l	1.2	2.0	1.0	1.5	1.0	0.3
Ammoniacal Nitrogen as N	mg/l	0.033	0.040	0.030	0.037	0.030	0.004
Nitrogen, Total Oxidised as N	mg/l	12.69	16.00	5.51	16.00	7.37	3.22
Nitrate as N	mg/l	12.68	16.00	5.48	16.00	7.35	3.23
Nitrite as N	mg/l	0.026	0.062	0.013	0.037	0.014	0.012
Ammonia un-ionised as N	mg/l	0.0007	0.0011	0.0003	0.0009	0.0004	0.0002
Alkalinity to pH 4.5 as $CaCO_3$	mg/l	229	270	150	255	185	31
Orthophosphate, reactive as P	mg/l	0.3348	0.6800	0.1000	0.5520	0.1400	0.1780
Oxygen, Dissolved, % Saturation	%	91.5	102.0	79.6	100.7	82.6	6.9
Oxygen, Dissolved as O_2	mg/l	10.01	12.00	8.54	11.85	8.62	1.28

9.6.34 Table 9-5 indicates the River Ter is slightly alkaline in nature with an average pH of 8.08 and falls within the WFD High classification (see **Table 9.7** for WFD environmental quality standards), based on the 17 samples considered here. A 10th percentile dissolved oxygen saturation of 82.6% is in the High WFD classification (with a 10th percentile of 70% being High) which suggests the waterbody is not limited by dissolved oxygen levels. BOD also meets the High

WFD classification (90th percentile lower than 4 milligrams per litre (mg/l)), suggesting low levels of organic pollution.

9.6.35 Ammonia levels fall within the WFD classification for High (90th percentile lower than 0.6 mg/l) which similarly suggests pollution from organics such as sewage materials are not having a detrimental impact on the waterbody.

9.6.36 Nitrate and orthophosphate values are elevated (mean of 12.68 mg/l and 0.334 mg/l respectively) and may be related to a sewage treatment works located shortly upstream of the monitoring point, as well as pressure from the surrounding agricultural land uses through use of fertilisers and other products which may runoff to the watercourse.

Table 9-6 Summary of Environment Agency Water Quality data for the Boreham Brook (based on 12 samples)

Determinands	*Units*	*Average*	*Max*	*Min*	*90th%ile*	*10th%ile*	*Std Dev*
pH	**pH Units**	8.08	8.19	7.95	8.18	8.00	0.069
Temperature of Water	**°C**	10.5	16.6	4.6	15.9	5.75	4.14
Conductivity at 25°C	**µs/cm**	809	890	628	883	681	82.74
Ammoniacal Nitrogen as N	**mg/l**	0.044	0.06	0.032	0.0562	0.0338	0.012
Nitrogen, Total Oxidised as N	**mg/l**	5.541	8.18	2.41	6.535	4.51	1.34
Nitrate as N	**mg/l**	5.528	8.15	2.4	6.525	4.499	1.34
Nitrite as N	**mg/l**	0.014	0.0297	0.0057	0.0223	0.0064	0.007
Ammonia un-ionised as N	**mg/l**	0.001	0.001	0.0004	0.0008	0.0004	0.0002
Alkalinity to pH 4.5 as CaCO3	**mg/l**	208	236	142	230	183	25.88
Orthophosphate, reactive as P	**mg/l**	0.052	0.12	0.024	0.063	0.032	0.023
Oxygen, Dissolved, % Saturation	**%**	97.7	118	86.2	104.1	91.0	7.58
Oxygen, Dissolved as O2	**mg/l**	11.01	13.9	8.49	12.73	8.91	1.52
Determinands	**Units**	**Average**	**Max**	**Min**	**90th%ile**	**10th%ile**	**Std Dev**

9.6.37 **Table 9-6** indicates the Boreham Brook is slightly alkaline in nature with an average pH of 8.08 and falls within the WFD High classification based on the

14 samples considered here. A 10th percentile dissolved oxygen saturation of 91% is classified as High which suggests the waterbody is not limited by dissolved oxygen levels.

9.6.38 Ammonia levels fall within the WFD classification for Good which similarly suggests pollution from organics such as sewage materials are not having a detrimental impact on the waterbody.

9.6.39 Similarly to the River Ter, nitrate values are somewhat elevated (mean 5.5 mg/l) and indicate probably pressure from the surrounding agricultural land uses through use of fertilisers and other products which may runoff to the watercourse. However, orthophosphate values are lower (mean 0.05 mg/l).

Table 9-7 Summary of WFD Standards for Lowland Inland Surface Waters (i.e. these are the relevant standards for the River Ter and Boreham Tributary watercourses)

Determinand	*Unit*	*Statistic*	*High*	*Good*	*Moderate*	*Poor*	*Bad*
BOD	mg/l	90%ile	4	5	6.5	9	>9
Ammonia	mg/l	90%ile	0.3	0.6	1.1	2.5	>2.5
Dissolved Oxygen	% sat	10%ile	70	60	54	45	<45
pH	pH units	High-Good: 5 and 95%ile; Mod-Poor 10%ile	>6 &<9	>6 &<9	4.7	4.2	<4.2
Temperature	Degrees Celsius (ºC)	98%ile (not in salmonid WBs and canals)	25	28	30	32	>32

Aquatic Ecology in Watercourses

9.6.40 According to the Environment Agency's Fish and Ecology Data Explorer online tool (Ref 9-50), no aquatic or fish surveys have been carried out within 1km of the Order limits since 2010. However, downstream of the Order limits, a number of surveys have been carried out on the River Ter and Boreham Tributary. Fish and macrophyte data were only available for the River Ter within this time period, while macroinvertebrate data was available for both the River Ter and Boreham Tributary.

9.6.41 Furthermore, Scheme specific pond surveys, macroinvertebrate surveys of the River Ter and white clawed crayfish surveys have been undertaken to inform the ES. Results are reported in full in ***ES Chapter 8 Ecology and Appendix 8D Aquatic Ecology Report***.

Fish

9.6.42 Two fish surveys were carried out by the Environment Agency (Ref 9-50) at the Nounsley Ford site on the River Ter in May 2013 and May 2019 (NGR TL 7956 1015), over 9km downstream of the Order limits and shortly upstream of the confluence with the River Chelmer. The 2013 survey was dominated by roach (*Rutilus rutilus*) with a total of 116 fish recorded over three runs. Three

brown/sea trout (*Salmo trutta*), 39 European eels/elvers (*Anguilla Anguilla*) and five bullhead (*Cottus gobio*) were also recorded during this survey.

9.6.43 The 2019 survey was dominated by roach (*Rutilus rutilus*) with a total of 107 fish recorded over two runs. Eight bullhead (*Cottus gobio*), 43 European eels/elvers (*Anguilla Anguilla*) and two brook lamprey ammocoetes (*Lampetra planeri*) were also recorded during this survey. Brown Trout and Bullhead were also observed in the River Ter during the aquatic surveys for the Scheme.

9.6.44 European eels/elvers (*Anguilla Anguilla*) are protected under the European Eel Regulation (European Commission) No. 1100/2007 and the Eels (England and Wales) Regulations 2009 (Ref 9-12). They are also listed as Critically Endangered on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (refer to ***Chapter 8: Ecology*** for further details).

9.6.45 Furthermore, brook lamprey and bullhead are listed on Annex II of the European Commission Habitats Directive and Special Area of Conservation (SAC) Annex II species at a number of sites. They are also both listed on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species. Bullhead, brown trout and brook lamprey are also priority species in the UK (refer to ***Chapter 8: Ecology*** for further details).

Macroinvertebrates

9.6.46 Macroinvertebrate samples were collected from the River Ter on the 14th May 2020 and the 23rd September 2020 (see ***Appendix 8D Aquatic Ecology Report***). The aquatic macroinvertebrate data were analysed to generate the Whalley, Hawkes, Paisley & Trigg (WHPT) score Average Score Per Taxon (ASPT), and Number of scoring taxa (NTAXA) values, which provides an indication of the ecological quality in the watercourse. This assigns numerical value to taxa according to their sensitivity to organic pollution. The average of the values for each taxon in a sample, known as ASPT is a stable and reliable index of organic pollution.

9.6.47 The aquatic macroinvertebrate survey contained 52 macroinvertebrate taxa. The samples were dominated by Chrionomidae larvae Tanytarsini and Orthocladiinae and freshwater shrimp Gammarus sp. Results indicate the River Ter is a Good, Clean and Slightly Impacted watercourse from the WHPT-ASPT interpretation (see Table 4.2 in ***Appendix 8D***), with WHPT varying between 107.4 and 155.2. There is likely a small impact from sedimentation, water quality or other environmental influences. The results differ between spring and autumn due to variations in caddisfly and mayfly populations because of their lifecycle emerging in late summer resulting in a dip in the WHPT score in autumn.

9.6.48 Two non-native species were identified in the macroinvertebrate samples, the New Zealand mud snail and the freshwater shrimp *Cranognyx pseudogracilis/floridanus*. These species are now classed as naturalised in the UK and are not thought to impact native flora and fauna. No white-clawed crayfish (*Austropotamobius pallipes*) were recorded during the field survey.

9.6.49 Two invertebrate surveys were carried out on the Boreham Tributary south of Boreham village (NGR TL76024 09001) by the Environment Agency (Ref 9-50) in June 2015 and October 2015. Dominant species included Gammarus

sp., Chrionomidae larvae Tanytarsini and Orthocladiinae, and *Pisidium nitidum*. WHPT-ASPT scores were 5.08 and 4.75, respectively indicative of moderate levels of organic pollution and degradation.

Macrophytes

9.6.50 A macrophyte survey was carried out by the Environment Agency on the River Ter south of Hatfield Peverel at NGR TL 78730 10750 in July 2017 where 11 taxa were recorded. The sample was dominated by branched bur reed (*Sparganium erectum*) with 7% cover, with the next most widespread species being hairy willowherb (*Epilobium hirsutum*) with 5% cover. At the time of the survey blue-green algal scum/pelts were also recorded, with 1% cover.

Ponds: Aquatic Ecology Surveys

9.6.51 Initial scoping surveys were carried out on three occasions: 17th March 2020, 19 May 2020 and 1st June 2020 to determine ponds requiring additional aquatic surveys (see ***Appendix 8D Aquatic Ecology Report***). The criteria used to determine the need for further surveys was based on an initial assessment of pond quality, and likelihood of supporting protected, notable or invasive species. Based on this criteria set, ten ponds were recommended for further analysis using the Predictive System for Multimetrics (PSYM) method (described in detail in ***Appendix 8D Aquatic Ecology Report***). The ponds were located either adjacent to or within agricultural fields. This is a standard method that provides an assessment of the biological quality of a pond and includes collection of physical data, invertebrate sampling and macrophyte recording. Surveys were carried out within the optimal PSYM survey season (summer) on 16th and 22nd June 2020.

9.6.52 The PSYM analysis (reported in full in ***ES Appendix 8D Aquatic Ecology Report***) indicates that only one out of the ten ponds surveyed (Pond 7 to the south of Scarlett's Wood, NGR TL 74403 14090) was assessed as Good and consequently classed as a Priority Pond (i.e. ponds which should be given protection for their wildlife interest). This was due to the diversity of uncommon aquatic plants within the pond. The results also suggest that Pond 7 provides ideal habitat for damselfly, dragonfly and beetle taxa resulting in it achieving a very high conservation value classification.

9.6.53 The remaining nine ponds were classified as very poor (4 ponds), poor (3 ponds) or moderate (2 ponds). The reasons for these ponds not achieving good status could be due to several factors including eutrophication from agricultural runoff, other sources of pollution or shading by riparian vegetation.

9.6.54 Four species of macrophytes recorded during the surveys were classed as uncommon; fine-leaved water dropwort (*Oenanthe aquatica*), common water-crowfoot (*Ranunculus aquatilis*), slender tufted-sedge (*Carex acuta*), and rigid hornwort (*Ceratophyllum demersum*). However, all of these macrophyte taxa are classed as Least Concern based on Joint Nature Conservation Committee (JNCC) taxa designations.

Great Crested Newts

9.6.55 The Great Crested Newt (GCN) is a European Protected Species and is listed as a priority species within the National/Local Biodiversity Action Plan.

9.6.56 GCN site surveys have been undertaken to support the assessment (see methodology and screening process in ***Appendix 8E Great Crested Newt Survey***).

9.6.57 The results of the surveys show that GCN was recorded in one pond (P5) within the Order limits during the survey visits between March and June 2020. The population size class was low. GCN were recorded in eight additional Ponds (P42, P44, P47, P48, P84, P85, P86 and P90) located outside the Order limits (but within a zone of 250 m from the Site boundary) during the eDNA surveys between April and June 2021.

9.6.58 As the Order limits consists predominantly of arable fields that are intensively managed, open and exposed habitats, these are considered to be completely unsuitable habitat for GCN. Although, suitable connective habitat exists between Pond 5 (see ***Figure 3-1***) and the Scheme in the form of semi-improved grassland and hedgerows, there was no evidence of GCN use in any of the other ponds within the Order limits, and as such, it is considered that the likelihood of significant dispersal of GCN away from Pond 5 will be limited.

Riparian Mammals

9.6.59 Otters (*Lutra lutra*) appear to use the River Ter very occasionally, with one confirmed sighting during a night survey and recent desk study records nearby. However, no otter holts, couches or resting sites were recorded within the Order limits during surveys undertaken for the Scheme (2020-2021). Otter is protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and under The Conservation of Habitats and Species Regulations 2017 (as amended).

9.6.60 No signs of Water Vole (*Arvicola amphibius*) were found during the surveys, or from any other observations during other field surveys of the wider Scheme area.

9.6.61 Refer to ES ***Chapter 8: Ecology*** for further details.

Nature Conservation Sites

9.6.62 The River Ter Site of Special Scientific Interest (SSSI) is immediately west of the Order limits near Lyons Hall (see ***Figure 9-1: Water Resource Features and Attributes***) and consists of an approximately 1.2km reach of the River Ter upstream of the Scheme (Ref 9-47). This is cited by Natural England as a geological SSSI, which is representative of a lowland stream with a distinctive floor regime. It is flashy, draining a low-lying catchment on glacial till, and has a very low base flow discharge but high flood peaks; daily, monthly and annual flow variability are also high. In addition, the SSSI demonstrates characteristic features of a lowland stream including pool-riffle sequences, bank erosion, bedload transport and dimensional adjustments to flooding frequency. The SSSI is at favourable status when last assessed in 2011 (Ref 9-47). As the SSSI is a geological site and upstream of the Site, it will not be affected by the development and so it is scoped out of impacts relating to surface water drainage, water quality and flood risk.

9.6.63 No other nationally or internationally important nature conservation sites are located within the Scheme study area.

Geology, Groundwater and Soils

9.6.64 The bedrock and superficial geology for the area is identified by the British Geological Survey (BGS) GeoIndex online mapping (Ref 9-46).

9.6.65 The bedrock consists of London Clay Formation – clay, silt and sand of sedimentary origin and is classified as unproductive strata.

9.6.66 The superficial deposits are a mixture of Lowestoft Formation (diamicton), Brickearth (clay, silt and sand), glaciofluvial deposits (sand and gravel), alluvium (clay, silt, sand and gravel), and head deposits (clay, silt and sand). The glaciofluvial, alluvium and head deposits are found in bands around the River Ter and Boreham Tributary. These deposits are predominantly Secondary B and Secondary undifferentiated aquifer.

9.6.67 Secondary B aquifers are predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers. Secondary undifferentiated aquifers have been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

9.6.68 Borehole scans available on the BGS GeoIndex website (Ref 9-46) near the Scheme indicate that groundwater levels are not shallow, with the majority of boreholes not striking water. However, there are some sand layers in the upper 5m of several borehole logs across the area which have the potential to carry water.

9.6.69 The Order limits are partially underlain by the Essex Gravels WFD groundwater body (ID: GB40503G00400). The area of this groundwater body mainly follows the location of watercourses including the River Ter and Boreham Tributary. The Essex Gravels WFD waterbody is at Poor Status, with Good Quantitative Status and Poor Chemical Status (Ref 9-43). Reasons for not achieving Good Status include poor livestock and nutrient management relating to agriculture. This WFD waterbody had an Overall Water Body objective of Poor in 2015. It is not higher due to an unfavourable balance of costs and benefits.

9.6.70 According to Cranfield University's Soilscapes mapping tool (Ref 9-64), the Order limits are underlain by a mix of lime-rich loamy and clayey soils with slightly impeded drainage and freely draining slightly acid loamy soils. The lime-rich loamy and clayey soils underlie the majority of the Scheme area except for where it crosses the River Ter to the north, which is underlain by slightly acid loamy soils, which are also widespread across the wider study area.

Water Resources

Drinking Water Safeguard Zone

9.6.71 The entire Scheme is within a Drinking Water Safeguard Zone for surface water (designation SWSGZ1029). Drinking Water Safeguard Zones are established around public water supplies where additional pollution control

measures are needed. Here water supplies are at risk from nitrate and pesticides (carbetamide, clopyralid, metaldehyde and propyzamide) (Ref 9-65).

9.6.72 There is a surface water Drinking Water Protected Area approximately 800m east of the Order limits at Porter's Hall. The designated area is from the A12 at Hogwells, and extends south towards Little Baddow and Danbury, and west to the south of Boreham and into Chelmsford. Drinking Water Protected Areas (Surface Water) are where raw water is abstracted from rivers and reservoirs and additional measures are required to protect the raw water supply to reduce the need for additional purification treatment (Ref 9-45).

Nitrate Vulnerable Zones

9.6.73 The Order Limits are wholly within the River Chelmer Nitrate Vulnerable Zone (NVZ) for Surface Water (designation ID: 428) and the Sandlings and Chelmsford NVZ for Groundwater (designation ID: 78).

9.6.74 NVZs are statutory designated areas as being at risk from agricultural nitrate pollution and includes about 55% of land in England (Ref 9-65). The designations are made in accordance with the Nitrate Pollution Prevention Regulations 2015 (Ref 9-66).

Source Protection Zones

9.6.75 There are no Source Protection Zones (SPZ) within the 1km study area. However, there is an area of Zone III – Total Catchment approximately 1.6km to the north of the Order limits. This zone is defined as the total area needed to support the abstraction or discharge from a protected groundwater source (Ref 9-45). There is a further Zone III – Total Catchment area over 3.6km south-west of the Order limits, to the south-west of Hatfield Peverel. As both of these SPZs are over 1km from the Order limits, they are outside the study area and are not considered further.

Private Water Supplies

9.6.76 According to data provided by Chelmsford City Council and Braintree District Council, there are no private water supplies located within the 1km study area surrounding the Order limits.

Abstractions

9.6.77 Data regarding surface and groundwater abstractions in the study area have been obtained from the Environment Agency's Water Abstraction Licenses (England) map viewer (Ref 9-49). The abstractions are shown in **Table 9-8**.

Table 9-8 Licensed abstractions within the study area (Ref 9-49)

Figure Ref.	Licence Holder	Licence No.	Use	Source Description	NGR	Surface/ Groundwater
A1	Lord Rayleigh's Farms Ltd	8/37/38/*S/0012	Spray Irrigation - Direct	General Agriculture	TL 74599 15398	Surface Water

A2	Lord Rayleigh's Farms Ltd	8/37/38/*S/0012	Spray Irrigation - Direct	General Agriculture	TL 76900 14902	Surface Water
A3	Lord Rayleigh's Farms Ltd	8/37/38/*S/0017 8/37/38/*S/0036 8/37/38/*S/0019 8/37/38/*S/0037	Spray Irrigation - Storage	General Agriculture	TL 75599 15203	Surface Water
A4	Lord Rayleigh's Farms Ltd	8/37/38/*S/0017 8/37/38/*S/0019 8/37/38/*S/0036 8/37/38/*S/0037	Spray Irrigation - Storage	General Agriculture	TL 78189 12909	Surface Water
A5	Lord Rayleigh's Farms Ltd	8/37/38/*S/0017	Spray Irrigation - Direct	General Agriculture	TL 78091 11505	Surface Water
A6	Lord Rayleigh's Farms Ltd	8/37/36/*G/0036	Spray Irrigation - Direct	General Agriculture	TL 75417 12003	Groundwater
A7	Hanson Quarry Products Europe Ltd	8/37/36/*S/0013	Spray Irrigation - Direct	General Agriculture	TL 74610 11311	Surface Water
A8	Hanson Quarry Products Europe Ltd	8/37/36/*S/0013	Spray Irrigation - Direct	General Agriculture	TL 73792 10986	Surface Water
A9	Hanson Quarry Products Europe Ltd	8/37/36/*S/0013	Spray Irrigation - Direct	General Agriculture	TL 74010 10800	Surface Water
A10	Hanson Quarry Products Europe Ltd	8/37/36/*S/0013	Spray Irrigation - Direct	General Agriculture	TL 74202 10214	Surface Water
A11	Hanson Quarry Products Europe Ltd	8/37/36/*S/0013	Spray Irrigation - Direct	General Agriculture	TL 74773 10595	Surface Water
A12	Hanson Quarry Products Europe Ltd	8/37/36/*S/0013	Spray Irrigation - Direct	General Agriculture	TL 75036 10314	Surface Water
A13	Hanson Quarry Products Europe Ltd	8/37/36/*S/0013	Spray Irrigation - Direct	General Agriculture	TL 74711 10195	Surface Water
A14	Hanson Quarry Products Europe Ltd	8/37/36/*S/0013	Spray Irrigation - Direct	General Agriculture	TL 74597 09998	Surface Water
A15	McMillan	8/37/36/*S/0018	Spray Irrigation - Direct	General Agriculture	TL 75810 09091	Surface Water

9.6.78 **Table 9-8** indicates that there are 15 locations with surface water abstractions, as shown on ***Figure 9-1***. These are predominantly from the River Ter and Boreham Brook and are all for spray irrigation for agriculture.

9.6.79 There is one groundwater abstraction in the study area from a gravel pit south of Holt's Lane (see ***Figure 9-1***), with the use also described as direct spray irrigation.

Water Activity Permits

9.6.80 Data regarding water activity permits in the study area have been obtained from the Environment Agency Public Register (Ref 9-48). These are summarised in **Table 9-9**.

Table 9-9 Water Activity Permits (discharge consents) in the study area (Ref 9-48)

Figure Ref	Consent Registration	Location (NGR)	Discharge Type	Receiving waters
D1	AN/PR2NFE13569/001	TL7500014000	Sewage - not water company	Drains to ground
D2	AN/PRENF19843/001	TL7457913506	Sewage - not water company	Drains to ground
D3	AN/PR2NFE11169/001	TL7503015770	Sewage - not water company	Drains to ground
D4	AN/PR2NFE00278/001	TL7497516006	Sewage - not water company	Drains to ground
D5	AN/PRENF02136/001	TL7414013130	Miscellaneous	Quarry Ponds
D6	AN/PR2NFE04158/001	TL7450012700	Miscellaneous	Quarry Ponds
D7	AN/PR2NFE32266/001	TL7510012200	Sewage - not water company	Quarry Ponds
D8	AN/PR2NFE01284/001	TL7516412176	Sewage - not water company	Quarry Ponds
D9	AN/PR2NFA2170/001	TL7353014650	Miscellaneous	Trib of River Ter
D10	AN/PR2NFA2156/001	TL7382015450	Miscellaneous	Drain
D11	AN/PR2NFA2167/001	TL7386015520	Miscellaneous	Spring
D12	AN/PR2NFA2159/001	TL7347014490	Miscellaneous	Drains to ground
D13	AN/PR2NFA2160/001	TL7345014380	Miscellaneous	Drains to ground
D14	AN/PR2NFA2174A/001	TL7368015400	Miscellaneous	Drains to ground
D15	AN/EPRFB3997WY/001	TL7561311848	Sewage - not water company	Quarry Ponds
D16	AN/PR2LF320/001	TL7330014400	Miscellaneous	Drains to ground
D17	AN/PR2NFE21166/001	TL7582711640	Miscellaneous	Quarry Ponds

D18	AN/PR2NFA2165/001	TL7305014140	Miscellaneous	Drains to ground
D19	AN/PR2NFE27066/001	TL7820013100	Trade	River Ter
D20	AN/PRENF08490/001	TL7337912593	Sewage - not water company	Drains to ground
D21	AN/PR2NFA2164/001	TL7315015630	Miscellaneous	Pond, nr Hole Farm
D22	AN/EPRGP3022XV/001	TL7280414031	Sewage - not water company	Trib of River Ter
D23	AN/PR2LFS11766/001	TL760621133 0	Sewage - not water company	Quarry Ponds

9.6.81 **Table 9-9** indicates that there are 23 discharge locations in the study area, which are predominantly sewage but not from a sewage company. The remainder are miscellaneous. There is one discharge direct to the River Ter, with the remainder being to upstream tributaries and drains, to quarry ponds and to ground. Locations are shown in ***Figure 9-1***.

Pollution Incidents

9.6.82 Data on pollution incidents were requested from the Environment Agency on two separate occasions but has not been received at the time of submission.

Flood Risk

9.6.83 Flood risk from all sources in the vicinity of the Scheme is summarised in **Table 9-10**, and also see ***Figure 9-2: Flood Zones*** and ***Figure 9-3: Surface Water Flood Risk***. Further details are available in ***Appendix 9A: FRA***

Table 9-10 Flood Risk Summary

Flood Risk Source	Flood Risk Level	Comments
Fluvial	Low (Majority) Medium – high (North West side)	The Order limits are predominantly in Flood Zone 1 according to the Flood Risk Map for Planning (Ref 9-51) (see ***Figure 9-2; Flood Zones).*** This is land assessed as having a less than 1 in 1,000 annual probability of river flooding (<0.1% Annual Exceedance Probability (AEP)). However, Flood Zone 2 (between 1 in 100 and 1 in 1,000 annual probability of river flooding (>0.1% AEP to <1% AEP) and Flood Zones 3 (1 in 100 or greater annual probability of river flooding (>1% AEP)) are shown to encroach into the Order limits to the north, in proximity of the River Ter, and towards the south-west, where Boreham Brook, flows in a north-south direction. SFRA mapping corroborates the Environment Agency mapping. The Braintree District Council SFRA (Ref 9-67) indicates climate change flood extents, which uses Flood Zone 2 as a proxy for Flood Zone 3a including climate change, i.e. 70% climate change. Refer to ***Figure 9-2*** for Environment Agency mapping and the FRA (***Appendix 9A***) for Braintree SFRA climate change flood risk mapping.

Flood Risk Source	Flood Risk Level	Comments
Surface Water	Very Low	The risk of surface water flooding is generally very low (annual chance of flooding of less than 0.1% AEP) with isolated patches of low (chance of flooding of between 0.1% and 1% AEP), medium (chance of flooding of between 1% and 3% AEP) and high risk (chance of flooding of greater than 3.3% AEP) generally associated with the River Ter and its tributaries, as well as isolated patches across the Scheme. Several field ditches displayed within the Order limits are also shown to be susceptible to surface water flooding (See ***Figure 9-3***). The Chelmsford Surface Water Management Plan (Ref 9-68) confirms the site does not fall within a Critical Drainage Area (CDA). Further pluvial modelling has been undertaken to inform the Scheme design (see ***Appendix 9C: SuDS Strategy)***. The revised modelling provides predicted surface water depths and extents across the DCO Boundary and surrounding areas for the 1 in 100-year storm event + 20% climate change. The mapping output from the modelling offers an opportunity to assess the risk of flooding from surface water sources more accurately specifically for the Order limits and surrounding area and therefore supersedes the mapping available from the Local Council's SFRAs and Environment Agency's Online Flood Maps for Planning. The model results show a reduction over the estimated flood risk indicated in SFRA and online mapping. The "Baseline Scenario" modelling indicates the existing maximum surface water flood depths are located in an isolated area within the Order Limits with a depth of approximately 0.9m. However, significant areas of the model extent have less than 0.1m depth of surface water flood levels. There are also areas within the Order limits boundary associated with existing surface water features (i.e. ponds, open land drains) demonstrating depths significantly greater than 0.9 m, however this is due to the depression in topography associated with these types of features. The "Refined Baseline Scenario" modelling indicates the maximum surface water flood depths within the Order limits decreased from the "Baseline Scenario" to approximately 0.88 m. The "Operational Phase Scenario" modelled the maximum surface water flooding depth as approximately 0.6m Refer to ***Appendix 9A: FRA*** for further detail.
Groundwater	Low (East side) - Medium (North West side) High (far eastern	Figure 6 of the Braintree District Council SFRA Update (Ref 9-67) produced in 2016 shows areas susceptible to groundwater flooding, indicating the probability of flooding from groundwater per 1km square grid. The map covers the majority of the site area, but also indicates in shaded squares, the risk outside of the borough boundary, which includes the Chelmsford City Council administrative area of the site. The probability of flooding is shown as generally less than 25%, increasing to values

Flood Risk Source	Flood Risk Level	Comments
	boundary adjacent to Ringers Farm)	between 25%-50% in proximity of the River Ter. A higher risk area of >75% encroaches into the east boundary of the Scheme adjacent to Ringers Farm. Refer to **Appendix 9A: FRA** for mapping.
Sewers	Low	Figure 5.1 and 5.2 of the Braintree District Council SFRA Update 2017 (Ref 9-67) shows no external or internal sewer flood incidents recorded at this location. Refer to Figure 6 of the FRA (***Appendix 9A)***.
Artificial Sources	Very Low	The Order limits is not within or near any registered reservoirs (assumed with volumes >10,000m^3) or other artificial sources. The Site is at very low risk of flooding from artificial sources.

Future Baseline – 2025-2026 No Development, (not earlier than) 2024-2026 Construction, (not earlier than) 2026 Operation)

Surface Water

9.6.84 The River Ter is currently at its target WFD objective for 2015 (Moderate Ecological Status), whereas Boreham Tributary is below its target objective of Good Ecological Status. However, these WFD classifications are subject to change during RBMP Cycle 3 (due to be published in 2021).

9.6.85 Indeed, there is a general trend for water quality improvements over time in response to improved regulation and treatment practices. However, the current receptor importance criteria presented in **Table 9-2** is largely based on the presence or not of various attributes (e.g. Drinking Water Protected Area, designated nature conservation site or WFD designation) and flow (i.e. the size of the watercourse). The application of these criteria is therefore not sensitive to more subtle changes or improvements in water quality as may be experienced over time. Thus, no significant changes to current baseline conditions are predicted for the future baseline, as the principle reasons for differences in water body importance are unlikely to change. For this reason, the impact assessment within this chapter is undertaken against existing baseline conditions.

Groundwater

9.6.86 The WFD groundwater body (Essex Gravels) is at its target WFD objective for 2015. However, these WFD classifications are subject to change during RBMP Cycle 3 (due to be published in 2021).

9.6.87 The future baseline will be largely the same as the current baseline. The Essex Gravels groundwater body is currently at Poor status and there is no time objective to reach Good status. However, the chemical status element and chemical GWDTEs test had targets of Good by 2015, which are yet to be realised, and so may improve in future.

9.6.88 No significant changes to current baseline conditions are predicted for the future baseline. The impact assessment within this chapter is therefore undertaken against existing baseline conditions.

Flood Risk

9.6.89 Climate change is predicted to alter the future fluvial flood risk and thus it is important that it is taken into account by FRA (**Appendix 9A: *SuDS Strategy***). Climate change resilience is accounted for within the for the Scheme, accommodating current government climate change projections.

9.6.90 The Scheme will not alter the current flood risk baseline described above. The drainage strategy will seek to ensure no detrimental impact relating to the surface water runoff from the Scheme following its construction. Therefore, no significant adverse changes to current baseline conditions are predicted for the future baseline, and so the impact assessment is undertaken against existing baseline conditions.

Future Baseline (Decommissioning) - (assumed for the purpose of the assessment to be up to 24 months, not earlier than 2066)

9.6.91 It is considered that continued environmental improvements, tighter regulation at both national, regional and local scales, and environmental enhancements would lead to a gradual improvement over current baseline conditions in terms of water quality.

9.6.92 Climate change has the potential to significantly impact on drainage and flood risk, for example through increased storm intensity and changes in future rainfall patterns. However, the design of the Scheme has incorporated the climate change projections required by the Environment Agency to ensure that potentially increased surface water flows are accounted for and managed across the lifetime of the Scheme (refer to ***Appendix 9A FRA*** for further details. Therefore, no significant adverse changes to current baseline conditions are predicted for the future baseline in 2066 (assumed to be the decommissioning date), and so the impact assessment within this chapter is undertaken against existing baseline conditions.

Importance of Receptors

9.6.93 **Table 9-11** provides a summary of the waterbodies that may be impacted by the Scheme (i.e. there is a source and a possible pathway), a description of their attributes, and states the importance of the waterbody as used in this impact assessment. Importance is based on the criteria presented in **Table 9-2**. Separate importance classifications are provided for water quality and morphological aspects of waterbodies as it is not always appropriate to have the same rating (e.g. a waterbody may be heavily modified or even artificial and thus have a low morphology importance, but the water quality may be high by virtue of supporting protected species or other important potable or socio-economic and recreational uses). Refer to ***Figure 9-1*** for surface water features, and ***Figure 3-1*** for pond locations.

Table 9-11 Importance of Receptors

Waterbody	*Importance*
River Ter	Very High Importance for water quality on the basis of being a WFD designated watercourse; being designated as a SSSI immediately upstream of the Order limits and within the study area; and supporting species protected by international legislation, namely bullhead, brook lamprey and European eel. Otter also appear to make occasional use of the watercourse. A notable geological feature, a tufa spring, is also located on this watercourse within the study area. Despite the very high importance there is pressure on water quality in the watercourse from sewage treatment work discharges and agricultural pollutants, and the Q95 flow is <1.0 m^3/s (0.034 m^3/s). There are several surface water abstractions from the watercourse in the study area, and it receives licensed discharges. Medium Importance for morphology on the basis of showing signs of previous alteration but still retaining some natural features. Modification around road crossings and agriculture has led to an over-deep channel in places within the study area, floodplain disconnection and deposition of fine sediment. However, there is a meandering planform and some variety in bedforms.
Boreham Tributary	High Importance for water quality on the basis of being a WFD designated watercourse but with an estimated Q95 flow of <1.0 m^3/s. However, there is pressure on water quality in the watercourse from agricultural pollution and there are several surface water abstractions from the watercourse in the study area. Low Importance for morphology on the basis of showing evidence of substantial modification and realignment, being artificially straight with steep, incised banks in places. It is subject to significant fine sediment accumulation, particularly towards the A12.
Tributary of Ter (T1)	Medium Importance for water quality on the basis of not being a WFD designated watercourse in its own right, its size and scale, and with estimated Q95 >0.001 m^3/s. Low importance for morphology on the basis of being artificially straight with steep, incised banks in places. It is subject to sediment accumulation and is overgrown and choked with vegetation.
Other Drains and Ditches	As artificial, generally ephemeral agricultural drains and ditches lacking any protected species or designations, these are considered Low Importance waterbodies for water quality and morphology.
Pond 7	High Importance for water quality as a Priority Pond (see ***Chapter 8: Ecology***). It exhibits a diversity of uncommon aquatic plants. Pond 7 also provides ideal habitat for damselfly, dragonfly and beetle taxa and so has a very high conservation value. Low Importance for morphology as a small pond heavily influenced by agriculture.

Waterbody	*Importance*
Pond 5 (within Order limits); Ponds 42, 44, 47, 48, 84, 85, 86 and 90 (in wider study area)	High importance for water quality due to containing GCN. Low Importance for morphology as a small ponds heavily influenced by agriculture.
Former Gravel Pit Ponds	The Boreham Mere ponds are of High Importance for water quality as a recreational fishery, and similarly those at Bulls Lodge Quarry also have socio-economic and commercial importance. Low Importance for morphology as artificial waterbodies derived from quarrying activity.
Other Small Ponds	Low Importance for water quality given they are ubiquitous across the study area, and generally have no notable flora/faunal communities and have little other ecological value. Given their abundance in the study area the ponds are considered to not reach the required levels to fulfil the criteria of a priority habitat and are considered as being of no more than local importance. Low importance for morphology as generally artificial waterbodies or have been heavily impacted by surrounding land uses (i.e. agriculture).
Groundwater	Medium importance as generally Secondary B and Secondary undifferentiated superficial aquifer, and unproductive bedrock aquifer. There are no groundwater private water supplies in the study area and no SPZs in the study area. There is one groundwater abstraction in the study area (but none within the Order limits).

Floodplain Sensitivity for Impact Assessment

9.6.94 For the construction assessment, the key receptor in terms of all forms of flood risk are the construction workers present within the Order limits, who are considered to be of Very High sensitivity.

9.6.95 For the operation assessment, the importance is based on understanding of the receptors present within areas at risk of flooding and the existing risk of flooding from all sources. With the exception of the riparian margins of the River Ter and Boreham Tributary, the Order limits are within Flood Zone 1, where sensitivity of the floodplain for impact assessment purposes is considered Low. The areas of Flood Zone 2 and 3 around the watercourses are at medium to high sensitivity to fluvial flooding. In EIA terms the sensitivity is Very High, due to the presence of essential power supply infrastructure (see **Table 9-2**).

9.6.96 The criteria described in **Table 9-2** does not provide examples of sensitivity for other forms of flood risk and so the sensitivity is based on the existing baseline risk described earlier in this chapter. For the purpose of this impact assessment the sensitivity of non-fluvial forms of flood risk is as follows:

a. Flooding from surface water - generally very low risk but with isolated patches of low, medium and high risk, associated with the presence of agricultural ponds, watercourses and topographic depressions. On the basis of surface water modelling undertaken for the scheme the areas at greatest risk of existing surface water flooding are the River Ter floodplain within Sandy Wood on the southern bank of the River Ter immediately east of the Order limits; the floodplain around tributary T1 east of Roll's Farm which is agricultural land; and the very eastern extent of the Order limits where there is existing surface water flooding associated with the Boreham Brook immediately south of the access road to Bulls Lodge substation (this is agricultural land);

b. Flooding from artificial sources – very low risk as the site is not within or near any registered reservoirs (assumed with volumes >10,000m^3) or other artificial flood sources;

c. Flooding from groundwater – generally low risk but with areas at medium risk close to the River Ter at the northern extent of the Order limits (this is woodland and agricultural land) and high risk at the eastern boundary of the Scheme on agricultural land adjacent to Ringers Farm; and

d. Flooding from existing drainage infrastructure (sewers) – low risk.

9.6.97 Further details on flood risk are available in ***Appendix 9A: FRA.***

9.7 Embedded Design Mitigation

9.7.1 The Scheme has been designed, as far as possible, to avoid and minimise impacts and effects on the water environment through the process of design development, and by embedding measures into the design of the Scheme.

9.7.2 A range of measures would also be implemented during construction to manage the impacts and reduce the effects that the construction of the Scheme would have on the water environment.

Measures during Construction

9.7.3 The construction of the Scheme will take place in accordance with a Construction Environmental Management Plan (CEMP). The CEMP details the measures that would be undertaken during construction to mitigate the temporary effects on the water environment. An outline CEMP is provided in **[EN010118/APP/7.10]** and provides the framework for detailed CEMPs to be produced.

9.7.4 The CEMP will comprise good practice methods that are established and effective measures to which the development will be committed through the development consent. The measures include:

a. Controlling and minimising the risk of pollution to surface waters and groundwater by managing construction site runoff and the risk of chemical spillages;

b. Measures to control the storage, handling and disposal of potentially polluting substances during construction;

c. The management of activities within floodplains in the area of the River Ter and Boreham Brook including storing materials outside of the

floodplain as far as reasonably practicable and production of a Flood Risk Management Plan with floodplain control measures and contingency actions;

d. Management of water removed from excavations. Managing the risk from groundwater flooding through appropriate working practices (during excavations) and with adequate plans and equipment in place for de-watering to ensure safe dry working environments;

e. Appropriate methods and mitigation measures when undertaking works within, over, under and adjacent to water bodies; and

f. Measures required to ensure safety of staff during construction from increased flood risk on-site due to climate change.

9.7.5 The Applicant will ensure that construction staff are fully aware of the potential impact to water resources associated with the construction works and procedures to be followed in the event of an accidental pollution event occurring. This would be included in the site induction and training, with an emphasis on procedures and guidance to reduce the risk of water pollution. Plans to deal with accidental pollution would be included within the detailed CEMPs prior to commencement of construction. Any necessary equipment (e.g. spillage kits) would be held on-site and all site personnel would be trained in their use. The Environment Agency would be informed immediately in the unlikely event of a suspected pollution incident.

9.7.6 The principles of the mitigation measures secured in the ***OCEMP*** **[EN010118/APP/7.10]** are the minimum standards that will be implemented. However, it is acknowledged that for some issues, there are multiple ways in which they may be addressed and methods of dealing with pollutant risk will be continually reviewed and adapted as construction works progress (e.g. the management of construction site runoff containing excessive levels of fine sediments).

9.7.7 The CEMP will be standard procedure for the Scheme and will describe the principles for the protection of the water environment during construction. The detailed CEMPs will be supported by a Water Management Plan (WMP), that will provide greater detail regarding the mitigation to be implemented to protect the water environment from adverse effects during construction including requirements for water quality monitoring. The potential for adverse impacts would be minimised by the adoption of the general mitigation measures described above.

9.7.8 The 132kV cables will be below ground. Cable crossings of watercourses will be installed using directional drilling techniques that do not impact on watercourse morphology.

Guidance for Pollution Prevention (GPP)

9.7.9 The following relevant GPPs have been released to date on the NetRegs website (Ref 9-69) and are listed below. While these are not regulatory guidance in England where the UK government website outlines regulatory requirements, it remains a useful resource for best practice. They will be secured through the CEMP:

a. GPP 1: Understanding your environmental responsibilities – good environmental practices;
b. GPP 2: Above ground oil storage;
c. GPP 3: Use and design of oil separators in surface water drainage systems;
d. GPP 4: Treatment and disposal of wastewater where there is no connection to the public foul sewer;
e. GPP 5: Works and maintenance in or near water;
f. GPP 8: Safe storage and disposal of used oils;
g. GPP 13: Vehicle washing and cleaning;
h. GPP 19: Vehicles: Service and Repair;
i. GPP 20: Dewatering underground ducts and chambers;
j. GPP 21: Pollution Incident Response Plans;
k. GPP22: Dealing with spills; and
l. GPP26: Safe storage – drums and intermediate bulk containers.

9.7.10 Where new GPPs are yet to be published, previous Pollution Prevention Guidance (PPGs) still provide useful advice on the management of construction to avoid, minimise and reduce environmental impacts, although they should not be relied upon to provide accurate details of the current legal and regulatory requirements and processes. Construction phase operations would be carried out in accordance with guidance contained within the following PPG:

a. PPG6: Working at construction and demolition sites (Ref 9-70);
b. PPG7: Safe storage – the safe operation of refuelling facilities (Ref 9-71); and
c. PPG18: Managing fire water and major spillages (Ref 9-72).

9.7.11 Additional good practice guidance for mitigation to protect the water environment can be found in the following key CIRIA documents and British Standards Institute documents:

a. British Standards Institute (2009) BS6031:2009 Code of Practice for Earth Works (Ref 9-73);
b. British Standards Institute (2013) BS8582 Code of Practice for Surface Water Management of Development Sites (Ref 9-74);i
c. C753 (2015) The SuDS Manual (second edition) (Ref 9-30);
d. C741 (2015) Environmental good practice on site guide (fourth edition) (Ref 9-75);
e. C648 (2006) Control of water pollution from linear construction projects, technical guidance (Ref 9-76);
f. C609 (2004) Sustainable Drainage Systems, hydraulic, structural and water quality advice (Ref 9-77);

g. C532 (2001) Control of water pollution from construction sites – Guidance for consultants and contractors (Ref 9-78); and

h. C736F Containment systems for prevention of pollution (Ref 9-79).

9.7.12 The key control measures compiled from this guidance is listed in the **OCEMP [EN010118/APP/7.10]**.

Cable Route Watercourse Crossings

9.7.13 Cable routes at the south-western margin of the Order limits cross Flood Zone 3 of the Boreham Tributary at three locations. These are approximately located at NGR TL 75877 10899, TL 75747 10495 and TL 75396 10374, but final locations are subject to the limits of deviation. The requirements for cable route watercourse crossings are secured through the Design Principles [**EN010118/APP/7.3**].

9.7.14 It is proposed to install the cable beneath the watercourse using underground techniques such as horizontal directional drilling beneath the bed of the channel. The cable would be installed at least 1.5m beneath the bed of the Boreham Tributary. A maximum depth would be determined based on site specific risk assessment at each crossing location in order to minimise groundwater interactions where possible.

9.7.15 In addition to the control and management measures for site runoff and spillage risk noted above, the methodology of the drilling, or other trenchless techniques, would include measures to minimise the risk to the environment. Although the use of this technique avoids the need to excavate a cable trench through the channel, there are risks associated with the use of drilling muds and plant close to the channel. For example, although rare, without due care there is a risk that drilling muds can 'break out' into watercourses leading to pollution (known as 'hydraulic fracture' or 'frac-out'). A site specific frac-out risk assessment would be developed following further investigation of specific ground conditions at the crossing locations, and appropriate mitigation developed in line with best construction practice (secured in the ***OCEMP [EN010118/APP/7.10]***). There is also a need to manage drilling muds and wastewater so that this would not be spilt into the channel when working close to the banks of a watercourse.

9.7.16 The method of watercourse crossing installation seeks to minimise the risk of pollution of nearby watercourses. The send and receive pit excavations would be located at least 10m from the watercourse (measured from the centre line of the watercourse as marked on Ordnance Survey mapping) under which they would be directional drilled (secured in the ***OCEMP [EN010118/APP/7.10]***).

9.7.17 The exact dimensions of the send and receive pits would be determined by site and ground conditions but will be kept to a safe minimum in terms of length, width and depth. Send and receive pits will be no greater than 2m by 2m, and 2m deep (secured in the ***OCEMP*** **[EN010118/APP/7.10]**). A shoring system appropriate to the ground conditions would be used as appropriate to minimise water ingress into the pits. This may be timbers, sheet piling, or a modular system and would be chosen based on suitability for the site conditions. The ingress of any groundwater will be carefully managed through design of the send or receive pit, shoring method, and a pumping and

treatment system. Excessive ingress of water would make the pit unsafe and thus it is important that ingress is minimised and that a suitable system of managing that water is implemented.

9.7.18 Once the cable is installed beneath the watercourse the pits and any cable trenches will be backfilled to the original ground level and seeded to reduce the risk of runoff and fine sediments entering the watercourse. The drill fluids used within the drilling machine would be water based, such as naturally occurring bentonite clay. The fluid component of the drilling mud would be mains water, obtained from a nearby supply and tankered to site when required. There would be some recycling of drilling muds by the drilling plant used.

9.7.19 The bentonite within the drilling fluid is a naturally occurring mineral and enables the fluid to have sufficient viscosity to carry the cutting chips back to the surface machine whilst lubricating and keeping cool the drilling bit. Directional drilling, or other trenchless techniques, would be undertaken by a specialist contractor and the water column above the drill path would be continuously monitored during drilling. It is acknowledged that drill fluid leakage into a watercourse is not a common problem. However, where any leakage of bentonite water is observed in the watercourse or there is an increased perceived risk (i.e. lack of drilling mud returns) the drilling/boring operation would be suspended, remediation action implemented, and subsequently the methodology for that crossing re-evaluated. It may be that the excavation, or boring, in that area must take place at a deeper depth than the minimum 1.5m below the bed of the watercourse to minimise environmental impacts.

Access Tracks

9.7.20 It is proposed to utilise the existing hard-surfaced tracks that run throughout the Order limits as Primary Access Tracks, and to construct additional Secondary Access Tracks where connectivity is required. These will consist of a layer of rock fill placed on a suitable underlying layer. Where areas of new access roads are planned, the footprint will be between 4 and 6m, and excavated down to approximately 200mm to 600mm depth depending on the underlying formation. Where existing roads are present and will need widening, the fill will be placed to the same depth as the existing road, typically 600mm in depth. The existing ground profile may be levelled flat and result in slightly deeper excavations in some areas. Where drainage is required, a ditch may be cut into the slope next to the road.

9.7.21 There will be structure improvements (e.g. strengthening) needed to existing culverts conveying roads and field accesses across existing ditches at the following locations (also shown on ***Figure 9-1***)):

a. TL 74150 14727;
b. TL 74741 15059;
c. TL 74383 14052;
d. TL 74719 14468;
e. TL 74585 13836;

f. TL 75123 13809;

g. TL 75683 13787;

h. TL 75890 13943;

i. TL 75271 12681; and

j. TL 76430 12512.

9.7.22 Based on site observations these are ephemeral/intermittently flowing ditches without functional flows and numerous of the culverts are partially blocked and overgrown. As a precautionary worst case for the assessment, it is assumed that a maximum extension of 2m for each culvert would be required. These would be of an environmentally sensitive design with a sunken bed to allow a natural substrate to develop, and would aim to minimise changes in watercourse alignment and length as much as is feasible.

9.7.23 A 1.55m widening of the culvert of Boreham Brook under Cranham Road may also be required to accommodate road widening of Cranham Road to improve access to the Scheme during construction, operation and decommissioning. This is again a precautionary worst case. As with the culverts of access tracks described above, this culvert would also have a sunken bed and would aim to minimise changes in alignment and length as much as is feasible.

9.7.24 The requirements for access tracks and the Cranham Road culvert are secured through the Design Principles.

Design measures to mitigate operational impact

9.7.25 Detailed information on Scheme design and infrastructure is provided in ***Chapter 2: The Scheme*** **[6.1]**.

Solar PV Panels

9.7.26 The Scheme is mostly located within Flood Zone 1 with the minimum height of the lowest part of the solar PV Panels to be 0.6m above ground level. No solar PV Panels or other infrastructure will be located within fluvial Flood Zone 2 or 3 extents. Mounting poles will generally be driven or screwed into the ground to an indicative depth of 2m. In certain areas where there are restrictive overhead lines, weight-ballasted solutions, such as the use of concrete foundations may instead be required. The design assumes that approximately 5% of foundations could be concrete pads. These measures are secured through the Design Principles.

Watercourse Buffers

9.7.27 There will be a minimum buffer of 8m around watercourses (measured from the water/channel edge under normal flows) within which there will be no built development. However, for main rivers a 10m buffer measured from the centre line of the watercourse as marked on Ordnance Survey mapping has been allowed for. A buffer of 5m around the margin of ponds has been included in the Concept Design and secured through the Design Principles..

Drainage Strategy

9.7.28 A Drainage Strategy is included in the in the Application. Refer to ***Appendix 9C SuDS Strategy*** **[EN010118/APP/6.2]** and ***Appendix 9D Bulls Lodge***

Substation Extension: Drainage Strategy **[EN010118/APP/6.2]**. The drainage design provides for the attenuation of surface water runoff from the operational Order limits, whilst minimising flood risk to the Scheme and surrounding areas. In accordance with planning policy guidance (as outlined in Section 9.2) runoff from the Order limits requires attenuation to ensure no increase in surface water discharge rates and to provide water quality treatment of runoff water. This will be secured through a requirement under the DCO.

PV Array Runoff

9.7.29 Installation of the PV Arrays does not involve the introduction of hardstanding at ground level meaning the superficial cover for the Scheme will remain largely the same as the baseline. Additionally, the PV array tables will have regular rainwater gaps to prevent water being concentrated along a single drip line.

9.7.30 Surface water management techniques will be used to control runoff based on SuDS. Such measures will manage surface water within the Order limits through interception and absorption via natural processes in order to drain the site as per the existing scenario.

9.7.31 To limit possible channelisation from surface water runoff from PV arrays and promote interception and infiltration potential throughout the Order limits, the grounds surrounding and between the PV Arrays will be planted with native species rich grassland and wildflower mix which will act as dripline planting. This will allow surface water which falls from the drip line across the face of PV Arrays to be intercepted by the vegetation and limit the potential of surface water to concentrate and run across the surface and into the surrounding hydrological network, which during extreme events and on steeper topography can lead to soil erosion and furrowing.

9.7.32 Perimeter swales are proposed within low lying areas and parallel to the existing site contours (see example perimeter swales shown in Plate 18 of ***Appendix 9C: SuDS Strategy*** to intercept extreme surface water runoff which may already run offsite from the Order limits. It is proposed to use scrapes (i.e. shallow depressions with gently sloping edges which can hold water) to provide additional surface water storage capacity relative to the baseline scenario. While these provide storage, they do not form part of the formal SuDS network. They are considered sufficient given the negligible increase in surface water runoff associated with the Scheme..

9.7.33 To limit the potential flows of surface water within the proposed swales, check dams will be provided within swales throughout the lifetime of the operational phase of the Scheme, limiting the potential of surface water to settle in low lying extents of the scrapes by slowing its movement through the swales. Check dams also reduce the risk of soil erosion of the bed of the swales.

BESS Compound Runoff

9.7.34 The Battery Energy Storage Systems (BESS) Development outlined in ***Appendix 9C: SuDS Strategy*** includes impermeable areas associated with the BESS, including adjacent units and transformers, substation transformer

buildings, office and welfare buildings, 400kv filter compound and square connection units to the west of the substation area.

9.7.35 Infiltration testing for the BESS indicates the underlying strata does not provide a significant infiltration rate allowing discharge to ground, and so runoff will instead be discharged to an open land drain (see ***Appendix 9C: SuDS Strategy***) for details of infiltration testing).

9.7.36 The ***SuDS Strategy*** indicates that surface water runoff associated with the BESS Compound will be attenuated within the unbound free-draining subbase beneath the aggregate chippings and an attenuation pond which will discharge to the existing open land drain to the east through an excavated surface water pipe.

9.7.37 The unbound free drainage subbase implemented beneath the aggregate chippings will be utilised to attenuate surface water runoff associated with the BESS Compound. The areas beneath the infrastructure and access roads have been discounted as providing attenuation volume.

9.7.38 Stone surfacing will comprise a minimum 300 mm deep unbound free-draining aggregate subbase and a minimum 75 mm top layer of stone chippings, which will allow storage of storm water prior to discharge to the attenuation pond.

9.7.39 The subbase will be served by a network of drains which will migrate surface water to two outfalls located at topographic low points within the BESS area. The two outfalls are located at the location of existing surface water flow routes which will lead to the attenuation pond to the east, as shown in the ***SuDS Strategy***.

9.7.40 The ***SuDS Strategy*** indicates that surface water flows from an impermeable area of 1.94 ha will be limited to the 1 in 1 year design storm event rate of 2.4 l/s up to and including the 1 in 100 year (+20% Climate Change) event in accordance with Essex County Council consultation requirements (as LLFA). In order to restrict surface water flows, a Hydro-Brake (or other flow restricting device) will be placed on the outfall of the pipes from the sub-base and the attenuation pond to the receiving land drain.

9.7.41 The attenuation pond has been designed in accordance with the SuDS Manual (Ref 9-30), with the design parameters as follows:

a. Depth: 1 m;

b. Slope: 1 in 4;

c. Base area: 4 m²; and

d. Total area: 82.1 m².

9.7.42 To support treatment of surface water runoff and provide additional ecological benefits the attenuation pond will incorporate embankments of approximately 0.5 m in width at 0.2 m increments, with native planting to be implemented on the wider banks of the pond. A cross section of the pond is shown in the ***SuDS Strategy***. Microdrainage calculations indicate that there is no surcharging within the proposed SuDS network up to and including the 1 in 100-year (+20% climate change) event. The designed SuDS Network accommodates

surface water flows with no out of system flooding in up to and including the 1 in 100-year (+20% CC) event.

9.7.43 The BESS will not alter existing ground levels and therefore, overland flow routes will not significantly vary from the baseline scenario.

9.7.44 During an exceedance event which exceeds the 1:100-year (+20% CC) event surface water flow routes will disperse as per the baseline scenario within the Order limits.

9.7.45 The Order limits are located within an agricultural catchment with no residential or manned property on-site. Therefore, any exceedance will disperse within the Order limits' catchment, with no risk to people or property.

9.7.46 Finally, any battery fluids will be contained within the BESS as:

a. Monitoring system(s) would pick up any failed cells and disconnect them, reducing the risk of a minor cell failure escalating to a failure of cell containment.

b. The cells themselves are relatively dry, so a containment failure does not necessarily mean that there will be liquid leakage.

c. The cells are enclosed in battery modules, providing secondary containment.

d. The battery modules are then enclosed in 'cubes' or shipping container, providing tertiary containment.

Firewater Storage

9.7.47 It is indicated within the ***SuDS Strategy*** that given the nature of the Scheme there will be an intention to contain any fire and allow it to burn out whilst keeping people at a safe distance, with fire water limited to cooling surroundings to prevent spread.

9.7.48 The BESS units will be underlain by a concrete base and any immediate runoff from the infrastructure during a fire event which would require direct firefighting would then runoff the concrete base and be intercepted by the drainage system. None would be able to percolate to the underlying ground.

9.7.49 In the instance there is a small fire which cannot be directly contained there may be potential for contaminated runoff into the SuDS system. The suppressant of firewater by applying firewater to cool surrounding areas will be the intent of firefighting operations, with any direct firefighting to occur during small events requiring limited firewater.

9.7.50 During larger fire events, whereby fires are to be managed onsite most likely by the application of water to adjacent equipment and land to cool them and prevent the spread of the fire, water will be immediately available from four 108,000 litre storage tanks. This will provide up to 4 hrs of water supply at the rate agreed with Essex County Council Fire and Rescue. Due to the potential contaminants within any firewater runoff a separation and storage mechanism will be required within the SuDS/drainage system.

9.7.51 Swales and/or ditches proposed around the perimeter of the BESS for surface water drainage will provide an opportunity to intercept fire-fighting water so

that it can be directed to a suitable storage prior to removal from the site as necessary. A bung and penstock system has been included to intercept and isolate potentially contaminated runoff from the wider SuDS system for all fire events and thus prevent contaminated runoff entering the wider hydrological network. This contaminated runoff would be suitably tested and disposed of offsite without entering the surrounding hydrological network. To attenuate 4,000 kilolitres of firewater a sub-surface attenuation tank storage volume of 4,000m³ will be provided (see ***Appendix 9C: SuDS Strategy***). Ancillary emergency equipment will be kept onsite (e.g., drain bungs, extra fire hose) and will be regularly tested and checked.

9.7.52 Following a fire event, the drainage network will require an assessment to confirm the absence of any contaminants prior to the penstock being released. The Scheme operator will be responsible for conducting a controlled flushing of the drainage network prior to the release of the penstock and bung tools. Refer to ***Appendix 9C SuDS Strategy*** for further details.

9.7.53 Should there be any other spillages on the BESS Compound such as battery leakage or spillage of fuel from the transformers then any contaminated runoff would be managed and intercepted by the penstock system, as with the firewater outlined above.

Ancillary Building Runoff

9.7.54 An ancillary building is part of the Scheme and measures 540m² and will comprise a warehouse building, office, kitchen and toilets. ***Appendix 9C: SuDS Strategy*** indicates that the greenfield runoff rate for the ancillary building would be 0.1 l/s for Qbar and 0.3 l/s for the 1 in 100 year design storm.

9.7.55 The ancillary building is not located within proximity of any watercourses. Given the limited footprint of the ancillary building and lack of surrounding hydrological network, surface water runoff from the ancillary building will be intercepted by a shallow filter drain located between the building and an adjacent proposed access track. The filter drain will not utilise an active outfall and instead will intercept and store onsite surface water flows with no overtopping, preventing any increase in surface water runoff.

9.7.56 The filter drain will be designed with no calculated outflow or discharge and will slowly percolate to the underlying strata as per the natural percolation of the soils. Acknowledging the lack of identified infiltration rate the proposed attenuation features have been designed with excess capacity in order to enable surface water to percolate without overtopping. The designed structure does not account for the potential percolation capacity and is therefore a conservative attenuation volume.

9.7.57 The filter drain would be 1 m deep, with a width of 0.5m and length of 90m.

9.7.58 The filter drain unit has been designed to attenuate surface water flows for the 504m² of impermeable areas associated with the ancillary building in up to and including the 1:100-year +20% climate change event. Over this event, surface water emanating from the filter drain would disperse as per existing flow routes within the wider Site and would flow away from the ancillary building.

9.7.59 The details of the Ancillary Building Runoff are secured within ***Appendix 9C: SuDS Strategy***.

Bulls Lodge Substation Extension Runoff

9.7.60 The Bulls Lodge Substation Extension is part of the Scheme. The existing substation comprises a hybrid soakaway and discharge system with surface water released into the Boreham Tributary to the south east of the Bulls Lodge Substation.

9.7.61 The drainage associated with the Substation Development extension is being designed as a separate component to the SuDS Strategy and is described in ***Appendix D: Bulls Lodge Substation Extension: Drainage Strategy***.This outlines the principles of the design. However, the footprint and impermeable surface dimensions will require review at detailed design. This forms part of the overall drainage strategy for the Scheme which is a requirement under the DCO.

9.7.62 The proposed site for the Bulls Lodge Substation extension covers an anticipated area of 1.525ha. The site will consist of a Gas Insulated Substation (GIS) building (switchgear), access roads and associated car parking facilities. The remainder of the site will be covered in a permeable stone surfacing.

9.7.63 The stone surfacing will be laid in accordance with National Grid Design Standards and will be constructed of a minimum 300mm deep unbound free draining subbase and a minimum 75mm top layer of stone chippings which will allow storage of storm water until it can infiltrate into the surrounding soil. As per the National Grid guidance TS 2.10.09 (Ref 9-82) all access roads and car parking areas will have sufficient cross fall to drain into the adjacent stone surfacing. Therefore, the only area of the site which will need to be 'positively' drained is the roof area.

9.7.64 In keeping with Essex County Council guidance (as LLFA) the surface water discharge rate for rainfall events larger than the 1 in 5-year event will be limited to the 1 in 1-year greenfield runoff rate for all events up to and including the 1 in 100-year rainfall event with an allowance for climate change. The 1 in 1-year greenfield runoff rate for the proposed development is estimated as 1.9 l/s.

9.7.65 The drainage strategy for Bulls Lodge Substation indicates that a hybrid system would be delivered, where any rainfall for events up to and including the 1 in 5-year return period discharge via infiltration. A piped outfall will be set to a level above this to discharge surface water runoff for events up to and including the 1 in 100 year plus 20% climate change events and the discharge rate limited to 1.9l/s. This piped outfall discharges to Boreham Brook to the south of the substation.

9.7.66 The proposed attenuation volume (1,160m^3) will be provided on site within the unbound free draining subbase beneath the stone chippings, the areas beneath the buildings and access roads have been discounted from providing attenuation volume. It has been calculated that the 1,160m^3 storage requirement can be this provided within a subbase of 360mm depth. However, to be conservative it has been assumed that the depth of the subbase will be

600mm at this design stage. It is proposed that the piped outlet would be set at 180mm above the invert level of the subbase

9.7.67 This SuDS system (i.e. permeable pavement) provides attenuation and water quality benefits and is also utilising the subbase for the substation (which is required anyway) and so does not require additional materials to be excavated or brought into the Order limits.

9.7.68 It is proposed that a land drain is installed around the perimeter of the substation to intercept any surface water runoff from adjacent land. It is proposed that this will discharge via gravity pipework to Boreham Brook via a new headwall structure. The rate or volume of flow from the land drainage has not been estimated at this stage. Confirmation of the catchment and relative Greenfield runoff flows will be determined during detailed hydraulic modelling

9.7.69 The substation will not be a manned facility, with only occasional maintenance visits and, as such will not be heavily trafficked. As such there will be no significant discharge of contaminants emanating from the development site apart from the standby generator with associated fuel tank.

9.7.70 The fuel tank will be double skinned and therefore incorporates its own oil containment bund. The bund will have sufficient capacity to contain the full capacity of the fuel tank itself pus an extra 50%, as per National Grid Specification TS 2.10.01 (Ref 9-83).

9.7.71 There is a risk of pollution to Boreham Tributary via the drainage system related to occasional delivery of fuel to refill the generator fuel tank. However, during the delivery an inflatable storage bund with a minimum storage capacity of 7500L will be laid out for the fuel tanker to be stationed on, before being inflated prior to the fuel delivery, enabling spill capture. All fuel deliveries will be supervised, however, should there be a pollution incident during the fuel delivery, there is a stop valve on the tanker to stop the flow of fuel. Any spilled fuel will be contained within the temporary inflatable bund and the procedure for use of the spill kit will be followed. The delivery tankers carry spill kits, and the substation will have a permanent spill kit on site. Spill kits will absorb the fuel so that is can be safely disposed of offsite by a licensed contractor.

9.7.72 National Grid will be responsible for operation and maintenance of the Bulls Lodge substation extension.

Drainage outfalls

9.7.73 The location, position and orientation of the new drainage outfalls described above will be carefully determined and informed by a hydromorphological survey to minimise any adverse local impacts on river processes. Appropriate micro-siting of the outfall will minimise loss of bank habitat, the need for bed scour or hard bank protection, and localised flow disturbance or disruption to sediment transport processes. It will also avoid the creation of ‘dead’ spaces with sedimentation and vegetation blockage risks and to that effect it is not proposed that outfalls are recessed into the bank

Foul Water Drainage

9.7.74 During the operational phase there is capacity for eight permanent staff members to be located at the Solar Farm Site with office and welfare facilities

within the ancillary building and Longfield substation. The welfare facilities at the ancillary building and BESS substation will comprise toilets and a kitchen with foul waters emanating from both facilities.

9.7.75 The ancillary building and Longfield substation are located approximately 550 m and 750 m from the nearest potential foul sewer, assumed to be on Waltham Road. Therefore, connection to a foul sewer will not be feasible.

9.7.76 Foul water associated with the ancillary building and Longfield substation will therefore be stored within a cesspit within the confines of the ancillary building and Longfield substation welfare facility areas. The cesspits will be managed, maintained, inspected and drained by a licensed courier who will then dispose of the waste offsite.

Operation and Management of Drainage Infrastructure

9.7.77 Appendix 9C: The SuDS Strategy indicates that it will be the responsibility of the Scheme operator to maintain effective drainage measures and rectify drainage measures that are not functioning adequately. A nominated person will also have responsibility for reporting on the functionality of drainage measures. Note that maintenance and operation of the Bulls Lodge Substation will be the responsibility of National Grid.

9.7.78 Where impermeable areas remain through the operational phase of the Scheme, the SuDS measures serving these areas will be checked on a regular basis. Should drainage measures require dredging or unblocking, this will be undertaken as soon as practicable by the Applicant or nominated personnel.

9.7.79 A maintenance schedule will be undertaken for the attenuation pond, attenuation tank, swales and check dams, filter drain, cess pit and all ancillary equipment, with indicative long-term maintenance requirements listed in Appendix K of ***Appendix 9C: SuDS Strategy*****.** The maintenance requirements are secured through the SuDS Strategy.

Permits and Consents

9.7.80 The ***Consents and Agreements Position Statement*** [**EN010118/APP/3.3**] sets out what permissions are required for the Scheme.

9.7.81 Various water-related permissions may be required where it is not agreed with the relevant regulating authority to disapply them through the DCO. These permissions may include:

a. Land drainage consent(s) under section 23 of the Land Drainage Act 1991 [Ref 9-5] for works affecting the flow in ordinary watercourses;

b. Flood risk activity permit(s) from the Environment Agency under the Environmental Permitting Regulations (England and Wales) 2016 [Ref 9-11] in connection with drainage outfall installation;

c. Water activity permit(s) from the Environment Agency under the Environmental Permitting Regulations (England and Wales) 2016 [Ref 9-11] for temporary construction and permanent operational discharges;

d. Trade effluent consent under the Water Industry Act 1991 [Ref 9-87] for the purposes of discharging trade effluent from welfare facilities during construction;

e. Full or temporary water abstraction licence(s) under section 24 of the Water Resources Act 1991 [Ref 9-6] (if more than 20m³/d is to be dewatered / over-pumped and exemptions do not apply) – see further detail below; and

f. Temporary water impoundment licence under section 25 of the Water Resources Act 1991 [Ref 9-6] in connection with the laying of cables.

9.7.82 There is the potential for the need for either full or temporary water abstraction licence(s) from the Environment Agency for the abstraction of water from the send and receive pits associated with the underground watercourse crossings or other excavations where groundwater may be encountered, other than where exemptions apply. A full licence is required when more than 20m³ per day of water may need to be abstracted for more than 28 days. A temporary licence is applicable where the abstraction is less than 28 days. Where less than 20m³ per day of water needs to be abstracted, no licence is required. However, in all circumstances it may be necessary to obtain a water activity permit(s) from the Environment Agency to discharge the water to ground or a watercourse if the water is considered to be 'unclean'.

9.8 Assessment of Likely Impacts and Effects

9.8.1 The impacts and effects (both beneficial and adverse) associated with the construction, operation and decommissioning of the Scheme are outlined in the sections below. The assessments have been assessed following consideration of the embedded mitigation measures as described in Section 9.7.

9.8.2 The BESS may be constructed in two phases, with the first phase taking approximately 12-18 months during construction of the Solar Farm Site and in parallel with the Longfield Substation and the Grid Connection Route, and the second phase taking approximately 12-18 months an estimated five years later. This chapter has assessed the reasonable worst-case scenario, which will be the BESS being built out in its entirety during the main construction works and prior to operation.

Potential Impacts during Construction (no earlier than 2024 to 2026)

9.8.3 The greatest risks of adverse impacts during construction are in the vicinity of the River Ter, Boreham Tributary and their tributaries, as well as the numerous small ponds present in the study area.

9.8.4 Overall, during construction the following adverse impacts may occur:

a. Pollution of surface or groundwater due to deposition or spillage of soils, sediment, oils, fuels, or other construction chemicals, or through uncontrolled site run-off;

b. Temporary impacts on sediment dynamics and hydromorphology within watercourses and waterbodies, where new crossings are required to lay cables, or where culverting is required for new access tracks;

c. Temporary impacts on groundwater flow due to the requirement for below ground excavations, including for the drilling/boring launch and receiving pits for watercourse cable crossings;

d. Temporary changes in flood risk from changes in surface water runoff and exacerbation of localised flooding, due to deposition of silt, sediment in drains and ditches;

e. Temporary changes in flood risk due to the construction of Solar PV Panels, site compound and storage facilities, which alter the surface water runoff from the Order limits; and

f. Potential impacts on local water supplies.

Surface Waterbodies – Construction Impact Assessment

9.8.5 The Order limits are located between the River Ter to the north and Boreham Tributary to the south-west. A tributary of the River Ter (referred to as T1) rises immediately east of the Order limits, and there are numerous ponds and agricultural ditches across the Order limits (please refer to ***Figure 9-1***).

9.8.6 Construction activities such as earthworks, excavations, site preparation, levelling and grading operations result in the disturbance of soils. Exposed soil is more vulnerable to erosion during rainfall events due to loosening and removal of vegetation to bind it, compaction and increased runoff rates. Surface runoff from such areas can contain excessive quantities of fine sediment, which may eventually be transported to watercourses where it can result in adverse impacts on water quality, flora and fauna.

9.8.7 Construction works within, along the banks and across watercourses can also be a direct source of fine sediment mobilisation. Other potential sources of fine sediment during construction works include water runoff from earth stockpiles, dewatering of excavations (surface and groundwater), mud deposited on site and local access roads, and that which is generated by the construction works themselves or from vehicle washing.

9.8.8 Generally, excessive fine sediment in runoff is chemically inert and affects the water environment through smothering riverbeds and plants, temporarily changing water quality (e.g. increased turbidity and reduced photosynthesis) and causing physical and physiological adverse impacts on aquatic organisms (such as abrasion or irritation).

9.8.9 During construction, fuel, hydraulic fluids, solvents, grouts, paints and detergents and other potentially polluting substances will be stored and/or used on-site. Leaks and spillages of these substances could pollute the nearby surface watercourses if their use or removal is not carefully controlled and spillages enter existing flow pathways or waterbodies directly. Like excessive fine sediment in construction site runoff, the risk is greatest where works occur close to and within waterbodies.

9.8.10 The majority of construction works across the Order limits are distant from watercourses and on relatively flat topography. As such, the risk to watercourses from construction activities is considered generally low. The greater risks of adverse impacts are where direct works are required within a watercourse.

9.8.11 Direct works to agricultural ditches to strengthen or replace existing culverts are required at ten locations. These ten locations are located approximately at i) TL 74150 14727; ii) TL 74741 15059; iii) TL 74383 14052; iv) TL 74719 14468; v) TL 74585 13836; vi) TL 75123 13809; vii) TL 75683 13787; viii) TL 75890 13943; ix) TL 75271 12681; and x) TL 76430 12512. These are shown on ***Figure 9-1***. Similarly, there will be a culvert extension of Boreham Tributary at Cranham Road and works within Boreham Tributary and an agricultural ditch (labelled T22 on ***Figure 9-1***) to install two new drainage outfalls. These would be at approximate grid references TL 75109 10354 and TL 77140 12023, respectively. Where concrete headwalls are required for these outfalls these will be prefabricated where possible to avoid the need to pour wet concrete into formwork close to a watercourse.

9.8.12 Construction works for culvert upgrades for access tracks and outfall installation have the potential to cause reduction in water quality through sediment disturbance and mobilisation from site clearance and works to install the structures, and the risk of chemical spillages from plant, equipment and materials. However, with regard to the access track culvert works, the affected agricultural ditches are ephemeral/intermittently flowing and when visited on site in September 2021 they were either dry or had ponded standing water that was not flowing at the crossing locations. Nevertheless, when flowing the potential for adverse water quality impacts exists, albeit the poor conveyance potential means the impact is likely to remain very localised. Where possible works should be timed to coincide with drier periods.

9.8.13 The extension of the Boreham Tributary culvert beneath Cranham Road by up to 1.55m has more potential for adverse water quality impacts given that it is expected to carry more permanent, functional flows. However, standard construction techniques would be used to over-pump the flow around the culvert works or flume flow through the works and will provide an effective barrier to interrupt any pollutant pathway and mitigate the potential impact. As with the access track culverts works should be timed to coincide with drier periods, and mitigation measures outlined in the ***OCEMP* [EN010118/APP/7.10]** and WMP would be implemented.

9.8.14 There is also a potential risk of adverse impact to Boreham Tributary where it is crossed by the cable route at three locations and to a ditch parallel to Waltham Road, which is also crossed by the cable route (at approximate grid reference TL 76105 11091). Drilling or boring techniques are proposed to be used which would not disturb the watercourse bed (with the cable a minimum of 1.5m below the bed). However, launch and receiving pits would be required for drilling (no closer than 10m from the water's/channel edge under normal flows) and there would be need for plant movements in the vicinity of the channel during construction. As such, there would be a risk of sediment mobilisation in runoff and for chemical spillages to occur that could enter the channel if not managed accordingly. There is also a chance of frac-out events (i.e. fluid break out) from drilling to the watercourse if not appropriately mitigated for site specific conditions.

9.8.15 To avoid, minimise and reduce potential, adverse impacts a range of mitigation measures will be implemented and these were discussed in Section 9.7. They include:

a. A site specific frac-out risk assessment will be produced prior to commencing works to define the mitigation required based on ground conditions. Water quality monitoring will also be undertaken prior to, during, and following on from the construction activity to ensure any spillages or other pollution is identified. These mitigation requirements will be outlined in a WMP.

b. The Scheme design includes a minimum buffer of 8m around all watercourses (measured from the centre line of the watercourse as marked on Ordnance Survey mapping) and 10m around main rivers (as measured from the centre line of the river as indicated on OS mapping) and 5m around ponds. With the exception of the culverts, outfalls and cable crossings there should, therefore, be no requirement to work in immediate proximity to watercourses or ponds.

c. During construction, all works would be carried out in accordance with the mitigation measures set out in the ***OCEMP*** **[EN010118/APP/7.10]** and WMP. The implementation of standard mitigation measures will help avoid or reduce any potential adverse effects on surface water quality during construction.

9.8.16 With regard to Boreham Tributary, given the requirement to install a drainage outfall, extend an existing culvert beneath Cranham Road, and to undertake works close to (and beneath) the channel for laying the grid connection cable, there is potential for a short term, temporary **minor adverse** impact on surface water quality from construction site runoff, mobilised sediments and the risk of chemical spillages during construction. For the high importance Boreham Tributary (as determined in **Table 9-11**) this results in a temporary **slight adverse effect** which is not significant

9.8.17 The potential for adverse impacts on surface water quality of the low importance agricultural ditches ('other drains and ditches' in Table 9-12) due to culverting works and outfall construction is considered a short term and temporary **minor adverse impact** in terms of water quality, given the mitigation measures outlined above. This results in a temporary **slight adverse effect** which is not significant.

9.8.18 Similarly, there would be temporary **minor adverse** impact from construction site runoff and the risk of chemical spillages to an unnamed drain alongside Waltham Road that also requires a cable crossing, and this will be installed by directional drilling. As a low importance receptor, the installation of the crossing would result in a temporary **slight adverse effect** (not significant) on this unnamed ditch taking into account the appropriate embedded mitigation as outlined above.

9.8.19 Given that no other watercourses or waterbodies will be directly affected by the construction works, and that the Scheme has buffer zones around watercourses and ponds, a **negligible** indirect impact is predicted for all other surface water receptors in the study area from site runoff and chemical spillages (as they may receive runoff indirectly from permitted site discharges of treated runoff). For the very high importance River Ter this results in a **slight effect** (not significant). For the high importance Pond 5, Pond 7, Pond 42, Pond 44, Pond 47, Pond 48, Pond 84, Pond 85, Pond 86 and Pond 90 this results in a **slight adverse effect** (not significant). For the medium importance

tributary T1 and medium importance former gravel pit ponds this results in a **neutral effect** (not significant). For the low importance ubiquitous small ponds this results in a **neutral effect** (not significant).

9.8.20 A summary of these effects is presented in **Table 9-12**.

Table 9-12. Summary of Effect on Surface Water during Construction

Receptor	*Importance (Value)*	*Description of Impact*	*Magnitude of Impact*	*Effect Classifi -cation*	*Significant effect (Yes/No)*
River Ter	Very High	Impact on water quality from fine sediment mobilisation and chemical spillages	Negligible	Slight adverse	No
Boreham Tributary	High	Impact on water quality from fine sediment mobilisation and chemical spillages	Minor adverse	Slight adverse	No
Ponds 5, 7, 42, 44, 47, 48, 84, 85, 86, 90	High	Impact on water quality from fine sediment mobilisation and chemical spillages	Negligible	Slight adverse	No
Tributary of Ter (T1) and former gravel pit ponds	Medium	Impact on water quality from fine sediment mobilisation and chemical spillages	Negligible	Neutral	No
Other ditches and drains	Low	Impact on water quality from fine sediment mobilisation and chemical spillages	Minor adverse	Slight adverse	No
Former gravel pit ponds	Medium	Impact on water quality from fine sediment mobilisation and chemical spillages	Negligible	Neutral	No

Receptor	Importance (Value)	Description of Impact	Magnitude of Impact	Effect Classifi -cation	Significant effect (Yes/No)
Other small ponds	Low	Impact on water quality from fine sediment mobilisation and chemical spillages	Negligible	Neutral	No

Groundwater – Construction Impact Assessment

9.8.21 As indicated in ***Chapter 2: The Scheme*** the Solar PV Panels will be attached to a PV Mounting Structure. The PV Mounting Structures would be piled to an indicative maximum depth of 2m. Other structures such as the Solar Stations and parts of the Balance of Solar System (BoSS) will have foundations with a maximum depth of 1m below ground level. Trenches for cables will be between 0.8m and 1.2m below ground level.

9.8.22 On the basis of existing borehole scans available on the Geoindex website (Ref 9-46), groundwater levels are not shallow across the Order limits, with the majority of boreholes not striking water. However, there are some sand layers in the upper 5m of several borehole logs across the area which have the potential to carry water. Glaciofluvial and alluvium deposits may also carry water at relatively shallow depths, although these are predominantly around watercourses where there will be no construction aside from the three cable crossings of the Boreham Tributary.

9.8.23 As no continuous foundations are in the design and given that groundwater is anticipated to be below 2m across the majority of the Order limits, the shallow, regularly spaced discrete strut PV Panel foundations are considered to have a negligible impact on groundwater flow. As such, no impediment to baseflow in the River Ter, Boreham Tributary or their tributaries are anticipated. Furthermore, the contribution of groundwater underlying the PV arrays to baseflow is likely to be a small proportion of the total baseflow to the rivers as these are generally clay dominated deposits compared to sand and gravel deposits closer to the watercourses. Only one groundwater abstraction has been identified in the study area (west of the Order limits, see **Table 9-8**), and this would also be unaffected (no PWS were identified in the study area, see Section 9.6). Overall, as a medium importance receptor, a **negligible impact** on groundwater flow is a **neutral effect** (not significant).

9.8.24 Construction works to install cables beneath Boreham Tributary using drilling or boring techniques would involve a temporary pit either side of the watercourse (>10m measured from the water's/channel edge under normal flows). The depth of this pit would be determined at a later stage depending on bed level relative to surrounding ground levels, noting the requirement to achieve a minimum of 1.5m headroom between the cables and the watercourse bed. The maximum dimensions of the launch and receiving pits are proposed to be 2m x 2m, with 2m depth (secured in the ***OCEMP* [EN010118/APP/7.10]**).

9.8.25 There may be shallow groundwater in the sand and gravel superficial deposits around Boreham Brook at a level close to that of the watercourse, and so there is potential for groundwater ingress to the pits. This would be managed following standard construction techniques potentially including pumping, damming or shoring up the pits with sheet piling. A temporary abstraction licence is required from the Environment Agency when abstracting more than 20 m^3/day of water per day lasting less than 28 days. Any discharge of groundwater to the watercourse may also require a discharge consent from the Environment Agency if it is considered to be 'unclean' and the conditions of the Environment Agency's Regulatory Position Statement 'Temporary dewatering from excavations to surface water' (April, 2021) cannot be met.

9.8.26 The pits would be backfilled with the original excavated material upon completion and would not affect groundwater flow in the longer term. Given the potential to encounter groundwater temporarily during construction, but that it would be appropriately managed in line with any required permit conditions and best industry practice as outlined in the CEMP, there is the likelihood of a short term, temporary **minor adverse** impact on groundwater flow. For a medium important groundwater aquifer this results in a **slight adverse effect** (not significant).

9.8.27 The Order limits and 1km study area are not known to have a history of potentially contaminating land uses. The nearest known historic landfill site is 2.6km west of the Order limits around the A4130 Essex Regiment Way (Ref 9-84) and there is quarrying activity to the west of the Order limits, west of Waltham Road. Given that no known contaminated land uses have been present within the Order limits themselves, the installation of the module structures to a maximum depth of 2m below ground, cable trenches to a maximum of 1.2m, foundations to a depth of 1m and swales to a maximum depth of 0.6m are not considered to create a significant risk of mobilising contaminants, creating a contaminant pathway or risking infiltration to the water table. A standalone, site specific frac-out risk assessment will be produced prior to drilling the cable crossings, as is standard practice, to mitigate any water quality deterioration from the drilling process. Consequently, water quality impacts to rivers receiving baseflow, and groundwater abstractions down gradient are considered to be **negligible**, and a **neutral effect** (not significant).

9.8.28 A summary of the groundwater effects during construction are provided in **Table 9-13**.

Table 9-13. Summary of Effect on Groundwater during Construction

Receptor	*Importance (Value)*	*Description of Impact*	*Magnitude of Impact*	*Effect Classifi -cation*	*Significant effect (Yes/No)*
Groundwater	Medium (as superficial Secondary aquifers, although bedrock is	Impact on groundwater flow	Minor adverse (temporary)	Slight adverse	No

	unproductive strata)				
Groundwater	Medium (as superficial Secondary aquifers, although bedrock is unproductive strata)	Impacts on water supplies (abstraction licenses/PWS)	Negligible	Neutral	No
Groundwater	Medium (as superficial Secondary aquifers, although bedrock is unproductive strata)	Impact on groundwater quality from mobilisation of contaminants	Negligible	Neutral	No

Flood Risk – Construction Impact Assessment

9.8.29 Fluvial Flood Risk: The Order limits are predominantly in Flood Zone 1. However, the installation of cable crossings beneath Boreham Tributary involve works in areas of Flood Zone 2 and 3. Should a fluvial flood event occur during construction, this could be a potential high risk to construction workers in the immediate vicinity (very high importance receptors). The baseline risk could be exacerbated during construction works by the temporary increase in the rate and volume of surface water runoff from an increase in impermeable areas such as compacted soils and the presence of stockpiled materials and equipment temporarily stored on the floodplain. Sediment, construction materials and equipment may also be washed downstream where it may block the channel and lead to or increase the risk of flooding.

9.8.30 However, with the implementation of standard construction methods and mitigation as described in the ***OCEMP*** **[EN010118/APP/7.10]** and a future WMP, this risk can be effectively managed (for example by monitoring weather forecasts and Environment Agency flood warnings, by undertaking works close to watercourses during periods of dry weather, by ensuring an adequate temporary drainage system is in place and maintained throughout the construction phase and avoiding stockpiling material on floodplains). As such, the magnitude of flooding from these sources during construction, on site and further downstream, is considered to be **negligible** resulting in a **slight adverse** effect (not significant).

Surface Water (Pluvial) Flood Risk

9.8.31 The Order limits are in general at a low risk from surface water flooding, although in some areas (mainly associated with ditches and depressions across the site) there are areas of medium and high risk as outlined in the baseline (Section 9.6) and the FRA. During the works, existing surface flow paths may be disrupted and altered due to site clearance, earthworks, and excavation work. The exposure and compaction of bare ground and the

construction of new embankments and impermeable surfaces may increase the rates and volume of runoff and increase the risk from surface water flooding. However, with the implementation of standard construction methods and mitigation measures (see Section 9.7), this risk can be effectively managed. As such, the impact of flooding from these sources on construction workers is considered to be **negligible** resulting in a **slight adverse effect** (not significant).

Groundwater Flood Risk

9.8.32 The Order limits are considered to be at low to medium risk of flooding from groundwater sources. PV Mounting Structure foundations have the potential to encounter and liberate groundwater in some areas (e.g. where there are sand layers with the potential to carry water), and open excavations (e.g. trenches for laying cables) in some locations may also be more prone to becoming inundated by groundwater. However, with the implementation of the measures outlined in the ***OCEMP*** and in the future WMP, a **negligible** magnitude of impact is predicted to construction workers resulting in a **slight adverse effect** (not significant).

Flood Risk from Drainage Infrastructure and Artificial Sources

9.8.33 The Order limits are at low risk of flooding from sewers and artificial sources. As such, with the implementation of the measures outlined in the ***OCEMP*** and WMP, flooding from these sources is considered to be **negligible** to construction workers, resulting in a **slight adverse effect** (not significant).

9.8.34 Statutory reservoirs (large raised reservoirs with volumes above ground of 25,000m^3 or over) are regularly inspected and maintained as set out in the Reservoirs Act 1975 (Ref 9-8). As such, flooding from these sources is considered to have a **negligible effect** on construction workers, which gives a **slight adverse effect** (not significant).

Flood Risk Summary for Construction

9.8.35 A summary of the flood risk effects during construction are provided in **Table 9-14**.

Table 9-14. Summary of Effect on Flood Risk during Construction

Receptor	*Importance (Value)*	*Description of Impact*	*Magnitude of Impact*	*Effect Classif-ication*	*Significant effect (Yes / No)*
Flooding from fluvial sources during construction	Flood Risk: Very High (construction workers)	Increased fluvial flood risk which could put construction workers at risk	Negligible	Slight adverse	No
Flooding from surface water sources during construction	Flood Risk: Very High (construction workers)	Increased pluvial flood risk which could put construction workers at risk	Negligible	Slight adverse	No

Flooding from groundwater sources during construction	Flood Risk: Very High (construction workers)	Increased groundwater flood risk which could put construction workers at risk	Negligible	Slight adverse	No
Flooding from artificial sources and drainage infrastructure during construction	Flood Risk: Very High (construction workers)	Increased flood risk from artificial source and drainage infrastructure which could put construction workers at risk	Negligible	Slight adverse	No

Potential Impacts during Operation (no earlier than 2026)

9.8.36 During the operational phase, the following impacts may occur without adequate mitigation:

a. Impacts on water quality in waterbodies that may receive surface water runoff or be at risk of chemical spillages from supporting infrastructure for the Scheme (e.g. substations, battery stores, solar stations, local site offices and car parking etc.) and maintenance activities;

b. Potential for reduced chemical loading of watercourses associated with cessation of nitrate, pesticide, herbicide and insecticide applications on arable fields, or reduction in fine sediment/soil erosion, which would be beneficial;

c. Hydromorphological impacts to waterbodies including changes to physical form (for example where outfalls or watercourse crossings are required) which underpin habitats;

d. Impacts on flood risk from increased runoff from new impervious areas across the site;

e. Potential impacts on hydrology as a result of the Scheme by changing the way water infiltrates into the ground; and

f. Potential beneficial impacts on local waterbodies where local abstractions are made for spray irrigation and therefore need will reduce.

Surface Waterbodies: Water Quality – Operation Impact Assessment

9.8.37 ***Appendix 9C: SuDS Strategy*** and ***Appendix 9D: Bulls Lodge Substation Extension Drainage Strategy*** provide the outline drainage arrangements for the Scheme, including attenuation of surface water runoff and containment of spillages from the operational Order limits, whilst minimising flood risk to the Scheme and surrounding areas. The key elements of the outline drainage arrangements are summarised in Section 9.7 of this chapter.

9.8.38 Surface water runoff would occur from solar PV panels and roofs (e.g. ancillary building) and would mainly be low risk. There would also be runoff from new

hardstanding areas such as the BESS Compound, Bulls Lodge Substation Extension, very low trafficked car parks and access tracks.

9.8.39 The SuDS Manual's Simple Index Approach (Ref 9-30) has been applied to assess the suitability of the indicative SuDS treatment train for surface water runoff and spillages. CIRIA have developed a Simple Index Approach Tool (Ref 9-86) to apply this assessment, and land use categories and hazard indices used in the assessment are derived from this tool.

PV Array Runoff

9.8.40 The impermeable area within the Order limits will remain largely consistent with its pre-development state as Solar PV Panels are elevated above ground. Runoff from the Solar PV Panels will alter the existing routing of runoff, by concentrating runoff into drip lines. However, this is mitigated by the PV array tables having regular rainwater gaps to avoid concentrating the drips. Furthermore, planting of species rich grassland and wildflowers will be implemented as 'dripline planting' to promote interception and infiltration of the rainfall. The rainwater will then drain to ground as per the existing situation. A series of perimeter swales and scrapes will be constructed to convey surface water runoff from intense rainfall events (when overland flow may occur) away from the panels and towards the existing drainage network across the site. With the negligible increase in surface water runoff as a result of the Solar PV array within the Order limits, the proposed swales and scrapes will provide additional surface water storage capacity relative to the baseline scenario. To limit the potential flows of surface water within the proposed swales, check dams will be installed within swales. These have the added advantage of reducing potential for soil erosion.

9.8.41 For the Solar PV panels, the 'Roof' land use category within the Simple Index Approach Tool is considered most appropriate. Within this category the '*Commercial/industrial roofing: Medium potential for metal leaching*' has been adopted. This is deemed the most suitable hazard level available but it likely to be precautionary. **Table 9-15** shows the pollutant hazard index score for different pollutants (total suspended solids, metals, and hydrocarbons) for this land use category, as outlined in the Simple Index Approach Tool from the CIRIA C753 The SuDS Manual (Ref 9-86).

9.8.42 **Table 9-15** also shows the treatment potential of swales when compared against the Low Pollution Hazard Index. To achieve a pass the total mitigation index must meet or surpass the pollution hazard index. On this basis, the mitigation index for the PV arrays passes the assessment for total suspended solids, metals, and hydrocarbons.

Table 9-15 Solar PV array runoff water quality risk assessment: Pollution Hazard Indices and the Total Pollutant Mitigation Index for each pollutant from the Solar PV arrays.

Proposed Development Land Use	*SuDS Train*	*Total Suspended Solids*	*Metals*	*Hydrocarbons*
Roof: Commercial/	Swale mitigation	0.5	0.6	0.6

industrial roofing: Medium potential for metal leaching	Pollution Hazard Index	0.3	0.6	0.05
	Total Mitigation Index	**0.5 (Pass)**	**0.6 (Pass)**	**0.6 (Pass)**
	Comment	The proposed treatment train passes the assessment for all pollutants. However, appropriate maintenance of the swales will be required to ensure that they remain effective in the long term.		

BESS Compound

9.8.43 Runoff from the 1.94 ha area of hardstanding at the BESS Compound (e.g. transformer units, ancillary units, office and welfare facilities and substation connection units) will be attenuated via a freely-draining subbase (i.e. a permeable pavement type system) and an attenuation pond before discharging to an existing drain (T22 on ***Figure 9-1***) at approximate NGR TL 77140 12023. Surface water flows will be limited to the 1 in 1 year design storm event rate of 2.4 l/s up to and including the 1 in 100 year (+20% Climate Change) event.

9.8.44 As with the Solar PV arrays, the '*Commercial/industrial roofing: Medium potential for metal leaching*' land use category from the CIRIA Simple Index Approach Tool (Ref 9-86) has been adopted as the most suitable Pollution Hazard Index to assess runoff from the BESS Compound.

9.8.45 **Table 9-16** shows the pollutant hazard index score for the different pollutants alongside the treatment potential of the sub-base permeable pavement and attenuation pond (i.e. the Mitigation Index). Note that the CIRIA C753 SuDS Manual (Ref 9-30) indicates that the treatment potential of a second treatment component should be considered to operate at 50% efficiency.

9.8.46 The mitigation index shown in **Table 9-16** is equal to / greater than the hazard index and so proposed arrangements are assessed as suitable for the treatment of total suspended solids, metals, and hydrocarbons in runoff from the BESS.

Table 9-16 Pollution Hazard Indices and the Total Pollutant Mitigation Index for each pollutant from the BESS.

Proposed Development Land Use	*SuDS Train*	*Total Suspended Solids*	*Metals*	*Hydrocarbons*
Roof: Commercial/ industrial roofing: Medium potential for metal leaching	Permeable Paving mitigation	0.7	0.6	0.7
	Pond (at 50% efficiency) mitigation	0.35	0.35	0.25
	Pollution Hazard Index	0.3	0.6	0.05

Total Mitigation Index	**1.05 (Pass)***	**0.95 (Pass)**	**0.95 (Pass)**
Comment	The proposed treatment train passes the assessment for all pollutants. However, appropriate maintenance of the SuDS features will be required to ensure that they remain effective in the long term.		

*Note A score above 1 is an unrealistic situation (i.e. more than 100% is not possible). However, this indicates that the two stage treatment process will provide a very high degree of treatment of suspended solids.

Ancillary Building

9.8.47 The ancillary building will comprise a warehouse building, office, kitchen and toilets. Runoff from this part of the Scheme will discharge to a filter drain that will slowly percolate to the underlying strata. The filter drain unit has been designed to attenuate surface water flows up to and including the 1:100-year +20% climate change event.

9.8.48 The most appropriate land use category given the low-risk nature of the ancillary building is considered to be '*Commercial/ industrial roofing: Low potential for metal leaching*' based on the CIRIA Simple Index Approach Tool (Ref 9-86).

9.8.49 **Table 9-17** shows the pollutant hazard index score for the different pollutants alongside the treatment potential of the filter drain.

Table 9-17 Pollution Hazard Indices and the Total Pollutant Mitigation Index for each pollutant from the ancillary building.

Proposed Development Land Use	*SuDS Train*	*Total Suspended Solids*	*Metals*	*Hydrocarbons*
Roof: Commercial/ industrial roofing: Low potential for metal leaching	Filter Drain treatment	0.4	0.4	0.5
	Pollution Hazard Index	0.3	0.4	0.05
	Total Mitigation Index	**0.4 (Pass)**	**0.4 (Pass)**	**0.5 (Pass)**
	Comment	The proposed treatment train passes the assessment for all pollutants. However, appropriate maintenance of the SuDS features will be required to ensure that they remain effective in the long term.		

9.8.50 The mitigation index shown in **Table 9-17** is equal to / greater than the hazard index and so proposed arrangements are assessed as suitable for the treatment of total suspended solids, metals, and hydrocarbons in runoff from the ancillary building.

Bulls Lodge Substation Extension

9.8.51 The proposed Bulls Lodge Substation Extension covers an area of 1.525ha. The site will consist of a GIS building, a permanent access road and associated car parking facilities. Runoff from the new area of hardstanding will be discharged via infiltration through a permeable paving system for events up to and including the 1 in 5-year return period discharge. A piped outfall will be set to a level above this to discharge surface water runoff for events up to and including the 1 in 100 year plus 20% climate change events to Boreham Brook with a limited discharge rate (1.9l/s). See Section 9.7 for further details.

9.8.52 The substation will not be a manned facility, with only occasional maintenance visits and, as such, will not be heavily trafficked. There will be no significant discharge of contaminants emanating from the development site apart from the standby generator with associated fuel tank, and this will be self-bunded with a capacity of 150% that of the tank.

9.8.53 To reflect the fact that there will be occasional vehicular movements involving fuel delivery within the Bulls Lodge Substation expansion as well as a car park and access road, a worst-case land use of *Yards/Depots: Standard Commercial and Delivery Yard* has been adopted from the CIRIA Simple Index Approach Tool from the CIRIA C753 The SuDS Manual (Ref 9-86). The hazard indices for this land use are also equivalent to the *Parking: Non-residential car parking with frequent change*. This is a precautionary approach as there will actually be infrequent vehicle movements. **Table 9-18** shows the pollutant hazard index score for different pollutants (total suspended solids, metals, and hydrocarbons) and the treatment potential of the permeable paving (i.e. the Mitigation Index). The mitigation index is equal to / greater than the hazard index and so proposed treatment arrangements are assessed as suitable to protect water receptors.

Table 9-18 Pollution Hazard Indices and the Total Pollutant Mitigation Index for each pollutant from the Bulls Lodge Substation Extension.

Proposed Development Land Use	*SuDS Train*	*Total Suspended Solids*	*Metals*	*Hydrocarbons*
Yards/Depots: Standard Commercial and Delivery Yard & Parking: Non-residential car parking with frequent change.	Permeable Paving treatment	0.7	0.6	0.7
	Pollution Hazard Index	0.7	0.6	0.7
	Total Mitigation Index	**0.7 (Pass)**	**0.6 (Pass)**	**0. 7 (Pass)**
	Comment	The proposed treatment train passes the assessment for all pollutants. However, appropriate maintenance of the SuDS features will be required to ensure that they remain effective in the long term.		

Firewater and Spillage Management

9.8.54 In the instance there is a small fire within the BESS area which cannot be directly contained there may be potential for contaminated firewater runoff into the SuDS system. To mitigate this, the SuDS Strategy (**Appendix 9C**) indicates that drains will be bunged and a penstock implemented at the downstream extremity of the pipework to isolate the network. The penstock will then enable potentially contaminated suppression waters to be isolated and extracted in order to be suitably tested and disposed of offsite without entering the surrounding hydrological network. Following a fire event, the drainage network will require an assessment to confirm the absence of any contaminants prior to the penstock being released. The Scheme operator will be responsible for conducting a controlled flushing of the drainage network prior to the release of the penstock and bung tools. This approach to mitigation is secured in Section 4 of the SuDS Strategy (***Appendix 9C***).

9.8.55 Should there be any other spillages on the BESS Compound such as battery leakage or spillage of fuel from the transformers then any contaminated runoff would be managed and intercepted by the penstock system, as with the firewater outlined above.

9.8.56 Within the Bulls Lodge Substation there is a risk of spillages associated with the delivery of fuel. During deliveries an inflatable storage bund with a minimum storage capacity of 7500L will be laid out for the fuel tanker to be stationed on, before being inflated prior to the fuel delivery, enabling spill capture. Any spilled fuel will be contained within the temporary inflatable bund and the procedure for use of the spill kit will be followed. The delivery tankers carry spill kits, and the substation will have a permanent spill kit on site. Spills will be disposed of offsite by a licensed contractor. The fuel tank will be double skinned and therefore incorporates its own oil containment bund. The bund will have sufficient capacity to contain the full capacity of the fuel tank itself pus an extra 50%. These measures are secured within ***Appendix 9D*** **Bulls Lodge Substation Extension: Drainage Strategy [6.2].**

9.8.57 Given the provision of this mitigation, it is considered that treatment arrangements are suitable to protect potential water receptors

Overview of Surface Water Drainage Impact

9.8.58 The preceding sections indicate that, during operation, there would be a surface water drainage strategy in place to manage all runoff from hardstanding areas, including adequate treatment for potential water quality contaminants. The potential for spillages and management of firefighting water has also been considered and mitigation provided. Furthermore, the Scheme would operate using good industry practice and comply with environmental legislation through the application of an Outline Landscape and Ecology Management Plan, including appropriate maintenance of SuDS.

9.8.59 It is anticipated that with the embedded mitigation of an appropriate drainage strategy mimicking natural flow status, as described above in Section 9.7, there would be no effect on existing surface water flow pathways from site runoff with the Scheme.

9.8.60 Overall, given the implementation of the ***SuDS Strategy*** and ***Bulls Lodge Substation Extension Drainage Strategy*** which are secured as a requirement of the DCO, there would be **negligible** impact to any receiving waterbodies from routine runoff or firefighting/spillage water, namely Boreham Brook (high importance), drain T22 (low importance) and other low importance ephemeral drains across the Order limits (low importance). For Boreham Brook this would result in a **slight adverse** effect, which is not significant. For the low importance drains and ditches this would result in a **neutral effect**, which is not significant. Given these non-significant effects, no downstream receptors such as the River Ter would be adversely affected (i.e. no change which is a non-significant neutral effect).

9.8.61 As land within the Order limits is being taken out of agricultural usage, it is considered there would a decrease in surface water runoff of agricultural additives to the land (be that nutrients in the form of phosphates and nitrates, or from pesticides, herbicides or insecticides). Taking land out of arable production may also have other benefits by reducing the risk of soil erosion and the need for local water abstraction for crop irrigation. This effect is not formally assessed given that there is no data or information on the application of agro-chemicals to the existing land in the Order limits, but nonetheless is worth noting as a potential benefit associated with the Scheme.

9.8.62 A summary of the surface water effects during operation are provided in **Table 9-19**.

Table 9-19 Summary of Effect on Surface Water during Operation

Receptor	Importance (Value)	Description of Impact	Magnitude of Impact	Effect Classification	Significant effect (Yes/ No)
River Ter	Very High	Impact on water quality from operational runoff	No change	Neutral	No
Boreham Tributary	High	Impact on water quality from operational runoff	Negligible	Slight adverse	No
Tributary T1	Medium	Impact on water quality from operational runoff	No change	Neutral	No
Other ditches and drains	Low	Impact on water quality from operational runoff	Negligible	Neutral	No
River Ter	Very High	Impact on water quality from spillages / firefighting water	No change	Neutral	No
Boreham Tributary	High	Impact on water quality from spillages / firefighting water	Negligible	Slight adverse	No

Receptor	Importance (Value)	Description of Impact	Magnitude of Impact	Effect Classification	Significant effect (Yes/ No)
Tributary T1	Medium	Impact on water quality from spillages / firefighting water	No change	Neutral	No
Other ditches and drains	Low	Impact on water quality from spillages / firefighting water	Negligible	Neutral	No

Surface Waterbodies – Morphological Assessment

9.8.63 No construction works are currently proposed within the channel of the River Ter or its tributary T1 (see ***Figure 9-1***). As such, there is no impact to report for these waterbodies.

9.8.64 For the culverted agricultural ditches and extension of the culvert of Boreham Tributary at Cranham Road there will be unavoidable direct loss of riparian, bank and bed habitats where they are wideneded and/or replaced (in the case of access tracks), and there may be indirect losses through shading effects. Shading is likely to reduce light intensity, photosynthesis, metabolic activity and biochemical cycling within the watercourse, thereby impacting on the aquatic ecosystem. The structures may also hamper movement of mammals and are likely to interrupt continuity of the natural hydraulic and sediment regimes. However, with the exception of Boreham Tributary these are ephemeral/intermittently flowing channels without functional flows and new crossings may actually improve conveyance when there is flow in comparison to existing pipe culverts many of which appeared during the site visit to be of an overly small diameter in comparison to the size of the drainage ditches. Culvert design will aim to minimise changes in alignment and length as much as is feasible. The channel bed would be sunken where they are existing box culverts to allow development of a naturalised bed and encourage ecological continuum, or oversized where they are pipe culverts to achieve a similar effect in terms of naturalised substrate. Despite these approaches to softening the impacts of the culverts, a **moderate adverse** magnitude of impact to morphology is considered appropriate as a worst-case scenario from works to culverts within these agricultural ditches and Boreham Tributary as part of the channel will be lost and the existing impact of existing structures will be increased. For these low importance receptors (in terms of morphology) this results in a **slight adverse effect**, which is not significant.

9.8.65 The Scheme will require two new surface water outfalls. Firstly, there will be an outfall carrying drainage from the Bulls Lodge Substation Extension to Boreham Brook at approximate NGR TL 75109 10354. Secondly, there will be an outfall conveying drainage from the BESS attenuation pond to a drain at approximate NGR TL 77140 12023 (watercourse labelled T22 on ***Figure 9-1***). The final location, position and orientation of any new outfall will be carefully determined and informed by a hydromorphological survey to minimise any adverse local impacts on river processes. Appropriate micro-siting of the

outfall will minimise loss of bank habitat, the need for bed scour or hard bank protection, and localised flow disturbance or disruption to sediment transport processes. It can also avoid the creation of 'dead' spaces with sedimentation and vegetation blockage risks and to that effect it is not proposed that outfalls are recessed into the bank. This mitigation is secured in the ***OCEMP.***

9.8.66 For the purposes of the morphological assessment, a headwall size is assumed to be 2 m wide as a worst-case scenario.

9.8.67 The outfall construction will result in unavoidable permanent loss of up to 2 m of riparian habitat on one bank of both of the affected watercourses. However, given appropriate construction methodology and micro-siting as described above, then the long-term impact is considered to be no more than a localised moderate adverse with minimal scour or disturbance of sediment transport processes. Both Boreham Brook and the drain (T22) are low importance receptors in terms of morphology and so the effect is **slight adverse** in both cases (not significant).

9.8.68 A summary of these effects is presented in **Table 9-20**.

Table 9-20. Summary of Effect on Morphology during Construction

Receptor	*Importance (Value)*	*Description of Impact*	*Magnitude of Impact*	*Effect Classifi -cation*	*Significant effect (Yes/No)*
Boreham Tributary	Low (for morphology)	Impacts on morphology of the channel (outfall installation)	Moderate adverse	Slight adverse	No
Watercour se T22	Low (for morphology)	Impacts on morphology of the channel (outfall installation)	Moderate adverse	Slight adverse	No
Other ditches and drains	Low (for morphology)	Impacts on morphology of the channel (culvert works for access tracks)	Moderate adverse	Slight adverse	No

Groundwater – Operation Impact Assessment

9.8.69 Rainfall that runs off the Solar PV panels will generally infiltrate to ground, except during intense rainfall events where infiltration rats may be exceeded and runoff may gather in perimeter swales connecting to the wider existing drainage network, as outlined in Section 9.7. These swales would also allow infiltration to mimic existing drainage patterns. The impact of rainwater runoff infiltrating to groundwater from the Solar PV Panels is considered to be **no change** in terms of water quality as it is purely rainfall as per the existing baseline scenario. There may also be improvements in terms of water quality as land is taken out of agricultural use meaning that there will no longer be

use of products such as fertilisers and pesticides which may leach into the underlying strata. However, at the scale of the wider groundwater aquifer (superficial Secondary aquifers and unproductive bedrock strata) this improvement is unlikely to be significant. No change results in a **neutral effect** on the medium importance groundwater aquifer in terms of water quality relating to PV panel runoff.

9.8.70 Runoff from the Bulls Lodge Substation Extension is to discharge to ground for events up to and including the 1 in 5-year return period discharge (see Section 9.7). The Simple Index Approach outlined above (**Table 9.17**) indicates that permeable paving provides sufficient treatment for potential contaminants in runoff from the substation prior to discharging to ground. The fuel tank on site will be bunded to a capacity of 150% and an inflatable storage bund used when fuel is delivered by tanker. Given this mitigation for runoff and spillages, any water quality impact to the groundwater body would be **negligible**, resulting in a **neutral effect**, which is not significant.

9.8.71 There is potential for localised accumulation of rainfall in driplines around the Solar PV panel arrays. However, the solar arrays are to have spaces to try and avoid all rainfall being directed to one dripline, and grassland and wildflower planting around the panels would allow interception of the drips and allow them to be dispersed. Changes to local runoff driven recharge would be very localised and is considered a **negligible** impact. Construction of building foundations and areas of new hardstanding will prevent recharge of rainfall directly under their footprint, with runoff being conveyed to an attenuation pond from the BESS, and towards permeable paving at the Bulls Lodge Substation extension (see Section 9.7). These areas of hardstanding are very limited in size in comparison to the large scale of the Order limits, the majority of which will remain permeable. The change in distribution of groundwater recharge locally is expected to be **negligible** in terms of its effect on water abstraction and baseflow to rivers. As groundwater is a medium importance receptor this results in a **neutral effect**, which is not significant.

9.8.72 The change of land use from cereal agriculture to solar development would mean that there is no longer a need for irrigation of crops across the Order limits. However, no groundwater abstractions have been identified within the Order limits themselves and only one in the wider study area (to the west of the Order limits, see **Table 9-8**). As such, there is considered to be **no discernible impact** to the groundwater aquifer from reduced abstraction.

9.8.73 No further risks to the groundwater receptors are anticipated during operation of the Scheme, provided that operation is conducted in accordance with the embedded mitigation outlined in Section 9.7 and which will be secured in the DCO, including adoption of best industry practice to manage the risk of chemical spillages.

9.8.74 A summary of the groundwater effects during operation is provided in **Table 9-21**.

Table 9-21 Summary of Effect on Groundwater during Operation

Receptor	Importance (Value)	Description of Impact	Magnitude of Impact	Effect Classification	Significant effect (Yes / No)
Groundwater	Medium (as superficial Secondary aquifers, although bedrock is unproductive strata).	Impact on groundwater quality from rainfall runoff from solar PV panels, and chemical spillages.	No change	Neutral	No
Groundwater	Medium (as superficial Secondary aquifers, although bedrock is unproductive strata).	Impact on groundwater quality from rainfall runoff from Bulls Lodge Substation Extension, and chemical spillages.	Negligible	Neutral	No
Groundwater	Medium (as superficial Secondary aquifers, although bedrock is unproductive strata).	Impact on groundwater recharge from changing land use, with potential impact on groundwater abstraction	Negligible	Neutral	No

Flood Risk – Operation Impact Assessment

Fluvial Flood Risk

9.8.75 The Order limits are predominantly in Flood Zone 1 with very small areas at the northern boundary (River Ter) and the south-west corner (Boreham Tributary) being in Flood Zones 2 and 3 (see ***Appendix 9A: FRA***). The Scheme design indicates no development, Solar PV Panels or associated infrastructure will be located within flood risk areas (aside from cables installed beneath watercourses which have no impact at the operational stage); therefore, flood risk is not increased to the development or elsewhere (and so no other receptors are at risk of flooding, such as ecological or heritage receptors). As the impact on flood risk is negligible, this results in a **slight adverse effect** (not significant) across the Order limits given that fluvial flood risk is of very high sensitivity due to presence of essential power supply infrastructure. In the wider study area the sensitivity is medium due to being less vulnerable development (i.e. predominantly agricultural, woodland and mineral working land use, thereby resulting in a **neutral effect** (not significant).

Surface Water (Pluvial Flood Risk)

9.8.76 It is envisaged that the Solar PV Panels will increase surface water runoff locally by directing rainfall towards driplines, although mitigation has been included in order to disperse such water (i.e. planting beneath the panels). Shallow swales from the PV Panel arrays will accommodate surface water runoff with scrapes included to increase storage capacity compared to the existing baseline condition, thereby reducing peak rates and peak runoff volumes leaving the Order limits during storm events; reducing pluvial flood risk on and off-site and reducing downstream flood risk. Similar mitigation measures have been implemented for the areas of hardstanding, including storage in permeable paving for runoff from the Bulls Lodge Substation Extension and an attenuation pond for runoff from the BESS Compound. Given the measures being implemented for management of surface water, a negligible impact is predicted to surface water flood risk across the Order limits and study area (and so no other receptors are at risk of flooding, such as ecological or heritage receptors).

9.8.77 In EIA terms this negligible impact results in a **slight adverse** effect (not significant) for the areas where surface water flood risk is of high sensitivity. On the basis of surface water modelling undertaken for the scheme the areas at greatest risk of existing surface water flooding are the River Ter floodplain within Sandy Wood on the southern bank of the River Ter immediately east of the Order limits; the floodplain around tributary T1 east of Roll's Farm which is agricultural land; and the very eastern extent of the Order limits where there is existing surface water flooding associated with the Boreham Brook immediately south of the access road to Bulls Lodge substation (this is agricultural land). For the remaining lower risk areas (very low to medium flood risk as shown by the surface water modelling) the result is a **neutral effect** (not significant).

Groundwater Flood Risk

9.8.78 The probability of groundwater flooding is generally less than 25% across the Order limits, increasing to values between 25%-50% in proximity of the River Ter. A higher risk area of >75% encroaches into the eastern boundary of the Order limits adjacent to Ringers Farm (see Section 9.6 and ***Appendix 9A: FRA***). ***Appendix 9C: SuDS Strategy*** and ***Appendix 9D: Bulls Lodge Substation Extension Drainage Strategy*** are designed to ensure no increase in flood risk to the Order limits or elsewhere. Should the Scheme comprise below ground development within strata where groundwater is recorded as present, mitigation measures, including those outlined in British Standard 8102 (Ref 9-85) will be required to reduce the risk of groundwater flooding to underground structures as is good industry practice. Further ground investigation to confirm groundwater levels should be undertaken following granting of the DCO to inform a detailed drainage strategy for the Order limits. Assuming this to be the case, the magnitude of impact from groundwater flooding during operation is considered negligible. As such, for the higher sensitivity area adjacent to Ringers Farm the effect would be **slight adverse** (not significant) whereas it would be **neutral** (not significant) for the medium risk area adjacent to the River Ter and for the remaining lower sensitivity areas across the Order limits. There will be no impact to on- or off-site receptors (e.g. ecological or heritage receptors).

Flood Risk from Drainage Infrastructure and Artificial Sources

9.8.79 Flood risk from drainage infrastructure (e.g. sewers) will not increase from the existing situation with the construction of the solar PV Panels and PV Mounting Structures (see ***Appendix 9A: FRA***). There is no connection between the Scheme and the local sewer network for removal of foul water from the Order limits. There is not envisaged to be any impact on flood risk from artificial sources either on or off site (see ***Appendix 9A: FRA***), and so no effect to on- or off-site receptors (e.g. ecological or heritage receptors). Overall, there is a **neutral effect** (not significant) on flood risk from drainage infrastructure and artificial sources.

Flood Risk Summary for Operation

9.8.80 A summary of the flood risk effects during operation are provided in **Table 9-22.**

Table 9-22 Summary of Effect on Flood Risk during Operation

Receptor	*Sensitivity (Value)*	*Description of Impact*	*Magnitude of Impact*	*Effect Category*	*Significant effect (Yes/ No)*
Flooding from fluvial sources during operation	Order limits: Very High (essential infrastructure) Wider study area: Medium (less vulnerable development)	Increased fluvial flood risk on or off site due to the Scheme	Negligible	Order limits: **Slight adverse** Wider study area: **Neutral**	**No**
Flooding from surface water sources during operation	Flood Risk: Low to High	Increased surface water flood risk on or off site due to the Scheme	Negligible	High sensitivity areas**: Slight adverse** Low to medium sensitivity areas: **Neutral**	**No**
Flooding from groundwater sources during operation	Flood Risk: Low to High	Increased ground water flood risk on or off site due to the Scheme	Negligible	High sensitivity area: **Slight adverse** Low to medium sensitivity areas**: Neutral**	**No**
Flooding from	Flood Risk: Low	Increased flood risk	Negligible	**Neutral**	**No**

Receptor	Sensitivity (Value)	Description of Impact	Magnitude of Impact	Effect Category	Significant effect (Yes/ No)
drainage artificial sources and drainage infrastructure during operation		from artificial sources or drainage infrastructure on or off site due to the Scheme			

Potential Impacts during Decommissioning (assumed for the purposes of the assessment to be up to 24 months, not earlier than 2066)

9.8.81 Potential impacts from the decommissioning of the Scheme are similar in nature to those during construction, as some groundwork would be required to remove infrastructure installed, although it is not proposed that cables installed beneath watercourses would be removed but that they would remain in situ. A Decommissioning Strategy **[EN010118/APP/7.13]** has been prepared to identify required measures to prevent pollution and flooding during this phase of the development. This includes pollution prevention measures, guidance on storage of materials and chemicals/fuel, management of runoff, temporary drainage and flood risk.

9.8.82 As a result of this mitigation, it is considered the decommissioning impacts and effects would be similar (and no worse) to type and scale as those described for the construction phase.

9.9 Additional Monitoring, Mitigation and Enhancement Measures

9.9.1 No additional mitigation measures are proposed.

9.9.2 A Biodiversity Design Strategy is included as Appendix B to the Design Statement [**EN010118/APP/7.3**] to illustrate the design approaches that could be incorporated to further enhance biodiversity on and around the Longfield Solar Farm. As set out in the Draft DCO **[EN010118/APP/3.1]**, Requirement 9 will necessitate the submission and approval of a detailed Landscape and Ecology Management Plan (LEMP) to deliver the provisions as set-out out in the Outline LEMP and to confirm how any approaches and measures set out in the Biodiversity Design Strategy have been incorporated into the design. This may include waterscape enhancements. The Applicant will also collaborate with an academic partner to develop a biodiversity trial area within Project. It is the Applicant's ambition that this would add to the accumulated knowledge on biodiversity enhancements and land use at solar farms and help to inform the solar industry, including other future schemes.

Monitoring

9.9.3 The future WMP will set out details of water quality monitoring to be undertaken during construction. Due to the level of risk posed by the construction works, this monitoring will consist of visual and olfactory observations plus in-situ testing using hand held water quality meters only.

9.9.4 It is important that during the Scheme operation phase that there is a requirement for regular inspection and maintenance of the drainage systems, SuDS and culverts. This will be carried out in accordance with good practice guidance, with indicative requirements outlined in ***Appendix 9C* SuDS Strategy** in which it is secured. The drainage system is designed in accordance with current guidance to ensure that the potential for siltation and blockages is minimised under normal operation. If there is any evidence of excessive erosion or sedimentation associated with new structures further actions will be considered to remedy that impact in as sustainable a way as possible.

9.10 Residual Effects and Conclusions

9.10.1 This section summarises the residual effects of the Scheme on the water environment following the implementation of mitigation.

9.10.2 Residual effects are listed in **Table 9-23** (Scheme construction and decommissioning) and **Table 9-24** (Scheme operation).

9.10.3 Given the embedded mitigation measures, all effects are assessed as not significant. As such, there is no change between significance including embedded mitigation and that including additional mitigation or enhancement.

Table 9-23 Summary of Residual Effects (Construction and Decommissioning)

Receptor	*Description of impact*	*Significance of effect without additional mitigation / enhancement*	*Residual effect after additional mitigation / enhancement*
Surface Water			
River Ter	Impact on water quality from fine sediment mobilisation and chemical spillages	Slight adverse Not significant	***Slight adverse*** ***Not significant***
Boreham Tributary	Impact on water quality from fine sediment mobilisation and chemical spillages	Slight adverse Not significant	***Slight adverse*** **Not significant**
Tributary T1	Impact on water quality from fine sediment mobilisation and chemical spillages	Neutral Not significant	***Neutral*** ***Not significant***
Ponds 5, 7, 42, 44, 47, 48, 84, 85, 86, 90	Impact on water quality from fine sediment mobilisation and chemical spillages	Slight adverse Not significant	***Slight adverse*** ***Not significant***
Former Gravel Pit Ponds	Impact on water quality from fine sediment mobilisation and chemical spillages	Neutral Not significant	***Neutral*** ***Not significant***
Other ditches and drains	Impact on water quality from fine sediment mobilisation and chemical spillages	Slight adverse Not significant	***Slight adverse*** ***Not significant***
Small ponds	Impact on water quality from fine sediment mobilisation and chemical spillages	Neutral Not significant	***Neutral*** ***Not significant***
Groundwater			
Groundwater	Impact on groundwater flow	Slight adverse	***Slight adverse***

Receptor	*Description of impact*	*Significance of effect without additional mitigation / enhancement*	*Residual effect after additional mitigation / enhancement*
		Not significant	***Not significant***
Groundwater	Impact on groundwater quality from mobilisation of contaminants	Neutral Not significant	***Neutral*** ***Not significant***
Groundwater	Impacts on water supplies (abstraction licenses/PWS)	Neutral Not significant	***Neutral*** ***Not significant***
Flooding from fluvial sources during construction	Increased fluvial flood risk which could put construction workers at risk	Slight adverse Not significant	***Slight adverse*** ***Not significant***
Flooding from surface water sources during construction	Increased pluvial flood risk which could put construction workers at risk	Slight adverse Not significant	***Slight adverse*** ***Not significant***
Flooding from groundwater sources during construction	Increased groundwater flood risk which could put construction workers at risk	Slight adverse Not significant	***Slight adverse*** ***Not significant***
Flooding from artificial sources and drainage infrastructure during construction	Increased flood risk from artificial sources and drainage infrastructure which could put construction workers at risk	Slight adverse Not significant	***Slight adverse*** ***Not significant***

Table 9-24 Summary of Residual Effects (Operation)

Receptor	*Description of impact*	*Significance of effect without mitigation*	*Residual effect after mitigation*
Surface Water			
River Ter	Impact on water quality from runoff and chemical spillages	Neutral Not significant	***Neutral*** ***Not significant***
Boreham Tributary	Impact on water quality from runoff and chemical spillages	Slight adverse Not significant	***Slight adverse*** ***Not significant***
Tributary T1	Impact on water quality from runoff and chemical spillages	Neutral Not significant	***Neutral*** ***Not significant***
Other ditches and drains	Impact on water quality from runoff and chemical spillages	Neutral Not significant	***Neutral*** ***Not significant***
River Ter	Impact on water quality from firefighting water/spillages	Neutral Not significant	***Neutral*** ***Not significant***
Boreham Tributary	Impact on water quality from firefighting water/spillages	Slight adverse Not significant	***Slight adverse*** ***Not significant***
Tributary T1	Impact on water quality from firefighting water/spillages	Neutral Not significant	***Neutral*** ***Not significant***
Other ditches and drains	Impact on water quality from firefighting water/spillages	Neutral Not significant	***Neutral*** ***Not significant***
Boreham Tributary	Impacts on morphology of the channel	Slight adverse	***Slight adverse***

Receptor	*Description of impact*	*Significance of effect without mitigation*	*Residual effect after mitigation*
		Not significant	***Not significant***
Watercourse T22	Low (for morphology)	Impacts on morphology of the channel (outfall installation)	Slight adverse
Other ditches and drains	Impacts on morphology of the channel	Slight adverse Not significant	***Slight adverse*** ***Not significant***
Groundwater			
Groundwater	Impact on groundwater quality from runoff and chemical spillages from solar PV panels	Neutral Not significant	***Neutral*** ***Not significant***
Groundwater	Impact on groundwater quality from runoff and chemical spillages from Bulls Lodge Substation Extension	Neutral Not significant	***Neutral*** ***Not significant***
Groundwater	Impact on groundwater recharge, baseflow and abstractions	Neutral Not significant	***Neutral*** ***Not significant***
Flooding from fluvial sources during operation	Increased fluvial flood risk on or off site due to the Scheme	Order limits: Slight adverse Wider study area: Neutral Not significant	Order limits: ***Slight adverse*** Wider study area: ***Neutral*** ***Not significant***

Receptor	*Description of impact*	*Significance of effect without mitigation*	*Residual effect after mitigation*
Flooding from surface water sources during operation	Increased surface water flood risk on or off site due to the Scheme	High sensitivity areas: Slight adverse Low to medium sensitivity areas: Neutral Not significant	High sensitivity areas: ***Slight adverse*** Low to medium sensitivity areas: ***Neutral*** ***Not significant***
Flooding from groundwater sources during operation	Increased groundwater flood risk on or off site due to the Scheme	Neutral Not significant	***Neutral*** ***Not significant***
Flooding from drainage artificial sources and drainage infrastructure during operation	Increased flood risk from artificial sources or drainage infrastructure on or off site due to the Scheme	Neutral Not significant	***Neutral*** ***Not significant***

9.11 Cumulative Effects

9.11.1 The potential for inter-project cumulative effects has been considered for the developments outlined in ***Chapter 17: Effect Interactions*** **[EN010118/APP/6.1]**.

9.11.2 Of those developments listed in ***Appendix 5A: Long List of Cumulative Schemes*** **[EN010118/APP/6.2]**, the following developments are considered to have potential for cumulative effects, due to being located in the study area or adjacent to water receptors which are potentially impacted by the Scheme (notably the River Ter, Boreham Brook and their tributaries). Further details for each of the developments are given in ***Appendix 5A: Long List of Cumulative Schemes***:

a. Flour Mill (16/01394/OUT) - Land North Of Cranham Road, Little Waltham – this consented development is within the study area and adjacent to Boreham Brook;

b. Chelmsford North East Bypass (CC/CHL/14/20/SPO) - located between Great and Little Leighs, Little Waltham, Boreham – this consented development is within the study area and is under construction, and is partly adjacent to Boreham Brook;

c. Stonepath Drive Residential Development (16/01813/OUT, 20/01329/VAR, 20/01906/REM)- Land South Of Stonepath Drive, Hatfield Peverel – this consented development is located adjacent to the River Ter;

d. Hatfield Bury Farm Residential Development (19/01803/FUL) - Hatfield Bury Farm, Bury Lane, Hatfield Peverel – this consented development is in close proximity to tributaries of the River Ter;

e. Bulls Lodge Quarry (CHL/1890/87, ESS/147/20/CHL) – this consented development is immediately adjacent to the Scheme with potential interactions with Boreham Tributary;

f. A12 Chelmsford to A120 Widening Scheme (DCO application expected Q2 2022) – this development is likely to interact with the River Ter and Boreham Brook if consent is granted following a DCO application in 2022;

g. Land At Station Road Residential Development, Hatfield Peverel (16/02096/OUT, 18/01650/VAR) – this consented development is likely to interact with the River Ter;

h. Hatfield Bury Lane Residential Development, Hatfield Peverel (17/00973/FUL) – this consented development is likely to interact with the River Ter;

i. Land East Of Plantation Road, Boreham Residential Development (18/00682/MAT/1) – this consented development appears to have potential interactions with Boreham Tributary;

j. Chelmsford Civic Amenity & Recycling Centre (ESS/42/11/CHL) – this consented development is within the study area and in close proximity to Boreham Brook;

k. Chelmsford Waste Transfer Station, Winsford Way, Chelmsford (ESS/19/20/CHL) – this consented development is within the study area and in close proximity to Boreham Brook;

l. Land South Of Stonepath Drive Residential Development, Hatfield Peverel (20/01906/REM) - this consented development is in close proximity to the River Ter;

m. Great Leighs – Local Plan site allocation – this site would interact with the River Ter and/or its tributaries if taken forward;

n. Willows Green Solar Farm, Braintree (UTT/22/0007/FUL) – this proposed development - this proposed development is in close proximity to the River Ter;

Cumulative Effects during Construction

9.11.3 There is potential for overlap between construction of adjacent schemes and construction of this Scheme. Thus, there is the potential for short term, temporary construction related pollutants generated from both the Scheme and adjacent developments to impact on watercourses in the study area. However, provided that standard and good practice mitigation is implemented on the construction sites through their respective CEMPs and as per the conditions of the relevant planning permission, environmental permits and licences, as is being proposed for this Scheme, the cumulative risk can be effectively managed and there would not be a significant increase in the risks to any waterbodies. As such, there would not be any significant cumulative effects anticipated during construction on the basis of the above assessment. Potential construction phase cumulative effects, mitigation and significance are summarised in Table 9-25.

Table 9-25 Summary of Cumulative Effect assessment during Construction (no earlier than 2024-2026)

Development	*Potential Cumulative Impact*	*Mitigation*	*Potential Residual Effect (taking mitigation into account)*	*Significant effect (Yes/ No)*
Flour Mill (16/01394/OUT)	Potential pollution of Boreham Brook and tributaries from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Unknown whether construction would be simultaneous with the Scheme.	Best practice construction measures assumed to be adopted through the use of a CEMP as per the Scheme, with appropriate adherence to planning and permit conditions.	Neutral	No
Chelmsford North East Bypass (CC/CHL/14/20/ SPO)	Potential pollution of River Ter and Boreham Brook and tributaries from construction site runoff containing	Best practice construction measures to be adopted through the use of a CEMP as	Neutral	No

Development	Potential Cumulative Impact	Mitigation	Potential Residual Effect (taking mitigation into account)	Significant effect (Yes/ No)
	pollutants and fine sediment; chemical spillages; increased flood risk during construction. Road intended to be open by 2024, but there remains potential for construction to be simultaneous with the Scheme.	per the Scheme, with appropriate adherence to planning and permit conditions.		
Stonepath Drive Residential Development (16/01813/OUT, 20/01329/VAR, 20/01906/REM)	Potential pollution of River Ter from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Unknown whether construction would be simultaneous with the Scheme.	Best practice construction measures to be adopted through the use of a CEMP as per the Scheme, with appropriate adherence to planning and permit conditions.	Neutral	No
Hatfield Bury Farm Residential Development (19/01803/FUL)	Potential pollution of tributaries of the River Ter (and hence the River Ter) from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Unknown whether construction would be simultaneous with the Scheme.	Best practice construction measures to be adopted through the use of a CEMP as per the Scheme, with appropriate adherence to planning and permit conditions.	Neutral	No
Bulls Lodge Quarry (CHL/1890/87, ESS/147/20/CHL)	n/a – application for continuation of development permitted by CHL/1890/87 to allow a rephasing of operations.	n/a	n/a	**n/a**
A12 Chelmsford to A120 Widening Scheme	DCO – scoping report submitted to PINS in 2020, with full submission in 2022. Potential pollution of River Ter and Boreham Brook from construction site runoff containing pollutants and fine sediment; chemical spillages; increased	Best practice construction measures to be adopted through the use of a CEMP as per the Scheme, with appropriate adherence to planning and permit conditions.	Neutral	No

Development	Potential Cumulative Impact	Mitigation	Potential Residual Effect (taking mitigation into account)	Significant effect (Yes/ No)
	flood risk during construction. Unknown whether construction would be simultaneous with the Scheme with project set for an end date of 2027-2028.			
Land At Station Road Residential Development (16/02096/OUT, 18/01650/VAR)	Potential pollution of River Ter from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Unknown whether construction would be simultaneous with the Scheme.	Best practice construction measures to be adopted through the use of a CEMP as per the Scheme, with appropriate adherence to planning and permit conditions.	Neutral	No
Hatfield Bury Lane Residential Development, Hatfield Peverel (17/00973/FUL)	Potential pollution of River Ter from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. However, construction appears to be underway and so there is unlikely to be overlap between construction of the two schemes.	Best practice construction measures to be adopted through the use of a CEMP as per the Scheme, with appropriate adherence to planning and permit conditions.	Neutral	No
Land East Of Plantation Road, Boreham Residential Development (18/00682/MAT/ 1)	Potential pollution of Boreham Brook from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. However, construction appears to be underway and so there is unlikely to be overlap between construction of the two schemes.	Best practice construction measures to be adopted through the use of a CEMP as per the Scheme, with appropriate adherence to planning and permit conditions.	Neutral	No
Chelmsford Civic Amenity & Recycling Centre	n/a – continued use of the civic amenity and recycling centre without compliance with condition 3 (fencing	n/a	n/a	**n/a**

Development	Potential Cumulative Impact	Mitigation	Potential Residual Effect (taking mitigation into account)	Significant effect (Yes/ No)
(ESS/42/11/CHL)	details) of CC/CHL/15/94 to allow the existing timber screen to be replaced with a new steel palisade fence			
Chelmsford Waste Transfer Station, Winsford Way, Chelmsford (ESS/19/20/CHL)	n/a – continued use of Waste Transfer Station but with revised operating hours.	n/a	n/a	**n/a**
Land South Of Stonepath Drive Residential Development, Hatfield Peverel (20/01906/REM)	Potential pollution of River Ter from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Unknown whether construction would be simultaneous with the Scheme	Best practice construction measures to be adopted through the use of a CEMP as per the Scheme, with appropriate adherence to planning and permit conditions.	Neutral	No
Great Leighs – Local Plan site allocation	Potential pollution of River Ter and its tributaries from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction from uncontrolled site runoff.	Unknown at this stage as a site allocation, however, if construction overlaps it is assumed appropriate best practice construction practices would be adopted via CEMP and permit conditions.	Neutral	No
Willows Green Solar Farm, Braintree (UTT/22/0007/FUL)	Potential pollution of River Ter and its tributaries from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction from uncontrolled site runoff.	Best practice construction measures to be adopted through the use of a CEMP as per the Scheme, with appropriate adherence to planning and permit conditions.	Neutral	No

Cumulative Effect during Operation

9.11.4 Drainage strategies for all cumulative developments listed above would be produced with reference to the relevant policies and guidance documents outlined in Section 9.2. This has been confirmed through reviewing development submissions on the relevant planning portals where available. In some cases planning applications have yet to be submitted, but it is assumed in these cases that flood risk assessments and appropriate drainage strategies are to be developed in line with best practice. The Scheme assessed in this chapter will similarly be designed to ensure no long-term deterioration in water quality or increase in flooding. Attenuation and treatment will be provided for runoff from the Scheme prior to discharge to waterbodies or ground. As such, provided that all the mitigation measures are implemented for all schemes, then the cumulative impacts from the Scheme and any cumulative schemes are not anticipated to produce any significant effects. Potential operational phase cumulative effects, mitigation and significance are summarised in Table 9-26.

Table 9-26 Summary of Cumulative Effect assessment during Operation (no earlier than 2026)

Development	*Potential Cumulative Impact*	*Mitigation*	*Potential Cumulative Residual Effect (taking mitigation into account)*	*Significant effect (Yes/ No)*
Flour Mill (16/01394/OUT)	Potential pollution of Boreham Brook and its tributaries from diffuse urban runoff from the development; increased flood risk from increased impervious area in the catchment.	A Drainage Strategy and Flood Risk Assessment have been produced for the feed flour mill incorporating SuDS to control runoff rate and provide treatment of pollutants.	Neutral	No
Chelmsford North East Bypass (CC/CHL/14/20/ SPO)	Potential pollution of River Ter and Boreham Brook and its tributaries from diffuse urban runoff from the development; increased flood risk from increased impervious area in the catchment. Potential hydromorphological impacts from watercourse crossings and road outfalls.	A Drainage Strategy and Flood Risk Assessment have been produced for the development incorporating SuDS to control runoff rate and provide treatment of pollutants. Appropriate design of structures is included.	Neutral	No
Stonepath Drive Residential Development (16/01813/OUT, 20/01329/VAR,20/01906/REM)	Potential pollution of River Ter and Boreham Brook and its tributaries from diffuse urban runoff from the development; increased flood risk from	A Drainage Strategy and Flood Risk Assessment have been produced for the development incorporating SuDS	Neutral	No

Development	Potential Cumulative Impact	Mitigation	Potential Cumulative Residual Effect (taking mitigation into account)	Significant effect (Yes/ No)
	increased impervious area in the catchment.	to control runoff rate and provide treatment of pollutants.		
Hatfield Bury Farm Residential Development (19/01803/FUL)	Potential pollution of River Ter and its tributaries from diffuse urban runoff from the development; increased flood risk from increased impervious area in the catchment.	A Drainage Strategy and Flood Risk Assessment have been produced for the development incorporating SuDS to control runoff rate and provide treatment of pollutants.	Neutral	No
Bulls Lodge Quarry (CHL/1890/87, ESS/147/20/CHL)	No impacts predicted as application is to vary phasing, end date and details of existing operation.	Existing operational impact would have been captured by the baseline environment (Section 9.6).	Neutral	No
A12 Chelmsford to A120 Widening Scheme	DCO – scoping report submitted to PINS in 2020, with full submission in 2022. Potential pollution of River Ter and Boreham Brook and its tributaries from diffuse urban runoff from the development; increased flood risk from increased impervious area in the catchment. Potential hydromorphological impacts from watercourse crossings and road outfalls. Unknown whether construction would be simultaneous with the Scheme with project set for an end date of 2027-2028.	Although not yet published, a Drainage Strategy and Flood Risk Assessment are expected to be produced for the development incorporating SuDS to control runoff rate and provide treatment of pollutants. Appropriate design of structures is expected.	Neutral	No
Land At Station Road Residential Development (16/02096/OUT, 18/01650/VAR)	Potential pollution of River Ter and its tributaries from diffuse urban runoff from the development; increased flood risk from increased impervious area in the catchment.	A Drainage Strategy and Flood Risk Assessment have been produced for the development incorporating SuDS to control runoff rate and provide		

Development	Potential Cumulative Impact	Mitigation	Potential Cumulative Residual Effect (taking mitigation into account)	Significant effect (Yes/ No)
		treatment of pollutants.		
Hatfield Bury Lane Residential Development, Hatfield Peverel (17/00973/FUL)	Potential pollution of River Ter and its tributaries from diffuse urban runoff from the development; increased flood risk from increased impervious area in the catchment.	A Drainage Strategy and Flood Risk Assessment have been produced for the development incorporating SuDS to control runoff rate and provide treatment of pollutants.	Neutral	No
Land East Of Plantation Road, Boreham Residential Development (18/00682/MAT/1)	Potential pollution of Boreham Brook and its tributaries from diffuse urban runoff from the development; increased flood risk from increased impervious area in the catchment.	A Drainage Strategy and Flood Risk Assessment have been produced for the development incorporating SuDS to control runoff rate and provide treatment of pollutants.	Neutral	No
Chelmsford Civic Amenity & Recycling Centre (ESS/42/11/CHL)	No impacts predicted as application is to replace a fence, and operation of the facility will continue as per the baseline scenario assessed within this chapter.	Existing operational impact would have been captured by the baseline environment (Section 9.6).	Neutral	No
Chelmsford Waste Transfer Station, Winsford Way, Chelmsford (ESS/19/20/CHL)	No impacts predicted as application is a minor change to extend operating hours.	Existing operational impact would have been captured by the baseline environment (Section 9.6).	Neutral	No
Land South Of Stonepath Drive Residential Development, Hatfield Peverel (20/01906/REM)	Potential pollution of River Ter and its tributaries from diffuse urban runoff from the development; increased flood risk from increased impervious area in the catchment.	A Drainage Strategy and Flood Risk Assessment have been produced for the development incorporating SuDS to control runoff rate and provide treatment of pollutants.	Neutral	No

Development	Potential Cumulative Impact	Mitigation	Potential Cumulative Residual Effect (taking mitigation into account)	Significant effect (Yes/ No)
Great Leighs – Local Plan site allocation	Potential pollution of River Ter and its tributaries from operational diffuse urban runoff from the development; increased flood risk from increased impervious area in the catchment. Potential for hydromorphological impacts but extent of these unknown at this stage.	Unknown at this stage as a site allocation, however it is assumed that an appropriate drainage strategy would be implemented to mitigate any increase in flood risk and to treat any pollutants prior to discharge to surface waterbodies. Watercourse crossings assumed to be of an appropriate clear span design to avoid hydromorphological impacts.	Neutral	No
Willows Green Solar Farm, Braintree (UTT/22/0007/FUL)	Potential pollution of the River Ter and its tributaries from diffuse urban runoff from the development; increased flood risk from increased impervious area in the catchment.	A Drainage Strategy and Flood Risk Assessment have been produced for the development incorporating SuDS to control runoff rate and provide treatment of pollutants.	Neutral	No

9.12 References

Ref 9-1 HMSO (2021) Environment Act 2021.
Ref 9-2 HMSO (2014) Water Act 2014.
Ref 9-3 HMSO (2010) Flood and Water Management Act 2010.
Ref 9-4 HMSO (1990) Environment Protection Act 1990.
Ref 9-5 HMSO (1991) Land Drainage Act 1991 (as amended).
Ref 9-6 HMSO (1991) Water Resources Act 1991 (as amended).
Ref 9-7 HMSO (1975) Salmon and Freshwater Fisheries Act 1975 (as amended).
Ref 9-8 HMSO (1975) The Reservoirs Act 1975
Ref 9-9 HMSO (2017) Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
Ref 9-10 HMSO (2017) Environmental Damage (Prevention and Remediation) Regulations 2017.
Ref 9-11 HMSO (2018) Environmental Permitting (England and Wales) Regulations 2016 (as amended 2018).
Ref 9-12 HMSO (2009) Eels (England and Wales) Regulation 2009.
Ref 9-13 HMSO (2001) Control of Pollution (Oil Storage) (England) Regulations 2001.
Ref 9-14 HMSO (2009) Eels (England and Wales) Regulation 2009.
Ref 9-15 HMSO (2009) The Water Resources Act (Amendment) (England and Wales) Regulations 2009.
Ref 9-16 HMSO (2009) The Flood Risk (England and Wales) Regulations 2009;
Ref 9-17 HMSO (2002) The Control of Substances Hazardous to Human Health (COSHH) Regulations 2002.
Ref 9-18 HMSO (1999) The Anti-Pollution Works Regulations 1999;
Ref 9-19 The Water Framework Directive (Standards and Classification) Directions 2015;
Ref 9-20 National Planning Statement (NPS) for Overarching Energy EN-1 (2011).
Ref 9-21 National Planning Statement (NPS) for Renewable Energy EN-3 (2011).
Ref 9-22 National Planning Statement (NPS) for Electricity Networks EN-5 (2011).
Ref 9-23 Draft National Planning Statement (NPS) for Renewable Energy EN-3 (2021).
Ref 9-24 Department of Communities and Local Government (DCLG) (2021) National Planning Policy Framework (NPPF).
Ref 9-25 Department of Communities and Local Government (2014) National Planning Practice Guidance.
Ref 9-26 Department of Communities and Local Government (2014) National Planning Practice Guidance: Flood Risk and Coastal Change.
Ref 9-27 The UK Government's 25 Year Environment Plan.
Ref 9-28 The UK Government's Future Water Strategy (2011).
Ref 9-29 The Non-statutory technical standards for Sustainable Drainage Systems.
Ref 9-30 CIRIA (2016) Report C753 The SuDS Manual 2nd Edition.
Ref 9-31 National Highways (2020) DMRB CD532 Vegetated Drainage Systems for Highways Runoff.
Ref 9-32 The Building Regulations 2010 Approved Document Part H: Drainage and Waste Disposal.
Ref 9-33 Water UK (2019) Sewerage Sector Guidance.
Ref 9-34 Environment Agency (2015) Anglian River Basin Management Plan.
Ref 9-35 Chelmsford City Council (2020) Chelmsford Local Plan.
Ref 9-36 Braintree District Council (2017) Draft Local Plan.

Ref 9-37 Braintree District Council (2011) Core Strategy.
Ref 9-38 Essex County Council (2020) Sustainable Drainage Systems: Design Guide.
Ref 9-39 Ordnance Survey maps.
Ref 9-40 Aerial Photographic maps.
Ref 9-41 Met Office website,
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