



The Sizewell C Project

6.9 Volume 8 Freight Management Facility Chapter 7 Terrestrial Ecology and Ornithology

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Plates

None Provided.

Figures (Refer to Annex 7A.1)

All figures can be found within Annex 7.1 of Appendix 7A Ecological Baseline for the Freight Management Facility.

Figure 7.1: Location of Statutory Designated sites within 5km of the Freight Management Facility

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Appendix 7A: Ecological Baseline for the Freight Management Facility.

7 Terrestrial Ecology and Ornithology

7.1 Introduction

7.1.1 This chapter of **Volume 8** of the **Environmental Statement (ES)** presents an assessment of the potential effects on terrestrial ecology and ornithology arising from the construction, operation, removal and reinstatement of the proposed freight management facility at Seven Hills (referred to throughout this volume as the ‘proposed development’). This includes an assessment of potential impacts, the significance of effects, the requirements for mitigation, and the residual effects.

7.1.2 Detailed descriptions of the freight management facility site (referred to throughout this volume as the ‘site’), the proposed development, and the different phases of development are provided in **Chapters 1** and **2** of this volume of the **ES**. A glossary of terms and list of abbreviations used in this chapter is provided in **Volume 1, Appendix 1A** of the **ES**.

7.1.3 This assessment has been informed by data from other assessments within this volume as follows:

- **Chapter 10:** Transport, of **Volume 2** of the **ES**.
- **Chapter 4:** Noise and vibration, of this volume.
- **Chapter 5:** Air quality, of this volume.
- **Chapter 6:** Landscape and visual (lighting), of this volume.
- **Chapter 10:** Soils and agriculture, of this volume.
- **Chapter 12:** Ground water and surface water, of this volume.

7.1.4 This assessment has been informed by data presented in the following technical appendix:

- **Appendix 7A:** Ecological Baseline for Freight Management Facility.

7.2 Legislation, policy, and guidance

7.2.1 **Volume 1, Appendix 6J** identifies and describes legislation, policy and guidance of relevance to the assessment of the potential terrestrial ecology and ornithology impacts associated with the Sizewell C Project across all **ES** volumes.

7.2.2 This section provides an overview of the specific legislation, policy and guidance of relevance to the proposed development assessment.

a) International

7.2.3 International legislation and policies relating to the terrestrial ecology and ornithology assessment include:

- Convention on Biological Diversity (Ref. 7.1).
- Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ref. 7.2).
- Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (Birds Directive) (Ref. 7.3).
- Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive) (Ref. 7.4).
- Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) (Ref. 7.5).
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (Ref. 7.6).

7.2.4 The requirements of these, as relevant to the terrestrial ecology and ornithology assessment, are set out in **Volume 1, Appendix 6J** of the **ES**.

b) National

7.2.5 National legislation and policies relating to the terrestrial ecology and ornithology assessment include:

- Wildlife and Countryside Act (Ref. 7.7).
- Conservation of Habitats and Species Regulations (Habitat Regulations) (Ref. 7.8).
- Countryside and Rights of Way Act (Ref. 7.9).
- Natural Environment and Rural Communities (NERC) Act (Ref. 7.10).
- The Hedgerows Regulation (Ref. 7.11).
- Protection of Badgers Act (Ref. 7.12).
- UK Biodiversity Action Plan (BAP) (Ref. 7.13) (now superseded by the 'UK Post-2010 Biodiversity Framework' (Ref. 7.14)).
- Planning Practice Guidance (Ref. 7.15).

- Government’s 25 Year Environment Plan (Ref. 7.16).
- National Planning Policy Framework (NPPF) (Ref. 7.17).
- National Policy Statements (NPSs) for Energy Infrastructure (Ref. 7.18).

7.2.6 The requirements of these, as relevant to the terrestrial ecology and ornithology assessment, are set out in **Volume 1, Appendix 6J** of the **ES**.

7.2.7 The overarching NPS for Energy (EN-1) (Ref. 7.18) and NPS for Nuclear Power Generation (EN-6) (Ref. 7.18) provide the primary policy framework within which the development will be considered. A summary of the relevant planning policy, together with consideration of how the advice has been taken into account is provided in **Volume 1, Appendix 6J** of the **ES**, with requirements specific to this site set out in **Table 7.1** and **Table 7.2**.

Table 7.1: Requirements of the National Policy Statement for Energy (EN-1).

Ref.	NPS topic requirement.	How the requirement has been addressed in relation to terrestrial ecology and ornithology.
EN-1 4.3	<i>“Under the Habitats and Species Regulations consideration must be given to whether the project may have a significant effect on a European site, or on any site to which the same protection is applied as a matter of policy, either alone or in combination with other plans or projects. In the event that an Appropriate Assessment is required, the applicant must provide information as may reasonably be required to enable the Appropriate Assessment to be conducted. This should include information on any mitigation measures that are proposed to minimise or avoid likely effects”</i>	A Habitat Regulations Assessment (HRA) Screening assessment is included in the Shadow HRA Report for the Sizewell C Project, (Doc Ref. 5.10). The Shadow HRA Report (Doc Ref. 5.10) considers the possible pathways whereby the proposed development (in this case the freight management facility) could have a significant effect on a European Site. It concludes that whilst possible pathways do exist, there is no potential for a significant effect.
EN-1 5.2.3	<i>“A particular effect of air emissions from some energy infrastructure may be eutrophication, which is the excessive enrichment of nutrients in the environment. Eutrophication from air pollution results mainly from emissions of NOx and ammonia. The main emissions from energy infrastructure are from generating stations. Eutrophication can affect plant growth and functioning, altering the competitive balance of species and thereby damaging biodiversity. In aquatic ecosystems it can cause changes to algal</i>	Air emissions have not been considered as a significant effect pathway due to the enforcement of the primary and tertiary mitigation which would suitably protect neighbouring habitats. See Chapter 5 of this volume, for further details.

Ref.	NPS topic requirement.	How the requirement has been addressed in relation to terrestrial ecology and ornithology.
	<i>composition and lead to algal blooms, which remove oxygen from the water, adversely affecting plants and fish. The effects on ecosystems can be short term or irreversible, and can have a large impact on ecosystem services such as pollination, aesthetic services and water supply.”</i>	
EN-1 5.2.7	<i>“The ES should describe... any potential eutrophication impacts.”</i>	Please refer to the explanation for EN-1 5.2.3 above.
EN-1 5.3.3	<i>“Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity.”</i>	Designated sites have been detailed within section 7.4 of this chapter. These have all been scoped out of the assessment in Table 7.10 due to the distance from the proposed development, and the implementation of the primary and tertiary mitigation described in section 7.5 of this chapter.
EN-1 5.3.18	<p><i>“The applicant should include appropriate mitigation measures as an integral part of the proposed development. In particular, the applicant should demonstrate that:</i></p> <ul style="list-style-type: none"> <i>• during construction, they will seek to ensure that activities will be confined to the minimum areas required for the works;</i> <i>• during construction and operation best practice will be followed to ensure that risk of disturbance or damage to species or habitats is minimised, including as a consequence of transport access arrangements;</i> <i>• habitats will, where practicable, be restored after construction works have finished; and</i> <i>• opportunities will be taken to enhance existing habitats and, where practicable, to create new habitats of value within the site landscaping proposals.”</i> 	<p>Primary and tertiary mitigation has been defined within section 7.5 of this chapter. Secondary mitigation is detailed in section 7.7 of this chapter.</p> <p>The site boundary has been restricted so as to avoid the most sensitive habitats. Habitat would be restored to its original use (agriculture) during removal and reinstatement.</p>

Table 7.2: Requirements of the National Policy Statement for Nuclear Power Generation (EN-6).

Ref.	NPS topic requirement.	How the requirement has been addressed in relation to terrestrial ecology and ornithology.
EN-6 1.7.4	<p><i>“Possible adverse effects on nature conservation sites of European importance were identified by the Nuclear Habitats Regulations Assessment (HRA). Further studies will need to be carried out, as part of the project HRA and environmental impact assessment (EIA) processes for individual development consent applications, to determine the significance of the effects and the effectiveness of any mitigation measures.”</i></p> <p><i>‘Possible significant adverse effects on nationally important nature conservation sites and designated landscapes were identified by the Nuclear AoS. Further studies will need to be carried out, as part of the project EIA process for individual development consent applications, to determine the significance of the effects and the effectiveness of any mitigation measures.’</i></p>	<p>A Habitat Regulations Assessment (HRA) Screening assessment is included in the Shadow HRA Report for the Sizewell C Project (Doc Ref. 5.10).</p> <p>The Shadow HRA Report (Doc Ref. 5.10) considers the possible pathways whereby the proposed development (in this case the freight management facility) could have a significant effect on a European Site. It concludes that whilst possible pathways do exist, there is no potential for a significant effect.</p> <p>Within this ES, the methodology used to determine the ecological baseline and baseline for terrestrial ecology and ornithology is detailed within section 7.3, section 7.4, both of this chapter, and Appendix 7A of this volume. Section 7.4 of this chapter also identifies the IEFs for which the impacts have been assessed within section 7.6 of this chapter, in line with the methodology defined within section 7.3 of this chapter. Section 7.7 of this chapter describes the additional mitigation prescribed to minimise significant effects and monitoring required to measure mitigation effectiveness.</p>
EN-6 Annex A A.7.4	<p><i>“All project level Habitats Regulations Assessments must take account of the potential adverse effects and the proposed avoidance and mitigation measures identified through the strategic level assessment(s).”</i></p>	
EN-6 Annex C C.8.54	<p><i>“The Habitats Regulations Assessment on sites of international importance has proposed a suite of avoidance and mitigation measures to be considered as part of the project level Habitats Regulations Assessment. At this stage, it is assessed that the effective implementation of the proposed suite of avoidance and mitigation measures may help to address adverse effects on European site integrity, but that more detailed project level Habitats Regulations Assessment is required to reach conclusions that are in accordance with the requirements of the Habitats Directive.”</i></p>	

Ref.	NPS topic requirement.	How the requirement has been addressed in relation to terrestrial ecology and ornithology.
EN-6 Annex C C.8.53	<p><i>“A precautionary approach suggests that the assessment at this strategic level cannot rule out the potential for adverse effects on the integrity of nine European sites (Alde-Ore and Butley Estuaries Special Area of Conservation (SAC), Alde-Ore Estuary SPA/Ramsar, Minsmere to Walberswick Heaths and Marshes SAC, Minsmere to Walberswick SPA/Ramsar, Orfordness-Shingle Street SAC, Sandlings SPA, Outer Thames Estuary SPA) through potential impacts on water resources and quality, habitat and species loss and fragmentation, and disturbance (noise, light and visual).”</i></p>	<p>An assessment of designated sites within 5 kilometres (km) of the site was carried out and is detailed in section 7.4 of this chapter. All designated sites have been scoped out of further assessment due to their distance from the site boundary and the lack of direct and indirect pathways. This has been described within Table 7.10.</p>
EN-6 Annex C C.8.60	<p><i>“Some responses focused on designated sites including Sizewell Marshes site of Special Scientific Interest (SSSI) and Leiston-Aldeburgh SSSI, and potential effects on Minsmere-Walberswick Heaths and Marshes SSSI, from which the site boundary includes some land-take. Some responses questioned how direct land take could be mitigated.”</i></p>	
EN-6 C.8.61	<p><i>“The Appraisal of Sustainability identified the potential for adverse effects on sites and species considered to be of national nature conservation importance means that significant strategic effects on biodiversity cannot be ruled out at this stage of the appraisal. The Appraisal of Sustainability identifies that there could be potential significant effects at the following SSSIs which are within 5km of the site: Sizewell Marshes SSSI; Minsmere-Walberswick Heaths and Marshes SSSI; Leiston-Aldeburgh SSSI; Alde-Ore Estuary SSSI.”</i></p>	

c) Regional

7.2.8 Regional policies relating to the terrestrial ecology and ornithology assessment include:

- Suffolk Nature Strategy (Ref. 7.19).
- Suffolk Local Biodiversity Action Plan (BAP) (Ref. 7.20).
- Suffolk’s Priority Species and Habitats list (Ref. 7.21).

7.2.9 The requirements of these, as relevant to the terrestrial ecology and ornithology assessment, are set out in **Volume 1, Appendix 6J** of the **ES**.

d) Local

7.2.10 Local policies relating to the terrestrial ecology and ornithology assessment include:

- Suffolk Coastal District Council Local Plan Core Strategy and Development Management Policies (Ref. 7.22).
- Suffolk Coastal District Council Final Draft Local Plan (Ref. 7.23).

7.2.11 The requirements of these, as relevant to the terrestrial ecology and ornithology assessment, are set out in **Volume 1, Appendix 6J** of the **ES**.

e) Guidance

7.2.12 This assessment has been undertaken in accordance with the Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment (EclA) (Ref. 7.24), to provide the determining body with clear and concise information about the likely significant ecological effects associated with the proposed development. In addition, the following guidance documents were considered during the survey and assessment process:

- Handbook for Phase 1 habitat survey – a technique for environmental audit (Ref. 7.25).
- Bird Monitoring Methods: A Manual of Techniques for Key UK Species (Ref. 7.26).
- UK Birds of Conservation Concern (Ref. 7.27).
- Red Data Book of British Invertebrates (Ref. 7.28).
- Hedgerows Regulations Guidelines (Ref. 7.11).
- Technical Information Note 102 – Reptile Mitigation Guidelines (Ref. 7.29).
- Great crested newt (*Triturus cristatus*) mitigation guidelines (Ref. 7.30).
- Evaluating the suitability of habitat for the great crested newt (Ref. 7.31).

- Natural England. Standing advice for local planning authorities who need to assess the impacts of development on badgers (*Meles meles*) (Ref. 7.32).
- Bat Surveys: Good Practice Guidelines, 3rd edition (Ref. 7.33).

7.3 Methodology

a) Scope of the assessment

- 7.3.1 The generic EIA methodology that has been applied for the Sizewell C Project is detailed in **Volume 1, Chapter 6** of the **ES**.
- 7.3.2 The full method of assessment for terrestrial ecology and ornithology that has been applied for the Sizewell C Project is included as **Volume 1, Appendix 6J** of the **ES**.
- 7.3.3 This section provides specific details of the terrestrial ecology and ornithology methodology applied to the assessment of the proposed development and a summary of the general approach to provide appropriate context for the assessment that follows. The scope of assessment considers the impacts of the construction, operation and removal and reinstatement of the proposed development.
- 7.3.4 Under the CIEEM guidelines (Ref. 7.24) habitats and species considered sufficiently important (in nature conservation terms) to be a material consideration in the planning decision, as well as legally protected and/or controlled species for which there is a potential for a breach of their respective legislation as a result of the proposed development, are considered to be Important Ecological Features (IEFs). Ecological features can be important for a variety of reasons (e.g. quality and extent of designated sites or habitats, habitat/species rarity).
- 7.3.5 To comply with the CIEEM Guidelines for EclA (Ref. 7.24), **section 7.4** of this chapter identifies the IEFs that are likely to be sufficiently affected by the proposed development, so as to be a material consideration in the planning decision, and require a more detailed assessment. **Section 7.4** of this chapter also identifies IEFs that are not likely to be significantly affected, and so do not require further assessment; that is, they can reasonably be scoped out of the EclA. Where protected species are present and there is the potential for a breach of the legislation, those species are also considered to be IEFs to be included in the EclA.
- 7.3.6 The scope of this assessment has been established through a formal EIA scoping process undertaken with the Planning Inspectorate. A request for

an EIA Scoping Opinion was initially issued to the Planning Inspectorate in 2014, with an updated request issued in 2019, provided in **Volume 1, Appendix 6A** of the **ES**.

7.3.7 Comments raised in the EIA Scoping Opinion received in 2014 and 2019 have been taken into account in the development of the assessment methodology. These are detailed in **Volume 1, Appendix 6C** of the **ES**.

i. Consultation

7.3.8 The scope of the assessment has also been informed by ongoing consultation and engagement with statutory consultees throughout the design and assessment process. A summary of the comments raised and SZC Co.’s responses are detailed in **Table 7.3**.

Table 7.3: Summary of consultation responses that have informed the scope and methodology of the terrestrial ecology and ornithology assessment.

Consultee	Date	Comment	SZC Co. response.
Suffolk County Council and Suffolk. Coastal District Council.	10 April 2019	<i>“Subject to further detailed discussion regarding design, layout and mitigation these works appear to be capable of being made acceptable in landscape terms. We would strongly encourage any mitigation tree and / or hedge planting to be sited in such a way that it may remain in place after post-construction site clearance such that it may remain as a permanent enhancement of landscape character.”</i>	The proposed landscaping of the site following re-instatement allows for the native tree and shrub planting installed as part of the construction and operational phase to remain in situ. The hedgerow within the middle of the site that would be removed to facilitate the construction of the proposed development would be replanted during the re-instatement phase.
Suffolk County Council and Suffolk. Coastal District Council.	10 April 2019	<i>“Although there is awareness of potential impacts upon bats, a detailed understanding of what is there and assessment of impacts upon biodiversity and a suitable mitigation and compensation strategy will be required.”</i>	A full suite of ecology surveys were undertaken at the site and full assessment of the effects of the proposed development on ecological receptors was undertaken.
Environment Agency.	29 March 2019	<i>“Protected species: Impacts to protected species have not been assessed.”</i>	See above response.

NOT PROTECTIVELY MARKED

Consultee	Date	Comment	SZC Co. response.
Natural England.	9 April 2019	<i>“We note that desk assessments only have been undertaken for this aspect of the Sizewell C Project proposals to date. We are unable to provide further comment until full surveys for protected species are carried out and mitigation/compensation proposals provided for any identified impacts.”</i>	See above response.
Natural England.	9 April 2019	<i>“We advise that these aspects of the proposals present opportunities for biodiversity creation through the planting up of landscaped areas with native species (9-10 hectares in area). However, we note that the intention here is to return the site to greenfield when no longer required (Vol 1, para 2.9.2, pg. 34); this should therefore be taken into account when considering these aspects in terms of potential environmental net gain when assessed against the current baseline value of the site options.”</i>	The proposed landscaping of the site following re-instatement allows for the native tree and shrub planting installed as part of the construction and operational phase to remain in situ. The hedgerow within the middle of the site that would be removed to facilitate the construction of the proposed development would be replanted during the re-instatement phase.
Natural England.	3 October 2019	<i>“In terms of the Freight Management Facilities (FMFs), the proposals are on land which includes habitats listed under Section 41 of the NERC Act, which in the Secretary of State’s opinion are of principal national importance for the purpose of conserving biodiversity. This includes deciduous woodland for the FMF Option 1.”</i>	A Phase 1 habitat survey was undertaken at the proposed development site and the site does not support deciduous woodland within the proposed site boundary.
Suffolk Wildlife Trust.	23 September 2019	<i>“We understand space might be at a premium at</i>	The proposed landscaping of the site following re-

Consultee	Date	Comment	SZC Co. response.
		<i>this location, however, hedge and scrub planting with native species to strengthen corridors and around the perimeter of the site would help toward Net Gain. Verges and other suitable grass areas should be planted with wildflower mixes suitable for the soil type and managed with one late season cut, again aiming for Net Gain.</i>	instatement allows for the native tree and shrub planting installed as part of the construction and operational phase to remain in situ. The hedgerow within the middle of the site that would be removed to facilitate the construction of the proposed development would be replanted during the re-instatement phase.

ii. Study area

- 7.3.9 The study area includes the land within the site and the Zone of Influence (ZOI) (defined below) of the proposed development. Due to the variable sensitivity of terrestrial ecology and ornithology receptors, the Zone of Influence, and therefore the study area, differs depending on the receptor considered.
- 7.3.10 The survey area for which baseline data was collected is defined as “*the geographical extent over which a particular field survey activity took place*”. The survey area differed depending on the receptor being surveyed.
- 7.3.11 Ecological features have been considered within the site and its immediate environs, taking into account their legislative protection, conservation status, and their status/distribution in the vicinity of the site, as well as desk-study information and previous survey work. **Appendix 7A** of this volume, provides the full ecological baseline for the proposed development.
- 7.3.12 Areas and resources that may be affected by the identified activities arising from the of the proposed development were considered. These areas and resources define the ZOI. The ZOI is defined as “*the area over which ecological features may be affected by potential biophysical changes caused by a proposed project and associated activities*” (Ref. 7.24).
- 7.3.13 The ZOIs have been developed as species/species assemblage-appropriate distances from the site boundary, taking account of the varying mobility of different species groups.
- 7.3.14 Based on the process set out above, **Table 7.4** defines the ZOI, study area and survey area for the ecological features of relevance to this assessment.

Table 7.4 Specific ZOI, study area and survey areas for ecological features.

Ecological Feature.		ZOI	Study Area.	Survey Area.
Designated sites.	Statutory	5km	5km	N/A
	Non-statutory	2km	2km	N/A
Plants and Habitats.		2km	2km	Within the site boundary.
Invertebrates		2km	2km	Not surveyed as habitat sub-optimal.
Reptiles		2km	2km	Not surveyed as habitat sub-optimal.
Amphibians		2km	2km	Within the site boundary and a 500m buffer area ¹ .
Birds		2km	2km	Not surveyed as habitat sub-optimal.
Bats		2km	2km	Within the site boundary (and a 10m buffer area for bat tree roost assessments).
Terrestrial Mammals.		2km	2km	Within the site boundary.

7.3.15 Additionally, a **Shadow HRA Report** (Doc Ref. 5.10) assessment has been undertaken which considers the site in the context of possible impacts on European Sites, and a **Water Framework Directive (WFD) Compliance Assessment** has been undertaken on the whole Sizewell C Project (Doc Ref. 8.14) which also considers a number of the important ecological features in the context of the WFD.

iii. [Assessment scenarios](#)

7.3.16 The assessment of effects on terrestrial ecology and ornithology is based on each of the construction, operation, and, where relevant, removal and reinstatement phases of the proposed development, rather than specific assessment years.

iv. [Assessment criteria](#)

7.3.17 As described in **Volume 1, Chapter 6** of the **ES**, the EIA methodology considers whether impacts of the proposed development are likely to have a significant effect on any resources or receptors. Assessments broadly

¹ This is in accordance with standing advice from Natural England for assessing the impacts of developments on great crested newts (Natural England, 2015).

consider the magnitude of impacts and value/sensitivity of resources/receptors that could be affected in order to classify effects.

7.3.18 A detailed description of the assessment methodology used to assess the potential effects on terrestrial ecology and ornithology arising from the proposed development is provided in **Volume 1, Appendix 6J** of the **ES**. A summary of the assessment criteria used in this assessment is presented in the following sub-sections.

b) Sensitivity

7.3.19 The definitions of value and sensitivity criteria used in this assessment are set out in **Table 7.5**. Value and sensitivity are assessed separately, as they are to an extent independent of each other.

Table 7.5: EIA criteria for the assessment of ecological value/sensitivity.

Importance/sensitivity.	Guidelines
High	<p>Value: Feature/receptor possesses key characteristics which contribute significantly to the distinctiveness, rarity and character of the site/receptor (e.g. designated features of international/national importance, such as SACs, Special Protection Areas (SPAs), Ramsar sites and sites of SSSIs).</p> <p>Sensitivity: Feature/receptor has a very low capacity to accommodate the proposed form of change.</p>
Medium	<p>Value: Feature/receptor possesses key characteristics which contribute significantly to the distinctiveness and character of the site/receptor (e.g. designated features of regional or county importance such as CWSs and local Biodiversity Action Plan (BAP) species).</p> <p>Sensitivity: Feature/receptor has a low capacity to accommodate the proposed form of change.</p>
Low	<p>Value: Feature/receptor only possesses characteristics which are locally significant. Feature/receptor not designated or only designated at a district or local level (e.g. Local Nature Reserves).</p> <p>Sensitivity: Feature/receptor has some tolerance to accommodate the proposed change.</p>
Very Low.	<p>Value: Feature/receptor characteristics do not make a significant contribution to local character or distinctiveness. Feature/receptor not designated.</p> <p>Sensitivity: Feature/receptor is generally tolerant and can accommodate the proposed change.</p>

7.3.20 The sensitivity of individual IEFs is provided within **section 7.6** of this chapter, where the potential impacts on IEFs are described. Different individual IEFs may show different levels of sensitivity, depending upon the type of impact being described as well as the predicted duration, extent and magnitude of the impact. The sensitivity of individual IEFs is qualified,

where sufficient information exists. In the absence of detailed information, professional judgement has been used to determine the sensitivity of individual IEFs.

7.3.21 In addition, in line with the CIEEM guidelines (Ref. 7.24), the importance of an ecological feature, as determined with reference to legal, policy and/or nature conservation considerations, has been assessed within the following geographical context:

- International and European importance.
- National importance (i.e. England).
- Regional importance (i.e. the East of England).
- County importance (i.e. Suffolk).
- Local importance, including assessment with a district or borough context, or within the ZOI of the proposed development.

c) **Magnitude**

7.3.22 **Table 7.6** sets out the thresholds that have been used in the definition of the different scales of magnitude to act as a guide for the assessment.

Table 7.6: Assessment of magnitude of impact for the terrestrial ecology and ornithology.

Magnitude	Guidelines
High	Large-scale, permanent/irreversible changes over a large area; for example, loss of greater than 30% of designated site/habitat used by an ecological receptor or greater than 30% loss of a species population within the development area (where this can be determined).
Medium	Medium-scale, permanent/irreversible changes; for example, loss of between 5 and 30% of designated site/habitat used by an ecological receptor or loss of between 5 and 30% of a species population within the development area (where this can be determined).
Low	Noticeable but small-scale change over a partial area; for example, loss of between 1 and 5% of designated site/habitat used by a receptor or loss of a few individuals of a species population.
Very Low.	Noticeable, but very small-scale change; for example, less than 1% of designated site/habitat used by an ecological receptor.

7.3.23 Where possible, magnitude of impact has been quantified taking account of not only the habitat or species resource within the site but also within the wider area, as appropriate. For example, for bats, consideration has been

given to the Core Sustenance Zone (CSZ) for each species, but also habitat quality within the CSZ.

7.3.24 In compliance with the CIEEM guidelines (Ref. 7.24) impacts on biodiversity are assessed not only by magnitude, but are also characterised and described as positive/negative together with their extent, duration, reversibility, timing and frequency (figures for percentage loss in **Table 7.6** above are therefore indicative and not absolute). **Table 7.7** provides impact criteria used in line with the CIEEM guidelines.

Table 7.7: Criteria for determining the impact on ecological features under CIEEM guidelines (Ref. 7.24).

Characteristic	Criteria
Positive or Negative.	Positive impact: a change that improves the quality of the environment. Positive impacts may also include halting or slowing an existing decline in the quality of the environment. Negative impact: a change that reduces the quality of the environment.
Extent	The spatial or geographic area over which the impact/effect may occur.
Magnitude	Refers to the size, amount, intensity and volume. It will be quantified if possible and expressed in absolute or relative terms.
Duration	Duration will be defined in relation to ecological characteristics (such as a species' lifecycle), as well as human timeframes. The duration of an activity may differ from the duration of the resulting effect caused by the activity. Effects may be described as short, medium or long-term and permanent or temporary. Where durations of short, medium, long-term and temporary are given in this assessment, they are defined in months/years, where possible, and often depends on the IEF being assessed.
Frequency	The number of times an activity that will impact biodiversity will occur.
Timing	The timing of an activity or change caused by the project may result in an impact if this coincides with critical life-stages or seasons.
Reversibility	Irreversible: an effect from which recovery is not possible within a reasonable timescale or there is no reasonable chance of action being taken to reverse it. Reversible: an effect from which spontaneous recovery is possible or which may be counteracted by mitigation.

7.3.25 Impacts can also be defined as being direct or indirect. A direct impact is defined as an impact resulting in the direct interaction of an activity with an environmental or ecological component. An indirect impact is defined as an impact on the environment which is not a direct result of a project or activity, often produced away from or as a result of a complex impact pathway.

d) Effect definitions

7.3.26 The definitions of effects for terrestrial ecology and ornithology are shown in **Table 7.8** in line with the EIA methodology set out within **Volume 1, Chapter 6** of the **ES**.

Table 7.8: Generic effect definitions.

Effect	Description
Major	Effects, both adverse and beneficial, which are likely to be important considerations at a national to regional level because they contribute to achieving national/regional objectives, or, which are likely to result in exceedance of statutory objectives and/or breaches of legislation.
Moderate	Effects that are likely to be important considerations at a regional or county level.
Minor	Effects that could be important considerations at a local level.
Negligible	An effect that is likely to have a negligible or neutral influence, irrespective of other effects.

7.3.27 Following the classification of an effect as presented in **Table 7.8**, a clear statement is made as to whether the effect is ‘significant’ or ‘not significant’. Under CIEEM guidelines (Ref. 7.24) the significance of an effect on the IEF(s) has been determined based on the analysis of the factors that characterise the impact (**Table 7.7**). The significance of effect is defined as *“an effect that either supports or undermines biodiversity conservation objectives for the IEFs or for biodiversity in general”*.

7.3.28 Using the CIEEM guidelines (Ref. 7.24) and approach, significance of effect has been qualified regarding an appropriate geographical scale, using the following terms:

- significant at the international level;
- significant at the national level;
- significant at the regional level;
- significant at the county level;
- significant at the local level; and
- not significant.

7.3.29 To allow a consistent approach across all disciplines within the **ES**, the standard levels of significance defined in the CIEEM guidelines (Ref. 7.24) are set out in **Table 7.9**, alongside the equivalent definitions of effect used elsewhere in this **ES**. Therefore, as a deviation from the standard EIA

methodology, minor effects identified within this chapter have been classified as significant at a local level.

Table 7.9: Summary and comparison of EIA and CIEEM based measures of significance of ecological effects

Significance following the CIEEM guidelines.	Equivalent significance definitions following the EIA guidelines Volume 1, Chapter 6.
Significant at the international level.	Major (= significant)
Significant at the national level.	Major (= significant)
Significant at the regional level.	Moderate (= significant)
Significant at the county level.	Moderate (= significant)
Significant at the local level.	Minor (= not significant)
Not significant.	Negligible (= not significant)

e) **Assessment Methodology**

i. **Establishing the baseline**

Existing baseline

7.3.30 Baseline conditions were determined through a combination of a desk-study and field surveys. Technical data has been assimilated from survey work carried out in 2019. A review was also conducted to determine any European and nationally designated sites located within 5km of the site. Through this method, habitat and species of importance were identified and assessed. **Appendix 7A** of this volume contains the detailed methodology and the results of this baseline study which are not replicated here; however, a summary has been provided below.

7.3.31 The desk-study exercise comprised the following steps:

- identification of designated sites (statutory and non-statutory) including SPAs, SACs, Ramsar sites, SSSIs, and National Nature Reserves within 5km, and Local Nature Reserves, CWSs, and Roadside Nature Reserves within 2km;
- review of Suffolk Biodiversity Information Service and Joint Nature Conservation Committee records;
- review of the Ancient Woodland Inventory information held on the Multi-Agency Geographic Information for the Countryside website (Ref. 7.34); and

- review of the Suffolk BAP (Ref. 7.20), Suffolk’s Priority Species and Habitats list (Ref. 7.21) and Section 41 of the NERC Act (Ref. 7.10).

7.3.32 A full account of the desk-study conducted for this EclA has been provided in **Appendix 7A** of this volume.

7.3.33 A detailed suite of ecological survey work was undertaken within the site and/or its immediate surrounds (i.e. within the relevant ZOI) in 2019. The following surveys have been conducted within the relevant ZOI:

- extended Phase 1 habitat and protected species survey, including a hedgerow assessment and badger survey (May 2019);
- great crested newt Habitat Suitability Index² (May 2019); and
- bat tree roost assessments (ground-level assessment only) (May 2019).

7.3.34 **Appendix 7A** of this volume and its associated annexes contain the detailed methodologies and results of these surveys.

Future baseline

7.3.35 Due to the relatively short operational life of the proposed development (9-12 years), the future baseline considers any committed development(s) or forecasted changes (e.g. climate change) that would materially alter the baseline conditions during the construction, operation and removal and reinstatement phases of the proposed development.

ii. Assessment

7.3.36 The assessment of effects on terrestrial ecology and ornithology is based on each of the construction, operation and removal and reinstatement phases of the proposed development, rather than specific assessment years.

iii. Inter-relationships

7.3.37 A number of inter-relationships and their effects have been considered on the different receptors, where relevant. This has included consideration of:

- noise;

² Habitat Sustainability Index refers to the suitability of ponds to support great crested newts; a score of excellent indicates that the pond is suitable to support great crested newts.

- air quality;
- lighting; and
- ground water and surface water.

f) **Assumptions and limitations**

7.3.38 The impact assessment is based on the prevailing ecological conditions which are not expected to change in the absence of the proposed development.

7.3.39 The following limitations have been identified:

- survey areas were based on the site boundary available at the time of survey that has since been modified, and full access to the entire survey area was not obtained; however, it was considered that sufficient access was obtained to be able to make a reasonable assessment of the value of the habitats to protected or notable species;
- access could not be obtained to any of the waterbodies within 500m of the site boundary and, therefore, great crested newt DNA surveys were not undertaken. A review of the nature and quality of existing habitats was undertaken to be able to make a professional judgement regarding presence or likely absence of great crested newts on the site; and
- bat tree roost assessments were undertaken from ground-level and areas within 10m of the site boundary were visually assessed from within the site boundary. Full access to the proposed bat tree survey area was not obtained. It is considered that sufficient access was obtained to be able to record all trees in the survey area that may be affected by the proposed development and to make a reasonable assessment of the potential of these trees to support roosting bats. The trees along the Felixstowe Road were not surveyed but as trees in this area would not be directly affected by the proposed development this is not considered to be a limitation to the assessment.

7.4 **Baseline environment**

7.4.1 This section presents a description of the baseline environmental characteristics within the footprint of the proposed development and in the surrounding area in relation to terrestrial ecology and ornithology. Further details can be found in **Appendix 7A** of this volume. Where a habitat or

species is of conservation concern, this is stated, and the conservation status is provided along with a reference to the appropriate legislation.

a) Current baseline

i. Designated sites

- 7.4.2 There are 11 statutory designated sites of conservation importance within 5km of the site. These are: Nacton Meadows SSSI (900m south-west); the Stour and Orwell Estuaries SPA and Ramsar site (1.6km south); Orwell Estuary SSSI (1.6km south); Ipswich Heaths SSSI (3.3km north-west); Newbourn Springs SSSI (4.1km north); Bixley Heaths SSSI (4.2km north-west); Waldringfield Pit SSSI (4.5km north); the Deben Estuary SPA and Ramsar site (4.9km north-east); and Deben Estuary SSSI (4.9km north-east).
- 7.4.3 The SPA and Ramsar sites support habitat and/or species of European importance listed under Annex I of the EC Birds Directive (Ref. 7.3) and Annex I and II of the EC Habitats Directive (Ref. 7.4). These designated sites are therefore of international importance under the CIEEM guidelines (Ref. 7.24) and of high importance under the EIA-specific methodology.
- 7.4.4 The SSSIs support habitats and species of national importance and are therefore considered to be of national importance under the CIEEM guidelines (Ref. 7.24) and of high importance under the EIA-specific methodology.
- 7.4.5 Six non-statutory designated sites are within 2km of the site boundary, all of which are located over 500m from the site boundary. These are: Nacton Meadows CWS (590m south-west); Levington Cut CWS (1.66km south-west); Kirton Reservoir CWS (1.73km east); Home Wood CWS (1.8km south-west); Levington Lagoon CWS (1.83km south); and Stratton Hall Wood CWS (also an Ancient and Semi-Natural Woodland on the Ancient Woodland Inventory) (1.84km south-east).
- 7.4.6 CWSs support habitat types listed on Section 41 of the NERC Act (Ref. 7.10) and are targeted for action under the Suffolk BAP (Ref. 7.20) and Suffolk's Priority Species and Habitats list (Ref. 7.21). These sites are therefore of county importance under the CIEEM guidelines (Ref. 7.24) and of medium importance under the EIA-specific methodology.
- 7.4.7 Full details of the reasons for designation are provided in **Table 4.1** and **Table 4.2** in **Appendix 7A** of this volume. The boundaries of statutory designated sites within 5km of the site and non-statutory designated sites within 2km are shown on **Figures 7.1** and **7.2** in **Appendix 7A** of this volume respectively.

7.4.8 The proposed development would not involve direct land take from any of these designated sites. Given that there would be no land take and that no obvious impact pathways, both statutory and non-statutory designated sites have been scoped out of the assessment in this volume of the **ES**.

ii. Plants and habitats

7.4.9 **Figure 7.3** in **Appendix 7A** of this volume presents the extended Phase 1 habitat plan for the site.

7.4.10 The site comprises predominantly intensively managed arable fields with no scarce arable weeds or other notable plant species identified. Arable field margins are a habitat listed under Suffolk’s Priority Species and Habitats list (Ref. 7.21), but no botanically rich arable margins were identified within the site boundary. Arable farmland is widespread in Suffolk. The arable habitat on site is of local importance under the CIEEM guidelines (Ref. 7.24) and of very low importance under the EIA-specific methodology.

7.4.11 The fields are bounded by fences and hedgerows; there are two defunct species-poor hedgerows with trees present (H2 and H3) and one species-rich hedgerow with trees (H1). No hedgerows were assessed as ‘important’ when assessed against the Wildlife and Landscape Criteria of the Hedgerows Regulations (Ref. 7.11). Hedgerows are a Suffolk BAP priority habitat (Ref. 7.20) and are listed under Section 41 of the NERC Act (Ref. 7.10). The hedgerows on site are of local importance under the CIEEM guidelines (Ref. 7.24) and of low importance under the EIA-specific methodology.

7.4.12 There is no woodland within the site boundary. An area of plantation woodland (Potter’s Hole) is present to the west of the site, between Felixstowe Road and the Ipswich to Felixstowe branch line, connecting to larger areas of woodland in the wider area to the west and north of the site.

7.4.13 Four waterbodies (ponds) are within 500m of the site boundary. There are no ponds within the site; however, two ponds (P005 and P161) are within 10m of the northern site boundary. Ponds are a habitat listed under Suffolk’s Priority Species and Habitats list (Ref. 7.21) and are listed under Section 41 of the NERC Act (Ref. 7.10). The network of ponds within the ZOI is of local importance under the CIEEM guidelines (Ref. 7.24) and of low importance under the EIA-specific methodology.

iii. Invertebrates

7.4.14 The desk-study, provided in **Appendix 7A** of this volume, identified four invertebrate species within 2km of the site; cinnabar moth (*Tyria jacobaeae*), grayling (*Hipparchia semele*), stag beetle (*Lucanus cervus*),

and tanner beetle (*Prionus coriarius*). Cinnabar moth, grayling, and stag beetle are all listed under Section 41 of the NERC Act (Ref. 7.10), and grayling and stag beetle are also on Suffolk's Priority Species and Habitats list (Ref. 7.21).

- 7.4.15 The Phase 1 habitat survey did not identify any habitat of value to invertebrates within the site or study area. Most of the site comprises arable fields and hedgerows of limited value for invertebrate species. The invertebrate assemblage within the ZOI of the proposed development is therefore of local importance under the CIEEM guidelines (Ref. 7.24) and of very low importance under the EIA-specific methodology.

iv. Amphibians

- 7.4.16 There was one desk-study record of smooth newt (*Lissotriton vulgaris*), located 1.1km north of the site. There were no desk-study records of great crested newts or any other amphibians within 2km of the site.
- 7.4.17 There are four ponds within 500 metres (m) of the site (P003, P004, P005, and P161) provided in **Figure 7.4** in **Appendix 7A** of this volume. Access was not obtained to these ponds. A Habitat Sustainability Index assessment was possible for Ponds P005 and P161 (which are within 10m of the site boundary). While the Habitat Sustainability Index score for Ponds P005 and P161 was 'good', the habitats on site mainly consist of intensively managed arable fields, which are of limited value to great crested newts, and lack connectivity to other suitable habitats. The A14 to the north of the site is considered a significant barrier to the dispersal of great crested newts. It is, therefore, considered unlikely that great crested newts or other common amphibian species would be present on the site.
- 7.4.18 Great crested newt is included on Suffolk's Priority Species and Habitats list (Ref. 7.21), and Section 41 of the NERC Act (Ref. 7.10), as well as protected under Schedule 5 of the Wildlife and Countryside Act (Ref. 7.7), and Schedule 2 of the Conservation of Habitats and Species Regulations (Ref. 7.8). Great crested newts within the ZOI are of local importance under the CIEEM guidelines (Ref. 7.24) and of very low importance under the EIA-specific methodology. Other amphibians within the ZOI are of local importance under the CIEEM guidelines (Ref. 7.24) and of very low importance under the EIA-specific methodology.

v. Reptiles

- 7.4.19 There were no desk-study records of reptile species within 2km of the site. Within the site boundary, suitable habitat for reptiles is limited, but includes marginal habitats, such as field boundaries. These are restricted in extent

and isolated within large tracts of arable farmland, and therefore, are of limited value to reptiles.

- 7.4.20 All four common species of reptile (i.e. grass snake (*Natrix helvetica helvetica*), adder (*Vipera berus*), common lizard (*Zootoca vivipara*) and slow-worm (*Anguis fragilis*)) are included on Suffolk's Priority Species and Habitats list (Ref. 7.21), and Section 41 of the NERC Act (Ref. 7.10). However, given the limited potential for reptiles within the site, the reptile assemblage is of local importance under the CIEEM guidelines (Ref. 7.24) and of very low importance under the EIA-specific methodology.

vi. Ornithology

- 7.4.21 The desk-study, provided in **Appendix 7A** of this volume, identified a considerable number of bird records. Most of these records are associated with the Stour and Orwell Estuaries Ramsar site, SPA and SSSI, 1.6km south of the site boundary. Habitats on the site are agricultural and not considered to be functionally-linked to this designated site. Wetland and coastal bird species are not expected to be present within the site boundary.

- 7.4.22 Of the other desk-study bird species records, an assemblage of birds typical of farmland habitats, including species such as corn bunting (*Emberiza calandra*), grey partridge (*Perdix perdix*), lapwing (*Vanellus vanellus*), linnet (*Linaria cannabina*), turtle dove (*Streptopelia turtur*), tree sparrow (*Passer montanus*), yellowhammer (*Emberiza citrinella*), and yellow wagtail (*Motacilla flava*) as well as ground-nesting species such as skylark (*Alauda arvensis*) (also recorded within the desk-study), could occasionally be present on the site. This is supported by breeding bird surveys undertaken at the park and ride sites at Darsham and Wickham Market in similar arable habitats which also recorded the presence of a farmland bird assemblage. It is also possible that bird species listed on Schedule 1 of the Wildlife and Countryside Act (Ref. 7.7), such as barn owl (*Tyto alba*) could use the site for foraging as part of the wider landscape.

- 7.4.23 The nesting and wintering bird assemblage within the ZOI is of local importance under the CIEEM guidelines (Ref. 7.24) and of low importance under the EIA-specific methodology.

vii. Bats

- 7.4.24 The desk-study, provided in **Appendix 7A** of this volume, identified 15 records of bats within 2km of the site boundary. Species recorded were common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), and brown long-eared bat (*Plecotus auritus*). The two brown long-eared bat records (from 2012) were related to roosts located 0.62km

and 0.81km north of the site. The other records of common pipistrelle and soprano pipistrelle were unspecified. All bat records were from over 500m north of the site.

7.4.25 The assessment of trees with bat roost potential (see **Figure 7.5** in **Appendix 7A** of this volume) identified 18 trees (ten trees with moderate potential, and eight trees with low) within the site with potential to support roosting bats. These trees would be retained, other than one low potential tree (T8) and one moderate potential tree (T9), both of which are within the central hedgerow that is to be removed.

7.4.26 All bat species in the UK are protected under Schedule 5 of the Wildlife and Countryside Act (Ref. 7.7) and Schedule 2 of the Conservation of Habitats and Species Regulations (Ref. 7.8). Five species (barbastelle, brown long-eared, lesser horseshoe, noctule and soprano pipistrelle bat) are listed as priority species on the Suffolk's Priority Species and Habitats list (Ref. 7.21); these and two species not normally present in Suffolk (greater horseshoe and Bechstein's bat) are priority species in England under Section 41 of the NERC Act (Ref. 7.10). Barbastelle additionally receive protection under Annex II of the Habitats Directive (Ref. 7.4). The roosting, foraging and commuting bats within the ZOI are of local importance under the CIEEM guidelines (Ref. 7.24) and of low importance under the EIA-specific methodology.

viii. Terrestrial mammals

7.4.27 There were 16 desk-study records of terrestrial mammals within 2km of the site, comprising brown hare (*Lepus europaeus*), badger and hedgehog (*Erinaceus europaeus*).

7.4.28 There was a single desk-study record of badger. The location information was not of sufficient resolution to determine the location of the record in reference to the site. No badger setts or signs of badgers were recorded during the extended Phase 1 habitat and protected species survey. The habitats on the site are of limited value to badgers for foraging. Badgers are considered absent from the site and are not considered further in this assessment.

7.4.29 A single brown hare was recorded during the extended Phase 1 habitat and protected species survey and there was one desk-study record which was from within the site boundary. Another seven brown hare records were between 0.28km and 0.6km north and north-east of the site boundary. The habitats on site are of moderate value to brown hares. Brown hares are listed under Section 41 of the NERC Act (Ref. 7.10) and Suffolk's Priority Species and Habitats list (Ref. 7.21). Within the ZOI of the proposed

development, brown hare is of local importance under the CIEEM methodology (Ref. 7.24) and of very low importance under the EIA-specific methodology.

7.4.30 There were seven hedgehog desk-study records within 2km of the site, the closest of which was 0.15km east of the site boundary. No hedgehogs were recorded during the extended Phase 1 habitat and protected species survey. The habitats on site are of moderate value to hedgehog. Hedgehog are listed under Section 41 of the NERC Act (Ref. 7.10) and Suffolk's Priority Species and Habitats list (Ref. 7.21). Within the ZOI of the proposed development, hedgehog is local importance under the CIEEM methodology (Ref. 7.24) and of very low importance under the EIA-specific methodology.

7.4.31 There were no desk-study or survey records of hazel dormouse (*Muscardinus avellanarius*), water vole (*Arvicola amphibius*), or otter (*Lutra lutra*) within the study area and no habitats suitable to support these species were recorded on the site. These species are considered absent from the site and are not considered further within this assessment.

b) Future baseline

7.4.32 There are no committed development(s) or forecasted changes (e.g. climate change) that would materially alter the baseline conditions during the construction, operation and removal and reinstatement phases of the proposed development.

c) Important Ecological Features

7.4.33 Following a review of the known baseline (outlined above) within the ZOI, **Table 7.10** lists the ecological features/receptors considered and details which have been carried forward into the detailed assessment. Further justification for these is also found within **section 7.5** of this chapter and in **Appendix 7A** of this volume. Those features/receptors carried forward are those IEFs of sufficient conservation value (local/low importance or above) with a potential to be affected by the proposed development, which therefore require further consideration within this chapter.

7.4.34 There are several ecological features that, while not of significant nature conservation value within the ZOI, do require some consideration because of the legislative protection afforded to them. While not taken forward for detailed assessment, these have been considered further within **section 7.5** of this chapter where appropriate tertiary mitigation to ensure legislative compliance for their protection has been described.

Table 7.10: Determination of IEFs to be taken forward for detailed assessment

Feature/Receptor	Importance (CIEEM/EIA Methodology).	Justification	Scoped in/Out.
Statutory designated sites within 5km of the site boundary.	International/High.	<p>The statutory designated sites support a range of important and European protected habitats and species. Given the distance of these statutory designated sites from the proposed development (the closest of which is 0.9km south-west), and the implementation of the primary and tertiary mitigation measures detailed in section 7.5 of this chapter, no direct or indirect impacts are anticipated on statutory designated sites.</p> <p>The statutory designated sites (Stour and Orwell Estuaries SPA and Ramsar site, Orwell Estuary SSSI, Ipswich Heaths SSSI, Newbourn Springs SSSI, Bixley Heaths SSSI, Waldringfield Pit SSSI, Deben Estuary SPA and Ramsar site, Deben Estuary SSSI, and Nacton Meadows SSSI) have therefore been scoped out of the detailed assessment.</p>	Scoped out.
Non-statutory designated sites within 2km of the site boundary.	County/Medium.	<p>The non-statutory designated sites support a range of habitats that are listed on Section 41 of the NERC Act (Ref. 7.10) and that are targeted for action in the Suffolk BAP (Ref. 7.20). Given the distance of these non-statutory designated sites from the site (the closest of which is 0.59km south-west), and the implementation of the primary and tertiary mitigation measures detailed in section 7.5 of this chapter, no direct or indirect impacts are anticipated on the non-statutory designated sites.</p> <p>The non-statutory designated sites (Nacton Meadows CWS, Levington Cut CWS, Kirton Reservoir CWS, Home Wood CWS, Levington Lagoon CWS, and Stratton Hall Wood CWS) have therefore been scoped out of the detailed assessment.</p>	Scoped out.
Arable habitats.	Local/Very Low.	<p>Arable field margins are a habitat listed under Suffolk’s Priority Species and Habitats list (Ref. 7.21). Arable farmland is widespread in Suffolk and no botanically rich arable margins were identified within the site boundary.</p> <p>This habitat has therefore been scoped out of the detailed assessment.</p>	Scoped out.
Hedgerow and pond habitats.	Local/Low.	<p>Hedgerows are a priority habitat under Section 41 of the NERC Act (Ref. 7.10) and are listed on Suffolk’s Priority Species and Habitats list (Ref. 7.21). There would be loss of one defunct species-poor hedgerow with trees on site to accommodate the proposed development. The majority of the remaining two hedgerows (one defunct species-rich hedgerow with trees and one defunct species-poor hedgerow</p>	Scoped out.

NOT PROTECTIVELY MARKED

Feature/Receptor	Importance (CIEEM/EIA Methodology).	Justification	Scoped in/Out.
		<p>with trees) would be retained. None of the hedgerows are classified as 'important' under the Hedgerows Regulations (Ref. 7.11). The retained hedgerows would be protected by a 10m buffer and new screen planting comprising native species would compensate for the removed hedgerow.</p> <p>Ponds are a priority habitat under Section 41 of the NERC Act (Ref. 7.10) and are listed on Suffolk's Priority Species and Habitats list (Ref. 7.21). The ponds adjacent to the northern site boundary would be retained and protected by a 10m buffer.</p> <p>With the inclusion of the primary and tertiary mitigation measures detailed in section 7.5, it is considered that there would not be any significant effects on this receptor as a result of the proposed development. Therefore, hedgerow and pond habitats have been scoped out of the detailed assessment.</p>	
Invertebrate assemblage.	Local/Very Low.	No habitat of particular value to invertebrates was identified within the site. The majority of the site comprises arable fields, with one species-rich hedgerow and the hedgerows are largely defunct or species-poor, and no other features of particular importance to invertebrate species are present on site, therefore invertebrates have been scoped out of the detailed assessment.	Scoped out.
Great crested newts.	Local/Very Low.	There were no desk-study records of great crested newts within the ZOI and the majority of the site comprises arable fields of limited value to amphibians. Great crested newts have been scoped out of the detailed assessment.	Scoped out.
Other amphibians.	Local/Very Low.	There was only one amphibian desk-study record (of smooth newt) within the ZOI. Most of the site comprises arable fields of limited value to amphibians. Amphibians have been scoped out of the detailed assessment.	Scoped out.
Reptile assemblage.	Local/Very Low..	There were no reptile desk-study records within the ZOI. The majority of the site comprises arable fields of limited value to reptiles. Reptiles have been scoped out of the detailed assessment.	Scoped out.

NOT PROTECTIVELY MARKED

Feature/Receptor	Importance (CIEEM/EIA Methodology).	Justification	Scoped in/Out.
Bird assemblage.	Local/Low	<p>A farmland bird assemblage is expected to be present within the site, representative of the arable habitats present. The assemblage is likely to have low species diversity considering the small size and low quality of the habitats within the site. Intensively managed arable habitat is widespread in Suffolk, and the site is not being managed specifically to benefit birds. It is considered unlikely that any significant adverse effects would occur on the bird populations as a result of the proposed development.</p> <p>Therefore, birds are scoped out of the detailed assessment, details of the tertiary mitigation measures employed to protect birds have been detailed within section 7.5 of this chapter.</p>	Scoped out.
Bat assemblage.	Local/Low	<p>All bat species in the UK are protected under the Conservation of Habitats and Species Regulations (Ref. 7.8). Additional relevant legislation includes the Wildlife and Countryside Act (Ref. 7.7), and the NERC Act (Ref. 7.10). All bat species are also included on Suffolk's Priority Species and Habitats list (Ref. 7.21). There were no records of bats within the site boundary and most of the habitats within the site are of limited value to foraging and commuting bats. There are 18 trees within the site with moderate or low potential to support roosting bats. The degree of sensitivity bats display varies between species; however, it is recognised that all bat species can be negatively impacted by human activities.</p> <p>Therefore, the bat assemblage is scoped into the detailed assessment.</p>	Scoped in.
Brown hare and hedgehog.	Local/Very Low.	<p>Brown hare and hedgehog are listed on Suffolk's Priority Species and Habitats list (Ref. 7.21) and Section 41 of the NERC Act (Ref. 7.10) and there were desk-study records of brown hare and hedgehog within 2km of the site. The habitat within the site boundary is suitable for brown hare and hedgehog and a brown hare was recorded on the site during surveys. The population of brown hare and hedgehog using the site would not be an important constituent of the wider populations of these species and effects are unlikely to be significant.</p> <p>Therefore, brown hare and hedgehog have been scoped out of the detailed assessment, details of the tertiary mitigation measures employed to protect these species have been detailed within section 7.5 of this chapter.</p>	Scoped out.

7.4.35 In summary, the IEFs taken forward for a detailed assessment within **section 7.6**, provided in this chapter, are:

- IEF: bat assemblage.

7.5 Environmental design and mitigation

7.5.1 As detailed in **Volume 1, Chapter 6** of the **ES**, primary and tertiary mitigation measures have been identified through the iterative EIA process and have been incorporated into the design and construction planning of the proposed development. Tertiary mitigation measures are legal requirements or are standard practices that would be implemented as part of the proposed development.

7.5.2 The assessment of likely significant effects of the proposed development assumes that primary and tertiary mitigation measures are in place. For terrestrial ecology and ornithology, these measures are identified below, with a summary provided on how the measures contribute to the mitigation and management of potentially significant environmental effects.

a) Primary mitigation

7.5.3 Primary mitigation is often referred to as ‘embedded mitigation’ and includes modifications to the location or design to mitigate impacts, these measures become an inherent part of the proposed development.

7.5.4 A summary of the primary mitigation that has been incorporated into the design of the proposed development that would protect the existing habitats and species is provided below:

- all species-rich hedgerows would be retained;
- three grassed landscape bunds are proposed within the site; two on the western boundary and another on the eastern boundary. The bunds would be a maximum of 3m high and would provide a visual and noise buffer between the site and surrounding habitats;
- the operational freight management facility would be bounded by 1.8m high security fencing. This security fence would prevent personnel using the from accessing the surrounding habitats;
- in addition to the security fence, ecological fencing would be installed around the Sustainable Drainage Systems infrastructure and landscape bunds, which would help prevent the risk of badgers establishing setts within the site boundary;

NOT PROTECTIVELY MARKED

- planting of additional screen planting around all boundaries of the site, to supplement the existing boundary vegetation;
- a 10m landscaped buffer zone is proposed around the north, east and west boundaries of the site. Where possible, existing vegetation in these areas would be enhanced. Where agreed with landowners, this planting would be retained as permanent;
- Sustainable Drainage Systems infrastructure (proposed as a swale) would be constructed across the northern boundary and part of the eastern boundary to ensure that surface water run-off would be contained within the site and infiltrated into the underlying strata. Sustainable Drainage Systems would minimise surface water run-off and prevent diffuse pollution from sediment and other pollutants arising. Bypass separators would be incorporated within the drainage design where considered necessary. The swales would attenuate and convey surface water runoff at a rate not exceeding existing green field run-off rates;
- lighting would be provided at the perimeter, and parking areas, for security and safety reasons. Lanterns would utilise LED based light fittings to ensure energy efficiency with zero-degree tilt, and lighting columns along the perimeter would use demountable shields to reduce backward spill of light. To further assist on mitigating obtrusive light, a Central Management System has been proposed for the lighting which would be capable of dimming of parts of the site independently from other parts (with the site envisaged to be divided in 6-8 main sections), as usage changes through the day. Guidance within the latest Institution of Lighting Professionals Guidance Note (Ref. 7.35) would be followed as far as possible. These measures would minimise impacts on nocturnal species such as bats that use the nearby tree lines or habitats for roosting or foraging;
- once the need for the proposed development has ceased, the buildings and associated infrastructure (other than the widened Felixstowe Road), would be removed in accordance with a removal and reinstatement plan and the area would be returned to agricultural use; and
- during the removal and reinstatement phase, the screen planting which would be provided around all boundaries of the site would be left in situ, where agreed with landowners. Temporary hedgerow planting within the site would be removed and reinstated along the original hedgerow lines. Other planting that was provided within and around the parking areas would be removed.

b) Tertiary mitigation

7.5.5 Tertiary mitigation would be required regardless of any EIA, as it is imposed, for example, as a result of legislative requirements and/or standard sectoral best practices.

7.5.6 Tertiary mitigation relevant to terrestrial ecology and ornithology would be detailed in the **Code of Construction Practice (CoCP)** (Doc Ref. 8.11). The **CoCP** (Doc Ref. 8.11) would be informed by relevant environmental legislative requirements as well as general requirements and compliance with current standards, construction and operational experience. The **CoCP** (Doc Ref. 8.11) would also establish the framework of arrangements required to manage environmental and ecological impacts, mitigate nuisance to the public and safeguard the environment during the enabling works, preliminary works, the main construction phase and site restoration phases.

7.5.7 Mitigation measures relevant to terrestrial ecology and ornithology that would be included in the **CoCP** (Doc Ref. 8.11) would comprise:

- Early in the construction phase, geo-cellular storage structures (beneath two of the landscape bunds) and swales would be used as appropriate to ensure that surface water run-off would be contained within the site. During construction, surface water run-off would be contained within the site, with drainage to ground wherever feasible. This would prevent the supply of sediment and other contaminants to the surface drainage network during construction.
- Construction work would take place during Monday to Saturday 07:00 to 19:00 and some lighting may be required during the Winter months, dependent upon the construction activities which are taking place; however, some activities may require 24 hour working and some targeted lighting would be required for site security. Temporary construction lighting would be controlled to minimise light spill on surrounding habitats. This would minimise impacts on nocturnal species such as bats that may use the nearby tree lines or habitats for commuting, roosts or foraging. The lighting design would use light fittings chosen to limit stray light and minimise impacts on sensitive species. The lighting would also be designed to minimise the visibility from sensitive receptors off-site.
- A 10m buffer area would be provided for the existing balancing pond, along the northern boundary, and also along the western and eastern boundaries.

7.5.8 The proposed development includes the removal of several trees identified as having the potential to support roosting bats. Therefore, tree inspections

to determine evidence of use as roosts would be undertaken sufficiently in advance of tree-felling to enable licence application(s) to be submitted to Natural England and develop an appropriate mitigation strategy, if required. Management measures would likely include:

- A final inspection of these trees would be undertaken as close to the timing of felling as possible to account for the regular roost-switching behaviour displaced by tree-roosting bat species. Should bats (or evidence of use by bats) be identified, the mitigation strategies laid out in the licence application(s) would be implemented (for example, the fitting of exclusion devices).
- Felling would be undertaken in September/October and so would avoid the maternity and hibernation periods during which bats are more vulnerable to disturbance (this timing also avoids the breeding bird season). However, timing requirements would be confirmed following a pre-felling inspection, which could include a climbed inspection, if required.
- To mitigate for the loss of the tree and potential roost resources, bat boxes would be installed on retained trees in suitable locations within the site boundary. One bat box would be installed per tree with medium or high bat roost potential that is due to be lost, whether or not a roost has been identified. A variety of bat boxes would be used to support different species.

7.5.9 Removal of vegetation, ground clearance, and the commencement of construction activities have the potential to risk killing or injuring nesting birds and to damage or destroy nests, including those of ground-nesting species, if works are undertaken during the breeding bird season (considered to be late February to August inclusive). Birds and their nests are protected under the Wildlife and Countryside Act (Ref. 7.7) and the removal of scrub and trees and ground clearance works would generally be undertaken outside of the breeding bird season. Measures could also be put in place to deter birds from nesting in any hedgerow to be removed (for example, cutting back vegetation and making the area less suitable); however, the ground would need to remain undisturbed during the reptile hibernation period. Where it is not possible to undertake these works outside of the breeding bird season, an inspection for nests would be undertaken by a suitably experienced Ecological Clerk of Works (ECoW) prior to the removal of vegetation. If nesting birds are identified during this process, works in the vicinity of the nest (estimated to be a 10m standoff) would cease until the young have fledged.

7.5.10 Works would be undertaken outside the root protection zones for the trees and the hedgerows that are to be retained as part of the proposed development. Tree protective fencing as described in section 6.2 of British

Standard 5837:2012 (Ref. 7.36) should be installed (distance of fencing from tree trunk = 12x trunk diameter, distance from hedgerows = 1m from the spread of hedgerow canopy), where required, prior to plant and machinery arriving on site and construction works commencing. The fencing should remain intact throughout the duration of the works and only be removed upon completion. Weather-proof notices should be attached to any protective fencing located adjacent to retained trees displaying the words 'Construction Exclusion Zone'. All personnel must be made aware of these restrictions. If works need to be undertaken within the root protection zones, an arboricultural survey would be required and any advice provided adhered to, to secure the long-term survival of the trees and hedgerows.

7.5.11 The central hedgerow would be re-instated following completion of removal and reinstatement works in accordance with the proposed landscape planting.

7.5.12 A small proportion of habitat within the site, primarily around the field margins, was identified as having some limited potential to support a small population of reptiles and amphibians. All reptile and amphibian species are protected from killing or injury under the Wildlife and Countryside Act (Ref. 7.7). Therefore, the following measures would be undertaken prior to the commencement of construction:

- An inspection would be undertaken by a suitably experienced ECoW of any potential refugia, after which they should be removed.
- A phased vegetation clearance process would be undertaken to displace any reptiles/amphibians from the site, under the supervision of a suitably experienced ecologist. Removal of vegetation and of places of shelter/hibernation features would be undertaken outside the reptile hibernating period (October to February inclusive), during periods of warm, dry weather (with due consideration of the seasonal constraints of clearance works during breeding bird season). If this is not possible, vegetation would be cut to the ground (to remove potential bird nesting habitat), but the roots would remain intact until hibernation is complete. The root system of vegetation would then be removed once the reptile hibernation season is over. Clearing of vegetation would be undertaken under in accordance with a method statement under the supervision of the suitably experienced ECoW.
- To minimise the risk of incidental mortality to amphibians and reptiles, all vegetation that is to be removed within the site boundary would be maintained in a state unsuitable to support them, i.e. vegetation should be maintained to bare ground. An ECoW would oversee all ground-breaking activities and would inspect all excavations in areas of habitat suitable for amphibians and reptiles on a daily basis.

- 7.5.13 Any excavations made during construction activities would be closed at the end of the day to prevent access by badgers and other terrestrial nocturnal animals. If it is not possible for excavations to be closed at night, a means of egress (i.e. a wooden plank or soil ramp) would be provided to ensure that any animals that may access these excavations have a means of escape. In addition, prior to construction works commencing, a pre-construction walkover of the site would be conducted in order to identify whether there are any signs of badgers and/or any newly established setts that may be impacted by the works. If any setts are identified that would be disturbed by the construction works, or would require closures, then a licence from Natural England would be obtained. All licensable works would be undertaken between July to November (inclusive).
- 7.5.14 During the preliminary works and site preparatory works, the phased approach to site clearance (as described above to safeguard reptiles) would discourage brown hare and hedgehog away from the site of activity and into the surrounding suitable habitat.
- 7.5.15 Further details of tertiary mitigation measures taken into account within the design of the proposed development to minimise noise and vibration impacts, dust pollution and air quality changes and to protect water quality are outlined in **Chapters 4, 5 and 12** respectively provided in this volume.
- 7.5.16 Mitigation applied to the construction phase is also recommended to be applied during the removal and reinstatement phase and effects are likely to be similar.

7.6 Assessment

a) Introduction

- 7.6.1 This section presents the findings of the terrestrial ecology and ornithology assessment for the construction, operation, removal, and reinstatement phases of the proposed development. It brings together the information presented in the preceding sections to consider the specific impacts likely to be experienced by the IEFs within the ZOI of the proposed development. Using the criteria set out within the CIEEM guidelines (Ref. 7.24), the sensitivity of the IEFs, and all of the potential impacts related to each IEF have been characterised.
- 7.6.2 This section identifies any likely significant effects that are predicted to occur, and **section 7.7** of this chapter, then identifies any secondary mitigation and monitoring measures that are proposed to minimise any adverse significant effects (if required).

b) Construction

i. IEF: Bat assemblage

7.6.3 During the construction phase of works, the main impact pathways to the bat assemblage would be associated with:

- habitat loss (land take);
- habitat fragmentation (including connectivity);
- incidental mortality of species; and
- disturbance effects (comprising light, noise, and visual effects).

7.6.4 Of the construction impact pathways listed above, incidental mortality of bats has been scoped out of this assessment. This is because although construction works would entail the movement of plant and other vehicles around the site, traffic would be travelling at low speeds and the likelihood of incidental mortality would be low. Construction would generally take place Monday to Saturday 07:00 to 19:00 hours. This means night-time works would be avoided, which is when bats are most active. Incidental mortality associated with traffic movements would therefore not have a significant effect on the bat assemblage,

7.6.5 Of the impact pathways taken forward within the assessment, the specific impact pathways that could be experienced by each IEF have been identified and detailed within the subsequent sections. In order to assess each impact pathway, the first four elements of the CIEEM assessment process (Ref. 7.24) are addressed here, namely:

- activity, duration of activity, biophysical change and relevance to IEF in terms of ecosystem structure and function;
- characterisation of unmitigated impact on the feature (taking into consideration the embedded primary and tertiary mitigation, as detailed in **section 7.5** of this chapter);
- rationale for prediction of effect on integrity (of a site or ecosystem) or conservation status (of a habitat or population); and
- effect without further (i.e. secondary) mitigation.

7.6.6 The remaining elements of the CIEEM assessment process, mitigation and significance of effects of residual impacts after mitigation, are discussed in **sections 7.7** and **7.8** respectively provided in this volume.

Habitat loss and habitat fragmentation

- 7.6.7 The design of the proposed development has sought to minimise the extent of habitat loss through the retention of most of the hedgerows along the site boundaries, including one defunct (i.e. no longer stockproof due to gaps) species-rich hedgerow with trees to the south-east of the site and one defunct species-poor hedgerow to the north-west of the site. Tertiary mitigation measures also ensure that ecological constraints, such as those that may be associated with the removal of trees with the potential to support roosting bats, are taken into consideration during the construction process.
- 7.6.8 The construction of proposed development would result in the loss of primarily arable fields and field margins (11 hectares (ha)), one defunct, species-poor hedgerow (approximately 200m in length), and two trees with bat roost potential (one low potential tree (T8) and one medium (T9)). Most of the hedgerows and associated trees assessed as suitable to support roosting bats would be retained, therefore this loss would not significantly reduce the overall tree roost resource available. The loss of the hedgerow could remove a linear feature used by commuting bats. Construction could therefore affect foraging, commuting and roosting bats; however, the defunct hedgerow to be lost is sub-optimal for commuting bats due to the existing gaps in the hedgerow.
- 7.6.9 The habitats present within the site are largely sub-optimal for bats, being intensively managed for arable farming purposes and primarily open in nature. The sub-optimal arable land has fewer invertebrates on which bats can forage. The bat assemblage within the ZOI is therefore not reliant on the arable habitat within the site for foraging.
- 7.6.10 The arable habitat to be temporarily lost would be approximately 11ha in area; this habitat, while sub-optimal, is used to a limited extent used by foraging bats. The proportion of foraging habitat lost that the proposed development footprint represents is dependent on the home range used by a bat. This home range varies between species and is dependent on a range of criteria, including the quality of habitats available. The concept of CSZ, as developed following an extensive literature review by the Bat Conservation Trust (Ref. 7.33), has been used to make this assessment, as detailed in **Table 7.11**.

Table 7.11: Summary of the proportion of each bat species’ CSZ to be lost as a result of the proposed development.

Species	CSZ(km)	Percentage of CSZ to be lost due to proposed development.
Common pipistrelle.	2km	0.88%
Soprano pipistrelle Brown long-eared bat.	3km	0.39%

7.6.11 This demonstrates that only a small proportion of each bat species’ CSZ would be affected due to this habitat loss (even in the absence of any consideration of quality), resulting in a very low magnitude of impact. This is further supported because the habitats to be lost are not of significant value and are unlikely to be an important component of any of the species’ CSZs.

7.6.12 The habitat surrounding the site, while dominated by arable habitat, contains several small to medium-sized woodland blocks, which are likely to provide multiple, alternative roost locations. The loss of two trees with roost potential would not impair the ability of the bat assemblage present to roost. Whilst individual bat species are considered to have a high sensitivity to the loss of roost sites, the two trees to be permanently lost were not found to have signs of current occupation by bats at the time of the assessment. However, tree-roosting bat species are known to switch roost on a regular basis (Ref. 7.37), and therefore the absence of signs of current occupation at the time of the assessment does not exclude the potential for these trees to be occupied in the future, at the time of felling.

7.6.13 The requirement of bats for linear features varies between species, with the majority of species (common pipistrelle and soprano pipistrelle) recorded within the site, and/or ZOI, less reliant on linear features for commuting. As outlined in **section 7.5** of this chapter, the extent of habitat loss has been kept to a minimum by the retention of hedgerows within the site boundary. These mitigation measures ensure that those habitats most suitable for bats within the immediate vicinity of the proposed development are retained.

7.6.14 The degree of sensitivity bats display with regards to habitat loss varies between species; however, the surrounding landscape is dominated by similar arable habitat. It is therefore considered that any bats affected by the loss of this habitat would be able to use the large areas of similar arable habitat present within the ZOI. The bat assemblage within the ZOI would therefore have a low sensitivity to this impact.

7.6.15 The loss of land would be temporary but long-term (operation is expected to last 9-12 years) and reversible, with the site returned to arable use once the need for the facility has ceased, reinstating the land as a sub-optimal

foraging resource for the bat assemblage. The loss of hedgerow would also be temporary but long-term, as the hedgerow would be reinstated along the original hedgerow line on completion of the removal and reinstatement phase.

- 7.6.16 Overall, the impact of habitat loss on the bat assemblage would have a minor adverse effect, which would be **not significant**.

Disturbance from noise

- 7.6.17 The construction of the proposed development may result in an increase in noise within the site and adjacent habitats. Noise disturbance may arise through construction activities (such as noise from machinery), increased vehicle movements, and increased human presence on site during construction (approximately 12 to 18 months). The number of vehicle movements during construction is described in **Chapter 2** of this volume.

- 7.6.18 Primary mitigation, provided in **section 7.5** of this chapter, includes the development of landscape bunds and a 10m buffer zone is proposed around the northern, eastern and western site boundaries, which would enhance existing vegetation in these areas, as well as create a buffer for neighbouring habitats and ecological features. These measures would facilitate attenuation of noise to habitats associated with foraging, commuting and roosting bats.

- 7.6.19 Construction working hours would generally not overlap with periods when bats are active so foraging and commuting bats would not be affected by construction noise. However, noise from construction activity could interfere with the bat assemblage through the disturbance to roosting bats in trees within the retained hedgerows resulting in delayed emergence, or roost abandonment.

- 7.6.20 Anecdotal evidence, such as bats roosting in the Wolvercote Railway Tunnel (Ref. 7.38) despite the presence of a live railway, suggests that in certain circumstances bats can become habituated to noise, although the degree to which this may occur is likely to be species-specific. However, the occupation of a site with increased noise levels does not indicate an absence of impact, as increased noise levels can result in a delay in roost emergence time (Ref. 7.39), which may result in the period of peak invertebrate activity (at or soon after dusk; Ref. 7.40) being missed, reducing the level of foraging a bat can undertake.

- 7.6.21 Noise associated with human activity during construction may be more detrimental than mechanical and vehicle noise, as such noise is more likely to be assessed by bats as potential predation (Ref. 7.41). This is also likely to be species-dependent with pipistrelle and long-eared bat species often found roosting and foraging in close proximity to human activity (relatively

to other species) while, other species including barbastelle appear to avoid areas with intense human activity (Ref. 7.40).

7.6.22 If bats are displaced by construction activities (in addition to displacement through habitat loss), there are (as for habitat loss) other areas of woodland in the vicinity of the site that would provide suitable alternative roosting and foraging habitat. It is, therefore, considered that bats would be able to use the large areas of more suitable habitat present within the wider ZOI. For these reasons, together with the primary mitigation embedded in the design, the bat assemblage is likely to have a low sensitivity to increases in noise levels.

7.6.23 The extent of noise from the construction of the proposed development is likely to be restricted to the footprint of the facility and habitats on the immediate boundary, resulting in a low magnitude of impact. This would result in a minor adverse effect, which would be **not significant**. Such an effect would be temporary, medium term (12-18 months) and reversible over time, once construction is complete.

Disturbance from light

7.6.24 Construction lighting would increase light levels and could cause light intrusion into nearby habitats. As described in **section 7.5** of this chapter, under primary and tertiary mitigation, the site would be lit for security and safety purposes, or for specific works/operations. The lighting design would minimise light spill and the potential for light disturbance on adjacent land. Mitigation would also include a 10m buffer on the northern, eastern and western site boundaries between the construction works and the boundary hedgerows and scrub.

7.6.25 Bat species are known to be sensitive to the effects of light, but this does vary with the type of lighting and species of bat being considered. An increase in light levels and light spillage could cause:

- disturbance to roosting bats in adjacent areas of woodland including delayed emergence, or roost abandonment (Ref. 7.42); and
- impacts to foraging and commuting bats, due to aversion to lit areas (Ref. 7.42), or effects on prey behaviour and availability (Ref. 7.39, Ref. 7.41).

7.6.26 The type of lighting has also been shown to impact the degree to which bats are affected by artificial lighting (Ref. 7.43, Ref. 7.35). Invertebrate species are highly attracted to ultraviolet, green and blue light (light with short wavelengths and high frequencies) which can result in increased insect numbers around artificial light sources (Ref. 7.43). Some bat species (including noctule, serotine and pipistrelle species) have been shown to

capitalise on this, foraging around artificial light sources. However, several bat species, including barbastelle, *Myotis* spp. and long-eared bats, generally avoid lit areas (Ref. 7.42). Additionally, some studies suggest that streetlights might negatively affect moths (the preferred prey of barbastelle) (Ref. 7.44). Artificial light is further thought to attract insects into lit areas from further afield, with the potential for this to reduce the levels of insect prey available within adjacent habitats.

7.6.27 For the reason stated above the bat assemblage in this location is likely to have a low sensitivity to increases in light levels. The area over which an increase in lighting is likely to occur would be limited to the site (including hedgerows) and due to the primary and tertiary mitigation, light spillage into the surrounding habitats would be minimised. This would result in a low magnitude of impact, with a minor adverse effect, which would be **not significant**. Such an effect would be medium-term, relating to specific requirements for lighting during the 12-18 month construction period, and reversible over time, once the source of lighting is removed.

ii. Inter-relationship effects

7.6.28 The assessment has inherently considered the impacts of noise and lighting on the IEF. Potential construction impacts have been assessed independently above. This section provides a description of the identified inter-relationship effects that are anticipated to occur on terrestrial ecology and ornithology receptors between the individual environmental effects arising from construction of the proposed development.

7.6.29 The potential impacts on the bat assemblage have been assessed above as being minor adverse and **not significant**, and even in combination the effect would be **not significant**.

c) Operation

i. IEF: Bat assemblage

7.6.30 During the operational phase, the main impact pathways on the bat assemblage would be associated with:

- incidental mortality of individuals; and
- disturbance effects (comprising light, noise and visual effects).

7.6.31 Of the operational impact pathways listed above, incidental mortality of bats has been scoped out of this assessment. This is because although operational of the proposed development would entail the movement of vehicles around the site, traffic would be travelling at reduced speeds and the likelihood of incidental mortality would be low. It is, therefore,

considered that this would not have a significant effect on the bat assemblage.

- 7.6.32 The characterisation of the impacts from disturbance is described in detail in the subsequent sections.

Disturbance from noise

- 7.6.33 The operation of the proposed development would lead to increases in noise levels from both traffic and people compared to the baseline. The freight management facility would be operational for a minimum of 7.5 hours a day, for five days a week, to a maximum of 24 hours a day, seven days a week, during peak construction period of the main development site.

- 7.6.34 At peak construction of the main development site, approximately 275 HGVs would arrive at the site on a typical weekday, and up to 425 HGVs would arrive on the busiest weekday during peak construction. Most HGVs would arrive and depart during the morning, with the onward movement of HGVs to the main development site regulated to manage HGV flows on the A12. The peak hourly rate is expected to be approximately 40 HGVs in each direction. The effect would occur for the duration of the operational phase (9-12 years).

- 7.6.35 It is considered that noise levels associated with the operational phase would be lower than those associated with the construction phase. As outlined in **section 7.5** of this chapter, primary mitigation measures (including landscape bunds and 10m landscaped buffer) would reduce the effect of operational noise levels on adjacent habitats and their associated species as far as practicable.

- 7.6.36 As noted above, although bats can be impacted by noise, the habitats present are largely sub-optimal. The bat assemblage, of low sensitivity, within the ZOI is therefore not considered to be reliant on this habitat for foraging.

- 7.6.37 The extent of noise from the operation of the proposed development is likely to be restricted to the site and habitats on the immediate boundary, resulting in a very low magnitude of impact and minor adverse effect, which is considered to be **not significant**. Any such effect would be temporary but long-term (as operation is expected to last between 9-12 years). The effect would be reversible over time, once the operational phase is complete.

Disturbance from light

- 7.6.38 The operation of the proposed development would result in an increase in light intrusion due to the operational lighting required. Lighting would be

provided at the perimeter, and parking areas, for security and safety reasons. Lighting columns would have a maximum height with lanterns at 8m. The lanterns would utilise LED based light fittings to ensure energy efficiency with zero-degree tilt, and lighting columns along the perimeter would be fitted with demountable shields to reduce backward spill of light. A Central Management System has been proposed for the lighting which would be capable of dimming of parts of the site independently from other parts (with the site envisaged to be divided in 6-8 main sections), as usage changes through the day. The system would allow for seasonal variations in the operational hours of the external lighting and would have the following functionality:

- 7.6.39 Primary embedded mitigation (for example, use of light fittings chosen to limit stray light, and landscape bunds, see **section 7.5** of this chapter) would reduce the spillage of light from the operational lighting into adjacent areas of habitat as far as possible.
- 7.6.40 The lighting would be in place for the operational period of the proposed development, approximately a 9-12 year period. This lighting would be available for security and safety purposes outside of daylight hours when the site is in use. It is possible during shorter daylight hours (i.e. in Winter months) that the lighting would be required during times when bats are active. Given the primary and tertiary mitigation measures, the light spill from fixed lighting beyond at the sites boundaries and hedgerows would be minimal (0.1lux) and there would be minimal light spillage into adjacent ecological receptors. However, these calculations do not consider the light from headlights of vehicles which would use the proposed development, which is considered below.
- 7.6.41 As indicated in **section 7.6** of this chapter, lighting can affect bats in a number of ways, and some bat species are regarded as highly sensitive to light disturbance. The increase in lighting compared to existing levels, would be restricted to the footprint of the site.
- 7.6.42 The impacts of artificial lighting vary between species (Ref. 7.40). Some species can capitalise on the increased insect prey often recorded around artificial light sources, while other, light-avoiding, bat species may be impacted to a greater degree. This is due to the deterrent effect of artificial lighting on these species and the potentially reduced prey availability in surrounding areas, because of artificial lighting attracting insects from adjacent habitats (Ref. 7.43).
- 7.6.43 Lighting can act as a deterrent to bats; however, bats using the site are almost certainly not dependent on the sub-optimal habitats present within the site and would also be using a range of additional habitats in the ZOI.

The bat assemblage, of low sensitivity, within the ZOI is therefore not considered to be reliant on this on-site habitat for foraging.

7.6.44 Overall, fixed lighting would have a very low magnitude of impact on the bat assemblage, resulting in a negligible adverse effect, which is considered to be **not significant**. With regards to vehicle lights, the 3m high landscape bunds would aid in screening surrounding habitats, resulting in a very low magnitude of impact and a negligible adverse effect which would be **not significant**. These effects would be temporary, but long-term (operation is expected to last 9 - 12 years) and reversible over time, once the operational phase is complete and the site is restored to its existing use.

ii. Inter-relationship effects

7.6.45 The assessment has inherently considered the impacts of noise and lighting on the IEF. Potential operational impacts have been assessed independently above. This section provides a description of the identified inter-relationship effects that are anticipated to occur on terrestrial ecology and ornithology receptors between the individual environmental effects arising from the operation of the proposed development.

7.6.46 The potential impacts on the bat assemblage have been assessed above as being negligible or minor adverse and **not significant**, and even in combination would not be expected to have a significant effect.

d) Removal and reinstatement

7.6.47 During removal and reinstatement, the potential impacts experienced by IEFs would be similar to those of construction. With the exception of habitat loss, the potential impact pathways scoped in are the same as those considered in the assessment of construction effects.

7.6.48 The specific impact pathways that could be experienced by the bat assemblage have been identified and detailed within the subsequent sections.

i. IEF: Bat assemblage

7.6.49 During the removal and reinstatement phase, the area would be returned to agricultural use. The screen planting which would be provided on the boundaries of the site during construction and operation would be left in situ. Temporary planting around parking bays and elsewhere within the site would be removed and the central hedgerow reinstated along the original alignment.

7.6.50 The main impacts on this IEF would be the same type, magnitude and significance as those described for construction, with the exception of

habitat loss, and would result in minor adverse effects, which are considered to be **not significant**.

7.6.51 As for construction, the impact pathway incidental mortality has been scoped out. This is because although construction works would entail the movement of plant and other vehicles around the site, traffic would be travelling at low speeds and the likelihood of incidental mortality would be low. In addition, construction would generally take place Monday to Saturday 07:00 to 19:00 hours. This means night-time works would be avoided, which is when bats are most active. Incidental mortality associated with traffic movements would therefore not have a significant effect on the bat assemblage.

7.6.52 Habitat would be returned to agricultural use, and all hardstanding removed and so habitat connectivity would be reinstated. This would have a permanent, **neutral** effect, which would be **not significant**.

ii. Inter-relationship effects

7.6.53 The assessment has inherently considered the impacts of noise and lighting on the IEF. Potential removal and reinstatement impacts have been assessed independently above. This section provides a description of the identified inter-relationship effects that are anticipated to occur on terrestrial ecology and ornithology receptors between the individual environmental effects arising from the removal and reinstatement of the proposed development.

7.6.54 The potential impacts on the bat assemblage during removal and reinstatement have been assessed above **not significant**, and even in combination would not be expected to have a significant effect.

7.7 Mitigation and monitoring

a) Introduction

7.7.1 Primary and tertiary mitigation measures which have been incorporated within the design of the proposed development and considered during the assessment are summarised in **section 7.5** of this chapter. As the assessment has not identified any likely significant effects when considering the primary and tertiary mitigation measures, no further secondary mitigation measures for the terrestrial ecology and ornithology assessment are required.

b) Monitoring

7.7.2 This section describes the monitoring requirements of specific receptors/resources or for the effectiveness of a mitigation measure. The

requirements, scope, frequency and duration of a given monitoring regime are set out, as far as possible.

i. **Construction**

7.7.3 All vegetation clearance and all ground-breaking activities would be under the supervision of a suitably experienced ECoW and excavations would be inspected on a regular basis.

7.7.4 During construction, there would be monitoring of the security fence to check these remain intact, and that there is no encroachment of construction activities beyond the boundary or within the buffer areas. This would also include checks that badgers are absent from the site and the landscape bunds. If badgers have gained access and created setts within the site, a licence to close these setts would be obtained from Natural England.

7.7.5 There would be regular checks of construction lighting to monitor and correct for any excessive light spill into the surrounding habitats and particularly into the adjacent hedgerows and habitats.

7.7.6 There would be regular checks of tree and hedgerow protection fencing to ensure the root protection buffer is maintained.

ii. **Operation**

7.7.7 Throughout the operational phase, monitoring of the security fence would be conducted to ensure that this remains intact and that badgers are not present on the site and the landscape bunds. If badgers have gained access and created setts within the site, a licence to close these setts would be obtained from Natural England for the removal and reinstatement phase. There would also be an ecological watching brief of the landscape bunds to monitor for any signs of badger activity.

7.7.8 There would be regular checks of operational lighting to monitor and correct for any excessive light spill into the surrounding habitats and particularly into the hedgerows.

7.7.9 Bat boxes would be monitored post-construction to confirm the presence/absence of bats and use of the bat boxes. If bat boxes have not been occupied by year 5 following installation, consideration would be given to moving them to alternative sites nearby, to be determined by a licensed bat ecologist.

iii. Removal and reinstatement

7.7.10 Monitoring during the removal and reinstatement phase would be in line with that described for construction.

7.8 Residual effects

7.8.1 The following tables (**Table 7.12**, **Table 7.13** and **Table 7.14**) present a summary of the terrestrial ecology and ornithology assessment for the proposed development. They identify the receptor/s likely to be impacted, the level of effect and, where the effect is deemed to be significant, the tables include the mitigation proposed and the resulting residual effect.

7.8.2 Overall, no significant residual effects have been identified.

Table 7.12: Terrestrial ecology and ornithology summary of effects arising during construction of the proposed development.

Receptor	Impact	Primary or Tertiary mitigation.	Classification of effect.	Additional Mitigation.	Residual Effect.
Bat assemblage	Habitat loss.	<ul style="list-style-type: none"> Retention of the majority of hedgerows within the boundary of the proposed development. Planting of vegetative screening during construction. Tree assessment surveys prior to tree felling, and Natural England licence application, if required. Loss of roost resource mitigated through the installation of bat boxes. 	Minor adverse (not significant)	No additional mitigation required. Regular checks of construction lighting.	Minor adverse (not significant) .
	Disturbance from noise.	<ul style="list-style-type: none"> Three 3m landscape bunds, two on the western boundary and another on the eastern boundary would provide a buffer between the site and surrounding habitats. A 10m buffer zone around the northern, eastern and western site boundaries would provide a buffer for neighbouring habitats and ecological features. 	Minor adverse (not significant)		Minor adverse (not significant) .
	Disturbance from light.	<ul style="list-style-type: none"> Three 3m landscape bunds, two on the western boundary and another on the eastern boundary would provide a buffer between the site and surrounding habitats. A 10m buffer zone around the northern, eastern and western site boundaries would provide a buffer for neighbouring habitats and ecological features. Perimeter and parking area lighting Lanterns would utilise LED based light fittings with 	Minor adverse (not significant)		Minor adverse (not significant) .

Receptor	Impact	Primary or Tertiary mitigation.	Classification of effect.	Additional Mitigation.	Residual Effect.
		zero-degree tilt, and lighting columns along the perimeter would be fitted with a demountable shield to reduce backward spill of light.			

Table 7.13: Terrestrial ecology and ornithology summary of effects arising during operation of the proposed development.

Receptor	Effect	Primary or Tertiary mitigation.	Classification of effect.	Additional Mitigation.	Residual Effect.
Bat assemblage	Disturbance from noise.	<ul style="list-style-type: none"> Three 3m landscape bunds, two on the western boundary and another on the eastern boundary would provide a buffer between the site and surrounding habitats. A 10m buffer zone around the northern, eastern and western site boundaries would provide a buffer for neighbouring habitats and ecological features. 	Minor adverse (not significant)	No additional mitigation required. Regular checks of operational lighting. Monitoring of any installed bat boxes (if required).	Minor adverse (not significant)
	Disturbance from light.	<ul style="list-style-type: none"> Three 3m landscape bunds, two on the western boundary and another on the eastern boundary would provide a buffer between the site and surrounding habitats. A 10m buffer zone around the northern, eastern and western site boundaries would provide a buffer for neighbouring habitats and ecological features. Perimeter and parking area lighting Lanterns would utilise LED based light fittings with zero-degree tilt, and lighting columns along the perimeter would be fitted with a demountable shield to reduce backward spill 	Negligible significant) (not		Negligible significant) (not

Receptor	Effect	Primary or Tertiary mitigation.	Classification of effect.	Additional Mitigation.	Residual Effect.
		of light.			

Table 7.14: Terrestrial ecology and ornithology summary of effects arising during the removal and reinstatement the proposed development.

Receptor	Effect	Primary or Tertiary mitigation.	Classification of effect.	Additional Mitigation.	Residual Effect.
Bat assemblage	Habitat reinstatement.	All hardstanding would be removed, and the land returned to agricultural use.	Neutral (not significant)	No additional mitigation required.	Neutral (not significant)
	Disturbance from noise.	<ul style="list-style-type: none"> Some protection from 3m landscape bunds prior to their removal. Screen planting provided on the boundary of the site during construction and operation would be left in situ. 	Minor adverse (not significant)	Monitoring inline construction above.	Minor adverse (not significant)
	Disturbance from light.	<ul style="list-style-type: none"> Some protection from 3m landscape bunds prior to their removal. Control of temporary lighting to minimise light spill. Screen planting provided on the boundary of the site during construction and operation would be left in situ. 	Minor adverse (not significant)		Minor adverse (not significant)

References

- 7.1. United Nations. 1992. Convention of Biological Diversity.
- 7.2. UNESCO. 1971. The Convention on Wetlands of International Importance (Ramsar Convention).
- 7.3. European Parliament and of the Council. Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (Bird Directive). Official Journal of the European Union. 2009.
- 7.4. Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive). Official Journal of the European Communities. 1992.
- 7.5. European Council. 1979. The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention).
- 7.6. United Nations Environment Programme. 1979. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).
- 7.7. Wildlife and Countryside Act, as amended. 1981. (Online) Available from <http://www.legislation.gov.uk/ukpga/1981/69> (Accessed 1 March 2019).
- 7.8. Statutory Instruments 2017 No. 1012. The Conservation of Habitats and Species Regulations 2017.
- 7.9. Countryside and Rights of Way Act. 2000. (Online) Available from <http://www.legislation.gov.uk/ukpga/2000/37/contents> (Accessed 1 March 2019).
- 7.10. Natural Environment and Rural Communities Act. 2006. (Online). Available from: <http://www.legislation.gov.uk/ukpga/2006/16/contents> (Accessed 1 March 2019).
- 7.11. The Hedgerows Regulations. 1997. (Online) Available from: <http://www.legislation.gov.uk/uksi/1997/1160/contents/made> (Accessed 18 February 2019).
- 7.12. Protection of Badgers Act. 1992. (Online) Available from: <http://www.legislation.gov.uk/ukpga/1992/51/contents> (Accessed 1 March 2019).
- 7.13. UK Biodiversity Action Plan. 1994.

- 7.14. Joint Nature Conservation Committee and Defra. 2012. UK Post-2010 Biodiversity Framework.
- 7.15. Ministry of Housing, Communities & Local Government. Planning Practice Guidance. The National Planning Policy Framework and relevant planning guidance. 22 October 2018. (Online). Available from: <https://www.gov.uk/government/collections/planning-practice-guidance> (Accessed 7 February 2019).
- 7.16. HM Government. A Green Future: Our 25 Year Plan to Improvement the Environment. 2018.
- 7.17. Department for Communities and Local Government. 2018. National Planning Policy Framework. February 2019.
- 7.18. National Policy Statements for energy infrastructure: National Policy Statement for Energy (EN-1) and National Policy Statement for Nuclear Power Generation (EN-6). July 2011. Available from: <https://www.gov.uk/government/publications/national-policy-statements-for-energy-infrastructure> (Accessed 7 February 2019)
- 7.19. Suffolk County Council. 2015. Suffolk's Nature Strategy.
- 7.20. Suffolk Biodiversity Partnership. Suffolk Local Biodiversity Action Plan. May 2012. (Online). Available from: https://www.suffolkbis.org.uk/sites/default/files/biodiversity/prioritiespecieshabitats/actionplans/Planning_BAP_Final%2018%20May%202012.pdf (Accessed 7 February 2019).
- 7.21. Suffolk Biodiversity Information Service. Priority Species and Habitats. 2015 (Online) Available from: <https://www.suffolkbis.org.uk/biodiversity/speciesandhabitats> (Accessed 1 February 2019).
- 7.22. Suffolk Coastal District. 2013. Suffolk Coastal District Local Plan. Core Strategy and Development Management Policies.
- 7.23. East Suffolk. Suffolk Coastal and Waveney Councils. Suffolk Coastal Local Plan (in Draft). January 2019. (Online). Available from: <https://www.eastsuffolk.gov.uk/planning/local-plans/suffolk-coastal-local-plan/local-plan-review/final-draft-local-plan/> (Accessed 7 February 2019).
- 7.24. Chartered Institute of Ecology and Environmental Management. 2018. Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland. Terrestrial, Freshwater, Coastal and Marine. Winchester: CIEEM.

- 7.25. Joint Nature Conservation Committee. 2010. Handbook for Phase 1 habitat survey: a technique for environmental audit.
- 7.26. G. Gilbert, D.W. Gibbons, & J. Evans. 1998. Bird Monitoring Methods. RSPB: Sandy.
- 7.27. M. A. Eaton, et al. 2015. Birds of Conservation Concern 4: Population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds, 2015, 94:452-504.
- 7.28. Bratton, J.H. 1991. British red data books: part 3: invertebrates other than insects. Peterborough: Joint Nature Conservation Committee.
- 7.29. Natural England. 2011. Natural England Technical Information Note TIN102: Reptile Mitigation Guidelines. Natural England.
- 7.30. English Nature. 2001. Great Crested Newt Mitigation Guidelines. English Nature, Peterborough.
- 7.31. R.S. Oldham, J. Keeble, M.J.S. Swan & M. Jeffcote. 2000. Evaluating the suitability of habitat for the Great Crested Newt (*Triturus cristatus*). Herpetological Journal, 10(4), 143-155.
- 7.32. Natural England. 2015. Standing advice for local planning authorities who need to assess the impacts of development on badgers. Natural England, (Online) Available from: <https://www.gov.uk/guidance/badgers-surveys-and-mitigation-for-development-projects> (Accessed 7 February 2019).
- 7.33. J. Collins (ed.). 2016. Bat Surveys for Professional Ecologists: Good Practice Guidelines. 3rd edition. London: The Bat Conservation Trust.
- 7.34. Natural England. Ancient Woodlands (England) Inventory. MAGIC, 2019. (Online) Available from: <https://data.gov.uk/dataset/9461f463-c363-4309-ae77-fdcd7e9df7d3/ancient-woodlands-england>
- 7.35. Institution of Lighting Professionals. 2018. Bats and artificial lighting in the UK. Guidance Note 08/2018. Institute of Lighting Professionals/Bat Conservation Trust.
- 7.36. British Standards Institute. 2012. British Standard for Trees in relation to design, demolition and construction (BS 5837:2012). British Standards Institute. 2012

- 7.37. D. Russo. L. Cistrone. G.Jones and S. Mazzoleni. Roost selection by barbastelle bats (*Barbastella barbastellus*) in beech woodlands of central Italy: Consequences for conservation. *Biological Conservation*, 2004, 117. 73-81
- 7.38. Greena Ecological Consultancy. Wolvercote Railway Tunnel. Date Unknown. (Online) Available from: http://www.bats.org.uk/data/files/Wolvercote_Tunnel_Geoff_Billington.pdf (Accessed 19 September 2016).
- 7.39. M. D. F. Shirley, V. L. Armitage, T.L. Barden, M. Gough, P.W.W. Lurz, D.E. Oatway, A.B. South, & S. P. Rushton. 2001. Assessing the impact of a music festival on the emergence behaviour of a breeding colony of Daubenton's bats *Myotis daubentonii*. *Journal of Zoology (London)*, 2001, 254(3): 367-373.
- 7.40. Bat Conservation Trust. 2008. Bat and Lighting in the UK. Bats and the Built Environment Series. Bat Conservation Trust.
- 7.41. J.R. Barber, K.R. Crooks, & K.M. Fristrup K.M. 2009. The costs of chronic noise exposure for terrestrial organisms. *Trends Ecol Evol.*, 2009, 25:180–189.
- 7.42. E.L., Stone, G. Jones & S. Harris. 2009. Street Lighting Disturbs Commuting Bats, *Current Biology*, doi:10.1016/j.cub.2009.05.058 Available from: <http://www.sciencedirect.com/science/article/pii/S0960982209011932>
- 7.43. Bat Conservation Trust. 2014. Artificial Lighting and Wildlife Interim Guidance: Recommendations to help minimise the impact of artificial lighting.
- 7.44. Sierro & R. Arlettaz. 1997. Barbastelle bats (*Barbastelle* spp.) specialize in the predation of moths: implications for foraging tactics and conservation. *Acta Oecologica*, 18 (2): 91–106.