

Norfolk Vanguard Offshore Wind Farm

Chapter 22

Onshore Ecology

Environmental Statement

Volume 1

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Environmental Impact Assessment Environmental Statement

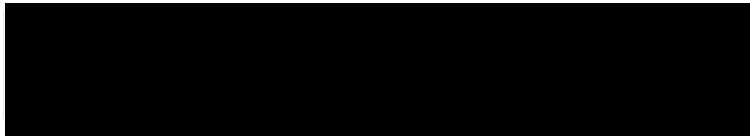
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For and on behalf of Norfolk Vanguard Limited

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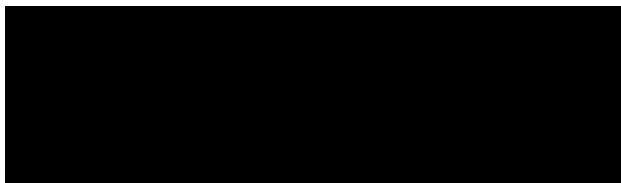
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Glossary

AONB	Area of Outstanding Natural Beauty
BAP	Biodiversity Action Plan
BCT	Bat Conservation Trust
CIA	Cumulative Impact Assessment
CIEEM	Chartered Institute for Ecology and Environmental Management
CIRIA	Construction Industry Research and Information Association
CMS	Construction Method Statement
CRoW	Countryside and Rights of Way Act
CRS	Cable Relay Station
CWS	County Wildlife Site
dB	Decibels
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
EclA	Ecological impact Assessment
EEC	European Economic Community
EIA	Environmental Impact Assessment
EPS	European Protected Species
ES	Environmental Statement
ETG	Expert Topic Group
ha	Hectares
HDD	Horizontal Directional Drilling
HRA	Habitats Regulations Assessment
HSI	Habitat Suitability Index
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
ICZM	Integrated Coastal Zone Management
IPC	Infrastructure Planning Committee
JNCC	Joint Nature Conservation Committee
LBAP	Local Biodiversity Action Plan
LNR	Local Nature Reserve
LwA	Sound power level
m	Metres
NBSG	Norfolk Barbastelle Study Group
NERC Act	Natural Environment and Rural Communities Act
NNR	National Nature Reserve
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NVC	National Vegetation Classification
NWT	Norfolk Wildlife Trust
O&M	Operations and Maintenance
OLEMS	Outline Landscape Environmental Management Strategy
PEIR	Preliminary Environmental Information Report
pSPA	Potential Special Protection Area
RNR	Roadside Nature Reserve

SAC	Special Area of Conservation
SNCB	Statutory Natural Conservation Body
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
TN	Target Note
UK BAP	UK Biodiversity Action Plan
UKHPI	UK Habitat of Principal Importance

Terminology

Attenuation pond zone	Zone within which the attenuation pond at the onshore project substation or Necton National Grid substation will be located.
Cable Relay Station	Primarily comprised of an outdoor compound containing reactors (also called inductors, or coils) and switchgear to increase the power transfer capability of the cables under the HVAC technology scenario as considered in the PEIR. This is no longer required for the project as the HVDC technology has been selected.
Indicative mitigation planting	Areas identified for mitigation planting at the onshore project substation and Necton National Grid substation.
Joining pit	Underground structures constructed at regular intervals along the cable route to join sections of cable and facilitate installation of the cables into the buried ducts
Landfall	Where the offshore cables come ashore at Happisburgh South
Landfall compound	Compound at landfall within which HDD drilling would take place
Link boxes	Underground chambers or above ground cabinets next to the cable trench housing low voltage electrical earthing links.
Mobilisation area	Areas approx. 100 x 100m used as access points to the running track for duct installation. Required to store equipment and provide welfare facilities. Located adjacent to the onshore cable route, accessible from local highways network suitable for the delivery of heavy and oversized materials and equipment.
Mobilisation zone	Area within which the mobilisation area will be located.
National Grid new / replacement overhead line tower	New overhead line towers to be installed at the National Grid substation.
National Grid overhead line modifications	The works to be undertaken to complete the necessary modification to the existing 400kV overhead lines
National Grid substation extension	The permanent footprint of the National Grid substation extension
National Grid temporary works area	Land adjacent to the Necton National Grid substation which would be temporarily required during construction of the National Grid substation extension.
Necton National Grid substation	The existing 400kV substation at Necton, which will be the grid connection location for Norfolk Vanguard
Onshore 400kV cable route	Buried high-voltage cables linking the onshore project substation to the Necton National Grid substation

Onshore cable corridor	200m wide onshore corridor within which the onshore cable route would be located as submitted for PEIR.
Onshore cable route	The 45m easement which will contain the buried export cables as well as the temporary running track, topsoil storage and excavated material during construction.
Onshore cables	The cables which take the electricity from landfall to the onshore project substation
Onshore project area	All onshore electrical infrastructure (landfall; onshore cable route, accesses, trenchless crossing technique (e.g. Horizontal Directional Drilling (HDD)) zones and mobilisation areas; onshore project substation and extension to the Necton National Grid substation and overhead line modification)
Onshore project substation	A compound containing electrical equipment to enable connection to the National Grid. The substation will convert the exported power from HVDC to HVAC, to 400kV (grid voltage). This also contains equipment to help maintain stable grid voltage.
Onshore project substation temporary construction compound	Land adjacent to the onshore project substation which would be temporarily required during construction of the onshore project substation.
Running track	The track along the onshore cable route which the construction traffic would use to access workfronts
The Applicant	Norfolk Vanguard Limited
The project	Norfolk Vanguard Offshore Wind Farm, including the onshore and offshore infrastructure
Transition pit	Underground structures that house the joints between the offshore export cables and the onshore cables within the landfall
Trenchless crossing zone (e.g. HDD)	Temporary areas required for trenchless crossing works.
Workfront	The 150m length of onshore cable route within which duct installation would occur

22 ONSHORE ECOLOGY

22.1 Introduction

1. This chapter of the Environmental Statement (ES) considers the potential impacts of the proposed Norfolk Vanguard Offshore Wind Farm (hereafter ‘the project’) on onshore ecology.
2. This chapter provides an overview of the existing baseline environment in respect to onshore ecology within a study area (see section 22.5.1) around the onshore project area. This chapter then provides an Ecological Impact Assessment (EcIA) of the potential impacts and any associated mitigation required for the construction, operation and decommissioning of the project based on this baseline environment.
3. The assessment also considers cumulative impacts of other proposed projects. The methodology adhered to for the Environmental Impact Assessment (EIA) and Cumulative Impact Assessment (CIA) is discussed in section 22.4.
4. Figures which accompany the text in this chapter are provided in Volume 2 Figures.
5. Due to the close association between onshore ecology and a number of other topics, this chapter refers to the other related ES chapters where appropriate. The relevant chapters are:
 - Chapter 20 Water Resources and Flood Risk;
 - Chapter 23 Onshore Ornithology;
 - Chapter 25 Noise and Vibration;
 - Chapter 26 Air Quality; and
 - Chapter 29 Landscape and Visual Impact Assessment.
6. Potential impacts on birds are not considered in this chapter but are discussed in full in Chapter 23 Onshore Ornithology.

22.2 Legislation, Guidance and Policy

22.2.1 Legislation

7. There are a number of pieces of legislation applicable to onshore ecology. The following sections provide detail on key pieces of International and UK legislation which are relevant to this chapter.

22.2.1.1 Habitats Directive - Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora

8. This Directive provides protection for specific habitats listed in Annex I and species listed in Annex II of the Directive. The Directive sets out decision making procedures for the protection of Special Areas of Conservation (SAC) and Special Protection

Areas (SPA), implemented in the UK through The Conservation of Habitats and Species Regulations 2017.

22.2.1.2 Birds Directive - Council Directive 79/409/EEC on the Conservation of Wild Birds

9. This Directive provides a framework for the conservation and management of wild birds in Europe (also see Chapter 23 Onshore Ornithology). The most relevant provisions of the Directive are the identification and classification of SPAs for rare or vulnerable species listed in Annex I of the Directive and for all regularly occurring migratory species (required by Article 4). It also establishes a general scheme of protection for all wild birds (required by Article 5). The Directive requires national Governments to establish SPAs and to have in place mechanisms to protect and manage them. The SPA protection procedures originally set out in Article 4 of the Birds Directive have been replaced by the Article 6 provisions of the Habitats Directive.

22.2.1.3 Wildlife and Countryside Act 1981 (as amended)

10. This Act makes it an offence (with exception to species listed in Schedule 2 and with additional penalties for species listed in Schedule 1) to intentionally: kill, injure, or take any wild bird; take, damage or destroy the nest of any wild bird while that nest is in use or being built; and take or destroy an egg of any wild bird.
11. The Act makes it an offence to intentionally kill, injure or take any animal listed in Schedule 5 of the act and protects occupied and unoccupied places used for shelter or protection.
12. The Act makes it an offence (subject to exceptions) to intentionally pick, uproot or destroy any wild plant listed in Schedule 8 of the Act.
13. The Act makes it a criminal offence to plant or otherwise cause to grow any non-native, invasive species listed under Schedule 9 of the Act.
14. The Act makes provision for the notification and confirmation of Sites of Special Scientific Interest (SSSI).

22.2.1.4 The Conservation of Habitats and Species Regulations 2017

15. The Regulations transpose the Council Directive 92 / 43 / EEC the 'Habitats Directive' in to national law (in respect of England and Wales) and requires the state to designate SACs.
16. The Regulations make it an offence (subject to exceptions) to deliberately capture, kill, disturb, or trade in the animals listed in Schedule 2, or pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 4.
17. The Regulations require competent authorities to consider or review planning permission, applied for or granted, affecting a European site, and, subject to certain

exceptions, restrict or revoke permission where the integrity of the site would be adversely affected.

22.2.1.5 The Protection of Badgers Act 1992

18. The Act makes it an offence to wilfully kill, injure or take, or attempt to kill, injure or take a badger *Meles meles*; and to cruelly ill-treat a badger.
19. The Act makes it an offence to intentionally or recklessly damage, destroy or obstruct a badger sett, or to disturb a badger whilst in a sett.

22.2.1.6 Natural Environment and Rural Communities (NERC) Act 2006

20. Section 41 of the Act requires the Secretary of State to compile a list of habitats and species of principal importance for the conservation of biodiversity in England (herein 'S41 species').
21. Decision makers of public bodies, in the execution of their duties, must have regard to the conservation of biodiversity in England, and the list is intended to guide them.

22.2.1.7 The Hedgerow Regulations 1997

22. The Regulations make it an offence to remove or destroy certain hedgerows without permission from the local planning authority and the local planning authority is the enforcement body for such offences.

22.2.1.8 Marine and Coastal Access Act 2009

23. The act includes provisions for the coastal environment including improving access to the coast and undertaking Integrated Coastal Zone Management (ICZM), which brings policy makers, decision makers and stakeholders together to manage coastal and estuarine areas.

22.2.1.9 The Commons Act 2006

24. The Act aims to protect areas of common land, in a sustainable manner delivering benefits for farming, public access and biodiversity (Department for Environment, Food and Rural Affairs (Defra), 2013).

22.2.1.10 Countryside and Rights of Way Act 2000 (CRoW)

25. The Act amends the law relating to public rights of way including making provision for public access on foot to certain types of land. Amendments are made in relation to SSSIs to improve their management and protection, as well as to the Wildlife and Countryside Act 1981, to strengthen the legal protection for threatened species. Provision is also made for Areas of Outstanding Natural Beauty (AONB) to improve their management.

22.2.2 Guidance

26. The impact assessment has been based upon the following guidance and standards:

- Chartered Institute of Ecology and Environmental Management (CIEEM) (2016a) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd Edition;
- British Standard 42020:2013 – Biodiversity. Code of Practice for planning and development;
- Construction Industry Research and Information Association (CIRIA) C648 (2006) Control of water pollution from linear construction projects; and
- CIRIA Guidance note C692 Environmental Good Practice on Site Guide (3rd Edition).

27. The following species-specific guidance and standards have been used during the EclA process:

- Standing advice on protected species:
 - Natural England (2014a) Otters: surveys and mitigation for development projects. Natural England Standing Advice;
 - Natural England (2014b) White-clawed crayfish: surveys and mitigation for development projects. Natural England Standing Advice;
 - Natural England (2015a) Badgers: surveys and mitigation for development projects. Natural England Standing Advice;
 - Natural England (2015b) Bats: surveys and mitigation for development projects. Natural England Standing Advice;
 - Natural England (2015c) Great crested newts: surveys and mitigation for development projects. Natural England Standing Advice;
 - Natural England (2015d) Invertebrates: surveys and mitigation for development projects. Natural England Standing Advice;
 - Natural England (2015e) Reptiles: surveys and mitigation for development projects. Natural England Standing Advice;
 - Natural England (2015f) Water voles: surveys and mitigation for development projects. Natural England Standing Advice;
- Natural England and Forestry Commission (2018) Ancient woodland and veteran trees: protecting them from development. Natural England and Forestry Commission Standing Advice;
- British Standard 5837: 2012 – Trees in relation to design, demolition and construction;
- Bat Conservation Trust and Institute of Lighting Engineers (2009) Bats and Lighting in the UK;

- Dean *et al.* (2016) The Water Vole Mitigation Handbook (The Mammal Society Guidance Series);
- Edgar *et al.* (2010) Reptile Habitat Management Handbook;
- English Nature (2001) Great Crested Newt Mitigation Guidelines;
- Joint Nature Conservation Committee (JNCC) (2003) Herpetofauna Worker's Manual;
- Strachan and Moorhouse (2011) Water Vole Conservation Handbook, 3rd Edition; and
- GB Non-native Species Secretariat (2015) Species Information.

22.2.3 Policy

22.2.3.1 National Planning Policy Framework (NPPF)

28. The NPPF, published in 2012 replaces the former series of Planning Policy Statements. From its outset the document makes plain that it is concerned with Sustainable Development, and paragraph 6 states that there are three dimensions to sustainable development: economic, social and environmental, and that all three are mutually dependent and gains for all should be sought jointly and simultaneously through the planning system. The environmental dimension is defined (as per the framework document) below:

- “an environmental role – contributing to protecting and enhancing our natural, built and historic environment; and, as part of this, helping to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate and adapt to climate change including moving to a low carbon economy”.

22.2.3.2 Natural Environment White Paper 2011

29. The paper was the first White Paper produced by the government in 20 years. The paper contains plans to reconnect nature, connect people and nature for better quality of life and capture and improve the value of nature.

22.2.3.3 A Green Future: Our 25 Year Plan to Improve the Environment 2018

30. The plan sets out 10 goals and a range of high-level policies aimed at helping “the natural world regain and retain good health”. The key policies within the plan relevant for this chapter are:

- Embedding an ‘environmental net gain’ principle for development, including housing and infrastructure;
- Focusing on woodland to maximise its many benefits; and
- Protecting and recovering nature (including improving biosecurity to protect and conserve nature).

22.2.3.4 Biodiversity 2020: A Strategy for England's wildlife and ecosystem services

31. The Strategy sets out how England will implement the 2010 Aichi Biodiversity Targets, European Commission's 2011 EU Biodiversity Strategy and the recommendations of the 2011 Natural Environment White Paper. It contains the following relevant targets:

- Better wildlife habitats with 90% of priority habitats in favourable or recovering condition and at least 50% of SSSIs in favourable condition, while maintaining at least 95% in favourable or recovering condition;
- More, bigger and less fragmented areas for wildlife, with no net loss of priority habitat and an increase in the overall extent of priority habitats by at least 200,000ha;
- By 2020, at least 17% of land and inland water, especially areas of particular importance for biodiversity and ecosystem services, conserved through effective, integrated and joined up approaches to safeguard biodiversity and ecosystem services including through management of our existing systems of protected areas and the establishment of nature improvement areas;
- Restoring at least 15% of degraded ecosystems as a contribution to climate change mitigation and adaptation;
- By 2020, we will see an overall improvement in the status of our wildlife and will have prevented further human-induced extinctions of known threatened species; and
- By 2020, significantly more people will be engaged in biodiversity issues, aware of its value and taking positive action.

22.2.3.5 National Policy Statements

32. The assessment of potential impacts upon terrestrial ecology has been made with specific reference to the relevant National Policy Statements (NPS). These are the principal decision-making documents for Nationally Significant Infrastructure Projects (NSIPs). Those relevant to the project are:

- Overarching NPS for Energy (EN-1) (Department of Energy and Climate Change (DECC), 2011a);
- NPS for Renewable Energy Infrastructure (EN-3) (DECC, 2011b); and
- NPS for Electricity Networks Infrastructure (EN-5) (DECC, 2011c).

33. The specific assessment requirements for terrestrial ecology, as detailed in the NPSs, are summarised in Table 22.1, together with an indication of the paragraph numbers of the ES chapter where each is addressed.

Table 22.1 NPS assessment requirements relevant to onshore ecology

NPS Requirement	NPS Reference	ES Reference
EN-1 Overarching NPS for Energy		
‘Where the development is subject to EIA [Environmental Impact Assessment] the applicant should ensure that the ES [Environmental Statement] 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. The applicant should provide environmental information proportionate to the infrastructure where EIA is not required to help the Infrastructure Planning Commission (IPC) consider thoroughly the potential effects of a proposed project.’	Section 5.3.3	Existing environment is discussed in section 22.6. Assessment is set out in sections 22.7 and 22.8.
‘The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests.’	Section 5.3.4	Embedded mitigation measures are presented in section 22.7.1 and further mitigation measures are set out in sections 22.7 and 22.8.
‘When considering the application, the IPC will have regard to the Government’s biodiversity strategy as (sic) set out in ‘Working with the grain of nature’, which aims to halt or reverse declines in priority habitats and species; accept the importance of biodiversity to quality of life. The IPC will consider this in relation to the context of climate change. As a general principle, and subject to the specific policies below, development should aim to avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives (as set out in section 4.4 above); where significant harm cannot be avoided, then appropriate compensation measures should be sought. In taking decisions, the IPC should ensure that appropriate weight is attached to designated sites of international, national and local importance; protected species; habitats and other species of principal importance for the conservation of biodiversity; and to biodiversity and geological interests within the wider environment.’	Sections 5.3.5 – 5.3.8	Embedded mitigation measures are presented in section 22.7.1 and further mitigation measures are set out in sections 22.7 and 22.8.
‘The IPC will have the same regard to potential Special Protection Areas (pSPAs) and Ramsar sites as those sites identified through international conventions and European Directives.’	Section 5.3.9	Designated sites are discussed in section 22.6. Assessment is set out in sections 22.7 and 22.8. Site selection decisions have been made to avoid interest features at designated sites.
‘Many SSSIs are also designated as sites of international importance and will be protected accordingly. Those that are	Section 5.3.11	Designated sites are discussed in section 22.6.

NPS Requirement	NPS Reference	ES Reference
not, or those features of SSSIs not covered by an international designation, should be given a high degree of protection.'		Assessment is set out in sections 22.7 and 22.8. Site selection decisions have been made to avoid interest features at designated sites.
<p>'Where a proposed development on land within or outside an SSSI is likely to have an adverse effect on an SSSI (either individually or in combination with other developments), development consent should not normally be granted.</p> <p>Where an adverse effect, after mitigation, on the site's notified special interest features is likely, an exception should only be made where the benefits (including need) of the development at this site, clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest and any broader impacts on the national network of SSSIs.'</p>	Section 5.3.11	Designated sites are discussed in section 22.6. Assessment is set out in sections 22.7 and 22.8. Site selection decisions have been made to avoid interest features at designated sites.
'The IPC will have regard to sites of regional and local biodiversity and geological interest, which include Regionally Important Geological Sites, Local Nature Reserves and Local Sites when considering applications since they are recognised to have a fundamental role in meeting overall national biodiversity targets.'	Section 5.3.13	Designated sites are discussed in section 22.6. Assessment is set out in sections 22.7 and 22.8. Site selection decisions have been made to avoid interest features at designated sites.
<p>'Ancient woodland is a valuable biodiversity resource both for its diversity of species and for its longevity as woodland. Once lost it cannot be recreated.</p> <p>The IPC should not grant development consent for any development that would result in its loss or deterioration unless the benefits (including need) of the development, in that location outweigh the loss of the woodland habitat.</p> <p>Aged or 'veteran' trees found outside ancient woodland are also particularly valuable for biodiversity and their loss should be avoided.</p> <p>Where such trees would be affected by development proposals the applicant should set out proposals for their conservation or, where their loss is unavoidable, the reasons why.'</p>	Section 5.3.14	Impacts to woodland and trees are discussed in sections 22.7 and 22.8, including avoidance and mitigation measures.
The IPC will aim to maximise opportunities to build in beneficial biodiversity features when considering proposals as part of good design.	Section 5.3.15	Embedded mitigation measures are presented in section 22.7.1 and further mitigation measures are set out in sections 22.7 and 22.8. This includes replanting and reinstatement of habitat where considered

NPS Requirement	NPS Reference	ES Reference
		necessary.
<p>The IPC shall have regard to the protection of legally protected species and habitats and species of principal importance for nature conservation.</p> <p>‘The IPC shall refuse consent where harm to the habitats or species and their habitats would result, unless the benefits (including need) of the development outweigh that harm. In this context the IPC should give substantial weight to any such harm to the detriment of biodiversity features of national or regional importance which it considers may result from a proposed development.’</p>	Sections 5.3.16 – 5.3.17	The existing environment for protected and important species and habitats is discussed in section 22.6. Assessment is set out in sections 22.7 and 22.8.
<p>The applicant should include appropriate mitigation measures as an integral part of the proposed development and demonstrate that:</p> <ul style="list-style-type: none"> during construction, they will seek to ensure that activities will be confined to the minimum areas required for the works; 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; habitats will, where practicable, be restored after construction works have finished; and opportunities will be taken to enhance existing habitats and, where practicable, to create new habitats of value within the site landscaping proposals. 	Section 5.3.18	Embedded mitigation measures are presented in section 22.7.1 and further mitigation measures are set out in sections 22.7 and 22.8. This includes replanting and reinstatement of habitat where considered necessary.
‘The IPC will need to take account of what mitigation measures may have been agreed between the applicant and Natural England has granted or refused or intends to grant or refuse, any relevant licences, including protected species mitigation licences.’	Section 5.3.20	Embedded mitigation measures are presented in section 22.7.1 and further mitigation measures are set out in sections 22.7 and 22.8.
EN-3 NPS for Renewable Energy Infrastructure		
‘Proposals for renewable energy infrastructure should demonstrate good design in respect of landscape and visual amenity, and in the design of the project to mitigate impacts such as noise and effects on ecology.’	Section 2.4.2	Project design has avoided sensitive features where possible. Embedded mitigation measures are presented in section 22.7.1 and further mitigation measures are set out in sections 22.7 and 22.8.
‘Ecological monitoring is likely to be appropriate during the construction and operational phases to identify the actual impact so that, where appropriate, adverse effects can then be mitigated and to enable further useful information to be published relevant to future projects.’	Section 2.6.70	Monitoring is discussed in mitigation set out in sections 22.7 and 22.8.

NPS Requirement	NPS Reference	ES Reference
'There may be some instances where it would be more harmful to the ecology of the site to remove elements of the development, such as the access tracks or underground cabling, than to retain them.'	Section 2.7.15	Decommissioning is discussed in section 22.7.8.

22.2.3.6 Local Planning Policy

34. EN-1 states, in paragraph 4.1.5 that:

- “Other matters that the IPC [now the Planning Inspectorate] may consider important and relevant to its decision-making may include Development Plan Documents or other documents in the Local Development Framework. In the event of a conflict between these or any other documents and an NPS, the NPS prevails for the purposes of IPC decision making given the national significance of the infrastructure.”

37. The project onshore electrical infrastructure falls within the following local authority boundaries:

- Norfolk County Council;
- Breckland Council;
- Broadland District Council; and
- North Norfolk District Council.

35. Table 22.2 provides details of the local planning policy documents and the relevant policies in respect of onshore ecology. Designated areas which these policies may refer to are shown on Figure 22.2. A number of policies which primarily relate to the management of water resources, and which are inter-linked with onshore ecology are discussed in Chapter 20 Water Resources and Flood Risk.

Table 22.2 Relevant local planning policies

Document	Policy / Guidance	Policy / Guidance purpose
Norfolk County Council		
Norfolk County Council's Environmental Policy (2016)	1	Protect and enhance the county's wildlife and the quality and character of the Norfolk landscape and coast; encouraging the variety of habitats and species to deliver the aims of Biodiversity 2020.
	2	Ensure nature contributes to the economic and social health of urban and rural areas in Norfolk for current and future generations.
Breckland Council		
Breckland Council Adopted Core Strategy and Development Control Policies	SS1 Spatial Strategy	Minimal development within the countryside, including the comprehensive protection from development of: <ul style="list-style-type: none"> • Breckland SPA and its qualifying features;

Document	Policy / Guidance	Policy / Guidance purpose
Development Plan Document (2009)		<ul style="list-style-type: none"> SSSIs; Ramsar site at Redgrave and South Lopham Fen; NNRs [National Nature Reserves]/ LNRs [Local Nature Reserves]; Any areas identified as priority habitats or target areas for habitat creation in the Norfolk Biodiversity Action Plan.
	CP10 Natural Environment	<p>The enhancement of biodiversity and geodiversity in the district will be sought. There is an expectation that development will incorporate biodiversity or geological features where opportunities exist. Development that fails to exploit opportunities to incorporate available biodiversity or geological features will not be considered appropriate.</p> <p>All international, national, regional and local sites (CWS [County Wildlife Site], Ancient woodland, LNRs, UK Habitat of Principal Importance [UKHPI]) for wildlife conservation will require a full environmental assessment for any development proposals which may affect them.</p> <p>A buffer zone of 1,500m around the Breckland SPA, within which certain development controls are in place.</p> <p>Ecological networks should be considered by any development proposal. This includes major river valleys and connections between core woodland areas within and outside the district.</p>
	DC12 Trees and Landscape	<p>Any development that would result in the loss of, or the deterioration in the quality of an important natural feature(s), including protected trees and hedgerows will not normally be permitted.</p> <p>The retention of trees, hedgerows and other natural features in situ will always be preferable. Where the loss of such features is unavoidable, replacement provision should be of a commensurate value to that which is lost.</p> <p>Appropriate landscaping schemes to mitigate against the landscape impact of and complement the design of new development will be required, where appropriate.</p>
Broadland District Council		
Joint Core Strategy for Broadland, Norwich and South Norfolk (2011; updated 2014)	Policy 1: Addressing climate change and protecting environmental assets	<p>The environmental assets of the area will be protected, maintained, restored and enhanced and the benefits for residents and visitors improved.</p> <p>All new developments will ensure that there will be no adverse impacts on European and Ramsar designated sites and no adverse impacts on European protected species in the area and beyond including by storm water runoff, water abstraction, or sewage discharge.</p> <p>In areas not protected through international or national designations, development will:</p> <ul style="list-style-type: none"> Minimise fragmentation of habitats and seek to

Document	Policy / Guidance	Policy / Guidance purpose
		conserve and enhance existing environmental assets of acknowledged regional or local importance. Where harm is unavoidable, it will provide for appropriate mitigation or replacement with the objective of achieving a long-term maintenance or enhancement of the local biodiversity baseline.
North Norfolk District Council		
North Norfolk Local Development Framework: Core Strategy (2008, updated 2011)	SS1 Spatial Strategy for North Norfolk and SS2 Development in the Countryside	North Norfolk outside of named settlements is designated as Countryside and development will be restricted to particular types of development to support the rural economy, meet affordable housing needs and provide renewable energy.
	EN3 Undeveloped Coast	In the Undeveloped Coast only development that can be demonstrated to require a coastal location and that will not be significantly detrimental to the open coastal character will be permitted.
	EN7 Renewable Energy	Renewable energy proposals will be supported and considered in the context of sustainable development and climate change, taking account of the wide environmental, social and economic benefits of renewable energy gain. Large scale renewable energy proposals should deliver economic, social, environmental or community benefits that are directly related to the proposed development and are of reasonable scale and kind to the local area.
	EN9 Biodiversity and Geology	All development proposals should: <ul style="list-style-type: none"> • Protect the biodiversity value of land and buildings and minimise fragmentation of habitats; • Maximise opportunities for restoration, enhancement and connection of natural habitats; and • Incorporate beneficial biodiversity conservation features where appropriate. Development proposals that would cause a direct or indirect adverse effect to nationally designated sites or other designated areas or protected species will not be permitted unless: <ul style="list-style-type: none"> • They cannot be located on alternative sites that would cause less or no harm; • The benefits of the development clearly outweigh the impacts on the features of the site and the wider network of natural habitats; and • Prevention, mitigation and compensation measures are provided.

22.3 Consultation

36. Consultation is a key driver of the EIA and ES, and is an ongoing process throughout the lifecycle of the project, from the initial stages through to consent and post-consent. To date, consultation regarding onshore ecology has been conducted through a range of fora, including:
- Responses to the submitted Scoping Report (Royal HaskoningDHV, 2016);
 - Expert Topic Group (ETG) meetings as part of the Evidence Plan Process (EPP) held in January 2017, July 2017 and January 2018 with representatives from Natural England, the Environment Agency, Norfolk County Council, Norfolk Wildlife Trust, North Norfolk District Council and Breckland Council;
 - Responses to ecological field survey-specific methodologies issued to stakeholders in 2017;
 - Responses to a PEIR submitted in November 2017 (Norfolk Vanguard Limited, 2017); and
 - Species-specific mitigation meetings held in 2018 in relation to great crested newts.
37. Full details of the project consultation process are presented within Chapter 7 Technical Consultation.
38. A summary of the consultation that has been undertaken to date with specific reference to onshore ecology is provided in Table 22.3. Further consultation responses are provided in Appendix 22.11.

Table 22.3 Consultation responses

Consultee	Document / Date received	Comment	Response / where addressed in the ES
Secretary of State	November 2016 Scoping Opinion	The Scoping Report has identified the need to consider indirect impacts on statutory and non-statutory designated sites for nature conservation through cable routing; however, direct impacts should also be considered if the onshore cable corridor does not avoid such sites.	Direct impacts, where appropriate, are considered within section 22.7 and 22.8 of this chapter.
Secretary of State	November 2016 Scoping Opinion	The ES should identify the locations where there would be loss of important habitats for example, hedgerow and/or ancient woodland.	Loss of habitat is assessed in sections 22.7 and 22.8 of this chapter.
Secretary of State	November 2016 Scoping Opinion	The ES should set out the measures for reinstating habitats which are removed during construction.	Reinstatement is set out in sections 22.7 and 22.8 of this chapter.
Secretary of State	November 2016	The Applicant should ensure that all mitigation measures proposed within the	A draft Outline Landscape and

Consultee	Document / Date received	Comment	Response / where addressed in the ES
	Scoping Opinion	ES are secured and with this in mind the Secretary of State welcomes the proposal for a project specific Ecological Management Plan. A draft of the plan should be provided with the DCO application. Consideration should also be made to any potential overlapping objectives of ecological and landscaping mitigation measures that may be proposed and secured through management plans.	Ecological Management Strategy (OLEMS) (Document reference 8.7) will form part of the documents which are submitted with the final DCO application.
Secretary of State	November 2016 Scoping Opinion	In terms of potential disturbance to protected species, the assessment should take account of impacts on noise, vibration and air quality (including dust); cross reference should be made to these specialist reports.	Where this assessment draws on other chapters, they have been referred to within sections 22.7 and 22.8 of this chapter. Other chapters referred to in this chapter are summarised in section 22.1.
Secretary of State	November 2016 Scoping Opinion	The ES should include a thorough assessment of the impact of the proposals on habitats and/or species listed as 'Habitats and Species of Principal Importance' within the England Biodiversity List.	Habitats and Species of Principal Importance are considered within sections 22.7 and 22.8 of this chapter.
Secretary of State	November 2016 Scoping Opinion	The ES should set out in full the potential risk to EPS [European Protected Species] and confirm if any EPS licences will be required.	EPS are considered within sections 22.7 and 22.8 of this chapter. A draft great crested newt mitigation licence has been drafted and consulted upon with Natural England. A Letter of No Impediment (dated 29 th June 2018) has been provided confirming that Natural England see no impediment to issuing a licence in the future (following submission of a final updated application).
Environment Agency	November 2016 Scoping Opinion	The EIA should include a detailed assessment of invasive non-native species present in water bodies and/or sensitive receptors along the cable route, together	Invasive species are considered within sections 22.7 and 22.8 of this chapter and any

Consultee	Document / Date received	Comment	Response / where addressed in the ES
		with a management plan to prevent the spread of these species (and any disease they carry) to uninfected receptors. For example, the cable route is shown to pass through different parts of the River Wensum where American signal crayfish and crayfish plague are present...We would expect that within the EIA the cable route would be assessed for the presence of invasive species and associated diseases detailing how spread will be prevented	required mitigation measures for the management of invasive species are captured in the OLEMS.
Natural England	November 2016 Scoping Opinion	The cable route has potential to directly affect both the hydrological processes and habitats present within the River Wensum SAC. There are many springs and seepages along the length of the river which would not be detectable during a desk study, and if missed has the potential to damage the river system, resulting in changes to the direction and speed of flow of the river...We therefore recommend that prior to any decisions on location a hydro-ecologist is employed to survey the area, to check for seepages/springs and to review where to place the cable to avoid damaging the habitats associated with the SAC...A qualifying species of the Wensum SAC is Desmoulin's whorl snail. This species is likely to be present throughout the area surrounding the Wensum, being particularly prevalent in locally designated greenspace nearby such as Lenwade and Witchingham Common. A survey should therefore be carried out along the route, which should take place mid to late summer.	A geo-hydromorphological survey has been undertaken and its findings are reported in Chapter 20 Water Resources and Flood Risk. A botanical survey of the floodplain has been undertaken in July 2017 and an invertebrate survey for the Desmoulin's whorl snail has been undertaken in July 2017. Findings are summarised in section 22.6.
Norfolk County Council	January 2017 ETG Minutes	Requested that those designated sites immediately outside of the survey area be considered within the assessment, e.g. Booton Common and Pigney's Wood (not yet designated).	These sites and others within 1km of the survey area have been considered within sections 22.7 and 22.8 of this chapter.
Norfolk County Council	January 2017 ETG Minutes	Barbastelle radio-tracking data from Norwich Northern Distributer Road and the Norfolk 'Living Map' data to be included, where available.	Norfolk 'Living Map' data is detailed in section 22.6 of this chapter.
Environment Agency	April 2017	Details of the water bodies in Norfolk	White-clawed crayfish

Consultee	Document / Date received	Comment	Response / where addressed in the ES
	Email response	known to support white clawed crayfish. These are: Rivers Stiffkey, Glaven and Weybourne Beck.	<i>Austropotamobius pallipes</i> have been considered within sections 22.7 and 22.8 of this chapter.
Norfolk County Council	July 2017 ETG Minutes	Bat survey methodology as presented in the Interim Survey Report [<i>Document Reference: PB4476-004-0224</i>] needs to be revised to provide clarity on the data collection methods used.	Bat Survey Methodology Update produced and issued to ETG on 20/09/2017. No further comments from ETG. Methodology therefore considered acceptable. Final methodology used presented in Appendix 22.4.
Environment Agency	November 2017 PEIR response	22.7.3.5.1 Impact 5. Hedgerows - Point 292. The Onshore Cable Corridor (ONC) work stands to result in the loss of approximately 6.3 km of hedgerow, which is a viable area of UKHPI and Norfolk BAP habitat....The proposal includes a replanting element; however, we would expect a further survey to differentiate between species rich hedgerow (ancient hedgerow) and species poor hedgerow. Where ancient hedgerow is identified, we would support the use of HDD techniques. Further information on surveying hedgerows can be found through The Norfolk Wildlife Trust and Natural England.	Hedgerows have been surveyed to this level of detail during the Extended Phase 1 Habitat Survey. This information is presented in Appendix 22.1.
Environment Agency	November 2017 PEIR response	Impact 8 Watercourses and ponds. 22.7.3.8.3 Point 314. Temporary loss of approximately 40 ponds. Section (22.7.3.13.4 – 388) – states that there will be permanent loss of up to 22 potential breeding ponds for Great Crested Newt (GCN). Within the EIA, this loss is classified as Major – High Magnitude, High importance, and Worse major impact. This loss of UKBAP priority habitat is unacceptable.	The project will ensure no net loss of pond habitats. The number of ponds affected during construction has been reduced (originally 40 and now five ponds) through project design iterations. Impacts and proposed mitigation upon these ponds are set out in sections 22.7 and 22.8 of this chapter.
Environment Agency	November	22.7.3.10.1 Impact 11 Water Vole: Extensive surveys carried out by a qualified	Water vole surveys were undertaken in

Consultee	Document / Date received	Comment	Response / where addressed in the ES
	2017 PEIR response	ecologist at the optimal time of year will be required at all potential crossing sites These surveys will need to include IDB drains, field drains (where habitat is suitable), and all watercourses. A Water Vole mitigation plan for each area of suitable habitat will be required once the results of surveys are complete. We are fully in support of the use of HDD techniques where water voles are present.	2017 and these survey results are provided in Appendix 22.3. Impacts on water voles and the required mitigation measures are set out in sections 22.7 and 22.8 of this chapter.
Environment Agency	November 2017 PEIR response	Fish species - no assessment on bullhead, brown trout, brook lamprey (Annex II)	Data on these species has been provided by the Environment Agency and is included in section 22.6 of this chapter. Impacts on these species and any required mitigation measures is set out in sections 22.7 and 22.8 of this chapter.
Natural England	November 2017 PEIR response	Whilst it is recognised that the requirement to produce an ES is through the EIA regulations consideration of the habitat regulations should not be excluded from each of the chapters. For example when considering a designated site it is not appropriate to use the EIA matrices which are for wider environmental receptors rather than a protected feature. The conservation objectives for the site should be used to determine significance for protected sites. At the end of the chapter NE expects a set of conclusions for EIA Regulations identify any sensitive receptors which may require further consideration in pre- and post-construction monitoring and conclusions in relation to any Likely Significant Effect (LSE) for protected features that will be taken forwards into the RIAA. A table determining significance is in-sufficient as need to determine what outcome will be for the projects. NB: if there are residuals concerns that may/may not be significant these will require further consideration including monitoring.	The HRA Report provides a detailed consideration of the potential LSE on the protected features (habitats and/or species) of European sites. The conclusions of the HRA Report are referenced within sections 22.7 and 22.8 of this chapter.
Natural England	November 2017	In terms of the HRA, Natural England agrees that the River Wensum SAC,	Additional screening has been undertaken

Consultee	Document / Date received	Comment	Response / where addressed in the ES
	PEIR response	Great Paston Barn SAC and the Norfolk Valley Fens SAC are scoped in for further assessment. We are satisfied with the criteria for screening out Broadland SPA/Ramsar site. However, The Broads SAC needs to be included in the scoping exercise as this site appears to have been omitted from considerations.	for The Broads SAC and is reported within the HRA Report and within sections 22.7 and 22.8 of this chapter.
Natural England	November 2017 PEIR response	We welcome further discussions in relation to a wider strategic approach to GCN mitigation in line with Natural England's latest change in licensing advice as per discussions in July.	A meeting was held on 12 th March 2018 to discuss these opportunities. The option for using off-site mitigation for great crested newts has been retained by the project so that it can be potentially used during post-consent mitigation. A draft great crested newt mitigation licence containing these proposals has been consulted upon with Natural England.
Natural England	November 2017 PEIR response	An area of particular concern is the hydrological impact of the construction affecting ground and surface water flows. This will need to be assessed according to the specific hydrological regime at individual locations where there is habitat linked to and dependant on the water regime. Small scale local disruptions can significantly affect important habitats and communities such as seepages and springs. Sites where the cable is adjacent to the River Wensum before crossing and running along the Penny Spot Beck, Dillington, and other locations with a wetland habitat component, will need detailed investigation.	These possible effects are considered within Chapter 19 Ground Conditions and Contamination. A summary of the potential impacts is provided in the HRA Report (with respect to the River Wensum) and within sections 22.7 and 22.8 of this chapter.
Natural England	November 2017 PEIR response	Mitigation needs to be designed to account for impacts on bats, e.g. linear features need to be reinstated; hedges should be double-planted with grassland strips on both sides so there is always a leeward side to forage. Trees should be planted where	Mitigation measures proposed for bats with respect to hedgerows are presented within sections 22.7 and 22.8 of this chapter and

Consultee	Document / Date received	Comment	Response / where addressed in the ES
		possible as well as native shrubs.	captured within the OLEMS.
Natural England	November 2017 PEIR response	Works will interrupt core bat foraging areas as well as commuting routes; mitigation should be in place for these. In order to be effective, the mitigation should be in place before the disruption works are carried out. Working on sensitive sections e.g. severing commuting routes, should ideally be carried out in winter, when the bats are dormant, so the bats can adapt to the change before the pupping season is underway.	Mitigation measures proposed for bats with respect to hedgerows are presented within sections 22.7 and 22.8 of this chapter and captured within the OLEMS.
Norfolk County Council	November 2017 PEIR response	Where CWS will be crossed by the cable corridor, the County Council would request that very strong consideration is given to using Horizontal Directional Drilling (HDD), particularly at Wendling Carr CWS 1013, which is associated with Wendling Beck. Paragraph 314 (p. 78) indicates that only one of the two crossings of Wendling Beck will be using trenchless techniques but it is unclear as to whether this will be at the CWS.	Following this comment, the project design has been revised and now trenchless techniques are proposed to be used at all identified CWS (a running track is retained within one CWS at Wendling Carr).
Norfolk County Council	November 2017 PEIR response	The cable route runs parallel to the Marriott's Way CWS at several points and bisects it twice. Potential impacts on this site may therefore be cumulative. Cables for the DONG/Orsted 'Hornsea 3' offshore windfarm scheme also bisect the Marriott's Way in two places and so cumulative impacts may be more significant than implied, notably east of Reepham.	Consideration of cumulative effects is presented within section 22.8 of this chapter.
Norfolk County Council	November 2017 PEIR response	Protected Species and Habitats At the Onshore Ecology Expert Topic Group meetings, various issues with surveys for bats have been raised. The Norfolk Vanguard Ecological Surveys Interim Report (June 2017) concludes "For bat surveys there is a more significant issue. If continuing with the present methodology, gaining sufficient access is a significant constraint for spatial and temporal coverage of the study area" (paragraph 8.9). At this stage, the County Council retains reservations regarding the ability of the bat survey results to allow a robust and	Since this PEIR response, the Bat Activity Survey Report has been circulated for comment. Comments received are detailed later in this consultation table. Full details of the impacts on commuting / foraging bats is presented within sections 22.7 and 22.8 of this chapter

Consultee	Document / Date received	Comment	Response / where addressed in the ES
		lawful decision to be reached.	
North Norfolk District Council	November 2017 PEIR response	The District Council welcomes the commitment by Vattenfall to undertake trenchless crossing points (HDD) at roads, railways and sensitive habitats. However, it is suggested that additional HDD points will be required to miss further sensitive habitats and areas where significant/important hedgerows and hedgerow trees will otherwise need to be removed. For example: West of The Street, Ridlington (TG 34631 30520) – an area of former grazing pasture and a large ditch network (currently unsurveyed)	Following refinement of the onshore project area, Paston Way Cutting CWS is now proposed to be crossed using trenchless techniques. Undesignated habitat at Ridlington Street is proposed to be crossed using trenching. Impacts upon the habitats and potential species at the habitat by Ridlington Street are presented within sections 22.7 and 22.8 of this chapter.
North Norfolk District Council	November 2017 PEIR response	General concern that only 50% of the cable route has been surveyed in the field, which could mean that many important ecological features may have been missed.	This is related to landowner access provision. For areas not surveyed the Norfolk Living Map and the aerial photography have been reviewed to confirm broad habitat types. The areas not surveyed prior to submission will be surveyed post-consent, as discussed within the ETG meeting held as part of the EPP. Further information is provided in section 22.5.3.
North Norfolk District Council	November 2017 PEIR response	In terms of long term and permanent effects on the landscape, there will be a need to provide appropriate landscape mitigation particularly where open cut trenches affect field boundaries and landscape features such as mature trees. Vattenfall has indicated they will seek to do this but this would need to be set out within the mitigation strategy. Where possible, the District Council would expect Horizontal Directional Drilling (HDD) to be used if routes through sensitive woodlands	Woodlands have been avoided by the project during the design process. Mitigation for locations where hedgerow removal is required is presented in sections 22.7 and 22.8 of this chapter.

Consultee	Document / Date received	Comment	Response / where addressed in the ES
		or landscapes cannot be avoided.	
The Wildlife Trusts	November 2017 PEIR response	HDD is only preferred at a small number of designated watercourses and the PEIR makes the assessment that “Given the extent of these habitats within the wider environment, this effect is anticipated to be of low magnitude.” (para 22.7.3.8.3). In our view HDD should be the preferred option at the great majority of watercourses and wetland habitats adjacent to watercourses. This will not only serve to give direct protection to habitats but will mitigate for potential impacts of pollution and silt run-off, whilst also improving biosecurity.	Impacts to watercourses is set out in Chapter 20 Water Resources and Flood Risk and summarised in sections 22.7 and 22.8 of this chapter.
Norfolk Wildlife Trust	January 2018 ETG Minutes	Boaton Common Reserve Manager does not have a concern regarding the Norfolk Vanguard project.	Noted.
Norfolk County Council	January 2018 ETG Minutes	<p>Approach to identification of important hedgerows is crude. Hard to pick up different spp. on technology. Better to have no. passes vs no. passes in other area and use to calculate relative abundance coefficient.</p> <p>5km buffer argued very well. Guidelines that sustenance zones for barbastelles are 6km. Agree with 5km but need to justify reasons for not using 6km. Falls into core sustenance zone for southern bat roosts – are colonies related? Careful in terminology when talking about bad weather – bad weather could push bats into other areas (‘bad weather areas’) so don’t dismiss as less important areas.</p>	Process for identifying important hedgerows for bats has been reviewed in light of this comment. Important hedgerows for bats are presented in section 22.6 of this chapter.
Natural England	February 2018 Review of baseline ecology reports	The data presented are clear and sufficiently detailed to have confidence in their accuracy. We note that there were no surveys undertaken north of the river, due to a lack of access permission. Natural England wish to highlight that this area will need to be surveyed to fully and accurately assess the impact of the project on the River Wensum SAC. In addition, we note that no [Desmoulin’s whorl snail] individuals were found in the surveys	The north bank of the river will be surveyed post consent. No works are proposed to take place within the floodplain on the north bank of the river, therefore the risk of impacts in this area is minimal. Further consideration of these

Consultee	Document / Date received	Comment	Response / where addressed in the ES
		despite suitable habitat being present. However as the species has the capacity to colonise new areas any suitable habitat contributes to the SAC site integrity for this species. This is particularly pertinent in the absence of data from the North side of the River Wensum, which could support populations capable of colonising suitable habitats on the south side. We therefore support the recommendations to survey the north bank of the river and to re-survey all areas if works occur 3 years after the date of these surveys.	impacts is presented in sections 22.7 and 22.8 of this chapter.
Natural England	March 2018 Great crested newt mitigation minutes	Norfolk Vanguard will submit a draft great crested newt mitigation licence both for traditional methods and including an option for offsite mitigation under policies 1 & 2. The draft licence would need to be submitted with a technical note explaining the proposals for alternative mitigation under policies 1 & 2.	A draft great crested newt mitigation licence has been drafted and consulted upon with Natural England. A Letter of No Impediment (dated 29 th June 2018) has been provided confirming that Natural England see no impediment to issuing a licence in the future (following submission of a final updated application).

22.4 Assessment Methodology

22.4.1 EcIA Methodology

39. Chapter 6 EIA Methodology details the general impact assessment method, and the following sections describe more specifically the EcIA methodology proposed in relation to onshore ecology is based on the Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (2nd Ed.) (CIEEM, 2016a). The methodology was consulted on and agreed via ETG meetings held in July 2017 and January 2018 (with Natural England, the Environment Agency, Norfolk County Council, Norfolk Wildlife Trust, North Norfolk District Council and Breckland Council), the Scoping Report (Royal HaskoningDHV, 2016) and the Preliminary Environmental Information Report (PEIR) (Norfolk Vanguard Limited, 2017).

40. The CIEEM guidelines aim to predict the residual impacts on important ecological features affected, either directly or indirectly by a development, once all the appropriate mitigation has been implemented.
41. The approach to determining the significance of an impact follows a systematic process for all impacts. This involves identifying, qualifying and, where possible, quantifying the sensitivity, value and magnitude of all ecological receptors which have been scoped into this assessment. Using this information, a significance of each potential impact has been determined. Each of these steps is set out in the remainder of this section.
42. The EclA has used professional judgement to ensure the assessed significance level is appropriate for each individual receptor, taking account of local values for biodiversity to avoid a subjective assessment wherever possible as per the CIEEM guidelines. As a result, the assessed significance level may not always be directly attributed to the guidance matrix detailed below.

22.4.1.1 Importance

43. The first stage of an EclA is determining the importance of ecological features or receptors. CIEEM identifies the important ecological features as those key sites, habitats and species which have been identified by European, national and local governments and specialist organisations as a key focus for biodiversity conservation in the UK. These include:
 - Statutory and non-statutory designated sites for nature conservation;
 - Species occurring on national biodiversity lists;
 - UK Habitats of Principal Importance; and
 - Red listed, rare or legally protected species.
44. Importance is also qualified by the geographic context of an ecological receptor, i.e. a species which may be not recognised on a national biodiversity list may be locally in decline, and therefore its local importance is greater than its national importance.
45. For this EclA, the guidelines outlined in Table 22.4 have been followed to provide the relative importance of different ecological features.

Table 22.4 Definitions of importance levels for onshore ecology

Importance	Definition
High	<ul style="list-style-type: none"> • An internationally designated site or candidate site or an area which the statutory nature conservation organisation has determined meets the published selection criteria for such designation, irrespective of whether or not it has yet been notified; • A nationally designated site or a discrete area, including ancient woodlands, which the statutory nature conservation organisation has determined meets the published selection criteria for national designation (e.g. SSSI selection guidelines) irrespective of whether or not it has yet been notified;

Importance	Definition
	<ul style="list-style-type: none"> • A viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas of such habitat which are essential to maintain the viability of a larger whole; • A viable area of a UK Habitat of Principal Importance or smaller areas of such habitat which are essential to maintain the viability of a larger whole; • A European protected species listed in The Conservation of Habitats and Species Regulations 2017; or • A regularly occurring, nationally significant population / number of any internationally important species.
Medium	<ul style="list-style-type: none"> • County Council / Unitary Authority designated sites and other sites which the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves selected on defined ecological criteria and Wildlife Trust sites; • Viable areas of habitat identified in a Local Biodiversity Action Plan (LBAP); • Semi-natural woodland greater than 0.5 hectares (ha) which is considered to be in 'good condition'; • Any regularly occurring population of a nationally important species which is threatened or rare in the region; or • A regularly occurring, locally significant number of a species identified as important on a regional basis.
Low	<ul style="list-style-type: none"> • Semi-natural woodland greater than 0.25ha which is considered to be in 'good condition' or greater than 0.5ha in unfavourable condition; • Network of inter-connected hedgerows including some species-rich hedgerows; • Individual Important hedgerows or other ancient-countryside linear features; • Viable areas of habitat identified in a sub-county (District / Borough) BAP; • Any regularly occurring population of a nationally important species which is not threatened or rare in the region or county; • Sites / features that are scarce within the District / Borough or which appreciably enrich the District / Borough habitat resource; or • Other features identified as wildlife corridors or migration routes.
Negligible	<ul style="list-style-type: none"> • Features of value to the immediate area only e.g. within the site.

46. In addition to the features listed in Table 22.4, ecological features which play a key functional role in the landscape or are locally rare have been considered. The importance of such features has been determined by professional judgement.

47. CIEEM places the emphasis on using professional judgement when considering importance of ecological receptors, based on available guidance, information and expert advice (CIEEM, 2016b). Different aspects of ecological importance should be taken into account, including designations, biodiversity value, potential value, secondary or supporting value, social value, economic value, legal protection and multi-functional features.

22.4.1.2 Magnitude

48. The magnitude of the impact is assessed according to:

- The extent of the area subject to a predicted impact;
- The duration the impact is expected to last prior to recovery or replacement of the resource or feature;

- Whether the impact is reversible, with recovery through natural or spontaneous regeneration, or through the implementation of mitigation measures or irreversible, when no recovery is possible within a reasonable timescale or there is no intention to reverse the impact; and
- The timing and frequency of the impact, i.e. conflicting with critical seasons or increasing impact through repetition.

49. Table 22.5 summarises the definitions of magnitude that have been used for the onshore ecology receptors.

Table 22.5 Definitions of magnitude levels for onshore ecology

Magnitude	Definition
High	Major impacts on the feature / population, which would have a sufficient effect to alter the nature of the feature in the short to long term and affect its long-term viability. For example, more than 20% habitat loss or damage.
Medium	Impacts that are detectable in short and long-term, but which should not alter the long-term viability of the feature / population. For example, between 10 - 20% habitat loss or damage.
Low	Minor impacts, either of sufficiently small-scale or of short duration to cause no long-term harm to the feature / population. For example, less than 10% habitat loss or damage.
Negligible / No change	A potential impact that is not expected to affect the feature / population in any way, therefore no effects are predicted.

22.4.1.2.1 Duration

50. The definitions of duration used within this EclA are dependent on the individual ecological receptor, and how sensitive it is to effects over different timescales. However, in general terms the following definitions have been used:

- **Short term** – effects which at most occur over a part of – or over a part of a key period of – a species' active season or a habitat's growing season, i.e. typically effects which occur over a matter of days or weeks;
- **Medium term** – effects which occur over the full duration of a species' active season or a habitat's growing season, i.e. typically effects which occur over a matter of months or one year; and
- **Long term** – effects which occur over the multiple active or growing seasons, i.e. typically effects which occur over more than one year.

51. Where deviations from these definitions are used within section 22.7, this is explained within the text.

22.4.1.3 Impact significance

52. Following the identification of receptor importance and magnitude of the effect, it is possible to determine the significance of the impact.

53. Ecologically significant impacts are defined as:

- ‘...impacts on structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution)’ (CIEEM, 2016a).

54. Impacts are unlikely to be significant where features of low importance are subject to small scale or short-term effects. If an impact is found not to be significant at the level at which the resource or feature has been valued, it may be significant at a more local level.
55. CIEEM recommend that the following factors are taken into account when determining significance for selected ecological receptors.

22.4.1.3.1 *Designated/defined sites and ecosystems*

- **Designated sites** – is the project and associated activities likely to undermine the site’s conservation objectives, or positively or negatively affect the conservation status of species or habitats for which the site is designated, or may it have positive or negative effects on the condition of the site or its interest/qualifying features?
- **Ecosystems** – is the project likely to result in a change in ecosystem structure and function?

22.4.1.3.2 *Habitats and species*

- **Habitats** – conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area.
- **Species** – conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area. (CIEEM, 2016a)

56. Following the identification of receptor importance and magnitude of effect, the significance of the impact has been considered using the matrix presented in Table 22.6 below and knowledge of the ecological features affected.
57. The assessment of potential impacts has been undertaken assuming that all embedded mitigation and project decisions made during the design process to minimise impacts will be successfully implemented. Where, following this assessment, significant impacts are identified, additional mitigation measures are then proposed. A final assessment of the residual impacts remaining following implementation of these additional mitigation measures is then made.

Table 22.6 Impact significance matrix

		Negative magnitude				Beneficial magnitude			
		High	Medium	Low	Negligible	Negligible	Low	Medium	High
Importance	High	Major	Major	Moderate	Minor	Minor	Moderate	Major	Major
	Medium	Major	Moderate	Minor	Minor	Minor	Minor	Moderate	Major
	Low	Moderate	Minor	Minor	Negligible	Negligible	Minor	Minor	Moderate
	Negligible	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Minor

58. The impact significance categories are defined as shown in Table 22.7.

Table 22.7 Impact significance definitions

Impact Significance	Definition
Major	Very large or large change in receptor condition, both adverse or beneficial, which are likely to be important considerations at a regional or district level because they contribute to achieving national, regional or local objectives, or, could result in exceedance of statutory objectives and / or breaches of legislation.
Moderate	Intermediate change in receptor condition, which are likely to be important considerations at a local level.
Minor	Small change in receptor condition, which may be raised as local issues but are unlikely to be important in the decision making process.
Negligible	No discernible change in receptor condition.
No impact	No impact, therefore no change in receptor condition.

59. Note that for the purposes of the EclA, major and moderate impacts are deemed to be significant. In addition, whilst minor impacts are not significant in their own right, it is important to distinguish these from other non-significant impacts as they may contribute to significant impacts cumulatively or through interactions.

60. Embedded mitigation has been referred to and included in the initial assessment of impact. If the impact does not require mitigation (or none is possible) the residual impact remains the same. If, however, mitigation is required an assessment of the post-mitigation residual impact is provided.

22.4.1.4 Approach to predicting impacts for unsurveyed areas

61. For all unsurveyed areas where potential impacts have been identified, post-consent ecological surveys will be required. Full details of these requirements are provided for each receptor within section 22.7.

62. Please see section 22.5.3 for a full assessment of the coverage and quality of the

data used to inform the ecological baseline presented within this EclA.

22.4.2 Cumulative Impact Assessment

63. Chapter 6 EIA Methodology provides a general methodology with regards to the CIA.
64. This chapter includes those cumulative impacts that are specific to onshore ecology.
65. The key consideration used in relation to linear development such as the onshore project area is whether there is spatial or temporal overlap of effects from multiple projects on the same receptors. Therefore, for habitats and non-mobile species, unless there is a spatial overlap there is no pathway for cumulative impact between spatially separated projects. There is however a potential for a cumulative impact upon the overall habitat resource at a regional or national level. Where potential regional or national level impacts are identified and considered to be relevant they are highlighted in the CIA.
66. For mobile species there is only a pathway for cumulative impact if there is spatial overlap of potential receptor ranges in addition to temporal overlap with the activity or its resultant impact i.e. where developments follow on from one another before the species has recovered from displacement or other impact. In addition, whilst it is assumed that any consented development would be subject to mitigation and management measures which would reduce impacts to non-significant unless there were exceptional circumstances, it is accepted that such projects may contribute to a wider cumulative impact.
67. Finally, in cases where this project has negligible or no impact on a receptor (through for example avoidance of impact through routeing or construction methodology) it is considered that there is no pathway for a cumulative impact.
68. Further details of the methods used for the CIA for onshore ecology are provided in section 22.8.

22.4.3 Transboundary Impact Assessment

69. There are no transboundary impacts with regards to onshore ecology as the proposed onshore project area works is not sited in proximity to any international boundaries. Transboundary impacts are therefore scoped out of this assessment and will not be considered further.

22.4.4 Habitats Regulations Assessment

70. A Habitats Regulations Assessment (HRA) has been undertaken for the project and will be submitted as part of the DCO submission. The HRA assesses whether or not the project is likely to give rise to a likely significant effect upon a European site (SPA, SAC or Ramsar sites), either alone or in combination with other projects.

71. The first stage of the HRA process is screening for those potential European sites which need to be scoped into the HRA. A HRA Screening for the onshore project area was provided in the PEIR (Norfolk Vanguard Limited, 2017). The full HRA Report (document reference 5.3) has been submitted alongside the ES as part of the DCO application.
72. This chapter refers to and draws on the HRA Report when discussing potential impacts upon ecological receptors which are European sites or are associated with European sites.

22.5 Scope

22.5.1 Study Area

73. The onshore development footprint is referred to hereafter as the onshore project area and is shown on Figure 22.1.
74. The onshore project area considered includes the following elements:
 - Landfall;
 - Onshore cable route, accesses, trenchless crossing technique (e.g. Horizontal Directional Drilling (HDD)) zones and mobilisation areas;
 - Onshore project substation; and
 - National Grid substation extension and overhead line modifications.
75. A full description of, and associated information for, the onshore project area is provided in Chapter 5 Project Description.
76. The study areas for specific onshore ecological receptors used in this EclA are provided in Table 22.8. Different study areas have been used for different receptors depending on their sensitivity and on their habitat preferences. These study areas were selected according to standard guidance and professional judgement. All study areas presented below have been discussed and agreed with stakeholders as part of the Norfolk Vanguard EPP.

Table 22.8 Study areas for different onshore ecology receptors used for this EclA

Data / survey	Study area	Study area name used in the remainder of this document
Statutory designated sites	Within 2km of the onshore project area (Figure 22.2).	'designated site study area'
Statutory designated sites located	Within 200m of site access routes which exceed set air quality criteria (Figure 26.1, Chapter 26 Air Quality)	'construction vehicle exhaust emissions study area'
Non-statutory designated sites	Within 2km of the onshore project area (Figure 22.3).	'designated site study area'

Data / survey	Study area	Study area name used in the remainder of this document
UKHPI and Norfolk LBAP Habitats	Within 50m of the onshore project area (Figure 22.5).	'habitats and species study area'
Protected and notable species (except great crested newts <i>Triturus cristatus</i>)	Within 50m of the onshore project area (Figure 22.5).	'habitats and species study area'
Great crested newts	Within 250m of the temporary ¹ onshore project area and within 500m of the permanent onshore project area (Figure 22.6).	'great crested newt study area'

22.5.2 Data Sources

77. This EclA has been informed by the findings from a desk-based exercise and field survey data which has been collected from July 2016 to October 2017. This data has been collected for different study areas depending on the receptor concerned and upon the project information available at the time of collection.
78. All of the data sources used to inform the EclA are summarised in Table 22.9.
79. The field survey programme outlined in the Onshore Ecology and Onshore Ornithology Method Statement (Document Reference: PB4476-003-029) (Royal HaskoningDHV, 2017) commenced in February 2017 and continued through to October 2017. This EclA has drawn on all of the findings from these completed field surveys.

¹ 'Temporary onshore project area' includes the landfall and onshore cable route works; 'permanent onshore project area' includes the onshore project substation and Necton National Grid substation extension.

Table 22.9 Data sources

Data source	Date	Data contents	Coverage	Status
Desk study data				
JNCC	July 2016 (updated March 2018)	European designated sites (SPA, SAC, Ramsar sites)	Onshore project area plus a 2km buffer	Data obtained
JNCC Natural England	July 2016 (updated March 2018)	UK designated sites (SSSI, NNR, LNR, Ancient Woodland)	Onshore project area plus a 2km buffer	Data obtained
JNCC	July 2016 (updated March 2018)	UK Habitats of Principal Importance	Onshore project area plus a 50m buffer	Data obtained
Norfolk Biodiversity Information Service (NBIS)	July 2016	Locally designated sites (CWS, RNR)	Onshore project area plus a 2km buffer	Data obtained
NBIS	July 2016	Protected and notable species records including: <ul style="list-style-type: none"> • Wildlife & Countryside Act 1981 Schedules 1,5, 8 & 9; • The Conservation of Habitats & Species Regulations 2010 Schedules 2 & 5; • Protection of Badgers Act 1992; • Bonn Convention Appendix 1 & 2; • Bern Convention Annex 1 & 2; • Habitats Directive Annex 2, 4 & 5; • NERC Act 2006 Section 41 species; 	Onshore project area plus a 2km buffer (5km for bats)	Data obtained

Data source	Date	Data contents	Coverage	Status
		<ul style="list-style-type: none"> • UK BAP species (both local and national); • Veteran trees²; IUCN Red List Species; • Nationally Notable species; • Locally Rare species. 		
APEM	March 2017	High-resolution aerial photography data	Onshore project area plus a 50m buffer	Data obtained
NBIS	March 2017	Norfolk 'Living Map' remote sensing habitat mapping data	Onshore project area plus a 50m buffer	Data obtained
Norfolk Barbastelle Study Group	June 2017 (further clarification on data provided January 2018)	<p>Barbastelles <i>Barbastella barbastellus</i>:</p> <ul style="list-style-type: none"> • Radiotracking data for maternity colonies, to show roost locations and home ranges; • Barbastelle roosts (summer and winter), commuting routes (at hedgerow level as far as possible), core foraging areas; • Additional acoustic data for later summer/autumn. <p>Other bat species:</p> <ul style="list-style-type: none"> • Roosts, species, type and counts; and • Acoustic records. 	<p>Radiotracking data and other species roost data: Onshore project area plus a 5km buffer</p> <p>Commuting routes and acoustic data: onshore project area plus 50m buffer</p>	Data obtained
Norfolk LBAP	June 2017	Lists of Norfolk priority habitat and species. Information on Norfolk's ecological networks.	Onshore project area plus a 50m buffer	Data obtained
NWT	July 2017	Management Statement for Kerdiston Old Hall Meadows	Site-specific information	Data obtained
Environment Agency	March 2018	<p>Records of:</p> <ul style="list-style-type: none"> • Crayfish (all species); • Fish species from the National Fish Population Database <p>Details of river restoration works at Wendling Beck.</p>	Watercourses in the Wensum and Bure catchments within the onshore project area plus a 50m buffer	Data obtained

² Veteran trees are not precisely defined (Forestry Commission, 2018), however the criteria set out in *Veteran Trees: A guide to good management* (Natural England, 2000) has been used here.

Data source	Date	Data contents	Coverage	Status
Field survey data				
Extended Phase 1 Habitat Survey	February 2017	<p>An Extended Phase 1 Habitat Survey following 'Extended Phase 1' methodology as set out in <i>Guidelines for Baseline Ecological Assessment</i> (Institute of Environmental Assessment (IEMA), 1995). Habitats were classified and mapped following JNCC's <i>Handbook for Phase 1 habitat survey: A technique for environmental audit</i> (2010).</p> <p>Included a search for:</p> <ul style="list-style-type: none"> • Field signs of badgers; • Assessment of roost suitability of trees and structures for bats; • Assessment of commuting / foraging suitability of all linear features for bats; • Field signs of otter <i>Lutra lutra</i>; • Assessment of suitability of watercourse to support water voles <i>Arvicola amphibius</i>; • Habitats suitability assessment of all standing water bodies for ability to support great crested newts; • Assessment of suitability of habitats to support reptiles; • Assessment of suitability of habitats to notable invertebrates; and • Evidence of non-native invasive species. 	<p>Great crested newts: Onshore project area plus 250m buffer (temporary works) and 500m buffer (permanent works)</p> <p>All other habitats and species: Onshore project area plus a 50m buffer)</p> <p>Coverage of approx. 50% of survey area.</p>	Full survey results available
Great Crested Newt Survey	March-June 2017	A great crested newt presence / likely absence survey of those standing water bodies identified during the Extended Phase 1 Habitat Survey as providing 'average', 'good' or 'excellent' habitat suitability to supporting breeding populations of great crested newts.	<p>Onshore project area plus a 250m (temporary works) and 500m (permanent works) buffer</p> <p>Coverage of approx. 30% of survey area.</p>	Full survey results available
Water Vole Survey	May-June 2017	A water vole presence / absence and population estimate survey of those watercourses identified as suitable to support water voles during the Extended Phase 1 Habitat Survey. Field signs of otters were also searched for during this survey.	<p>Onshore project area plus a 50m buffer</p> <p>Coverage of approx. 50% of survey area.</p>	Full survey results available

Data source	Date	Data contents	Coverage	Status
Reptile Presence/ Absence Survey	April- September 2017	A reptile presence / absence survey of all habitat mosaics identified during the Extended Phase 1 Habitat Survey as providing suitable habitat for common reptile species.	Onshore project area plus a 50m buffer	Full survey results available
Bat Emergence / Re-entry Surveys	April - October 2017	Bat emergence / re-entry surveys of all trees and structures identified during the Extended Phase 1 Habitat Survey as providing moderate or high suitability to support roosting bats.	Onshore project area plus a 50m buffer	Full survey results available
Bat Activity Surveys	May - October 2017	Bat activity surveys of all linear features (hedgerows, watercourses scrub patches and woodland edges, coastline) identified during the Extended Phase 1 Habitat Survey as providing moderate or high suitability to support commuting or foraging bats.	Onshore project area plus a 50m buffer	Full survey results available
Aquatic Invertebrate Survey	July 2017	A survey for the Desmoulin's whorl snail within floodplain habitats adjacent to the River Wensum.	Floodplain habitats of the River Wensum	Full survey results available
<i>Odonata</i> Transect Survey	July 2017	A transect survey for the Norfolk hawkler (adult stage) along drainage ditches adjacent to the River Bure.	Drainage ditches of the River Bure floodplain	Full survey results available
Botanical National Vegetation Classification (NVC) Survey	July 2017	A NVC survey searching for the qualifying flora species (Stream water-crowfoot <i>R. penicillatus</i> ssp. <i>Pseudofluitans</i> , thread-leaved water-crowfoot <i>R. trichophyllus</i> and fan-leaved water-crowfoot <i>R. circinatus</i>) of the River Wensum SAC.	Floodplain habitats of the River Wensum	Full survey results available

22.5.3 Assumptions and Limitations

80. Biological records data provided by NBIS includes records collected by members of the public and volunteers, and therefore these are not necessarily subject to quality control or necessarily contain full details of, or spatially accurate information for, the species recorded. The absence of records does not imply any species, habitat or designation is absent from the search area. Nor does recorded presence imply current, continuing or breeding presence. Despite these caveats, biological records provide very useful supporting data to provide context when field survey data is not available.
81. No accuracy assessment has been carried out on the Norfolk Living Map by NBIS, and it is anticipated that there may be errors in the data, for example where there was cloud cover in the remote sensing imagery, or shadow caused by steep gulleys or on north-facing slopes. However, such errors are likely to be systematic and as such it has been possible to check the Living Map habitat classification against the field survey data and to identify which habitat types have been misidentified. One example is the wet grassland in Wendling Carr, which has been incorrectly identified as Lowland Mixed Deciduous Woodland, likely due to the presence of a small number of scattered trees. Such errors have been identified during the production of the Extended Phase 1 Habitat Survey maps and therefore minimised as far as possible.
82. The field surveys which have been undertaken to inform this EclA were undertaken during the 2017 ecological survey season. The findings of the surveys have been used to inform this chapter. However, landowner access was not possible for the entire onshore project area and access was only possible for approximately 50% of the field survey habitats and species study area (i.e. 50% of the onshore project area plus a 50m buffer) for the 2017 ecological surveys. The Norfolk Living Map data provided by NBIS has been used to characterise the habitats for the remaining 50% of the habitats and species study area (as shown in Figure 22.5), and other desk study data (e.g. the NBSG's bat data) has been used to provide additional species information where possible. This approach was presented to and agreed with stakeholders during the July 2017 and January 2018 ETG meetings, as part of the Norfolk Vanguard EPP.
83. For the purposes of this EclA, and for areas where survey data is not available due to access restrictions, a precautionary approach has been adopted, i.e. it has been assumed that protected or notable species will be present within these unsurveyed areas. In these instances, an assessment of the habitat and its suitability to support protected or notable species has been made using either the findings from the Extended Phase 1 Habitat Survey or from reviewing the Norfolk Living Map data.

Where surveys have not been possible due to the lack of landowner access, full surveys of these areas will be carried out post-consent.

84. Some habitats could not be fully accessed during the field surveys due to physical barriers preventing entry, for example complex field drain networks or dense scrub. However, these areas were encountered infrequently and, where they were, they were recorded and it was noted that the presence of field signs within these areas could not be ruled out.
85. The Extended Phase 1 Habitat Survey was undertaken during February 2017 and early March 2017, which is outside of the optimal survey period for identifying ground flora species and hence habitat communities. Despite this, sufficient evidence was found during the survey to successfully identify habitat communities, and a number of early season plant species were able to be identified. In order to ensure that rare plant species which may be present during the summer period were not overlooked, where sensitive habitats were identified, further targeted botanical surveys were recommended and were subsequently undertaken in the summer months of 2017 and within the optimum surveying window for plant species.
86. Whilst the survey team made the utmost effort to cover every habitat and record all field signs present during the 2017 field surveys, on occasion due to human error some field signs can be missed or overlooked. However, and despite this, the data presented in Appendices 22.1 – 22.9 and summarised in section 22.6 is considered to provide an accurate description of the habitats and accurate account of species presence / absence within the survey area and in turn to inform a robust EclA.
87. The one exception to this is the Norfolk hawker dragonfly survey (Appendix 22.9). It is acknowledged that although the results gathered within the survey report are useful, they do not meet the British Dragonfly Society criteria for establishing breeding presence (i.e. evidence of a copulating pair of dragonflies, females ovipositing, or the presence of a larva, exuvia or teneral individual at the water body (BDS, 2015)). If there is any risk to this species arising from the project³, further survey will be required to determine whether breeding is taking place (see section 22.7 for assessment of the potential impacts upon this species).
88. Despite the survey limitations described, the data collected is considered to be sufficient to identify the nature and scale of impacts likely to arise as a result of the project in order to conduct a robust EclA. Where there are gaps in the data collected due to landowner access restrictions, impenetrable habitat or other restrictions, by using detailed desk study data where available (e.g. using the Norfolk Living Map)

³ Following route refinements, the suitable habitats for Norfolk hawker dragonfly identified at the River Bure are no longer located within the onshore project area (see section 22.7 for more details).

and by assuming that species are present within these unsurveyed areas the EclA presented in this chapter ensures that a worst case scenario assessment of impacts upon ecological receptors has been adequately undertaken.

22.6 Existing Environment

22.6.1 Statutory Designated Sites

89. A total of 37 statutory designated sites for nature conservation are located within the designated sites study area (Figure 22.2). These are:
 - Two SACs (and also SSSIs);
 - 11 other SSSIs;
 - One NNR (and also a SSSI);
 - Three LNRs; and
 - 20 ancient woodlands.
90. One of these sites, the River Wensum SAC and SSSI, is also located directly within the onshore project area.
91. A further SSSI (Happisburgh Cliffs) is designated for its geological features and is not considered further in this chapter. This SSSI is considered in Chapter 19 Ground Conditions and Contamination.
92. Table 22.10 lists the 37 statutory designated sites that are located within the designated sites study area. Table 22.10 also provides a summary of the qualifying features/reasons for notification of these designated sites. The legislation underpinning statutory designated sites is discussed in section 22.2.1. The locations of these statutory designated sites are also shown on Figure 22.2.
93. In addition to these sites, Chapter 26 Air Quality identified eight statutory designated sites which have been scoped into the construction vehicle emissions study area (see Figure 26.3, Chapter 26 Air Quality). These sites are shown in Table 26.20 Chapter 26 Air Quality.
94. All statutory designated sites for nature conservation are considered to be of high importance.

Table 22.10 Designated sites for nature conservation of relevance to onshore ecology

Name	Designation	Location (National Grid Reference (NGR) / Distance from onshore project area / size	Qualifying features/reasons for notification
Norfolk Valley Fens (Component: Booton Common)	SAC	TL 937960 0.6km 616.48ha	<p>Annex I habitats that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> Alkaline fens. <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:</p> <ul style="list-style-type: none"> Northern Atlantic wet heaths with <i>Erica tetralix</i>; European dry heaths; Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites); Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>); Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> (Priority feature); and Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) (priority feature). <p>Annex II species that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> Narrow-mouthed whorl snail <i>Vertigo angustior</i>; and Desmoulin's whorl snail <i>Vertigo moulinsiana</i>.
River Wensum	SAC, SSSI	TF 942246 to TG 250078 Within onshore project area 306.79ha	<p>SAC</p> <p>Annex I habitats that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> Watercourses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation. <p>Annex II species that are a primary reason for selection of this site:</p> <ul style="list-style-type: none"> White-clawed (or Atlantic stream) crayfish. <p>Annex II species present as a qualifying feature, but not a primary reason for selection of this site:</p> <ul style="list-style-type: none"> Desmoulin's whorl snail <i>Vertigo moulinsiana</i>; Brook lamprey <i>Lampetra planeri</i>; and Bullhead <i>Cottus gobio</i>.

Name	Designation	Location (National Grid Reference (NGR) / Distance from onshore project area / size	Qualifying features/reasons for notification
			<p>SSSI</p> <p>The Wensum has been selected as one of a national series of rivers of special interest as an example of an enriched, calcareous lowland river. With a total of over 100 species of plants, a rich invertebrate fauna and a relatively natural corridor, it is probably the best whole river of its type in nature conservation terms, although short stretches of other similar rivers may show a slightly greater diversity of species.</p> <p>Key features: calcareous river habitat, flora, invertebrate assemblage.</p>
Paston Great Barn	SAC, SSSI	<p>TG 322344</p> <p>3km (NB: located outside of 2km buffer, but scoped in due to large home range of interest feature (barbastelle bat))</p> <p>0.95ha</p>	<p>SAC</p> <p>Annex II species that are a primary reason for selection of this site</p> <ul style="list-style-type: none"> • Barbastelle bat. <p>SSSI</p> <p>This site is notified as it supports the only barbastelle bat maternity roost in Norfolk and one of only three known in the UK.</p> <p>Key features: barbastelle bat.</p>
Beetley & Hoe Meadows	SSSI	<p>TF 982174 to TF 979169</p> <p>1.4km</p> <p>11.7ha</p>	<p>Beetley and Hoe Meadows are situated in the valley of a tributary of the River Wensum, and represent one of the finest remaining areas of wet unimproved grassland in Norfolk. Springs emerge from the valley-side and variations in the acidity and dampness of the underlying soils account for the exceptionally wide range of grassland communities occurring on the site. The unimproved grassland is species-rich and includes several locally uncommon plants. The meadows are under a traditional management of summer grazing.</p> <p>Key features: wet unimproved grassland habitat, locally uncommon flora.</p>
Dereham Rush Meadow	SSSI	<p>TF 976140</p> <p>0.4km</p> <p>20.6ha</p>	<p>This site comprises an area of winter-flooded meadowland and alder carr along the valley of a small tributary of the River Wensum, and exhibits a wide range of grassland and woodland communities which are particularly unusual in Norfolk. The site is also of interest for its breeding bird population including snipe, lapwing, sedge warbler and reed warbler, and winter floods are periodically used by waterfowl.</p> <p>Key features: grassland and woodland habitats, breeding bird assemblage.</p>

Name	Designation	Location (National Grid Reference (NGR) / Distance from onshore project area / size	Qualifying features/reasons for notification
Foxley Wood	SSSI, NNR	TG 056227 1.5km 122.7ha	<p>SSSI Foxley Wood forms the largest area of ancient woodland now remaining in Norfolk, and includes an unusually wide range of woodland stand types, including several which are nationally rare. The wood is also exceptionally rich in plant species, with over 250 different species recorded, and there is in addition considerable entomological interest, in particularly butterfly species.</p> <p>NNR Foxley Wood NNR is the NWT's premier woodland reserve and the largest remaining ancient woodland in the county. The site is a good example of how ancient woodland can be restored following coniferisation.</p> <p>Key features: ancient woodland, nationally rare woodland stands types, flora assemblage, rare butterflies.</p>
Dillington Carr, Gressenhall	SSSI	TF 971158 0.4km 49.0ha	<p>This site is an extensive area of carr woodland and open water occupying the valley floor and sides of a small tributary of the River Wensum. The wettest areas of carr are probably the best example of sump alder woodland in west Norfolk, closely resembling the carr woodlands found in Broadland. The site also includes extensive stands of the nationally rare lowland bird cherry-alder woodland. Irrigation reservoirs have been created within the carr and these flooded areas of former woodland support the freshwater component of an outstanding assemblage of breeding birds including several uncommon species.</p> <p>Key features: sump alder woodland habitat, lowland bird cherry-alder woodland habitat, breeding bird assemblage.</p>
East Ruston Common	SSSI	TG 340280 2km 38.3ha	<p>East Ruston Common is a large area of unimproved heathland and fen situated in the valley of a tributary of the River Ant. Acidic flushes emerging from sands and gravels at the base of surrounding high ground, are a notable feature of the site and an unusual plant community has developed in these conditions, providing a contrast with the majority of the spring-fed fens which are calcareous. There is a very clear zonation of vegetation types from acidic grassland through acidic flush and fen to carr woodland on the lowest-lying ground. Two rare species of spider have been recorded on the site.</p> <p>Key features: unusual acidic fen habitat, rare spider species.</p>
Holly Farm Meadow, Wendling	SSSI	TF 936131 0.9km 2.5ha	<p>This site, which is situated in the valley of a small tributary of the River Wensum, is a valuable example of a calcareous spring-line meadow with gradations between wet and dry conditions. It supports an area of species-rich unimproved fen grassland which is maintained by seasonal grazing.</p> <p>Key features: calcareous spring-line meadow habitat.</p>

Name	Designation	Location (National Grid Reference (NGR) / Distance from onshore project area / size	Qualifying features/reasons for notification
Honeypot Wood, Wendling	SSSI	TF 932144 1.4km 9.03ha	A good example of an ancient, coppiced, ash-maple wood on calcareous soil. Key features: ancient woodland habitat.
Whitwell Common	SSSI	TG 088206 1.2km 19.17ha	Whitwell Common lies in the valley of a tributary of the River Wensum and supports a wide range of wetland plant communities' characteristic of peat-based soils. Calcareous flushes are present in low-lying hollows created by past peat cutting and a variety of interesting plants are associated with this uncommon habitat type. Wet valley alder wood, fen communities and unimproved neutral grassland are also represented on the site. Key features: unimproved grassland habitat, alder carr habitat, flora assemblage.
Bryant's Heath, Felmingham	SSSI	TG 259294 1.5km 17.56ha	Bryant's Heath is an area of dry acidic heathland, unusual in that it encompasses within a relatively small area a mix of dry heath, wet heath and fen communities. Rich plant communities, including several plants that are now uncommon in East Anglia are present. Key features: dry heathland habitat., wet heathland habitat, nationally uncommon flora
Cawston and Marsham Heaths	SSSI	TG 170235 1.8km 125.7ha	Cawston and Marsham Heaths form the largest area of Heather-dominated heathland now remaining in east Norfolk. They represent a locally scarce type which shows affinities to the Atlantic coastal heaths found in western Britain. There is a diverse flora which includes a rich assemblage of lichens. The site is also of considerable ornithological interest. Key features: dry heathland habitat, breeding bird assemblage, wintering bird roost (hen harriers).
Happisburgh Cliffs	Geological SSSI, no ecological reasons for notification		
Booton Common	SSSI	TG 113230 0.6km 7.73ha	Booton Common lies in the valley of a tributary of the River Wensum, about 1 mile east of Reepham. The principal interest of the site is associated with a mosaic of wet calcareous fen grassland and acid heath communities which have developed due to the naturally undulating ground. Areas of tall fen and a strip of valley alder woodland occupy the lower ground adjacent to the stream. Key features: wet heathland habitat, calcareous fen habitat, breeding bird assemblage.
Felmingham Cutting	LNR	TG 248 287 2km	A butterfly nature reserve, home to 16 different species.

Name	Designation	Location (National Grid Reference (NGR) / Distance from onshore project area / size	Qualifying features/reasons for notification
		1.04ha	
Knapton Cutting	LNR	TG 299 329 1.1km 0.87ha	A butterfly nature reserve.
Pigney's Wood	LNR	TG295319 Adjacent to onshore project area 20.87ha	Pigney's Wood is a woodland site with reedbeds, a scrape, and wildflowers, butterflies, trees and birds.
Cawston Wood	Ancient Woodland	N/A ⁴	Identified in the Ancient Woodland Inventory.
Foxley Wood			
Great Wood			
Honeypot Wood			
Jack Bells Grove			
Necton Wood			
Newhall Grove			
North Grove			
Old Carr	Ancient Woodland	N/A ⁵	Identified in the Ancient Woodland Inventory.
Old Lane Carr			
Potters Grove			

⁴ Data not available

⁵ Data not available

Name	Designation	Location (National Grid Reference (NGR) / Distance from onshore project area / size	Qualifying features/reasons for notification
Sparham Grove			
Sparham Wood			
The Leaslands			
The Tollands			
6 x Unnamed Woodlands			

22.6.2 Non-statutory Designated Sites

95. There are a total of 95 non-statutory designated sites (CWS) and Roadside Nature Reserves (RNR) within and up to 2km of the designated sites study area, as shown on Figure 22.3. Five of these sites are located directly within the onshore project area. These sites are Wendling Carr CWS (CWS no. 1013), Little Wood CWS (CWS no. 2024), Land South of Dillington Carr CWS (CWS no. 1025), Marriott's Way CWS (CWS no. 2176) (crossed twice) and Paston Way and Knapton Cutting CWS (CWS no. 1175). In addition, there is a proposed CWS which, if it is designated, will be located within the onshore project area at Kerdiston between Kerdiston Hall and the Marriott's Way ('Kerdiston Old Hall Meadows').
96. All non-statutory designated sites are considered to be of medium importance.

22.6.3 Terrestrial Habitats

97. The baseline presented here is based on the field survey data collected during the 2017 Extended Phase 1 Habitat Survey. Where habitats were not recorded during the Extended Phase 1 Habitat Survey, habitats have been described using the Norfolk 'Living Map'. Full details of the habitats present are provided in Appendix 22.1 Extended Phase 1 Habitat Survey Report. Features of interest are described in 'target notes', which are referenced using a numbering system shown on Figure 22.5. Further details are provided within Appendix 22.1. Please note that habitat areas provided here relate to the areas of habitat found within the onshore project area, not the habitats and species study area (i.e. the onshore project area plus a 50m buffer). Both the onshore project area and the habitats and species study area are shown on Figure 22.5.

22.6.3.1 Woodland

98. Several woodland habitats are UKHPI, including the following three habitat types, which are present within the habitats and species study area:
 - Lowland mixed woodland;
 - Wet woodland; and
 - Wood-pasture and parkland.
99. Lowland mixed deciduous woodland, wet woodland, and wood-pasture and parkland are also listed as Priority Habitats on the Norfolk LBAP.
100. There are approximately 8.8ha of woodland habitat located within the onshore project area (see Figure 22.5), equating to approximately 1.9% of the onshore project area. The majority of this woodland habitat is comprised of broadleaved and coniferous plantation woodland (3.9ha) and broadleaved semi-natural woodland (4.9ha).

101. Small parcels of lowland mixed woodland are located within the onshore project area at TN7 on the east side of the River Bure, TN10 at the King's Beck, TN78, at the railway cutting at Northall Green (TN173), at two locations on The Marriott's Way (TN264), and at Witton Hall (see Figure 22.5). Land at Dillington Carr (TN158) is also transitional wet woodland habitat.
102. Typical semi-natural woodland composition recorded during the 2017 Extended Phase 1 Habitat Survey was English oak *Quercus robur* and ash *Fraxinus excelsior* woodland, with alder *Alnus glutinosa* and goat willow *Salix caprea* with an understorey dominated by hazel *Corylus avellana*, hawthorn *Crataegus monogyna* and elder *Sambucus nigra*. Ground flora typically comprised of dog's mercury *Mercurialis perennis*, nettle *Urtica dioica* dominated, lords and ladies *Arum maculatum*, wood avens *Geum urbanum* and ground ivy *Glechoma hederacea*.
103. Mixed semi-natural woodland present within the habitats and species study area typically consists of: beech *Fagus sylvatica*, ash, English oak, sweet chestnut *Castanea sativa*, larch *Larix decidua* and cherry laurel *Prunus laurocerasus*.
104. Small areas within the habitats and species study area were classified as wood-pasture and parkland, typically where oak standards in hedgelines had become overgrown and remained after the hedgeline had been removed.

22.6.3.2 Scrub

105. Approximately 0.6ha of scrub habitat is located within the onshore project area, located in scattered parcels throughout the onshore project area (see Figure 22.5). The areas where scrub was recorded represented a range of habitat sub-types, including transitional habitat between woodland and grassland, boundary features, waste ground, watercourse margins or field margins. Species composition varied, with elder and crack willow *Salix fragilis* common in wood scrub and bramble dominating where no woody species were present.

22.6.3.3 Isolated trees

106. Isolated trees are located throughout the habitats and species study area, associated with previous hedgerow lines, other linear features, isolated within the middle of pasture fields or domestic gardens.
107. Two veteran trees (one English oak, one alder) were noted during the 2017 field survey at TN168 and TN288 (see Figure 22.5).

22.6.3.4 Hedgerows

108. Hedgerows are both UKHPI and Norfolk LBAP priority habitats.
109. A total of 310 hedgerows were recorded during the 2017 Extended Phase 1 Habitat Survey, of which 110 are located within the onshore project area. A further 55 were

identified from the Norfolk 'Living Map', totalling approximately 3.3km in length of hedgerow in total. These hedgerows are located both within and along the perimeter of the onshore project area (see Figure 22.5).

110. Of the 110 hedgerows recorded within the onshore project area during the 2017 Extended Phase 1 Habitat Survey, 58 hedgerows are species-rich (both intact/defunct, and with/without trees). There are a total of 52 species poor hedgerows (both intact and defunct, and with/without trees), all of which are common features throughout the onshore project area.
111. Species-rich hedgerows typically consisted of shrub and tree species including field maple, elm, hawthorn, blackthorn *Prunus spinosa*, rose *Rosa canina*, hazel, English oak, holly *Ilex spp.*, ash, ivy *Hedera spp.*, with ground flora typically including common nettle, cleavers *Galium aparine*, broad-leaved dock *Rumex obtusifolius*, herb Robert *Geranium robertianum*, dog's mercury, lords and ladies, red dead nettle *Lamium purpureum*. Species-poor hedgerows were characterised as having fewer than five species in a 30m stretch, and were typically dominated by hawthorn.

22.6.3.5 Unimproved and semi-improved grassland

112. No areas of unimproved grassland were recorded within the habitats and species study area.
113. No areas of semi-improved grassland were recorded during the 2017 Extended Phase 1 Habitat Survey, although one area was identified from the Norfolk 'Living Map' (see Figure 22.5). This area total approximately 1.2ha of semi-improved grassland (0.3% of the onshore project area).
114. The 2017 Extended Phase 1 Habitat Survey recorded areas of semi-improved grassland in areas outside of the onshore project area, but within the habitats and species study area. These areas comprise coarse, ruderal grass species and ruderal herbs. Cock's foot *Dactylis glomerata*, rough meadow grass *Poa trivialis*, meadow foxtail *Alopecurus pratensis*, ribwort plantain *Plantago lanceolata*, creeping buttercup *ranunculus repens*, white clover *Trifolium repens* and red dead-nettle *Lamium purpureum* are common species found within these areas.
115. No species-rich grasslands were noted during the 2017 Extended Phase 1 Habitat Survey.

22.6.3.6 Marshy grassland

116. Marshy grassland was recorded within six locations within the onshore project area during the Extended Phase 1 Habitat Survey, totalling approximately 8.1ha (1.7% of the onshore project area).

117. Marshy grassland was recorded adjacent to watercourses within the habitats and species study area, at the River Wensum, River Bure, North Walsham and Dilham Canal and at minor watercourses near Salle and Sparham during the 2017 Extended Phase 1 Habitat Survey. Patches of common rush *Juncus effuses* in the wet areas are typical, with pendulous sedge *Carex pendula*, common vetch *Agrostis capillaris*, common bent, cranesbill *Geranium pratense*.
118. Selected areas of marshy grassland are also classified as coastal and floodplain grazing marsh, which is a UKHPI and Norfolk LBAP priority habitat. This habitat is located in three areas within the habitats and species study area: namely at the River Wensum, Salle, and the North Walsham and Dilham Canal (see Figure 22.4).

22.6.3.7 Improved grassland

119. Improved grassland which is subject to regular grazing is the most common grassland type found within the onshore project area. This habitat type was recorded in 11 separate locations within the onshore project area during the 2017 Extended Phase 1 Habitat Survey, and a further seven areas were identified from the Norfolk 'Living Map' (see Figure 22.5) totalling approximately 1.8% of the onshore project area. Typically, where this habitat has been recorded, the sward was short and grazed, and of low diversity, dominated by cock's foot and perennial rye-grass *Lolium perenne* with broad-leaved dock *Rumex obtusifolius*, sorrel *Rumex acetosa*, and patches of nettle, ragwort *Senecio jacobaea* and thistle species *Cirsium* sp.

22.6.3.8 Tall ruderal vegetation

120. Localised areas of tall ruderal habitat were recorded within the habitats and species study area during the 2017 Extended Phase 1 Habitat Survey (see Figure 22.5). This habitat was recorded typically along roads or track boundaries, or adjacent to scrub land. The typical species recorded include common nettle, common hogweed *Heracleum sphondylium*, broad-leaved dock, ribwort plantain.

22.6.3.9 Lowland fen

121. Lowland fen, which is a UKHPI, was also noted within the habitats and species study area at Dillington Carr in the desk study data received from JNCC (JNCC, 2016). Survey access to this location has not been possible at the time of preparing this document, and the Norfolk Living Map identifies this habitat as deciduous woodland, so it is uncertain as to the actual nature of this habitat. Prior to ground-truthing, and based on JNCC data and aerial photography of the site, it is assumed that this habitat is indeed lowland fen. Desk study data received from JNCC indicates that there is 1.0ha of lowland fen within the habitats and species study area at Dillington Carr.
122. Fen is also a Norfolk Biodiversity Action Plan (BAP) priority habitat.

22.6.3.10 Standing water

123. Ponds are a UKHPI and Norfolk LBAP priority habitat.
124. There are a total of 206 standing water bodies, i.e. ponds, lakes, selected ditches (those which are deep, with no flow) located within the great crested newt study area, of which six are located within the onshore project area (see Figure 22.5). Standing water accounts for approximately 0.2ha (0.1%) of habitat within the onshore project area.

22.6.3.11 Running water

125. Rivers are a UKHPI; they are not a Norfolk LBAP priority habitat.
126. There are five main rivers located within the habitats and species study area (see Figure 20.4, Chapter 20 Water Resources and Flood Risk for locations). These are:
- River Wensum;
 - River Bure;
 - King's Beck;
 - Wendling Beck; and
 - North Walsham and Dilham Canal.
127. In addition, there are numerous minor watercourses and field drains located throughout the habitats and species study area.

22.6.3.12 Coastal habitats

128. There are two coastal habitat types within the onshore project area. These include intertidal sand and dune grassland, which cover 6.3ha (1.4%) and 0.8ha (0.2%) of the onshore project area respectively. Coastal sand dunes are a UKHPI and Norfolk LBAP priority habitat. An intertidal survey was completed at the Norfolk Vanguard landfall location (see Chapter 10 Benthic and Intertidal Ecology and Appendix 10.3 for further information).

22.6.3.13 Other habitats

22.6.3.13.1 Arable land

129. The largest habitat by area within the habitats and species study area is arable land (405.7ha). This equates to approximately 87% of the onshore project area.
130. Whilst arable land is not a designated habitat, arable field margins are a UKHPI and Norfolk LBAP priority habitat. These will constitute a small proportion of the 405.7ha identified above.

22.6.3.13.2 Buildings

131. There are no significant built-up areas within the habitats and species study area; however, there are several buildings and structures which were noted during the

2017 Extended Phase 1 Habitat Survey. These are primarily residential dwellings and farm buildings.

22.6.3.14 Summary

132. Table 22.11 summarises the key habitat type described in section 22.6.3, along with its approximate area and any designations it is afforded. The totals below are the combined total derived from both the 2017 Extended Phase 1 Habitat Survey results and the Norfolk Living Map, unless otherwise specified.

Table 22.11 Habitat footprints within the onshore project area

Habitat type	Area (ha)	% of onshore project area	Habitat designation
Lowland mixed deciduous woodland	3.6	0.8%	UKHPI, Norfolk LBAP
Broadleaved semi-natural woodland	1.3	0.3%	UKHPI, Norfolk LBAP
Broadleaved plantation woodland	0.4	0.1%	UKHPI, Norfolk LBAP
Coniferous plantation woodland	3.3	0.7%	
Mixed plantation woodland	0.2	0.0%	
Dense/continuous scrub	0.4	0.1%	
Scattered scrub	0.2	0.0%	
Broadleaved parkland / scattered trees	<0.1	0.0%	UKHPI, Norfolk LBAP
Woodland rides	<0.1	0.0%	
Improved grassland	8.4	1.8%	
Marshy grassland	8.1	1.7%	
Coastal and floodplain grazing marsh	0.3	0.1%	UKHPI, Norfolk LBAP
Semi-improved grassland	1.2	0.3%	
Poor semi-improved grassland	8.3	1.8%	
Tall ruderal	0.1	0.0%	
Standing water	0.2	0.1%	UKHPI, Norfolk LBAP
Running water	0.8	0.2%	UKHPI
Cultivated / disturbed land - arable	405.7	87.4%	(NB: cereal field margins are a UKHPI and Norfolk LBAP habitat)
Cultivated / disturbed land - amenity grassland	0.7	0.2%	
Gardens	1.2	0.3%	
Bare ground	1.4	0.3%	

Habitat type	Area (ha)	% of onshore project area	Habitat designation
Urban	11.3	2.4%	
Other habitat	0.1	0.0%	
Intertidal mud / sand	6.3	1.4%	UKHPI
Dune grassland	0.8	0.2%	Norfolk LBAP
Beach	<0.1	0.0%	
Maritime Cliff and Slopes	<0.1	0.0%	UKHPI, Norfolk LBAP

133. Table 22.12 below restates the relative importance of those habitats outlined above.

Table 22.12 Definitions of importance of habitats

Importance	Definition
High	<ul style="list-style-type: none"> A viable area of a UK Habitat of Principal Importance or smaller areas of such habitat which are essential to maintain the viability of a larger whole;
Medium	<ul style="list-style-type: none"> Viable areas of habitat identified in a County BAP; Semi-natural woodland greater than 0.5ha which is considered to be in 'good condition'.
Low	<ul style="list-style-type: none"> Semi-natural woodland greater than 0.25ha which is considered to be in 'good condition' or greater than 0.5ha in unfavourable condition; Network of inter-connected hedgerows including some species-rich hedgerows; Individual Important hedgerows or other ancient-countryside linear features; Viable areas of habitat identified in a sub-county (District / Borough) BAP; Sites / features that are scarce within the District / Borough or which appreciably enrich the District / Borough habitat resource (e.g. veteran trees); or Other features identified as wildlife corridors or migration routes.
Negligible	<ul style="list-style-type: none"> Features of value to the immediate area only e.g. within the site.

22.6.4 Ecological Networks

134. The onshore project area is not located within any of The Wildlife Trusts' 'Living Landscapes' areas.

135. The onshore project area crosses three key ecological networks identified by the 2006 *Report of Ecological Network Mapping Project for Norfolk* (NWT, 2006), namely the River Wensum and River Bure river valleys and the North Walsham and Dilham Canal.

22.6.5 Protected, Notable and Invasive Species

136. This section provides a summary of the key species recorded within the habitats and species study area, drawing on the information provided by NBIS, the Environment Agency and the NBSG, findings of the 2017 field surveys (see Table 22.9 for further information).

22.6.5.1 Badgers

22.6.5.1.1 Desk study

137. NBIS records indicate that badgers have been recorded at 13 locations within 2km of the onshore project area. These include Swafeld, Bawdeswell, Edingthorpe Green, Dereham, Bylaugh, Hoe Railway, Sparham, Scarning, Dillington and Elsing.

22.6.5.1.2 Field survey

138. No active setts were found within the onshore project area during the 2017 field survey, although four active main setts and a further four active subsidiary and outlier setts were found within the wider habitat and species study area. A further 21 active setts were also found within the 2017 Extended Phase 1 Habitat survey area, providing further information about badger territories. Numerous field signs including latrines, tracks, paths and snuffles holes were observed within the survey area. Full details of the badgers recorded within the habitat and species study area are presented in Appendix 22.1.
139. Approximately 50% of the survey area has not been surveyed for badgers as landowner access could not be agreed, as set out in section 22.5.3. The impacts described in section 22.7 consider the potential impacts on the badger resource found, and on the potential resource present within the unsurveyed areas.
140. Badgers are protected under the Protection of Badgers Act 1992.
141. As a regularly occurring population of a nationally important species which is not threatened or rare in the county, badgers are considered to be of low importance.

22.6.5.2 Bats

22.6.5.2.1 Desk study

142. NBIS hold records of eight species of bat within 5km of the onshore project area, namely:
- Western Barbastelle *Barbastella barbastellus*;
 - Serotine *Eptesicus serotinus*;
 - Natterer's *Myotis nattereri*;
 - Lesser noctule *Nyctalus leisleri*;
 - Nathusius's pipistrelle *Pipistrellus nathusii*;
 - Common pipistrelle *Pipistrellus pipistrellus*;
 - Soprano pipistrelle *Pipistrellus pygmaeus*; and
 - Brown long-eared *Plecotus auritus*.
143. These species have been recorded at various locations, including Witton Bridge, Ridlington, Edingthorpe, Brick Kiln Farm, Bacton, Blickling, Silvergate Village, Edingthorpe and Edingthorpe Green.

144. In addition, NBSG hold records of a further one species, Daubenton's bat, within 5km of the onshore project area.

145. NBSG also hold records of a further 29 bat roosts located within 5km of the onshore project area. These results are summarised in Table 22.13.

Table 22.13 NBSG bat roost records

Roost location	Roost type	Species present
Blickling Hall Estate, Great & Waterloo Woods (7 roosts)	Maternity	Barbastelle
Blickling	Hibernation	Daubenton's Natterer's Brown long-eared Barbastelle
Hercules Wood	Hibernation	Daubenton's Natterer's Brown long-eared Barbastelle
Bacton Wood	Bat box	Common pipistrelle Soprano pipistrelle Natterer's
Witton Hall	Hibernation	Daubenton's Natterer's Brown long-eared
Witton Church	Maternity	Brown long-eared
Ridlington Church	Maternity	Common pipistrelle
Paston Great Barn	Maternity Day Hibernation	Common pipistrelle (day; hibernation) Soprano pipistrelle (day; hibernation) Natterer's (maternity) Brown long-eared (maternity) Barbastelle (maternity)
Old Hill Woods	Maternity	Barbastelle
Calthorpe Broad	Maternity	Barbastelle
Swan Farm, Meeting House Hill	Bad weather	Barbastelle
White Horse Common	Bad weather	Barbastelle
Edingthorpe Heath	Day	Barbastelle
Edingthorpe Green	Day	Barbastelle
Witton Hall (4 roosts)	Day Bad weather	Barbastelle
Manor Farm, Witton Bridge	Day	Barbastelle

Roost location	Roost type	Species present
The Grange, Pollard Street	Day	Barbastelle
Stow Hill	Bad weather	Barbastelle
Paston Green	Day	Barbastelle
Knapton House	Day	Barbastelle

146. None of these bat roosts are located within the habitat and species study area.
147. Approximately 4km of the onshore cable route is within the known home ranges of the Old Hills Wood and Paston Great Barn barbastelle colonies, as indicated by the data obtained from the NBSG and from their radio-tracking surveys. Table 22.14 contains details of the core foraging areas for the Paston Great Barn and Old Hills, Honing Estate colonies found within the onshore project area.

Table 22.14 Core foraging areas of the Paston Great Barn and Old Hall, Honing Estate barbastelle colonies

Core foraging area*	Barbastelle maternity colony	Activity type
North Walsham and Dilham Canal and land east of the North Walsham and Dilham Canal	Paston Great Barn Old Hills, Honing Estate	Foraging
Hedgerow along North Walsham Road from Edingthorpe Green to Edingthorpe Heath	Paston Great Barn Old Hills, Honing Estate	Commuting / foraging
Witton Hall Plantation along Old Hall Road	Paston Great Barn	Commuting / foraging
Road from Bacton Wood to Witton	Paston Great Barn	Commuting
Two hedgerows between Witton and North Walsham Road	Paston Great Barn	Commuting / foraging

*Locations of core foraging areas are provided in the HRA Report (Document Reference 5.3) submitted alongside this ES as part of the DCO application.

148. In addition to the core foraging area described above, occasional foraging bats have also been recorded along the drains and hedgerows at Ridlington Street.

22.6.5.2.2 *Field survey*

22.6.5.2.3 *Bat roosts*

149. All trees and structures (a total of 358 features) noted during the 2017 Extended Phase 1 Habitat Survey were assessed from the ground using binoculars (following the Bat Conservation Trust's (BCT) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Ed.) (2016)) for their suitability to support roosting bats. Following route refinement since the PEIR, 93 of these are now located within the

habitat and species study area of which 21 are located within the onshore project area (see Figure 22.5).

150. Of the 93 trees and structures located within the habitat and species study area, 65 were assessed as providing low suitability for roosting bats and 28 as providing moderate suitability. Full details of the preliminary daytime roost assessments are provided in Appendix 22.1.
151. The 28 trees identified as providing moderate suitability were subject to bat emergence / re-entry surveys during 2017 to confirm the presence/absence of roosting bats. These surveys were undertaken in accordance with the methodology outlined in the 2016 BCT guidance, i.e. each tree / structure, was subject to two survey visits (i.e. one dusk emergence survey and one dawn re-entry survey) between May and September with one survey visit between May and August. Full details of the 2017 bat emergence / re-entry surveys are provided within Appendix 22.5.
152. The bat emergence / re-entry surveys recorded no roosts present within these 28 trees and structures within the habitats and species study area, and three roosts present within trees and structures located within the habitat and species study area. These roosts include a probable pipistrelle spp. roost (BER20), a soprano pipistrelle roost (BER22) and a brown-long eared roost (BER44).
153. Nine of the trees within the habitat and species study area identified as providing moderate suitability and scoped into the 2017 bat emergence / re-entry surveys were not surveyed due to landowner access constraints.
154. A review of the Living Map dataset has identified eight additional locations as potentially providing roosting habitat for bats, due to the presence of trees or structures, which were unable to be surveyed during the 2017 Extended Phase 1 Habitat Survey, as set out in section 22.5.3. The impacts described in section 22.7 consider the impacts on the bat resource within the three known roosts located within the habitat and species study area plus the potential impacts of the nine unsurveyed trees and the potential bat resource present within the unsurveyed areas.

22.6.5.2.4 *Commuting and foraging bats*

155. In addition to trees and structures, all linear features (e.g. watercourses, hedgerows) were categorised in terms of their suitability to support commuting or foraging bats following the BCT 2016 guidance (BCT, 2016). This categorisation was based on the habitat type and their connection to the surrounding habitat. The categorisation used was:

- Defunct hedgerows and field drains typically provided low suitability for commuting and foraging bats.
 - Intact species rich hedgerows, areas of scrub and small watercourses typically provided moderate suitability for commuting and foraging bats.
 - Species-rich hedgerows with trees and large watercourses well connected to the wider landscape typically provided high suitability for commuting and foraging bats.
156. In total, 266 linear features (which included both watercourses and hedgerows) were assessed for their suitability to support commuting or foraging bats. Of these, 99 were assessed as providing low suitability to support commuting or foraging bats, 78 as providing moderate suitability and 89 as providing high suitability.
157. Following onshore route refinements since the publication of the PEIR, only 110 of the 266 linear features are now located within the habitat and species study area. Of these, 52 are assessed as providing low suitability to support commuting or foraging bats and 58 as providing moderate or high suitability. The locations of these commuting and foraging features are shown on Figure 22.5.
158. Bat activity surveys were proposed in order to understand the level of bat activity along the commuting or foraging features identified as providing moderate or high suitability to supporting commuting or foraging bats. The linear features identified as providing moderate or high suitability to supporting commuting or foraging bats were grouped into a series of habitat networks, following which 24 survey transects were designed to cover as many of the habitat networks as possible. Subsequently, a suite of bat activity surveys (herein 'the 2017 bat activity surveys') were undertaken along the 24 transects within the onshore project area between May and October 2017. The location of these transects and the locations of the commuting and foraging features are shown on Figure 22.8.
159. Data were collected over a six-month period with the aim of providing a detailed understanding of the usage of potential commuting and foraging features within the onshore project area by bats. Where survey access was possible, all transects were walked bi-monthly and all bat echolocations recorded. Static detectors were also set out along each transect for five nights each month, with two or three detectors placed on transects covering linear features identified as providing 'moderate' or 'high' suitability for supporting commuting or foraging bats respectively. Data collected from 24 transects was identified as suitably robust to draw conclusions about the value of the linear features for commuting / foraging bats. Full details of the 2017 bat activity surveys and the process of scoping the surveys are provided within Appendix 22.4.

160. Bats were recorded on all transects surveyed and often in large numbers, with peak counts for bat passes reaching over 1,000 passes on six transects. A total of nine species were recorded during the entire suite of the 2017 bat activity surveys. The nationally rare barbastelle species was recorded at 21 out of 24 transects surveyed. The species recorded are summarised in Table 22.15.

Table 22.15 Species recorded during 2017 bat activity surveys

Species	No. of transects recorded	Transects recorded	UK Status ⁶	Habitat preferences
Barbastelle	21	BACT04, BACT05, BACT08, BACT09, BACT10, BACT13, BACT14, BACT16, BACT17, BACT18, BACT19, BACT20, BACT21, BACT22, BACT26, BACT28, BACT30, BACT31, BACT32, BACT33, BACT34	Rare	Riparian zones and broad-leaved woodland were habitats most strongly selected for foraging. Hedgerows should be protected as commuting corridors (Zeale et al., 2012).
Serotine	19	BACT04, BACT05, BACT08, BACT10, BACT14, BACT16, BACT17, BACT18, BACT19, BACT20, BACT21, BACT22, BACT26, BACT28, BACT29, BACT30, BACT31, BACT32, BACT34	Uncommon, largely restricted to south of U.K.	Less dependent on hedgerows than smaller species (Verboom & Huitema 1997).
Leisler's	7	BACT05, BACT08, BACT09, BACT17, BACT27, BACT29, BACT30,	Uncommon in GB although may be under recorded [Few records in Norfolk]	[Data not available – however likely similar to noctule species.]
Myotis spp. (inc. Daubenton's)	23	BACT04, BACT05, BACT08, BACT09, BACT10, BACT13, BACT14, BACT16, BACT17, BACT18, BACT19, BACT20, BACT21, BACT22, BACT26, BACT27, BACT28, BACT29, BACT30, BACT31, BACT32, BACT33, BACT34	Common	Closely associated with hedgerows for commuting / foraging (Limpens & Kapteyn 1991)
Noctule	23	BACT03, BACT04, BACT05, BACT08, BACT09, BACT10, BACT13, BACT14, BACT16, BACT17, BACT18, BACT19, BACT20, BACT21, BACT22, BACT26, BACT28, BACT29, BACT30, BACT31, BACT32,	Uncommon	Tree roosting species, less dependent on hedgerows than smaller species (Verboom & Huitema 1997).

⁶ Source: Bat Conservation Trust (2014) The state of the UK's bats 2014 National Bat Monitoring Programme Population Trends <http://www.bats.org.uk/pages/nbmp.html>

Species	No. of transects recorded	Transects recorded	UK Status ⁶	Habitat preferences
		BACT33, BACT34		
Nathusius' pipistrelle	22	BACT03, BACT04, BACT05, BACT09, BACT10, BACT14, BACT16, BACT17, BACT18, BACT19, BACT20, BACT21, BACT22, BACT26, BACT27, BACT28, BACT29, BACT30, BACT31, BACT32, BACT33, BACT34	Uncommon but widespread, may be under recorded [Few records in Norfolk]	Less dependent on hedgerows than other species (Kelm et al, 2014)
Common pipistrelle	24	BACT03, BACT04, BACT05, BACT08, BACT09, BACT10, BACT13, BACT14, BACT16, BACT17, BACT18, BACT19, BACT20, BACT21, BACT22, BACT26, BACT27, BACT28, BACT29, BACT30, BACT31, BACT32, BACT33, BACT34	Common	Closely associated with hedgerows for commuting / foraging (Limpens & Kapteyn 1991; Kelm et al, 2014))
Soprano pipistrelle	24	BACT03, BACT04, BACT05, BACT08, BACT09, BACT10, BACT13, BACT14, BACT16, BACT17, BACT18, BACT19, BACT20, BACT21, BACT22, BACT26, BACT27, BACT28, BACT29, BACT30, BACT31, BACT32, BACT33, BACT34	Common	Closely associated with hedgerows for commuting / foraging. (Kelm et al, 2014) Preference for presence of standard trees in linear features (Boughley et al., 2011)
Brown long-eared	19	BACT03, BACT04, BACT05, BACT16, BACT17, BACT18, BACT19, BACT20, BACT21, BACT22, BACT26, BACT27, BACT28, BACT29, BACT30, BACT31, BACT32, BACT33, BACT34	Common	Closely associated with hedgerows for commuting / foraging (Limpens & Kapteyn 1991; Kelm et al, 2014))

161. In order to determine the importance of the linear features which are located within the habitat and species study area, criteria have been defined and agreed with the Norfolk Vanguard ETG in order to differentiate between important linear features which are integral to the functioning of the bat resource within the region. The following criteria have been used to identify an 'important' feature:

- At least one barbastelle passes on more than two separate survey nights (i.e. to ensure that it was not simply one bat flying round and round on one occasion); and
- A relative abundance of >1% of all transects surveyed (the mean peak count per static detector has been used to determine relative abundance).

162. Barbastelle bats are rare across Europe and therefore any linear feature which is reliably used as a commuting or foraging feature is an important linear feature.

Based on the evidence from the dataset collected, a >1% relative abundance threshold is considered a reasonable threshold for ensuring all key habitats for bats are included.

163. Table 22.16 summarises the results of applying these criteria to the datasets to identify important linear features.

Table 22.16 Important bat hedgerow networks (shaded cells indicated that the transect meets the criteria for 'importance')

BACT	Bat passes - peak count per detector per night	No. of nights with 1+ barbastelle pass	Relative abundance	Important bat hedgerow network	Species richness
3	177	0	0.95%		5
4	527	2	2.84%	Yes	8
5	1412	7	7.61%	Yes	9
8	1197	1	6.45%	Yes	7
9	301	3	1.62%	Yes	7
10	845	10	4.55%	Yes	7
13	723	0	3.89%	Yes	5
14	684	11	3.68%	Yes	7
16	999	3	5.38%	Yes	6
17	664	3	3.58%	Yes	9
18	716	4	3.86%	Yes	9
19	594	7	3.20%	Yes	8
20	894	5	4.82%	Yes	8
21	176	2	0.95%		6
22	550	13	2.96%	Yes	7
26	494	1	2.66%	Yes	9
27	1605	0	8.64%	Yes	7
28	283	6	1.52%	Yes	8
29	223	0	1.20%	Yes	9
30	1329	3	7.16%	Yes	9
31	877	6	4.72%	Yes	8
32	697	8	3.75%	Yes	8
33	1057	2	5.69%	Yes	8
34	1542	5	8.31%	Yes	8

164. Twenty-two of the 24 transects surveyed in 2017 were identified as containing important features for commuting and foraging bats. Of the remaining two, BACT21

is located adjacent to North Walsham and Dilham Canal, which is within the known home range of the Paston Great Barn barbastelle maternity colony. The remaining survey transect, BACT03, is notable as it is the only transect which covers species-poor hedgerows (including those with trees).

165. Following route refinement since the publication of the PEIR, BACT13, BACT34 and BACT30 are no longer located within the habitat and species study area and have not been considered further.
166. The results from the 2017 surveys indicate that there is a very good bat resource present throughout the survey area, with species-rich intact hedgerows (with and without trees) providing a very well used network of habitats within the habitat and species study area. As a consequence, it has been assumed that wherever a species-rich hedgerow occurs within the habitat and species study area, it should be assumed to be an important bat commuting / foraging feature and to be part of a wider habitat network. Where species-poor intact hedgerows have been identified, although not 'important', these have been demonstrated within the 2017 activity survey to still support a smaller bat assemblage and therefore also provide commuting and foraging habitat within the wider landscape.
167. A review of the Living Map dataset identified 55 linear features as potentially providing suitable habitat for commuting or foraging bats due to the presence of intact hedgerows, watercourses, scrub, and other linear features. No information is available concerning the suitability of these features to support commuting or foraging bats. The location of these features is shown on Figure 22.5. These features were not surveyed during the 2017 Extended Phase 1 Habitat Survey as landowner access could not be agreed, as set out in section 22.5.3. The impacts described in section 22.7 consider the potential impacts on the bat resource within the 58 moderate or highly suitable linear features (species-rich hedgerows) identified above, and on the potential bat resource present within the unsurveyed areas.
168. All bats are EPS. Barbastelle, brown long-eared bat, noctule and soprano pipistrelle are all Norfolk LBAP priority species.
169. As EPS, all bat species are considered to be of high importance.

22.6.5.3 Water vole

22.6.5.3.1 Desk study

170. NBIS holds six records for water vole within 2km of the onshore project area. These records are located within the North Walsham and Dilham Canal and within the Pigney's Wood LNR (TN347, Figure 22.5).

22.6.5.3.2 *Field survey*

171. During the 2017 Extended Phase 1 Habitat Survey, 38 watercourses were assessed for their suitability to support water voles. Of these, 31 were assessed as being of optimal habitat and the remaining seven were assessed as being sub-optimal. An additional two watercourses were subsequently identified and assessed as optimal water vole habitat following the 2017 Extended Phase 1 Habitat Survey. Therefore, a total of 33 watercourses were scoped in for water vole presence/absence surveys.
172. Those watercourses assessed as sub-optimal were assessed as such primarily due to the watercourse having very little bank for burrowing, noted as being of very poor water quality, very shallow banks, low flows, evidence of regular channel maintenance or isolation from any connecting habitat. Watercourses assessed as sub-optimal were not subject to further surveys.
173. Following route refinement since the publication of the PEIR, 21 of the 33 watercourses are within the habitat and species study area and therefore required a water vole presence/absence survey to be undertaken. The remaining 12 watercourses were scoped out and no further survey was undertaken.
174. A water vole survey was undertaken on 19 of the 21 watercourses. The remaining two watercourses were not surveyed in 2017 due to landowner access not being obtained at the time of the 2017 water vole survey.
175. Water voles were recorded in six of the 19 surveyed watercourses, five of which are located within the onshore project area. Table 22.17 provides details of those watercourses where presence was recorded. The location of these watercourses is shown on Figure 22.7. Full results to date from the water vole survey are presented in Appendix 22.3.
176. A further eight watercourses were identified by the Norfolk Living Map as suitable for water vole. These watercourses were not surveyed for water vole in 2017 as landowner access could not be agreed, as set out in section 22.5.3. The impacts described in section 22.7 consider the potential impacts on the water vole resource found, and on the potential resource present within the unsurveyed areas.

Table 22.17 Water vole survey results

Water-course	Location	Maximum number of latrines within a 100m section	Other field signs ⁷	Highest population density recorded within watercourse
WV05	Within the habitat and species study area	0	Yes	Low

⁷ i.e. burrows, feeding stations, runs, prints

Water-course	Location	Maximum number of latrines within a 100m section	Other field signs ⁷	Highest population density recorded within watercourse
WV13	Within the onshore project area	0	Yes	Low
WV14	Within the onshore project area	0	Yes	Low
WV15	Within the onshore project area	2	Yes	Low
WV32	Within the onshore project area	15	Yes	High
WV22	Within the onshore project area	0	Yes	Low

177. The one watercourse where a high population density of water voles has been recorded is the River Wensum (WV32), as shown on Figure 22.7.
178. Water voles are protected under the Wildlife and Countryside Act 1981 (as amended) and are a Norfolk LBAP priority species.
179. As a nationally important species which is threatened in the region, water voles are considered to be of medium importance.

22.6.5.4 Otter

22.6.5.4.1 Desk study

180. NBIS holds two records for otter within 2km of the onshore project area. These records are shown within the North Walsham and Dilham Canal and within the Pigney's Wood LNR (TN347, Figure 22.5).

22.6.5.4.2 Field survey

181. Of the 21 watercourses within the habitat and species study area assessed for their suitability to support water voles during the 2017 Extended Phase 1 Habitat Survey, seven were also assessed as being suitable for commuting and foraging otter as they were running watercourses of sufficient depth and size, functionally connected to the local river network. These watercourses are:

- WV13 (Wendling Beck);
- WV15 (Penny Spot Beck);
- WV32 (River Wensum);
- WV22 (River Bure);
- WV23 (King's Beck);

- WV24 (drain adjoining King's Beck); and
- WV27 (North Walsham and Dilham Canal).

182. The remaining 14 watercourses were scoped out of further assessment.
183. Suitable otter resting habitat was also observed in the woodland on the left hand bank of the River Bure, within the survey area (TN283), as shown on Figure 22.7. Potential otter resting sites were also noted at TN12 and TN254, although no field signs were observed at these sites.
184. Field signs of otter were searched for during the 2017 water vole survey. Otter spraints were found in two locations, at WV15 (tributary of the River Wensum) and at WV22 (the River Bure), as shown on Figure 22.7.
185. No further watercourses within the unsurveyed areas were identified by the Norfolk Living Map as suitable for otter. As such the survey data collected to date for otters is considered sufficient to characterise the baseline environment.
186. Otter are a EPS and are a Norfolk LBAP priority species.
187. As EPS, otters are considered to be of high importance.

22.6.5.5 Great crested newt

22.6.5.5.1 Desk study

188. NBIS returned no records of great crested newt within 2km of the onshore project area. However, great crested newts are known to be present within 2km of the search area from ecological surveys undertaken for other projects, namely Dudgeon Offshore Wind Farm.

22.6.5.5.2 Field survey

189. During the 2017 Extended Phase 1 Habitat Survey, a total of 208 standing water bodies were assessed using the Habitat Suitability Index (HSI). A further 212 standing water bodies are located within the survey area, but could not be surveyed as landowner access could not be agreed. Of these 208, 25 were no longer present, or are now part of another pond or dry at the time of the survey. In these instances, these water bodies were discounted. The remaining 183 were subject to a HSI assessment following the methodology devised by Oldham *et al.* (2000). The results of which are summarised in Table 22.18. Full details of these water bodies are provided in Appendix 22.1.

Table 22.18 Habitat Suitability Index summary table

HSI score	Habitat suitability	No. of standing water bodies
<0.5	Poor	47
0.5 – 0.59	Below average	59
0.6 – 0.69	Average	36
0.7 – 0.79	Good	25
> 0.8	Excellent	16

190. A total of 43 water bodies were subject to further great crested newt surveys in order to determine the presence/likely absence of great crested newts. These 43 water bodies are drawn from the 82 water bodies identified during the 2017 Extended Phase 1 Habitat Survey and during the 2017 great crested newt surveys as requiring further survey due to being assessed as providing average or higher habitat suitability. The remaining 39 water bodies identified as requiring further survey could not be surveyed in 2017 due to access restrictions.
191. Suitable terrestrial habitat for supporting foraging and hibernating great crested newts was observed throughout the survey area. Part of the habitat suitability assessment includes an assessment of the habitat surrounding a potential breeding pond for its suitability to support foraging and hibernating newts.
192. The 2017 great crested newt surveys recorded great crested newt presence in five of the 43 water bodies surveyed. Great crested newts were not recorded in the remaining 38 water bodies.
193. Following route refinement since the publication of the PEIR, 206 of the 420 water bodies within the survey area are now located within the great crested newt study area. The locations of these water bodies are shown on Figure 22.6. None of the water bodies in which great crested newts were recorded during the 2017 great crested newt surveys are located within the onshore project area. Four of the water bodies in which great crested newts were recorded during the 2017 great crested newt surveys are located within the great crested newt study area, where three are within 250m of the cable route and one within 500m of the onshore project substation.
194. The four water bodies where great crested newts have been found are considered likely to be part of three separate metapopulations.
195. Table 22.19 summarises the findings of 2017 great crested newt survey. Locations of these water bodies are shown in Figure 22.6. Full results of the 2017 great crested newt surveys are presented in Appendix 22.2.

Table 22.19 Water bodies with great crested newt presence within the great crested newt study area

Water body	Peak adult count using any method	Eggs found	Population size class assessment	Metapopulation
TF9010-50	2	No	Small	Metapopulation 1
TF9614-154	1	Yes	Small	Metapopulation 2
TF9614-155	12	No	Medium	Metapopulation 2
TF0721-256	3	No	Small	Metapopulation 3

196. Six water bodies located within the onshore project area and a further 124 water bodies identified within the great crested newt study area have not been surveyed for great crested newts as landowner access could not be agreed, as set out in section 22.5.3. Approximately 40% of the water bodies located within the great crested newt study area have therefore been surveyed to date. The impacts described in section 22.7 consider the potential impacts on the great crested newt resource found, and on the potential resource present within the unsurveyed areas.

197. Great crested newts are an EPS and a Norfolk LBAP priority species.

198. As EPS, great crested newts are considered to be of high importance.

22.6.5.6 Reptiles

22.6.5.6.1 Desk study

199. NBIS returned three records for common lizard and grass snake within 2km of the onshore project area, located near Necton and Blickling.

22.6.5.6.2 Field survey

200. During the 2017 Extended Phase 1 Habitat Survey, 16 areas of suitable habitat mosaics were identified as potentially being suitable to support common species of reptiles within the onshore project area. These are located at TN117, TN140, TN141, TN163, TN173, TN196, TN199, TN204, TN224, TN231, TN277, TN289, TN315, TN358, TN374 and TN399. The locations of these areas are shown on Figure 22.5. These mosaics contain a range of habitats, including wet and tussocky grassland with long sward, watercourses, debris piles and leaf litter, woodland edges and scrub. A further suitable location was identified during the 2017 reptile presence / absence survey at plantation woodland near Salle (NGR: TG120242).

201. Following route refinement since the publication of the PEIR, only 15 of these 17 habitat mosaics are now located within the habitat and species study area.

202. A reptile presence / absence survey was undertaken during 2017 on 13 of the 15 areas. The locations of the reptile presence / absence survey areas are shown in Figure 22.10.
203. Small numbers of common reptiles (1-7no.) were recorded in five of the reptile habitat mosaics. Grass snake and slow worm were the only species recorded at any site, and more than one individual was recorded at only RE01 and RE21. The results of the reptile presence / absence survey are shown in Table 22.20.

Table 22.20 Reptile presence / absence survey results

Water body	Species recorded	Peak count (within habitat mosaic)	Location
RE01	Slow worm	6	Within the habitat and species study area
RE04	Slow worm	1	Within the onshore project area (accesses)
RE12	Grass snake	1	Within the onshore project area
RE13	Grass snake	1	Within the onshore project area
RE21	Slow worm	5 (slow worm)	Within the habitat and species study area
	Grass snake	2 (grass snake)	

204. Further details of the reptile presence / absence survey are presented within Appendix 22.4.
205. A review of the Living Map dataset has identified an additional six areas of suitable habitat which were not accessible during the 2017 Extended Phase 1 Habitat Survey, as having potential to support common reptile species. These were identified due to the presence of a mosaic of woodland, semi-improved grassland, watercourses and heathland habitat. These are shown on Figure 22.5. These areas are in addition to the two locations which were identified during the 2017 Extended Phase 1 Habitat Survey which could not be surveyed for reptile presence / absence (RE05 and RE16). These areas have not been surveyed for reptiles as landowner access could not be agreed, as set out in section 22.5.3. The impacts described in section 22.7 consider the potential impacts on the reptile found, and on the potential resource present within the unsurveyed areas.
206. Reptiles are protected under the Wildlife and Countryside Act 1981 (as amended).
207. As a nationally important species which is rare in the region, reptiles are considered to be of medium importance.

22.6.5.7 White-clawed crayfish

22.6.5.7.1 Desk study

208. NBIS holds no records for white-clawed crayfish within 2km of the onshore project area. Advice received from the Environment Agency indicated that white-clawed crayfish are not known to be present in any reaches located within the habitat and species study area (Environment Agency, 2017). Further data supplied from the Environment Agency showing the results of the most recent white-clawed crayfish surveys indicates that white-clawed crayfish are not present in the Blackwater, a tributary of the Wensum upstream of the habitat and species study area (Environment Agency, 2018).
209. The River Wensum and River Bure are known to support populations of white-clawed crayfish in other reaches (Environment Agency, 2017).
210. White-clawed crayfish are an EPS and are a Norfolk LBAP priority species.
211. As EPS, white-clawed crayfish are considered to be of high importance.

22.6.5.8 Other invertebrates

22.6.5.8.1 Desk study

212. NBIS holds records for 64 notable invertebrates within 2km of the onshore project area, including notable bee, dragonfly, butterfly, moth, cricket and beetle species.
213. Of these 64 species, the following invertebrate species are subject to Norfolk Species Action Plans: silver-studded blue butterfly *Plebejus argus*, little-whirlpool ram's-horn snail *Anisus vorticulus*, depressed river mussel *Pseudanodonta complanata*, shining ram's-horn snail *Segmentina nitida*, narrow-mouth whorl snail *Vertigo angustior*, Desmoulin's whorl snail *Vertigo moulinsiana*, ground beetle *Ophonus laticollis*, brush-thighed seed-eater beetle *Harpalus froelichii*, flixweed flea beetle *Psylliodes sophiae* and the Norfolk hawket dragonfly *Anaciaeschna isosceles*.

22.6.5.8.2 Field survey

Desmoulin's whorl snail

214. Following consultation with Natural England (Royal HaskoningDHV, 2017), targeted surveys for the Desmoulin's whorl snail (a qualifying feature of the River Wensum SAC) of the floodplain habitat adjacent to the River Wensum that are within the habitat and species study area were undertaken to understand any potential effects of the project on this species within both the SAC boundary and its associated ditches (see Figure 22.12).
215. Desmoulin's whorl snail surveys of the southern bank of the River Wensum and the ditches of the floodplain on the southern bank of the River Wensum (the 'survey

area') were carried out in August 2017, following the monitoring protocol developed by Killeen and Moorkens (2003). The locations of these surveys are shown in Figure 22.12.

216. Desmoulin's whorl snail was not recorded during any survey, and is therefore considered to be absent from the survey area. Furthermore, no records of Desmoulin's whorl snail were identified during the desk study, indicating that this species has not been recorded within 2km of the onshore project area previously. The full findings of the Desmoulin's whorl snail survey are shown in Appendix 22.6.
217. The ditch in the floodplain on the northern bank of the River Wensum could not be surveyed in 2017 due to access constraints.
218. As a species which is a qualifying feature of the River Wensum SAC, Desmoulin's whorl snail is considered to be of high importance.

Norfolk hawker dragonfly

219. During the 2017 reptile surveys, the Norfolk hawker dragonfly was recorded at one location (TG 20027 28654) along a drainage ditch adjacent to the River Bure on 5th June 2017. This species has not previously been recorded at this location along the River Bure, with the only records returned by NBIS within 2km of the onshore project area being unconfirmed sightings located at Pigney's Wood.
220. The Norfolk hawker is protected under the Wildlife and Countryside Act 1981 (as amended), is listed as 'Endangered' in the Odonata Red Data List and is a Norfolk LBAP priority species.
221. As a nationally important species which is rare in the region, the Norfolk hawker is considered to be of medium importance.
222. Suitable habitats for other notable invertebrates were not identified within the habitat and species study area.

22.6.5.9 Fish

22.6.5.9.1 Desk study

223. NBIS returned no records of notable fish species within 2km of the onshore project area. The Environment Agency National Fish Population Database returned records of the following Annex II fish species (and qualifying features of the River Wensum SAC) within watercourses within the habitat and species study area:

- Bullhead; and
- Brook lamprey.

224. Records of brown trout, a NERC Act 2006 Section 41 species, were also provided.
225. Table 22.21 summarises the National Fish Population Database for each watercourse within the habitat and species study area.

Table 22.21 National Fish Population Database records for bullhead, brook lamprey and brown trout

Watercourse	Catchment	Species recorded	Record location
Wendling Beck	Wensum	Bullhead Brown Trout	Within the habitat and species study area
Penny Spot Beck	Wensum	Bullhead Brown Trout	Within the habitat and species study area
River Wensum	Wensum	Bullhead Brown Trout Brook lamprey	Upstream and downstream of the habitat and species study area
Reephams Stream (western branch)	Wensum	Bullhead	Upstream of the habitat and species study area
Reephams Stream (eastern branch)	Wensum	Bullhead	Upstream of the habitat and species study area
Booton Watercourse	Wensum	Brown trout	Upstream and downstream of the habitat and species study area
River Bure	Bure	Bullhead Brown Trout Brook lamprey	Upstream and downstream of the habitat and species study area
King's Beck		Brown Trout Brook lamprey	Upstream and downstream of the habitat and species study area

226. Bullhead and brook lamprey, as qualifying features of the River Wensum SAC, are considered to be of high importance.
227. As a nationally important species which is uncommon in the region, brown trout is considered to be of medium importance.

22.6.5.10 Protected flora

22.6.5.10.1 Desk study

228. NBIS returned records of the notable plant species holly-leaved naiad *Najas marina* has been recorded within 2km of the onshore project area.

22.6.5.10.2 Field survey

229. No evidence of this species or any other notable plant species was recorded during the 2017 Extended Phase 1 Habitat Survey.
230. Following consultation with Natural England (Royal HaskoningDHV, 2017), a detailed botanical survey of the floodplain habitat adjacent to the River Wensum within the habitat and species study area has been undertaken in order to confirm whether species which comprise the River Wensum SAC designated habitat '*Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation*' are present. A survey was subsequently undertaken in July 2017, the aim of which was:
- To identify the National Vegetation Classification (NVC) communities within the River Wensum SAC;
 - To note if the following plants are growing within the River Wensum or ditches of the adjacent floodplain habitats:
 - pond water-crowfoot *Ranunculus peltatus*;
 - stream water-crowfoot *Ranunculus penicillatus* ssp. *pseudofluitans*;
 - river water-crowfoot *Ranunculus fluitans*.
 - To identify the NVC communities within the floodplain habitats found adjacent to the River Wensum; and
 - To look for presence of calcareous groundwater springs/seepage within the floodplain habitats.
231. This survey covered the River Wensum within the SAC boundaries and the floodplain habitat on the right-hand (southern) bank of the River Wensum (herein referred to as the 'survey area'). The location of these surveys is shown in Figure 22.11. No surveys were conducted on the floodplain on the left-hand (northern) bank of the River Wensum. The scope for this survey was agreed with the Norfolk Vanguard ETG in March 2017 (Royal HaskoningDHV, 2017b).
232. Two main NVC communities (following Rodwell, 2006) were identified within the stretch of the River Wensum surveyed in July 2017:
- A8a-*Nuphar lutea* community, species-poor sub community; and
 - S5-*Glycerietum maximae* swamp, *Alisma plantago-aquatica*-*Sparganium erectum* sub community.

233. The semi-improved grassland adjacent to the River Wensum consisted of two main NVC communities (following Rodwell, 2006), which were often transitional to each other:
- MG6 – *Lolium perenne*-*Cynosurus cristatus* grassland; and
 - MG10 – *Holco-Juncetum effusi* rush pasture.
234. Five separate communities (following Doarks and Leach, 1990) were identified within the drain ditches of the River Wensum floodplain within the survey area:
- Aquatic End Group A5b – *Lemna minor*-*Lemna trisulca*-filamentous algae;
 - Aquatic End Group A6 - *Callitriche stagnalis*/*platycarpa*;
 - Aquatic End Group A7b - *Potamogeton pectinatus*-*Myriophyllum spicatum*;
 - Emergent End Group E1 – *Carex riparia/acutiformis*-*Phragmites australis*;
 - Emergent End Group E2 – *Glyceria Maxima*-*Berula erecta*; and
 - Emergent End Group E3 - *Juncus effusus*.
235. None of the following species, associated with the River Wensum SAC habitat were recorded during the 2017 botanical survey within the River Wensum or its floodplain: *R. peltatus*, *R. penicillatus ssp. pseudofluitans* or *R. fluitans*.
236. There was no evidence of calcareous groundwater spring or seepage activity with the survey area.
237. The full findings of the 2017 botanical survey are shown in Appendix 22.7.
238. As species which support the Annex 1 habitat *Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion* vegetation these are considered to be of high importance.

22.6.5.11 Invasive non-native species

22.6.5.11.1 Desk study

239. NBIS returned records of a number of different invasive non-native species within 2km of the onshore project area:
- Japanese knotweed *Fallopia japonica* has been recorded at three locations, including Drabblegate, Aylsham and Burnt Fen Cottages;
 - American mink *Neovison vison* have been recorded at five locations along the River Wensum; and
 - Signal crayfish *Pacifastacus leniusculus* have been recorded at two locations at Park Farm on the River Wensum and on Booton Watercourse.
240. The Environment Agency provided records from 1989-present indicating that signal crayfish are present in the following watercourses within the habitat and species study area:

- Blackwater drain;
- Reepham Stream;
- River Wensum; and
- Wendling Beck.

241. Records have been found within the onshore cable route at the Blackwater Drain at Salle (NGR: TG 12530 24550).

22.6.5.11.2 *Field survey*

242. During the 2017 Extended Phase 1 Habitat Survey, non-native invasive species were recorded at two locations:

- One established patch of Japanese knotweed, approximately 30m² in area, was identified within the survey area at TN291; and
- One patch of giant hogweed at TN29 (see Figure 22.5).

243. These locations are shown on Figure 22.5.

244. Signal crayfish were also recorded in the River Wensum during the 2017 botanical survey within the habitat and species study area.

245. The 2017 Extended Phase 1 Habitat Survey was conducted outside the optimum season for identifying other invasive flora species; therefore, it may have been present and not noted during the field survey.

246. Invasive species are listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).

247. As the risk posed by these species is of national importance, these species are considered to be of medium importance.

22.6.6 **Biodiversity**

248. As outlined within the new Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, an EclA must now consider the potential impact not upon 'flora and fauna' but instead upon 'biodiversity, with particular attention to species and habitats protected under the Habitats Directive and Birds Directive'. This EclA has considered potential impacts upon biodiversity through considering the potential impacts on those sites, habitats and species protected through EU and UK law or through local policy, as representing the elements of UK biodiversity most at risk of loss, isolation or degradation.

22.6.7 **Anticipated Trends in Baseline Conditions**

249. The ecological baseline described in the preceding sections provides a summary of the habitats and species present within the study areas. In broad terms, the study

areas represent typical lowland UK habitat types comprising largely arable farmland with hedgerows, with pockets of woodland, wetland and standing and flowing water located through the study areas. The key habitats within this mosaic for notable species and habitats are typically designated sites and parcels of woodland and wetland, with species in other areas relying strongly on ecological corridors such as watercourses and hedgerows between arable farmland.

250. The overall trend in the UK is for a decline in priority species since the 1970s, although the gradient of this decline has lessened since 2000 (Defra, 2017). This overall trend is driven by certain species groups, with moths in particular declining by approximately 80% over this period (Defra, 2017). Habitat connectivity has remained static since 1990, and indicators of ecosystems services provision (pollinators) have also remained static over the short term. Perhaps most relevant to the study area, species associated with farmland have declined over the short and long term, with farmland birds and butterflies both declining, whilst mammal (bats) numbers increased from 1999-2015, but the increase has levelled out from the period 2010-2015 (Defra, 2017).
251. Attempts to manage trends in biodiversity are delivered through EU, UK and local legislation and policies. The UK has transposed protection for European protected species and habitats into UK law, and also provides domestic legislation for species and sites not covered by European protection. These species will continue to be protected under the forthcoming EU Withdrawal Bill. The UK's approach to managing Biodiversity Loss is set by *Biodiversity 2020: a strategy for England's wildlife and ecosystem services* (Defra, 2011). The policies set out under this strategy seek to reverse these declining trends. Data is still being gathered to determine success of these measures, however for the time being it appears that declining trends in biodiversity for the habitats and species present within the study area may continue. As a consequence, it is assumed that the ecological baseline within the study area will continue to change over time as measures to try and manage the decline in protected species and habitats continue.

22.7 Potential Impacts

252. The following sections describe the impacts upon those ecological receptors described in section 22.6 predicted to arise as a result of the construction, operation and decommissioning phases of the project, following the methodology set out in section 22.4.1. Information on the embedded mitigation which has already been included in the project, and on the project 'worst case scenario' against which the assessment is undertaken, is also included.

22.7.1 Embedded Mitigation

253. Norfolk Vanguard Limited has made a decision on a number of techniques and engineering designs/modifications inherent as part of the project, during the pre-application phase, in order to avoid a number of impacts or reduce impacts as far as possible. Embedding mitigation into the project design is a type of primary mitigation and is an inherent aspect of the EIA process.
254. A range of different information sources has been considered as part of embedding mitigation into the design of the project (for further details see Chapter 5 Project Description, Chapter 4 Site Selection and Assessment of Alternatives and the Consultation Report (document reference 5.1)) including engineering requirements, feedback from community and landowners, ongoing discussions with stakeholders and regulators, commercial considerations and environmental best practice.
255. The following sections outline the key embedded mitigation measures relevant for this assessment. These measures are presented in Table 22.22. Where embedded mitigation measures have been developed into the design of the project with specific regard to onshore ecology, these are described in Table 22.23.

Table 22.22 Embedded mitigation

Parameter	Mitigation measures embedded into the project design	Notes
Strategic approach to delivering Norfolk Vanguard and Norfolk Boreas	<p>Subject to both Norfolk Vanguard and Norfolk Boreas receiving development consent and progressing to construction, onshore ducts will be installed for both projects at the same time, as part of the Norfolk Vanguard construction works. This would allow the main civil works for the cable route to be completed in one construction period and in advance of cable delivery, preventing the requirement to reopen the land in order to minimise disruption. Onshore cables would then be pulled through the pre-installed ducts in a phased approach at later stages.</p> <p>In accordance with the Horlock Rules, the co-location of Norfolk Vanguard and Norfolk Boreas onshore project substations will keep these developments contained within a localised area and, in so doing, will contain the extent of potential impacts.</p>	The strategic approach to delivering Norfolk Vanguard and Norfolk Boreas has been a consideration from the outset.
Commitment to HVDC technology	<p>Commitment to HVDC technology minimises environmental impacts through the following design considerations;</p> <ul style="list-style-type: none"> HVDC requires fewer cables than the HVAC solution. During the duct installation phase this reduces the cable route working width (for Norfolk Vanguard and Norfolk Boreas combined) to 45m from the previously identified worst case of 100m. As a result, the overall footprint of the onshore cable route required for the 	Norfolk Vanguard Limited has reviewed consultation received and in light of the feedback, has made a number of decisions in relation to the project design. One of these decisions is to deploy

Parameter	Mitigation measures embedded into the project design	Notes
	<p>duct installation phase is reduced from approx. 600ha to 270ha;</p> <ul style="list-style-type: none"> • The width of permanent cable easement is also reduced from 54m to 20m; • Removes the requirement for a CRS; • Reduces the maximum duration of the cable pull phase from three years down to two years; • Reduces the total number of jointing bays for Norfolk Vanguard from 450 to 150; and • Reduces the number of drills needed at trenchless crossings (including landfall). 	HVDC technology as the export system.
Site Selection	<p>The project has undergone an extensive site selection process which has involved incorporating environmental considerations in collaboration with the engineering design requirements. Considerations include (but are not limited to) adhering to the Horlock Rules for onshore project substations and National Grid infrastructure, a preference for the shortest route length (where practical) and developing construction methodologies to minimise potential impacts.</p> <p>Key design principles from the outset were followed (wherever practical) and further refined during the EIA process, including;</p> <ul style="list-style-type: none"> • Avoiding proximity to residential dwellings; • Avoiding proximity to historic buildings; • Avoiding designated sites; • Minimising impacts to local residents in relation to access to services and road usage, including footpath closures; • Utilising open agricultural land, therefore reducing road carriageway works; • Minimising requirement for complex crossing arrangements, e.g. road, river and rail crossings; • Avoiding areas of important habitat, trees, ponds and agricultural ditches; • Installing cables in flat terrain maintaining a straight route where possible for ease of pulling cables through ducts; • Avoiding other services (e.g. gas pipelines) but aiming to cross at close to right angles where crossings are required; • Minimising the number of hedgerow crossings, utilising existing gaps in field boundaries; • Avoiding rendering parcels of agricultural land inaccessible; and • Utilising and upgrading existing accesses where possible to avoid impacting undisturbed ground. 	<p>Constraints mapping and sensitive site selection to avoid a number of impacts, or to reduce impacts as far as possible, is a type of primary mitigation and is an inherent aspect of the EIA process. Norfolk Vanguard Limited has reviewed consultation received to inform the site selection process (including local communities, landowners and regulators) and in response to feedback, has made a number of decisions in relation to the siting of project infrastructure. The site selection process is set out in Chapter 4 Site Selection and Assessment of Alternatives.</p>
Duct Installation Strategy	<p>The onshore cable duct installation strategy is proposed to be conducted in a sectionalised approach in order to minimise impacts. Construction teams would work on a short length (approximately 150m section) and once the cable ducts have been installed, the section would be back</p>	<p>This has been a project commitment from the outset in response to lessons learnt on other similar NSIPs. Chapter 5</p>

Parameter	Mitigation measures embedded into the project design	Notes
	filled and the top soil replaced before moving onto the next section. This would minimise the amount of land being worked on at any one time and would also minimise the duration of works on any given section of the route.	Project Description provides a detailed description of the process.
Long HDD at landfall	Use of long HDD at landfall to avoid restrictions or closures to Happisburgh beach and retain open access to the beach during construction. Norfolk Vanguard Limited have also agreed to not use the beach car park at Happisburgh South.	Norfolk Vanguard Limited has reviewed consultation received and in response to feedback, has made a number of decisions in relation to the project design. One of those decisions is to use long HDD at landfall.
Trenchless Crossings	<p>Commitment to trenchless crossing techniques to minimise impacts to the following specific features;</p> <ul style="list-style-type: none"> • Wendling Carr County Wildlife Site; • Little Wood County Wildlife Site; • Land South of Dillington Carr County Wildlife Site; • Kerdiston proposed County Wildlife Site; • Marriott's Way County Wildlife Site / Public Right of Way (PRoW); • Paston Way and Knapton Cutting County Wildlife Site; • Norfolk Coast Path; • Witton Hall Plantation along Old Hall Road; • King's Beck; • River Wensum; • River Bure; • Wendling Beck; • Wendling Carr; • North Walsham and Dilham Canal; • Network Rail line at North Walsham that runs from Norwich to Cromer; • Mid-Norfolk Railway line at Dereham that runs from Wymondham to North Elmham; and • Trunk Roads including A47, A140, A149. 	A commitment to a number of trenchless crossings at certain sensitive locations was identified at the outset. However, Norfolk Vanguard Limited has committed to certain additional trenchless crossings as a direct response to stakeholder requests.

Table 22.23 Embedded mitigation for onshore ecology

Parameter	Embedded mitigation for onshore ecology	Notes
Designated sites	<p>Constraints mapping was undertaken prior to the publication of the Norfolk Vanguard EIA Scoping Report (Royal HaskoningDHV, 2016). This constraints mapping exercise was used to determine the route options for the onshore project area for the project. The following ecological receptors were considered as part of the constraints mapping process:</p> <ul style="list-style-type: none"> • International designated sites for nature conservation (SAC, SPA, Ramsar sites); • National designated site for nature conservation (The 	More information can be found in Chapter 4 Site Selection and Assessment of Alternatives.

Parameter	Embedded mitigation for onshore ecology	Notes
	<p>Broads National Park, SSSI, NNR, LNR); and</p> <ul style="list-style-type: none"> • Ancient woodland. <p>These ecological receptors have been avoided during the onshore project area route selection process.</p>	
Route Refinement	<p>Route refinements have included consideration of more detailed ecological constraints, and the following principles have been applied when refining the onshore project area:</p> <ul style="list-style-type: none"> • Ancient woodland – following the Forestry Commission’s Standing Advice on Ancient Woodland and Veteran Trees, a buffer of 15m around all ancient woodlands has been used (Forestry Commission, 2014); • Woodland – areas of woodland have been avoided where possible during the route selection process; • Habitat – standing water bodies, trees, and agricultural ditches have been avoided where possible; and • Hedgerows – the number of hedgerow crossings has been minimised as far as possible, taking other fixed constraints into account. 	Further information on the route refinement process can be found in Chapter 4 Site Selection and Assessment of Alternatives.
Hedgerow and watercourse crossings	<p>The working width at hedgerow and watercourse crossings is 20m⁸ (reduced from 54m at PEIR) due to the selection of a HVDC electrical solution.</p> <p>Where hedgerow gaps are required beyond the two-year duct installation phase (i.e. for the duration of the subsequent two-year cable pull phase), the number of gaps required will be minimised as far as possible and will be no wider than 6m.</p>	Further information can be found in Chapter 5 Project Description.
Country Wildlife Sites	<p>In response to comments from stakeholders raised in response to the PEIR as part of the EPP, Norfolk Vanguard Limited is now proposing to use trenchless crossing techniques (e.g. HDD) at all CWS and proposed CWS crossed by the onshore project area in order to minimise the impacts upon the habitats contained within these sites.</p> <p>This includes proposed trenchless crossing techniques (e.g. HDD) at the following locations:</p> <ul style="list-style-type: none"> • Wendling Carr CWS (CWS no. 1013); • Little Wood CWS (CWS no. 2024), • Land South of Dillington Carr CWS (CWS no. 1025), • Kerdiston proposed CWS (no CWS number); • Marriott's Way CWS (CWS no. 2176) (in two locations); and 	<p>Further information on trenchless crossing techniques can be found in Chapter 5 Project Description.</p> <p>At one location, Wendling Carr CWS, only a running track will be required to pass through the CWS. This will be a 6m by up to 180m</p>

⁸ This width assumes that the onshore cable route bisects each hedgerow in a perpendicular fashion. In reality, some hedgerows will be crossed at an angle, therefore increasing the maximum width of the gap required up to a possible 25m. Where this is the case for a particular receptor, it is noted within this report.

Parameter	Embedded mitigation for onshore ecology	Notes
	<ul style="list-style-type: none"> Paston Way and Knapton Cutting CWS (CWS no. 1175). <p>At five of these six locations, no works will be undertaken within the CWS boundary.</p>	road located within the CWS. This is shown on Figure 22.3.
Construction Programme	<p>The construction programme for the onshore cables has been designed to minimise the duration and extent of impacts to ecological receptors at any given location along the onshore cable route.</p> <p>Specifically:</p> <ul style="list-style-type: none"> During the two-year duct installation phase, each duct installation team will work along a section of the cable route, tackling a short section (approximately 150m) at a time. Where possible, each 150m workfront (approximately 0.7ha in area) will be reinstated following duct installation, before works commence on the next section. The works at each section, including reinstatement, will take approximately one week (up to two in a worst case scenario). Within each section, a 6m wide strip will be retained for the running track, for up to the remainder of the two-year duct installation phase (i.e. as a worst case a 60km by 6m strip along the onshore cable route will be lost for the duration of the cable duct installation); During the cable pulling phase, a reduced 12km by 6m strip along the onshore cable route is anticipated to be lost for up to approximately 16 weeks during the cable pull for the running track, thus minimising the number of hedgerow gaps required for the duration of construction down to approximately 20%; and The majority of disturbance to watercourses will only occur during the two-year duct installation phase. Once the ducts are in the ground, subsequent cable pulling operations will not result in further disturbance to watercourses. There may be disturbance to a small number of watercourses which need to be crossed when the running track is reinstated to facilitate the cable pulling operations. 	For further details on the construction approach and programme, please see Chapter 5 Project Description.
Strategic landscape mitigation	<p>Mitigation measures associated with the onshore project substation, National Grid substation extension and access from the A47 form part of a strategic approach to enhancing landscape character and biodiversity in the local area. Figure 29.12 in Chapter 29 Landscape and Visual Impact Assessment shows how mitigation planting will contribute to the wider landscape structure of the area and help consolidate green corridors for wildlife.</p>	For further details on project landscaping, please see Chapter 29 Landscape and Visual Impact Assessment.

22.7.2 Outline Landscape and Environmental Management Strategy

256. The mitigation measures set out within this EclA will be delivered via an Outline Landscape and Environmental Management Strategy (OLEMS) (document reference 8.7) and secured through DCO Requirement 24. This document, submitted alongside the final ES, will be the primary document detailing the ecological mitigation measures required in order to ensure that all potential impacts identified within this EclA are reduced to a non-significant level. The document will encapsulate those mitigation measures proposed for individual ecological receptors within this EclA and will set out how they will fit into the wider approach to managing landscape impacts during construction and operation of the project.
257. The OLEMS (document reference 8.7) will aim to ensure that all mitigation proposed within this EclA is part of an integrated management strategy which will ensure that adverse impacts upon biodiversity and ecological networks are not treated in isolation.
258. The OLEMS (document reference 8.7) has been developed as follows:
- Initial outline mitigation measures were identified and outlined at the PEIR stage. These mitigation measures were indicative only, as they were based on partial ecological field data, as the 2017 data collection programme was ongoing at the time of the PEIR;
 - Further survey data from the 2017 survey effort became available from December 2017. These findings provided details about the nature of ecological constraints within the survey area (where survey access had been granted);
 - All of the collected survey data from the 2017 survey effort was consulted upon with the project ETG as part of the EPP in spring 2018;
 - Following consultation, detailed mitigation measures have now been identified and are included within this EclA, and included within the OLEMS (document reference 8.7).
259. As outlined in section 22.5.3, survey access for the full survey area was not possible in 2017. As a consequence, the detailed mitigation measures set out within the OLEMS (document reference 8.7) for these inaccessible areas have applied a precautionary, non-specific approach along with a requirement that further post-consent surveys for these unsurveyed areas will be undertaken. The OLEMS (document reference 8.7) therefore provides a route map of how potential ecological impacts in those inaccessible areas will be managed.
260. Chapter 29 Landscape and Visual Impact Assessment includes details of mitigation planting schemes for the proposed permanent works at the onshore substation. These have been developed in consultation with Norfolk County Council. These requirements are included within the OLEMS (document reference 8.7).

22.7.3 Monitoring

261. The development of the detailed design and OLEMS (document reference 8.7) will refine the worst-case impacts assessed in this EIA. It is recognised that monitoring is an important element in the management and verification of the actual project impacts. The requirement for an appropriate design and scope of monitoring will be agreed with the appropriate stakeholders and included within the OLEMS (document reference 8.7) and the Construction Method Statement (CMS) commitments prior to construction works commencing. An outline CoCP (OCoCP) (document reference 8.1) is provided with the DCO application.

22.7.4 Worst Case

262. The EclA uses the Rochdale Envelope principle and assesses impacts against a defined project worst case scenario (or scenarios).
263. Chapter 5 Project Description sets out the details of the project. This section sets out the worst case scenario with respect to onshore ecology. The 'worst case scenario' includes the parameters of the different potential construction options for the project which would result in the greatest potential impact upon the ecological receptors described in section 22.6.
264. Table 22.24 sets out those parameters which comprise the worst case scenario for onshore ecology.

Table 22.24 Worst case assumptions

Worst case assumptions			
Parameter	Worst case criteria	Worst case definition	Notes
Landfall			
Construction	Construction method	Trenchless technique (e.g. HDD)	Worst case construction noise levels are as set out within Chapter 25 Noise and Vibration.
	Maximum drill length	1,000m	
	Temporary works footprint	6,000m ²	
	Maximum temporary works duration	20 weeks	
HDD compounds	Maximum number and maximum land take for temporary HDD compounds	Assumes 2 at 3,000m ² each to support parallel drill rigs	

Worst case assumptions			
Parameter	Worst case criteria	Worst case definition	Notes
Onshore cable route			
Construction	Construction method	Open cut trenching	Mitigation by design with respect to hedgerows already included in Chapter 5 Project Description.
	Maximum working width and length	45m and 60km	The gap at hedgerows is indicative, depending on the angle of crossing.
	Cable installation maximum footprint	447,688m ²	This width assumes that the onshore cable route bisects each hedgerow in a perpendicular fashion. In reality, some hedgerows will be crossed at an angle, therefore increasing the maximum width of the gap required up to a possible 25m. Where this is the case for a particular receptor, it is noted within this report.
	Onshore cable route maximum footprint	2,700,000m ²	
	Total maximum duct installation footprint	3,052,500m ²	Cable installation footprints include the running track and joint bay (Norfolk Vanguard only).
	Gaps at hedgerow / other crossing points	20m	This width assumes that the onshore cable route bisects each hedgerow in a perpendicular fashion. In reality, some hedgerows will be crossed at an angle, therefore increasing the maximum width of the gap required up to a possible 25m.
	Maximum hedgerows to be removed	165 ⁹	
	Running track excavated material	108,000m ³	Onshore cable route footprint covers all works required for duct installation (trenching, spoil storage, etc.).
	Trench excavated material	360,000m ³	Total maximum duct installation footprint covers the onshore cable route footprint plus all associated works footprints (mobilisation areas, trenchless launch and reception sites).

⁹ Estimated based on 110 hedgerows surveyed within the onshore project area plus a further 55 identified from the Norfolk Living Map and aerial photography taken in 2017. The final number of hedgerows to be removed will be determined during surveys of the unsurveyed areas post-consent when access becomes available.

Worst case assumptions			
Parameter	Worst case criteria	Worst case definition	Notes
Permanent joint pits	Maximum number and required dimensions	Assume 150 at 90m ² and 2m deep each	Norfolk Vanguard only, spaced approximately one per circuit per 800m cable.
Mobilisation areas	Maximum number and required dimensions	Assumes 14 at 10,000m ²	
Trenchless launch and reception sites	Maximum number and maximum land take for trenchless launch and reception sites	Assumes 17 pairs at 7,500m ² and 5,000m ² respectively	
Construction programme - ducting	Ducting at any 150m workfront	2 weeks	Where considered necessary, hedgerows will be reinstated immediately after each duct installation, with a small number left open to facilitate access for cable pulling. As the locations of these openings are not available at this time, the WCS assumes at this stage that no hedgerows will be reinstated during the construction phase, i.e. between trenching and cable pulling. Mitigation by design with respect to hedgerows is included in Chapter 5 Project Description.
	Trenchless works at each watercourse	8 weeks	
	Running track topsoil storage area	2 years	
	Total construction window	2 years	
Construction programme - cable pull, joint and commission	Hardstand area	10 weeks	
	Running track topsoil storage area	16 weeks	
	Total construction window	2 years	
Construction programme	Total construction window	6 years	Includes 2 years pre-construction works.
Decommissioning		Joint pits and ducts left in situ	Where cables are in pre-installed ducts, cables may be extracted once de-energised.
Onshore project substation			
Construction	Maximum land take for temporary works area	20,000m ² (200m x 100m)	Norfolk Vanguard only. Worst case construction and operation noise levels are as set out within Chapter 25 Noise and Vibration. Indicative construction timing 24
	Maximum duration	30 months	

Worst case assumptions			
Parameter	Worst case criteria	Worst case definition	Notes
			months
Operation	Maximum land take for permanent footprint Access	75,000m ² One visit per week, site lighting required during maintenance visits	
Decommissioning	No decision has been made regarding the final decommissioning policy for the onshore project substation, as it is recognised that industry best practice, rules and legislation change over time. However, the onshore project equipment will likely be removed and reused or recycled. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, for the purposes of a worst case scenario, impacts as for the construction phase are assumed.		
National Grid extension and overhead line modification			
Construction	Maximum land take for temporary works area – substation extension Maximum land take for temporary works area – overhead line Maximum duration	67,500m ² 174,264m ² 30 months	Indicative construction timing 24 months
Operation	Maximum land take for substation extension permanent footprint Maximum land take for overhead line permanent footprint Access	49,300m ² 9,250m ² One visit per month, site lighting required during maintenance visits	Includes existing Necton National Grid substation area

22.7.5 Assessment Scenarios

265. Chapter 5 Project Description outlines the scenarios to be assessed in relation to the phasing of the works. The phasing of the construction works is as follows:

- The offshore project may be constructed as one or two phases and elements of the onshore construction would also be phased to reflect this;
- Pre-construction works (e.g. hedgerow clearance) for the onshore cable route to be conducted over a two year period, prior to duct installation.
- Cable ducts would be installed in one operation over two years, regardless of the offshore strategy;
- Cable pull through would be done in either one or two phases;
- The onshore project substation ground preparation and enabling works would be done in one phase, anticipated to take two years for pre-construction works and two years for primary works;
- The required electrical infrastructure and plant within the onshore project substation would then be installed as required for each phase if the one or two phase options were adopted for offshore construction; and
- Total construction window for the one phase scenario is anticipated to be five years, and six years for the two phase scenario.

266. In all cases for onshore ecology, the two phase option is assumed to be the worst case, due to the increased length of time that receptors will be potentially impacted by the project.

22.7.6 Potential Impacts during Construction

22.7.6.1 Impact 1: Impacts to statutory designated sites

22.7.6.1.1 Landfall

267. There are no terrestrial ecology statutory designated sites within 2km of the landfall location. As such there will be no change upon statutory designated sites due to the proposed project landfall works.

22.7.6.1.2 Onshore cable route

268. There are 37 terrestrial statutory designated sites within 2km of the onshore cable route (of which 20 are ancient woodlands). Following embedded mitigation to avoid statutory designated sites at the route selection stage, only two designated sites, namely the River Wensum SAC and SSSI and Old Carr ancient woodland, are located within the onshore cable route. The remaining 35 sites have been avoided entirely and therefore no direct impacts on these sites will occur.

269. The following sites are located within 500m of the onshore cable route, and have therefore been considered further due to the potential for indirect effects upon these sites to occur:

- River Wensum SSSI and SAC;
- Dillington Carr, Gressenhall SSSI;
- Pigney's Wood LNR;

- The following ancient woodlands:
 - Old Lane Carr;
 - Bacton Wood;
 - The Leaslands;
 - Sparham Grove;
 - North Grove; and
 - Great Wood.

270. Following consultation with Natural England as part of the EPP the following European designated sites have also been considered further for indirect impacts:

- Paston Great Barn SAC; and
- Norfolk Valley Fens SAC (Booton Common component SSSI).

River Wensum SAC and SSSI

271. A full HRA Report has been prepared providing information on the potential for likely significant effects on European and Ramsar sites as a result of the project. The information provided here summarises the information presented in the HRA Report with respect to the River Wensum SAC. Please refer to the HRA Report (Document Reference 5.3) submitted as part of the DCO application for full details of the potential effects upon the River Wensum SAC.

272. As part of the embedded mitigation, the River Wensum will be crossed using trenchless crossing techniques (e.g. HDD), in order to minimise direct impacts upon this site and the habitats/species for which it is designated.

273. The trenchless crossing receptor zone for the River Wensum trenchless crossing is located within the floodplain habitat on the south bank of the River Wensum. This habitat was surveyed during the 2017 botanical survey and 2017 invertebrate survey for presence of qualifying features of the River Wensum SAC (*Ranunculus fluitantis* and *Callitriche-Batrachium* vegetation and Desmoulin's whorl snail). These species were not found during the surveys and are considered to be absent from the floodplain habitat on the south bank of the River Wensum. Access to the single drain in the floodplain habitat of the River Wensum on the northern bank of the river was not possible during the 2017 surveys due to survey access constraints (survey permission not granted). Due to route refinement and site selection, this drain is now located outside of the proposed trenchless crossing zones, as shown on Figure 22.11. Therefore, potential direct effects upon this habitat have been avoided at this location.

274. There is a risk of indirect impacts upon the qualifying features of the River Wensum SAC and notified features of the River Wensum SSSI due to works on the land which

is functionally connected to the River Wensum at Elsing. The following potential indirect effects have been identified:

- Potential indirect effects on local hydrological conditions within the River Wensum channel due to the introduction of impermeable features (buried cables);
- Potential indirect effects on water quality arising from accidental release of lubricants, fuels, oils and drilling fluid from construction machinery working in and adjacent to surface watercourses; and
- Potential increase in the supply of fine sediment to surface watercourses through surface runoff and the erosion of exposed soils.

275. The HRA Report quantified the magnitude of effect on the local hydrological conditions as negligible, although it identified the potential effect arising from release of lubricants, fuels, oils and drilling fluid and release of fine sediment as of low magnitude without mitigation.
276. In addition to the SAC features identified above, barn owls *Tyto alba* are a notified feature of the River Wensum SSSI and have been recorded holding territories within the habitat and species study area during the 2017 breeding bird survey. The territory is located outside of the onshore project area (see Appendix 23.4), and as no record of a breeding site was recorded the potential effects on this species are predicted to be negligible.
277. The potential indirect effects upon the River Wensum SAC and SSSI arising from changes in water regime, risk of pollutant release, dust emissions, and temporary construction lighting during construction are discussed in detail in Chapter 20 Water Resources and Flood Risk, Chapter 26 Air Quality and Chapter 29 Landscape and Visual Impact Assessment. No significant impacts arising from changes in water regime, pollutant release, changes in dust levels and construction lighting have been identified within these chapters.

Paston Great Barn SAC and SSSI

278. As outlined above, a full HRA Report has been prepared providing information on the potential for likely significant effects on European and Ramsar sites as a result of the project. The information provided here summarises the information presented in the HRA Report with respect to the Paston Great Barn SAC. Please refer to the HRA Report (Document Reference 5.3) full details of the potential effects upon the Paston Great Barn SAC.
279. Paston Great Barn SAC and SSSI is located approximately 3km north of the onshore cable route and is designated for its barbastelle bat population. The HRA Report identifies a 5km study area around Paston Great Barn as an appropriate study area for potential impacts upon this site.

280. The project involves hedgerow removal at four of the five important barbastelle features identified within the HRA Report. The fifth, Witton Hall Plantation along Old Hall Road, i.e. the deciduous woodland habitat, will be subject to trenchless crossing techniques (i.e. HDD) in order to minimise impacts upon woodland habitats and the sensitive ecological features they support. This is predicted to result in the following impacts on the barbastelle colony of Paston Great Barn:
- Direct loss of 130m of hedgerow foraging / commuting habitat across six hedgerows (0.16% of the available habitat within the Paston Great Barn colony's home range);
 - Fragmentation of approximately 11ha of broadleaved woodland, rank grassland, hedgerows and drainage ditches around Witton used by barbastelles of the Paston Great Barn colony (approximately 0.6% of the Paston Great Barn maternity colony home range); and
 - Indirect effects upon commuting bats arising from construction lighting.
281. Hedgerows will be replanted following works at each location (replanting is described in more detail below). Hedgerows are anticipated to take between 3-7 years to mature, therefore the habitat loss will be temporary and will take place over the medium term (i.e. during the lifespan of one barbastelle). A maximum hedgerow gap of 6m will be retained, if required, for two years to allow for the running track required for cable installation. All UK bat species are considered able to traverse gaps of 10m or less (JNCC, 2001; BCT, 2012). The duration and scale of this effect is anticipated to give rise to an effect of low magnitude.

Norfolk Valley Fens SAC

282. As outlined above, a full HRA Report has been prepared providing information on the potential for likely significant effects on European and Ramsar sites as a result of the project. The information provided here summarises the information presented in the HRA Report with respect to the Norfolk Valley Fens SAC. Please refer to the HRA Report full details of the potential effects upon the Norfolk Valley Fens SAC.
283. Booton Common SSSI, a component SSSI of the Norfolk Valley Fens SAC, is located within 1km of the onshore project area. Although outside of the designated sites study area used within this EclA, following consultation as part of the EPP, Natural England requested that potential impacts upon all component SSSIs of the Norfolk Valley Fens SAC be considered within this assessment. This includes the following component SSSIs:
- Badley Moor;
 - Buxton Heath;
 - Potter & Scarning Fens, East Dereham; and
 - Southrepps Common.

284. The HRA Report considered potential indirect effects upon these four component SSSIs arising from changes to local hydrology of the watercourses which supports these component SSSIs. All these component SSSIs are located upstream of the onshore project, and at least 2.8km from the onshore project area. As such, no change is anticipated upon these component SSSIs of the Norfolk Valley Fens SAC.
285. The HRA Report considered potential indirect effects upon Booton Common arising from changes to local air quality from construction traffic and changes to local hydrology of the tributaries of the Blackwater Drain, which supports the SSSI.
286. As water flow would be maintained, and given the distance of these sites from Booton Common, effects from trenching works at these locations upon the Blackwater Drain will be minimal.
287. Booton Common is located approximately 1.4km south of the nearest access route for construction vehicles for the proposed project, and is located 600m from the onshore project area. As such, following IAQM guidance, it is considered to be outside the potential zone of influence of the project in terms of air quality emissions.
288. As such, no change is anticipated upon the Booton Common SSSI and the Norfolk Valley Fens SAC.

The Broads SAC

289. Although outside of the designated sites study area used within this EclA, following consultation as part of the EPP, Natural England requested that potential impacts upon The Broads SAC be considered within this assessment.
290. As outlined above, a full HRA Report has been prepared providing information on the potential for likely significant effects on European and Ramsar sites as a result of the project. The information provided here summarises the information presented in the HRA Report with respect to The Broads SAC. Please refer to the HRA Report full details of the potential effects upon The Broads SAC.
291. The HRA Report considered potential indirect effects upon The Broads SAC arising from changes to local hydrological conditions upstream of the SAC on the watercourses crossed by the project (North Walsham and Dilham Canal and the Hundred Stream), and upon suitable habitats for otter (the qualifying feature).
292. As the North Walsham and Dilham Canal would be crossed using trenchless techniques, no effects upon local hydrological conditions are anticipated at this site. The Hundred Stream will be crossed using trenching techniques. The construction techniques at this location will ensure that flow is maintained and that risk of release of pollutants and sediment is minimised as far as possible. Given the distance

between this site and the onshore project area, the magnitude of these potential effects is negligible.

293. Otters are potentially present along the North Walsham and Dilham Canal within the onshore project area. As this site will be avoided through the use of trenchless techniques, direct effects to otter habitats have been avoided. No signs of otters were recorded adjacent to the North Walsham and Dilham Canal during the 2017 water vole surveys. The Hundred Stream within the onshore project area is not suitable for otters.

294. As such, the greatest magnitude of effect upon The Broads SAC is negligible.

Dillington Carr, Gressenhall SSSI

295. Dillington Carr, Gressenhall SSSI is located approximately 550m downstream of the cable route, on the Wendling Beck watercourse.

296. As part of the embedded mitigation, the Wendling Beck will be crossed using trenchless crossing techniques (e.g. HDD), in order to avoid direct impacts upon this watercourse and the habitats and species it supports.

297. There are potential indirect effects upon the Dillington Carr, Gressenhall SSSI arising from changes in water regime due to the trenchless crossing receptor site works located adjacent to the Wendling Beck upstream of the SSSI proposed for the Wendling Beck. These effects are anticipated to arise due to the risk of pollutant and fine sediment release from the works at the trenchless crossing zone at the Wendling Beck during construction. Given the distance between this site and the onshore project area, the magnitude of these potential effects is negligible.

Pigney's Wood LNR

298. Pigney's Wood LNR is located adjacent to the onshore cable route. Due to its proximity, the following potential indirect effects may occur:

- Indirect effects upon the habitats and species of the LNR arising from construction dust emissions;
- Indirect effects upon the habitats and species of the LNR arising from pollutant release; and
- Indirect effects upon the species of the LNR arising from temporary construction lighting.

299. These effects are discussed in Chapter 26 Air Quality, Chapter 20 Water Resources and Flood Risk and Chapter 29 Landscape and Visual Impact Assessment. No significant impacts arising from changes in dust levels, risk of pollutant release and construction lighting have been identified by these chapters, and therefore no change is anticipated.

Ancient woodlands

300. There are seven ancient woodlands located within 500m of the onshore cable route (see Figure 22.2). A buffer of 15m around all ancient woodlands forms part of the embedded mitigation. These woodlands are:

- Old Lane Carr (330m south of the cable route);
- Bacton Wood (180m south of the cable route);
- The Leaslands (30m west of the cable route);
- Sparham Grove (450m east of the cable route);
- Old Carr (Dillington) (adjacent to the cable route);
- North Grove (130m west of the cable route); and
- Great Wood (250m south of the cable route);
- Necton Wood (adjacent to the cable route).

301. Following the Forestry Commission's guidance on assessing the impacts of development (Natural England and Forestry Commission, 2018), the following potential effects on ancient woodland from development on adjacent land have been considered:

- Fragmentation and loss of ecological connections with surrounding woodland/ veteran trees and the wider natural landscape;
- Reduction in the area of other semi-natural habitats adjoining ancient woodland;
- Increased deposition of dust, particularly from quarries, resulting in physical and/or chemical effects;
- Impacts on local hydrology through drainage or water table levels changing;
- Change to the landscape context for ancient woods and veteran trees; and
- Change to light pollution at night (if development includes street lighting).

302. Indirect effects are not predicted to arise in relation to Old Lane Carr, Bacton Wood, Sparham Grove and North Grove ancient woodlands given their distance from the onshore cable route. In addition, the onshore cable route is not located within an important ecological corridor for any of these woodlands.

303. Potential effects arising from changes in local hydrology, dust emissions, light levels and landscape context are discussed in Chapter 20 Water Resources and Flood Risk, Chapter 26 Air Quality and Chapter 29 Landscape and Visual Impact Assessment. A Surface Water and Drainage Management Plan included within the OCoCP provided with the DCO application (Document reference 8.1) addresses the changes to local hydrology and the measures that will be implemented to manage them.

304. There will be loss of approximately 40m of species-poor hedgerow with trees in two locations which potentially act as linkages between Necton and Great Wood.

Barbastelle bats have been recorded commuting along these features during the 2017 activity survey. These gaps may potentially affect commuting routes between these two ancient woodlands. As this potential fragmentation effect is considered focussed on two connections only, the impact is considered to be of low magnitude.

305. Construction works associated with the installation of the cable route will not result in the reduction of the area of other semi-natural habitats adjoining ancient woodland.
306. No significant impacts arising from changes in dust levels or in the lighting provision and landscape context have been identified in the assessments reported in Chapter 26 Air Quality or Chapter 29 Landscape and Visual Impact Assessment. As such, effects of a low magnitude are anticipated.

22.7.6.1.3 *Onshore project substation*

307. There are two ancient woodlands within 2km of the onshore project substation location, namely Necton Wood (ancient semi-natural) and Great Wood (ancient semi-natural and ancient replanted) which are located approximately 150m north and approximately 600m east of the proposed onshore project substation respectively. There are no other terrestrial statutory designated sites located within 2km of the proposed onshore project substation.
308. Following the Forestry Commission's guidance on assessing the impacts of development (Natural England and Forestry Commission, 2018), as the proposed onshore project substation location is located within 500m of Necton Wood, the following potential effects on ancient woodland from development on adjacent land have been considered:
 - Fragmentation and loss of ecological connections with surrounding woodland/ veteran trees and the wider natural landscape;
 - Reduction in the area of other semi-natural habitats adjoining ancient woodland;
 - Increased deposition of dust, particularly from quarries, resulting in physical and/or chemical effects;
 - Impacts on local hydrology through drainage or water table levels changing;
 - Change to the landscape context for ancient woods and veteran trees; and
 - Change to light pollution at night (if development includes street lighting).
309. Potential effects arising from changes in local hydrology, dust emissions, light levels, landscape context are discussed in Chapter 20 Water Resources and Flood Risk, Chapter 26 Air Quality and Chapter 29 Landscape and Visual Impact Assessment.
310. Construction of the onshore substation will result in the permanent loss of approximately 390m of hedgerow (of which 360m is species-poor hedgerow with

trees, and 30m species-rich hedgerow with trees), and the further temporary loss of approximately 400m of hedgerow (of which 130m is species-rich hedgerow with trees, and 270m species-rich hedgerow). Approximately 30m of the hedgerow permanently affected is identified as important bat commuting / foraging habitat, while approximately 360m is identified as other habitat supporting commuting / foraging bats; all 400m of the of the hedgerow temporarily affected is identified as important bat commuting / foraging habitat. Construction of the onshore substation will therefore affect the woodland's ecological connections, although this is of local scale in the context of the wider hedgerow resource within the region, and therefore is an effect of low magnitude. Fragmentation of habitat networks that have been identified as important for supporting commuting and foraging bats will occur, but not between other ancient woodlands in the vicinity of Necton Wood. The magnitude of this effect is also low.

311. No significant impacts arising from changes in dust levels or in the lighting provision and landscape context have been identified by Chapter 26 Air Quality or Chapter 29 Landscape and Visual Impact Assessment. As such, no change upon this receptor is anticipated.

22.7.6.1.4 *National Grid substation extension and overhead line modifications*

312. There are two ancient woodlands within 2km of the National Grid substation extension zone, namely Necton Wood (Ancient semi-natural) and Great Wood (ancient semi-natural and ancient replanted). These areas are located approximately 150m east and approximately 1.4km east of the National Grid substation extension respectively. There are no other terrestrial ecology statutory designated sites located within 2km of the National Grid substation extension.
313. Following the Forestry Commission's guidance on assessing the impacts of development (Natural England and Forestry Commission, 2018), as the proposed National Grid substation extension works are located within 500m of Necton Wood, the following potential effects on ancient woodland from development on adjacent land have been considered:
- Fragmentation and loss of ecological connections with surrounding woodland/ veteran trees and the wider natural landscape;
 - Reduction in the area of other semi-natural habitats adjoining ancient woodland;
 - Increased deposition of dust, particularly from quarries, resulting in physical and/or chemical effects;
 - Impacts on local hydrology through drainage or water table levels changing;
 - Change to the landscape context for ancient woods and veteran trees; and
 - Change to light pollution at night (if development includes street lighting).

314. Potential effects arising from changes in local hydrology, dust emissions, light levels, landscape context are discussed in Chapter 20 Water Resources and Flood Risk, Chapter 26 Air Quality and Chapter 29 Landscape and Visual Impact Assessment.
315. The proposed National Grid substation extension works would result in the potential loss of approximately 210m of species-poor hedgerow (100m of which is with trees). Given the higher quality of linking habitat found in other areas surrounding the proposed substation site, this is not anticipated to be an important linking habitat with Necton Wood. The proposed National Grid substation extension works are therefore not anticipated to affect the woodland's ecological connections. Based on current available data, this is therefore an impact of negligible magnitude.
316. No significant impacts arising from changes in dust levels or in the lighting provision and landscape context have been identified by Chapter 26 Air Quality or Chapter 29 Landscape and Visual Impact Assessment. As such, no change upon this receptor is anticipated.

22.7.6.1.5 Road transport network

317. Chapter 26 Air Quality considered the potential impacts of increases in nutrient nitrogen deposition arising from increases in road traffic during the construction phase of the project upon sensitive habitats and species which are qualifying features of SAC, SPA and SSSIs located within 200m of the road transport network. This assessment of the air quality impacts arising from increases in road traffic on the road transport network has been undertaken following the latest IAQM guidance on assessment of impacts on air quality arising from road traffic emissions (IAQM, 2014).
318. There are eight sites located within the construction vehicle emissions study area. Of these, Chapter 26 Air Quality predicted nutrient nitrogen deposition of >1% of the critical load to occur at two of the sites. These sites are summarised in Table 22.25 below.

Table 22.25 Statutory designated sites subject to >1% of the relevant nutrient nitrogen deposition

Statutory Designated site	Nutrient nitrogen deposition sensitive habitat or features present within the site	Lowest Critical Load ($\text{kgN} \cdot \text{ha}^{-1} \cdot \text{y}^{-1}$)	Suitable habitat present within 50m of road network?	% of critical load
Felbrigg Woods SSSI	Broadleaved, mixed and yew woodland	10	Yes	2%
Broadland SPA	Eurasian Marsh Harrier Eurasian Wigeon Great Bittern	15	No	N/A

319. At Felbrigg Wood SSSI, the only habitat type within the study area is broadleaved woodland. At the critical load for broadleaved woodlands, nutrient nitrogen deposition is anticipated to result in changes in soil processes, nutrient imbalance, altered composition mycorrhiza and ground vegetation (Bobink et al., 2011). As the project is anticipated to result in a temporary increase in nutrient nitrogen deposition at only 2% of the critical load for areas immediately adjacent to the road network only (woodland provide a rough surface which will ensure that nutrient nitrogen deposition rapidly drops off with distance from source) for the duration of the construction period, the localised, temporary effect is anticipated to be of negligible magnitude.
320. At the Broadland SPA, no suitable habitats for supporting the nutrient nitrogen deposition sensitive features of the site (Eurasian marsh harrier, Eurasian wigeon, and great bittern) are present within 50m of the road network. As such, no change is anticipated.

22.7.6.1.6 *Impact without mitigation*

321. Without mitigation, the greatest magnitude arising from the onshore project area is at the River Wensum SAC and SSSI and Necton Wood ancient woodland. This is low magnitude on a high importance receptor, resulting in an impact of at worst **moderate adverse** significance.

22.7.6.1.7 *Mitigation*

River Wensum SAC and SSSI

322. The following mitigation measures will be put in place to minimise the risk of sediment or pollutant release into the watercourses which are functionally connected to the River Wensum:
- Best practice topsoil management practices will be followed. All topsoil will be reinstated and measures will be put in place to reinstate any damage to ground conditions caused by vehicle tracking. All sediment management measures used (e.g. sediment traps) will be removed and disposed of following construction. The practices to be followed will be detailed in a CoCP, an outline of which has been submitted as part of the application (document reference 8.1).
 - A pre-construction drainage plan will also be developed and implemented to minimise water within the cable trench and ensure ongoing drainage of surrounding land. Where water enters the trenches during installation, this will be pumped via settling tanks or ponds to remove sediment, before being discharged into local ditches or drains via temporary interceptor drains in order to prevent increases in fine sediment supply to the watercourses.
 - Existing tracks and roadways will be utilised for access where possible. Where temporary accesses are needed, topsoil and surface water management

measures will be employed as defined in the Surface Water and Drainage Plan and CoCP.

- Geotextile, or other suitable material, will be used, where required, to allow the safe storage and movement of vehicles within the area, maintain required drainage, and prevent soil erosion and increased surface runoff.
- The working methodology will follow construction industry good practice guidance, as detailed in the Environment Agency's Pollution Prevention Guidance (PPG) notes (including PPG01, PPG05, PPG08 and PPG21)¹⁰, and CIRIA's '*Control of water pollution from construction sites – A guide to good practice*' (2001), such as having spill kits on site at all times, checking equipment regularly to ensure leakages do not occur, and limiting refuelling of construction plant to designated impermeable areas.
- The project is aiming for a construction scenario whereby construction works within the River Wensum floodplain (i.e. land north of Penny Spot Beck) are not required, and a trenchless crossing technique (e.g. HDD) at the River Wensum would run beneath this area. However, in advance of a more detailed assessment of ground conditions, this cannot be confirmed at this stage. If land north of Penny Spot Beck within the River Wensum floodplain is used during construction, then works will take place outside of the winter period (October – February inclusive) to avoid the wettest period of the year to minimise the risk of effects on local ground conditions due to vehicle tracking.

323. These mitigation measures will be applied for all works at trenchless crossing zones and are considered suitable for minimising the risk of sediment / pollutant release into watercourses functionally connected with the River Wensum. These measures are good construction working practices and are captured in the OLEMS (document reference 8.7).

Dillington Carr, Gressenhall SSSI

324. The mitigation measures outlined with respect to the River Wensum will be applied for all works at the trenchless crossing zone at Wendling Beck and are considered suitable for minimising the risk of sediment / pollutant release into the Wendling Beck.

Paston Great Barn SAC and SSSI

325. To minimise the potential effect upon commuting and foraging barbastelle bats arising from temporary loss of habitat, the following mitigation measures will be implemented:

¹⁰ The Environment Agency's PPG were formally withdrawn on 17 December 2015. However, the guidance contains the best reference source for good practice guidance regarding pollution prevention, and in the absence of any formally statutory guidance provide the best framework for managing pollution prevention.

- Hedgerow removal will be programmed during winter where possible, to allow bats time to adjust to the change prior to their maternity period. Hedgerows will be removed as close to the onset of works as possible, and works will not commence after nights of poor weather (in case of bad weather roosts being used).
 - Replanting will where possible follow in the first winter after construction, with the exception of the 6m gap required for the running track (BCT, 2012). Replanting will follow guidance within the Norfolk hedgerow BAP and will include appropriate species for north-east Norfolk (NBP, 2009), including ground flora planting designed to encourage insect biomass (BCT, 2012). Future hedgerow management to include allowing standard trees to develop to improve quality of the hedgerow as a foraging resource. Hedges will be double-planted with 2m grassland strips on both sides so there is always a leeward side to forage.
 - Subject to landowner permissions, the six hedgerows that are important for foraging and commuting bats would be left to become overgrown either side of the section to be removed prior to construction. Hedgerows would be allowed to become overgrown within the onshore cable route width, therefore at each hedgerow a total of up to 25m will be left to become overgrown in this manner. This would be undertaken to improve the quality of the surrounding hedgerow as a resource for commuting and foraging bats (Bates, 2010).
 - The replanting measures described above are captured in the OLEMS (document reference 8.7).
 - Pre-construction bat activity surveys at the hedgerow along North Walsham Road from Edingthorpe Green to Edingthorpe Heath and at two hedgerows between Witton and North Walsham Road will be undertaken to provide full baseline data for these features.
326. In addition to the above mitigation measures, during detailed project design undertaken post-consent, the project will seek to avoid mature trees within hedgerows through the micro-siting of individual cables, in order to retain as many mature trees as possible given the benefits they provide within linear commuting / foraging features (following Boughley *et al.*, 2011).

Norfolk Valley Fens SAC

327. No mitigation is proposed for this site.

Ancient woodlands

328. The mitigation measures listed under Paston Great Barn SAC and SSSI will also be applied to the two species-rich hedgerows between Necton Wood and Great Wood.
329. The landscaping proposals described in Chapter 29 Landscape and Visual Impact Assessment have been designed so that any ecological connections severed by

construction of the substation are recreated to ensure ecological corridors connect Necton Wood to other woodlands to the east and south.

22.7.6.1.8 *Impact following mitigation*

330. If these mitigation measures are implemented, the greatest magnitude of effect upon a statutory designated site is expected to be negligible, resulting in a **minor adverse** impact being predicted.

22.7.6.2 *Impact 2: Impacts to non-statutory designated sites*

22.7.6.2.1 *Landfall*

331. There is one non-statutory designated site within 2km of the landfall, namely The Marram Hills CWS which is located approximately 800m south-east of the landfall. Due to the distance between the Marram Hills CWS and the landfall, there will be no change upon non-statutory designated sites due to the proposed project landfall works.

22.7.6.2.2 *Onshore cable route*

332. There are five CWSs and one proposed CWS located within the onshore cable route (see Figure 22.3), specifically:
- Wendling Carr (CWS no. 1013), an area of semi-improved neutral grassland with a thin belt of semi-natural woodland;
 - Little Wood CWS (CWS no. 2024), an ancient woodland;
 - Paston Way & Knapton Cutting (CWS no. 1175), an ecological corridor with a butterfly reserve and wet woodland;
 - Marriott's Way (CWS no. 2176), a green woodland corridor;
 - Land south of Dillington Carr (CWS no. 1025), an area of wet woodland; and
 - Kerdiston Old Hall Meadows (proposed CWS so it has not been assigned a number at the time of preparing this chapter), proposed for its semi-improved grassland, hedgerow and ditch mosaic.
333. As part of the embedded mitigation measures, all of the CWSs including the proposed CWS will be crossed using trenchless crossing techniques (e.g. HDD), in order to minimise direct impacts upon these sites.
334. One of these sites, Wendling Carr CWS, will require a 6m wide running track to be constructed across it. The running track will be approximately 180m long, and will result in the temporary loss of approximately 0.1ha grazed meadow habitat (NWT, 1996). This represents approximately 2.8% of the total grazed meadow habitat within the CWS. The running track will be micro-sited to avoid sensitive features within the grazed meadow (mature trees) where possible. The running track will also need to cross the Wendling Beck. The running track will remain in place for the full duration of the onshore construction period in the worst case scenario (i.e. four

years in total). These effects are predicted to be of low magnitude given the scale of habitat loss and the temporary nature of the habitat loss over the medium term.

335. These six CWS avoided through the use of trenchless techniques (e.g. HDD), plus a further seven CWS (namely Necton Wood, Little Wood, Old Carr, pits near Mill Street, Long Hollands Clump and belt, Pond Wood, Holly's Grove, Vernon Wood), are located adjacent to the trenchless crossing zones along the onshore cable route and therefore indirect effects during the construction phase may be experienced. Indirect impacts may potentially arise during the construction phase from dust, noise, temporary lighting and changes in the local hydrology regime. These effects will occur over two years (duct installation) plus a further 16 weeks during the two year cable pull element of the construction phase. No significant impacts have been identified within Chapter 20 Water Resources and Flood Risk, Chapter 25 Noise and Vibration, Chapter 26 Air Quality and Chapter 29 Landscape and Visual Impact Assessment. These effects are predicted to be of low magnitude.

22.7.6.2.3 *Onshore project substation*

336. There are five non-statutory designated sites within 2km of the onshore project substation, namely Necton Wood, Great Wood, Fox Covert, Necton Old Common and Land Adjacent to River Wissey. The latter four sites are located over 650m from the onshore project substation, and as such there will be no change upon these non-statutory designated sites due to the construction of the onshore project substation.
337. Necton Wood is located approximately 130m from the onshore project substation. Indirect impacts may potentially arise during the construction phase from dust, noise, temporary lighting and changes in the local hydrology regime. These effects will continue for up to 30 months. No significant impacts have been identified within Chapter 20 Water Resources and Flood Risk, Chapter 25 Noise and Vibration, Chapter 26 Air Quality and Chapter 29 Landscape and Visual Impact Assessment. These effects are identified within the relevant chapter to be of low magnitude.

22.7.6.2.4 *National Grid substation extension and overhead line modifications*

338. There are four non-statutory designated sites within 2km of the National Grid substation extension, namely Necton Wood, Great Wood, Fox Covert and Necton Old Common. The latter three sites are located over 1.4km from onshore project substation, and as such there will be no change upon these non-statutory designated sites due to the proposed onshore project substation works.
339. Necton Wood is located approximately 150m from onshore project substation. Indirect impacts may potentially arise during the construction phase from dust, noise, temporary lighting and changes in the local hydrology regime. These effects will continue for up to 18 months. No significant impacts have been identified within Chapter 20 Water Resources and Flood Risk, Chapter 25 Noise and Vibration,

Chapter 26 Air Quality and Chapter 29 Landscape and Visual Impact Assessment. These effects are identified within the relevant chapter to be of low magnitude.

22.7.6.2.5 *Impact without mitigation*

340. Without mitigation, the greatest magnitude of effect is low on a medium importance receptor, resulting in an impact of at worst **minor adverse** significance.

22.7.6.2.6 *Mitigation*

341. Following advice received by NWT during the EPP, the management proposals for Wendling Carr CWS have been taken into account when considering mitigation. The management proposals for the site state that control of the young (pioneer) species of the broadleaved woodland parcel on the site should be prevented from establishing within the grazed meadow where possible. Methods other than grazing should be used to achieve this. Furthermore, continued monitoring of the site is recommended (NWT, 1996). As such a pre-construction botanical survey of Wendling Carr CWS is recommended. Following the botanical survey and subsequent consultation with NWT, manual clearance of any pioneer woodland species establishing within the meadow should be carried out within the grazed meadow prior to construction of the running track.
342. Best practice construction mitigation measures will be in place to minimise dust and noise emissions during construction. These measures are described in full in Chapter 25 Noise and Vibration and Chapter 26 Air Quality.

22.7.6.2.7 *Impact following mitigation*

343. If these mitigation measures are applied, the greatest magnitude of effect upon a non-statutory designated site is expected to be negligible, resulting in a **negligible** impact.

22.7.6.3 *Impact 3: Arable land*

22.7.6.3.1 *Landfall*

344. The landfall works will lead to a temporary loss of approximately 0.6ha of arable land for the duration of the construction phase (approximately four years). Cereal field margins are a UKHPI and Norfolk LBAP habitat. This habitat was not identified in any of the arable habitats found at the landfall. Arable land is typically of low ecological value due to the homogeneity of the habitat as well as farming practices and the presence of insecticides and herbicides within the crops. As such this habitat is of negligible importance. Given the extent of arable land within the surrounding area, the magnitude of effect is negligible.

22.7.6.3.2 *Onshore cable route*

345. The onshore cable route works will result in a temporary loss of approximately 349ha of arable land during the cable ducting element of the construction phase

(approximately two years) and up to approximately 7ha for 16 weeks during the two year cable pull element of the construction phase.

346. Cereal field margins are a UKHPI and Norfolk LBAP habitat. This habitat type was identified in a number of areas along the cable route during the 2017 Extended Phase 1 Habitat Survey. As a UKHPI, this habitat type is of high importance. There is likely to be a negligible temporary loss of cereal field margin habitat. Loss of this habitat will not coincide with arable cropping on the adjacent arable land, therefore the role of these habitats as conservation headlands will not be affected during construction. The area of cereal field margin lost is of a small scale in the context of the 15ha of field margins within Norfolk. As such, the magnitude of effect is negligible.

22.7.6.3.3 *Onshore project substation*

347. The onshore project substation works will lead to at most a temporary loss of approximately 25.8ha of arable land for the duration of the construction phase (approximately 30 months). Cereal field margins are a UKHPI and Norfolk LBAP habitat. This habitat was not identified in any of the arable habitats found at the onshore project substation. As such this habitat is of negligible importance. Given the extent of arable land in the surrounding area, the magnitude of effect is negligible.

22.7.6.3.4 *National Grid substation extension and overhead line modifications*

348. Work at the National Grid substation extension will result in a temporary loss of approximately 14.8ha of arable land for the duration of the construction phase (approximately 30 months). Cereal field margins are a UKHPI and Norfolk LBAP habitat. This habitat was not identified in any of the arable habitats found at the National Grid extension zone. As such this habitat is of negligible importance. Given the extent of arable land in the surrounding area, the magnitude of effect is negligible.

22.7.6.3.5 *Impact without mitigation*

349. Without mitigation, the greatest magnitude arising from one element of the onshore project area is low magnitude on a high importance receptor, resulting in an impact of at worst **moderate adverse** significance.

22.7.6.3.6 *Mitigation*

350. The locations of all arable field margins within the onshore project area identified during the 2017 Extended Phase 1 Habitat Surveys or during post-consent surveys of the unsurveyed areas will be recorded, and these habitats should be reinstated post-construction.

22.7.6.3.7 *Impact following mitigation*

351. With these mitigation measures in place, the greatest magnitude of effect upon arable land would be negligible, which is expected to result in a **minor adverse** impact (upon arable field margins).

22.7.6.4 *Impact 4: Woodland, trees and scrub*

22.7.6.4.1 *Landfall*

352. The landfall works are located outside of any woodland habitat and as such no change upon these habitats is anticipated as a result of the landfall works.

22.7.6.4.2 *Onshore cable route*

353. As part of the embedded mitigation, a set of key design principles was developed during the site selection process, for the avoidance of ancient woodland and woodland parcels where possible. In addition, trenchless crossing techniques (e.g. HDD) are proposed to be used at any location where mixed lowland deciduous woodland is present and which cannot be avoided, and no works will take place within 15m of any woodland. In the area of cable route immediately east of the onshore project substation, if the northern route option is selected trenchless techniques will not be possible for one area of woodland and cable trenching activities will lead to a loss of approximately 0.15ha of semi-natural broadleaved woodland at this location. The importance of a 0.15ha parcel of woodland is identified in Table 22.12 as negligible. In the context of the available habitat within the county, this represents a negligible magnitude of effect.
354. Isolated mature trees located within the onshore cable route will need to be removed during the construction phase. Two veteran trees are located within the cable route. TN288 at the River Bure will be avoided using trenchless techniques. The remaining tree at TN168 (see Figure 22.5) will be avoided through micro-siting of the route as part of the project embedded mitigation. Loss of other mature trees encountered along the route represents an effect of moderate magnitude on a negligible value receptor. Trees located within hedgerows are discussed in section 22.7.6.5.

22.7.6.4.3 *Onshore project substation*

355. There are no woodland habitats located within the onshore project substation area and as such no change upon these habitats is anticipated as a result of the project. Potential effects upon the Necton Wood Ancient Woodland, located within 150m of onshore project substation, are considered in section 22.7.6.1.

22.7.6.4.4 *National Grid substation extension and overhead line modifications*

356. There are woodland strips along the A47 located within the overhead line temporary working area. Temporary works at this location will not involve the removal of this woodland. As a consequence no change is anticipated upon this habitat.

22.7.6.4.5 *Impact without mitigation*

357. Without mitigation, the greatest effect arising from one element of the onshore project area is of moderate magnitude on a negligible importance receptor (mature trees), resulting in an impact of at worst **negligible** significance.

22.7.6.4.6 *Mitigation*

358. A pre-construction walkover survey will be undertaken by an appropriately experienced arboriculturalist. This survey will define specific mitigation measures to protect trees situated adjacent to the working width, including defining root protection areas. The arboricultural report will be submitted to and agreed with the local authority prior to the commencement of any construction works. In addition, the following mitigation measures will also be undertaken:

- The roots of retained trees along the edge of the working width will be protected from soil compaction by the enforcement of Root Protection Areas that will be fenced off from the construction (the extent of which will be calculated using guidance from BS5837: 2012);
- Facilitation pruning may be recommended where tree crowns are at risk from impact by machinery or high sided vehicles;
- Where possible, removal of vegetation will be timed to avoid the bird breeding season (March to October inclusive); and
- If bat roosts are found in the trees then the measures set out in section 22.7.6.10 (bat mitigation) will be followed.

22.7.6.4.7 *Impact following mitigation*

359. If these mitigation measures are applied, a residual impact of **negligible** significance (upon mature trees) would be expected.

22.7.6.5 *Impact 5: Hedgerows*

22.7.6.5.1 *Landfall*

360. There are no hedgerows located within the landfall and as such no change upon these habitats is anticipated as a result of the project.

22.7.6.5.2 *Onshore cable route*

361. The onshore cable route works will result in a temporary loss of approximately 3.3km of hedgerow habitat across 165 hedgerows (of which up to 2.3km may be

species-rich¹¹ (113 hedgerows)) for two years during the duct installation element of the construction phase, of which approximately 650m across 33 hedgerows (of which up to 450m may be species-rich (23 hedgerows)) will also be lost for two years during the cable pull element of the construction phase. As part of the project embedded mitigation, the maximum size of the hedgerow gap created is 20m for perpendicular crossings. As a viable area of UKHPI and Norfolk BAP hedgerow habitat, the local resource is of high importance. The scale of the habitat loss is of low magnitude as although individual gaps are small, 3.3km of hedgerow represents a notable area of habitat at a district level.

22.7.6.5.3 *Onshore project substation*

362. Construction of the onshore substation will result in the permanent loss of approximately 390m of hedgerow (of which 360m is species-poor hedgerow with trees, and 30m species-rich hedgerow with trees), and the further temporary loss of approximately 400m of hedgerow (of which 130m is species-rich hedgerow with trees, and 270m species-rich hedgerow). As a viable area of UKHPI and Norfolk BAP hedgerow habitat, the local resource is of high importance. The scale of the habitat loss is of low magnitude given the context of surrounding hedgerows.

22.7.6.5.4 *National Grid substation extension*

363. There are no hedgerows located within the National Grid substation extension and as such no change upon these habitats is anticipated as a result of the project.

364. The National Grid substation extension will result in a potential temporary loss of approximately 210m of species-poor hedgerow (100m of which is with trees) for the duration of the construction phase (approximately 30 months). As a viable area of UKHPI and Norfolk BAP hedgerow habitat, the local resource is of high importance. The scale of the habitat loss is of low magnitude given the context of surrounding hedgerows.

22.7.6.5.5 *Impact without mitigation*

365. Without mitigation, the greatest effect arising from one element of the onshore project area is of low magnitude on a high importance receptor, resulting in an impact of at worst **moderate adverse** significance.

22.7.6.5.6 *Mitigation*

366. To minimise the potential effect upon hedgerows arising from temporary loss of habitat, the following mitigation measures will be implemented. Note, this mitigation applies to hedgerows that will be removed – additional mitigation applies

¹¹ 2.3km assumes, following a precautionary approach, that all hedgerows identified using the Norfolk Living Map and aerial photography are species-rich.

to those hedgerows which have been identified as important for the species which they support (for example, see section 22.7.6.1):

- Replanting will where possible follow in the first winter after construction of all except the 6m gap required for the running track. Replanting will follow guidance within the Norfolk hedgerow BAP and will include appropriate species for north-east Norfolk (NBP, 2009), including ground flora planting designed to encourage insect biomass (BCT, 2012). Future hedgerow management to include allowing standard trees to develop to improve quality of the hedgerow as a foraging resource. Hedges will be double-planted with 2m grassland strips on both sides so there is always a leeward side to forage.
- The replanting measures described above are captured in the OLEMS (document reference 8.7).

367. In addition to the above mitigation measures, during detailed project design, the project will seek to avoid mature trees within hedgerows through the micro-siting of individual cables, in order to retain as many mature trees as possible.

368. The landscaping proposals described in Chapter 29 Landscape and Visual Impact Assessment have been designed to ensure that new planting is created to compensate for the permanent loss of species-rich hedgerow at the onshore project substation. Approximately 230m of new hedgerow is proposed along the western margin of onshore project substation, and a further approximately 1km of existing hedgerow will be enhanced with adjacent woodland and species-rich grassland planting. Please see Chapter 29 Landscape and Visual Impact Assessment for full details of the proposed landscape mitigation planting.

22.7.6.5.7 *Impact following mitigation*

369. These mitigation measures will ensure that the habitat which is temporarily lost for between two and four years (plus the length of time for reinstatement hedgerows to mature) is replaced by improved hedgerow habitat which meets the criteria set out in the Norfolk Hedgerow BAP (NBP, 2009). However, given the duration of these temporary effects, a residual impact of **moderate adverse** significance is expected to remain.

22.7.6.6 *Impact 6: Grassland*

22.7.6.6.1 *Landfall*

370. The onshore elements of the landfall works are located outside of any grassland habitat and as such no change upon these habitats is anticipated as a result of the project.

22.7.6.6.2 *Onshore cable route*

371. The onshore cable route works will result in a temporary loss of approximately 0.5ha

of coastal floodplain grazing marsh UKHPI and Norfolk LBAP habitat for trenchless crossing works within the River Wensum floodplain for the duration of the trenchless crossing works element of the construction phase (approximately eight weeks) and for a further 16 weeks during the two year cable pull element of the construction phase. The onshore cable route works will lead at most to a temporary loss of 1.2ha of semi-improved grassland and 8.1ha of marshy grassland. All habitats will be reinstated upon completion of the project. Reinstatement of these grasslands will be by natural regeneration following demobilisation.

372. As a UKHPI, coastal floodplain grazing marsh is of high importance. The area of coastal floodplain grazing marsh lost is of a small scale in the context of the 29,500ha of this habitat within Norfolk. As the potential effects are of short duration and reinstatement will happen rapidly, the magnitude of effect is negligible.

22.7.6.6.3 *Onshore project substation*

373. There are no grassland habitats located within the onshore project substation and as such no change upon these habitats is anticipated as a result of the project.

22.7.6.6.4 *National Grid substation extension*

374. There are no grassland habitats located within the National Grid substation extension and as such no change upon these habitats is anticipated as a result of the project.

22.7.6.6.5 *Impact without mitigation*

375. Without mitigation, the greatest magnitude arising from one element of the onshore project area is low magnitude on a high importance receptor, results in an impact of at worst **minor adverse** significance.

22.7.6.6.6 *Mitigation*

376. All grassland habitats would be reinstated following the completion of works, including coastal floodplain grazing marsh. Reinstatement of these grasslands will be by natural regeneration following demobilisation.
377. The mitigation measures set out with respect to the River Wensum SAC and SSSI will be adhered to during all works undertaken within the UKHPI coastal and floodplain grazing marsh. These good construction working practices are captured in the OLEMS (document reference 8.7).

22.7.6.6.7 *Impact following mitigation*

378. Following implementation of these mitigation measures, a residual impact of **minor adverse** significance would remain.

22.7.6.7 Impact 7: Coastal habitats

22.7.6.7.1 *Landfall*

379. The onshore elements of the landfall works are located outside of any coastal habitat and as such no change upon these habitats is anticipated as a result of the project.

22.7.6.7.2 *All other infrastructure*

380. There are no coastal habitats located within or adjacent to any other element of the onshore project area, and as such no change upon these habitats is anticipated to arise from these elements of the construction phase.

22.7.6.7.3 *Impact without mitigation*

381. As these habitats are not present within the onshore project area, **no impact** upon this receptor is anticipated.

22.7.6.7.4 *Mitigation*

382. No mitigation is required.

22.7.6.8 Impact 8: Watercourses and ponds

22.7.6.8.1 *Landfall*

383. The onshore elements of the landfall works are located outside of any rivers or ponds and as such no change upon these habitats is anticipated as a result of the project.

22.7.6.8.2 *Onshore cable route*

384. The onshore cable route will result in a temporary loss of five ponds during the cable ducting element of the construction phase (approximately two years) and potentially for a further 16 weeks during the two year cable pull element of the construction phase. The sixth pond, which is located within the onshore project area, will be avoided using trenchless crossing techniques. All lost ponds will be reinstated as part of the project embedded mitigation. Ponds are a UKHPI and a Norfolk LBAP habitat, and as such are of high importance. Given the extent of these habitats within the wider environment, this effect is anticipated to be of low magnitude. The potential for these habitats to support protected or notable species is considered in section 22.7.6.13.

385. Five main rivers will be crossed by the onshore cable route, one of which – the Wendling Beck – is crossed twice (i.e. six main river crossings in total). These watercourses will be crossed using trenchless crossing techniques (e.g. HDD) as part of embedded mitigation, and as such there will be no direct effects upon these receptors. A total of 27 other watercourse crossings will be made using trenched techniques during the construction phase. Potential indirect effects arising from all

watercourse crossings are considered in Chapter 20 Water Resources and Flood Risk. Rivers are a UKHPI and a Norfolk LBAP habitat, and as such are of high importance. Given the extent of these habitats within the wider environment, this effect is anticipated to be of low magnitude.

22.7.6.8.3 *Onshore project substation*

386. There are no rivers or ponds located within the onshore project substation and as such no change upon these habitats is anticipated as a result of the project.

22.7.6.8.4 *National Grid substation extension*

387. The National Grid substation extension will result in a temporary loss of at most one pond during the construction phase (approximately 30 months). All lost ponds will be, as a minimum, reinstated as far as possible as part of the upfront project decisions. Ponds are a UKHPI and a Norfolk LBAP habitat, and as such are of high importance. Given the extent of these habitats within the wider environment, and the reversible nature of these effects, this impact is anticipated to be of low magnitude. The potential for these habitats to support protected or notable species is considered in section 22.7.6.13.

22.7.6.8.5 *Impact without mitigation*

388. Without mitigation, the greatest magnitude arising from one element of the onshore project area is low magnitude on a high importance receptor, and results in an impact of at worst **moderate adverse** significance.

22.7.6.8.6 *Mitigation*

389. All ponds habitats lost during construction will be reinstated as far as possible following the completion of works. All pond restoration will follow the guidelines set out in the Norfolk Ponds BAP (NBP, 2009). The project is also retaining the option to recreate a greater number of ponds than is lost during project construction (five) or restore new ponds outside the onshore project area. Full details of this approach to mitigation is set out in section 22.7.6.13.

390. These measures are captured in the OLEMS (document reference 8.7).

22.7.6.8.7 *Impact following mitigation*

391. Following implementation of these mitigation measures, the long term habitat improvement following the ponds restoration, means the magnitude will be negligible, giving an expected residual impact of **minor adverse** significance.

22.7.6.9 Impact 9: Badgers

22.7.6.9.1 Landfall

392. No badger setts or field sign of badgers were recorded within 50m of the landfall, therefore there is predicted to be no change upon badgers at the landfall as a result of the project.

22.7.6.9.2 Onshore cable route

393. A total of four active main setts and a further four active subsidiary and outlier setts were found within the habitat and species study area. These setts are all located outside of the onshore project area but are within 30m of the onshore cable route. These setts will be subject to temporary disturbance arising from trenching activities, vehicle movements and spoil storage within 30m of these active setts during the cable ducting element of the construction phase (approximately two years) and for a further 16 weeks during the two year cable pull element of the construction phase.
394. The construction of the onshore cable route would also represent the temporary loss of a negligible area of arable and hedgerow foraging habitat adjacent to the badger setts identified within the habitat and species study area. This is sub-optimal foraging habitat, and in the context of the available foraging resource surrounding the identified setts this is small in scale. Furthermore, creation of the running track will result in potential fragmentation of badger territories, over two years. Given the extensive alternative foraging habitat available within the habitat and species study area and that the onshore cable route does not separate two main setts at any location within the habitat and species study area, this is considered to have a negligible, effect upon local badger territories.
395. Overall the magnitude of effect is medium given the long term nature of the potential disturbance effect upon badgers.

Unsurveyed areas

396. Approximately 50% of the habitat and species study area has not been surveyed for field signs of badgers. In these areas, following a precautionary approach it has been assumed that active main setts may be present within or adjacent to the onshore cable route, and which may be destroyed during the project construction phase. Should this occur, this would represent an effect of medium magnitude.

22.7.6.9.3 Onshore project substation

397. No badger setts or field sign of badgers were recorded within 50m of the onshore project substation, therefore no change upon badgers at the onshore project substation works is anticipated as a result of the project.

22.7.6.9.4 *National Grid substation extension and overhead line modifications*

398. No badger setts or field sign of badgers were recorded within 50m of the National Grid substation extension, therefore no change upon badgers at the proposed National Grid substation extension as a result of the project.

Unsurveyed areas

399. Approximately 50% of the National Grid substation extension and overhead line modifications habitat and species study area has not been surveyed for badgers. In these areas, a precautionary approach has been followed and therefore it is assumed that active main badger setts may be present within the National Grid substation extension and overhead line modifications, and which may be destroyed during the project construction phase. Should this occur, this would represent an effect of medium magnitude.

22.7.6.9.5 *Impact without mitigation*

400. Without mitigation, the greatest effect arising from one element of the onshore project area is medium magnitude on a low importance receptor, resulting in an impact of at worst **minor adverse** significance.

Unsurveyed areas

401. Without mitigation, the greatest effect arising from one element of the onshore project area is medium magnitude on a low importance receptor, resulting in an impact of at worst **minor adverse** significance.

22.7.6.9.6 *Mitigation*

402. In order to minimise the potential disturbance effects on badger during the construction phase, mitigation measures will be agreed in advance of any works within 30m of an active badger sett (following Natural England's Standing Advice on the impact of development on badgers (Natural England, 2015a; English Nature, 2002), which will include consideration of habitat manipulation, buffer zones for different construction activities within 30m of known badger setts, timing of construction works and construction lighting.
403. Adherence to mitigation measures agreed in advance with Natural England would be considered sufficient that a licence to disturb a badger sett will not be required.
404. A pre-construction badger survey of all active badger setts found within the habitat and species study area will be undertaken in advance of construction to ensure that the location of setts has not changed. If setts have now moved closer to the onshore project area, a suitably qualified ecologist would assess whether a disturbance licence may be required (or alternatively works under a badger class licence). The details of this licence would need to be agreed with Natural England in advance of construction.

- 405. All hedgerow habitat removed will be reinstated in line with the Norfolk Hedgerow BAP (NBP, 2009).
- 406. These measures are captured in the OLEMS (document reference 8.7).

Unsurveyed areas

- 407. For all unsurveyed areas of the onshore cable route, a full badger survey will be undertaken to search for field signs of badgers within the habitat and species study area.
- 408. If main setts are found within the onshore project area, they would need to be closed and destroyed. This would require the preparation and submission of a licence application to Natural England and would follow their Standing Advice (Natural England, 2015a) on sett closure and destruction.
- 409. The exact details of sett closure would be agreed in advance with Natural England through the licensing process, and would follow Natural England's Standing Advice (Natural England, 2015a) on sett closure and destruction.

22.7.6.9.7 Impact following mitigation

- 410. Following implementation of these mitigation measures, the risk of disturbance to badger setts is reduced to an effect of negligible magnitude. Potential medium-term, localised habitat fragmentation of low magnitude will remain, which is likely to result in a residual impact of **minor adverse** significance.

Unsurveyed areas

- 411. As above, following implementation of these mitigation measures, the risk of disturbance to badger setts or killing or injuring badgers is reduced to a negligible magnitude. Potential medium-term, localised habitat fragmentation of low magnitude will remain, giving an expected residual impact of **minor adverse** significance.

22.7.6.10 Impact 10: Bats

22.7.6.10.1 Landfall

- 412. Barbastelle bats of the Paston Great Barn maternity colony are known to use the north Norfolk coastline for foraging and commuting purposes. The key areas of the coastline are from Mundesley to Walcott (NBSG, 2017). These areas are located approximately 5km from the landfall. There are no other suitable commuting / foraging or potential bat roost features located within the landfall. In light of this, no change upon commuting or foraging bats is anticipated.

22.7.6.10.2 Onshore cable route

- 413. There are 110 identified commuting / foraging features (i.e. hedgerows) along the onshore cable route, totalling approximately 4.95km of suitable commuting /

foraging habitat (see Figure 22.5). This includes 58 important features for commuting and foraging bats (approximately 2.61km) and 52 other linear features (approximately 2.34km) which are suitable for commuting / foraging bats, but which have not been identified as 'important' within the landscape.

414. Furthermore, the 58 important features include five areas that have been identified as important core areas for barbastelle bat colonies at Paston Great Barn SAC and Old Hill Woods. Potential impacts upon the Paston Great Barn SAC are considered within section 22.7.6.1. A full HRA Report has been prepared providing information on the potential for likely significant effects on European and Ramsar sites as a result of the project. Please refer to the HRA Report submitted with the DCO application for full details of the potential effects upon the Paston Great Barn SAC.
415. Potential impacts on the Old Hill Woods colony is considered with the wider impact assessment upon commuting / foraging bats below.
416. As part of the embedded mitigation, individual hedgerow crossings have been reduced from 45m to 20m wide, resulting in a 50% reduction in the amount of commuting or foraging habitat removal required during the construction phase of the works. In light of this embedded mitigation, the following impacts are anticipated upon the important features:
 - Direct loss of up to 1.16km of hedgerow foraging / commuting habitat across 58 important features to facilitate cable trenching for the duration of the two year cable trenching works;
 - Fragmentation of foraging / commuting habitat for bats commuting or foraging across 58 important features to facilitate cable trenching for the duration of the two year cable trenching works, including core foraging areas within the home ranges for the Old Hills and Paston Great Barn maternity colonies, of which approximately 12 will be required to remain open during the two year cable installation phase; and
 - Indirect effects upon commuting bats arising from construction lighting.
417. The following impacts are anticipated upon the commuting foraging / commuting features not classified as important:
 - Direct loss of up to 1.04km of hedgerow foraging / commuting habitat across 52 features to facilitate cable trenching for the duration of the two year cable trenching window;
 - Fragmentation of foraging / commuting habitat for bats commuting or foraging across 52 features to facilitate cable trenching for the duration of the two year cable trenching window, of which approximately 10 will be required to remain open during the two year cable installation window; and

- Indirect effects upon commuting bats arising from construction lighting, for the duration of the two year cable trenching works, plus a further 16 weeks in any one area during the two year cable installation window.
418. No active bat roosts have been found within the onshore project area. Three active bat roosts have been recorded within trees within the habitat and species study area. The following impacts are anticipated upon these bat roosts:
- Indirect effects upon the trees which support three active roosts arising from vehicle tracking and spoil storage within the root protection area of these trees for two years during the duct installation phase; and
 - Indirect effects upon three bat roosts arising from construction lighting in works adjacent to these roosts for the two year cable trenching works, plus a further 16 weeks in any one area during the two year cable installation works.
419. Approximately 1.16km loss of important bat features and 1.04km loss of other bat features is of local scale in the context of the wider hedgerow resource within the region: this equates to approximately 0.22km and 0.18km of hedgerow lost per km², which represents approximately 5.5% and 4.5% of the typical amount of hedgerow per km² within the county (NBP, 2009), which is an effect of low magnitude. Habitat fragmentation for 58 important features and 52 other features represents fragmentation across multiple habitat networks across the county. Gaps of 20m are over the threshold for ensuring that fragmentation effects do not occur (BCT guidance advises that gaps should not exceed 10m (BCT, 2012)). As such, fragmentation effects for those species which are most closely associated with hedgerows for commuting or foraging (common pipistrelle, soprano pipistrelle, brown long-eared, Daubenton's, and barbastelle) may potentially still occur. This effect is anticipated to be of moderate magnitude. Indirect effects and impacts upon roosting bats are anticipated to be localised and of low likelihood of disturbing commuting or foraging bats, therefore this magnitude of effect is negligible.

Unsurveyed areas

420. Approximately 55 linear features were identified by the Norfolk Living Map and aerial photography but not surveyed for their suitability to support commuting or foraging bats. Under a precautionary approach, it has been assumed that these features may provide valuable habitat for commuting or foraging bats. The impacts upon these linear features will be in line with those set out above for important features.
421. Nine trees and structures were not surveyed during the 2017 Bat Activity Survey. A further eight areas within the habitat and species study area were identified by the Norfolk Living Map and aerial photography as potentially containing additional trees which may be suitable to support roosting bats. As such, and by applying a

precautionary approach, it has been assumed that these trees may support roosting bats. Therefore, the following effects may occur (in addition to those identified above):

- A risk of killing or injuring roosting bats when trees are removed to facilitate cable trenching works; and
- A risk of destroying active roosts when trees are removed to facilitate cable trenching works.

422. These effects would result in the killing or injuring of individuals across a range of habitats within the habitat and species study area. As such the potential magnitude of effect is high.

22.7.6.10.3 Onshore project substation

423. There are four identified commuting / foraging features (i.e. hedgerows) within the onshore project substation, totalling approximately 790m of hedgerow (of which 270m is species-rich hedgerow, 360m species-poor hedgerow with trees, and 160m species-rich hedgerow with trees) (see Figure 22.5). Approximately 430m of this hedgerow is identified as important bat commuting / foraging habitat, while 360m is identified as other habitat supporting commuting / foraging bats.

424. The following impacts are anticipated upon these features:

- Permanent loss of up to 30m of important foraging / commuting habitat;
- Permanent loss of up to 360m of other foraging / commuting habitat;
- Temporary loss of up to 400m of important foraging / commuting habitat during the 30 month construction phase;
- Fragmentation of foraging / commuting habitat by severing the commuting route for bats commuting north-south through the onshore project area; and
- Indirect effects upon commuting bats arising from construction lighting.

425. No active bat roosts have been found within the habitat and species study area. As such no change is anticipated upon roosting bats.

426. An approximately 30m permanent loss and 400m temporary loss of important bat features and 360m loss of other bat features is of local scale in the context of the wider hedgerow resource within the region, which is an effect of low magnitude. Fragmentation of habitat networks that have been identified as important for supporting commuting and foraging bats will occur. Gaps of up to 300m will be generated, which cannot be traversed by commuting bats (any species). This effect is a localised but permanent effect. Figure 22.5 shows the alternative habitat networks available within the immediate surroundings, which will mitigate some of the potential effect. However, as the commuting route has been identified as supporting and important bat population, the magnitude of effect is assessed to be medium.

22.7.6.10.4 *National Grid substation extension and overhead line modifications*

427. There are four identified commuting / foraging features (i.e. hedgerows) within the National Grid Substation and overhead line modifications, totalling approximately 210m of species-poor hedgerow (see Figure 22.5). These hedgerows are assessed as not providing important bat commuting / foraging habitat, but are used by commuting / foraging bats (i.e. are 'other' bat features).
428. The following impacts are anticipated upon the other bat features:
- Direct loss of up to 210m of other foraging / commuting habitat during the 30 month construction phase;
 - Indirect effects upon commuting bats arising from construction lighting.
429. No active bat roosts have been found within the habitat and species study area. As such no change is anticipated upon roosting bats.
430. Approximately 210m loss of bat features not classified as 'important' is of local scale in the context of the wider hedgerow resource within the region, which is an effect of negligible magnitude.

Unsurveyed areas

431. Approximately 50% of the National Grid substation extension and overhead line modifications habitat and species study area has not been surveyed for its suitability to support commuting / foraging bats. Under a precautionary approach, it has been assumed that these features may all be important features for supporting commuting or foraging bats. The impacts upon these linear features would be in line with those set out above for important features.

22.7.6.10.5 *Impact without mitigation*

432. Without mitigation, the greatest effect arising from one element of the onshore project area is medium magnitude on a high importance receptor, which results in an impact of at worst **major adverse** significance.

Unsurveyed areas

433. Without mitigation, the greatest potential effect arising from one element of the onshore project area is high magnitude on a high importance receptor, resulting in an impact of at worst **major adverse** significance.

22.7.6.10.6 *Mitigation*

434. The following mitigation measures will be adhered to for all important bat commuting / foraging features:
- Hedgerow removal will be programmed for winter where possible, to give bats time to adjust to the change prior to maternity period. Hedgerows will be removed as close to the onset of works as possible, and works will not

- commence after nights of poor weather (in case of bad weather roosts being used).
 - Hedgerow replanting will where possible follow in the first winter after construction, with the exception of the 6m gap required for the running track (BCT, 2012). Replanting will follow guidance within the Norfolk hedgerow BAP and will include appropriate species for north-east Norfolk (NBP, 2009), including ground flora planting designed to encourage insect biomass (BCT, 2012). Future hedgerow management to include allowing standard trees to develop to improve quality of the hedgerow as a foraging resource. Hedges will be double-planted with 2m grassland strips on both sides so there is always a leeward side to forage.
 - Subject to landowner permissions, the six hedgerows that are important for foraging and commuting bats would be left to become overgrown either side of the section to be removed prior to construction. Hedgerows would be allowed to become overgrown within the onshore cable route width, therefore at each hedgerow a total of up to 25m will be left to become overgrown in this manner. This would be undertaken to improve the quality of the surrounding hedgerow as a resource for commuting and foraging bats (Bates, 2010).
 - The project will seek to avoid mature trees within hedgerows through the micro-siting of individual cables, in order to retain as many mature trees as possible given the benefits they provide within linear commuting / foraging features (following Boughley et al., 2011);
 - Mitigation planting at the onshore project substation has been designed to replace and improve all ecological connections currently located within the onshore project substation footprint. This includes creation of new woodland strips connecting the commuting / foraging resources severed by the construction phase works. The location of this mitigation planting can be seen in Chapter 29 Landscape and Visual Impact Assessment.
435. The following mitigation measures will be adhered to for all other bat commuting / foraging features:
- Hedgerow removal will be programmed for winter where possible, to give bats time to adjust to the change prior to maternity period. Hedgerows will be removed as close to the onset of works as possible, and works will not commence after nights of poor weather (in case of bad weather roosts being used).
 - Hedgerow replanting will, where possible, follow in the first winter after construction, with the exception of the 6m gap required for the running track (BCT, 2012). Replanting will follow guidance within the Norfolk hedgerow BAP (NBP, 2009). Future hedgerow management to include allowing standard trees to develop to improve quality of the hedgerow as a foraging resource.

- The project will seek to avoid mature trees within hedgerows through the micro-siting of individual cables, in order to retain as many mature trees as possible given the benefits they provide within linear commuting / foraging features (following Boughley et al., 2011).
436. The three trees which support bats roosts located within the habitat and species study area will be subject to the following mitigation measures to ensure that the construction works do not affect tree health:
- A tree survey of the trees will be constructed prior to works;
 - The tree's root protection area (RPA) will be calculated and no works will take place within the trees' RPA.
437. To avoid indirect effects arising from the construction phase works, the following mitigation measures will be adhered to:
- Construction phase lighting will be used between 7am-7pm in low light conditions, with lower-level security lighting outside of these times; and
 - All temporary lighting to be designed in line with the BCT *Bats and Lighting in the UK* guidance (2009). This to include the use of directional lighting during construction.
438. The measures described above are captured in the OLEMS (document reference 8.7).

Unsurveyed areas

439. Nine trees and structures were not surveyed during the 2017 bat emergence / re-entry survey and therefore they will need to be surveyed during the post-consent survey effort to confirm whether they support roosting bats.
440. If bats or signs of bats are found in any of the features, appropriate mitigation measures would be developed adhering to Natural England Standing Advice (Natural England, 2015b), which may include blocking up features, soft felling and timing of works. A European Protected Species (EPS) licence may be necessary to work on or remove the trees.
441. The approach to unsurveyed areas described above is captured in the OLEMS (document reference 8.7).

22.7.6.10.7 Impact following mitigation

442. Following implementation of these mitigation measures, the potential fragmentation effects will be reduced, although will not be completely avoided until the mitigation planting matures. As such, the residual effect is of low magnitude, which is expected to result in a **moderate adverse** impact following mitigation.

Unsurveyed areas

443. Following implementation of these mitigation measures, the risk of killing or injuring bats will be reduced to a negligible level and the potential fragmentation effects will be reduced, although fragmentation effects will remain while the mitigation planting matures. As such, the residual effect is of low magnitude, which is expected to result in a **moderate adverse** impact following mitigation.

22.7.6.11 Impact 11: Water vole

22.7.6.11.1 Landfall

444. There are no watercourses within or adjacent to the landfall which are suitable for water voles. As such there will be no change upon water voles due to the proposed landfall works.

22.7.6.11.2 Onshore cable route

445. To date, field signs of water vole have been recorded on five watercourses along the onshore cable route, as shown on Figure 22.7.
446. Of these five watercourses, only one has recorded a high density of water voles – the River Wensum (WV32) (see Figure 22.7).
447. Three of the five watercourses where water voles have been recorded, i.e. the River Wensum, the River Bure and the Wendling Beck at Dillington, will be subject to trenchless crossing techniques (e.g. HDD) as part of embedded mitigation to avoid potential impacts at these locations.
448. Table 22.26 summarises the potential effects on these and on the remaining two watercourses where water voles have been recorded.

Table 22.26 Water vole impacts along the cable route (see Figure 22.7)

Watercourse (see Figure 22.7 for locations)	Effects	% of local of habitat affected	Magnitude of effect (without mitigation)
WV13	None, trenchless crossing techniques (e.g. HDD) used.	0%	No change
WV14	<ul style="list-style-type: none"> A risk of killing or injuring water voles which are undertaking foraging within the watercourse; Temporary loss of approximately 45m of suitable watercourse habitat, which is functionally connected to an identified water vole burrow; Fragmentation of the local drainage ditch network; A risk of habitat degradation due to pollutant release during the construction phase. 	10%	Medium
WV15	As above.	10%	Medium
WV22	None, trenchless crossing techniques (e.g. HDD) used.	0%	No change

Watercourse (see Figure 22.7 for locations)	Effects	% of local of habitat affected	Magnitude of effect (without mitigation)
WV32	None, trenchless crossing techniques (e.g. HDD) used.	0%	No change

449. The maximum magnitude of effect along the cable route is medium.

Unsurveyed areas

450. An additional eight watercourses have been identified using the Norfolk Living Map and aerial photography which may be optimal habitat for water voles. A further two watercourses were scoped into the 2017 Water Vole Survey but which were unable to be surveyed in 2017 due to landowner access restrictions. There is potential for the construction works within these watercourses to give rise to the following impacts:

- A risk of killing or injuring water voles which are undertaking foraging within the watercourse;
- A risk of destroying water vole burrows;
- Temporary loss of approximately 45m of suitable watercourse habitat functionally connected to identified water vole burrows at ten locations;
- Fragmentation of the local water vole habitat network; and
- A risk of habitat degradation due to pollutant release during construction.

451. The impacts will occur for up to eight weeks at each watercourse (duct installation) plus a further 16 weeks during the following two year cable pull element of the construction phase, and therefore will be medium term for water voles' life-cycle. The impacts will be localised on narrow sections of a water vole's territory in each location. As the populations recorded on these watercourses are currently unknown and may potentially be high, the magnitude of effect is anticipated to be medium.

22.7.6.11.3 Onshore project substation

452. One watercourse (a ditch, WV05) is located within the onshore project substation compound area. A single potential water vole burrow was recorded along this watercourse during the 2017 Water Vole Survey (Figure 22.7). This burrow is located approximately 350m west of the onshore project substation.

453. Water vole territories can extend up to 500m, as such water voles may be active adjacent to the onshore project substation. There is a risk of killing or injuring water voles which are using the bank habitat for foraging/commuting. There is also a risk of habitat degradation due to pollutant release during the construction phase. These risks will occur for up to 30 months during construction of the onshore project substation. Noise and visual disturbance are unlikely to have a significant effect on

water voles (Dean *et al.*, 2016). The construction phase works will affect approximately 5% of the available foraging habitat within the drainage network at this location. As such, the magnitude of effect is anticipated to be low.

22.7.6.11.4 *National Grid substation extension and overhead line modifications*

454. Two watercourses (ditches) are located adjacent to the National Grid substation extension. No water vole field signs were recorded along these watercourses, but a single potential water vole burrow was recorded along an adjacent connecting watercourse during the 2017 Water Vole Survey (WV05, Figure 22.7). This burrow is located approximately 40m south of the National Grid substation extension works.
455. Water vole territories can extend up to 500m, as such water voles may be active adjacent to the National Grid substation extension. There is a risk of killing or injuring water voles which are undertaking bankside foraging adjacent to the laydown area. There is also a risk of habitat degradation due to pollutant release during the construction phase. Noise and visual disturbance are unlikely to have a significant effect on water voles (Dean *et al.*, 2016). The construction phase works will affect approximately 5% of the available foraging habitat within the drainage network at this location. As such, the magnitude of effect is anticipated to be low.

22.7.6.11.5 *Impact without mitigation*

456. Without mitigation, the greatest effect arising from one element of the onshore project area is medium magnitude on a medium importance receptor, resulting in an impact of at worst **moderate adverse** significance.

Unsurveyed areas

457. Assuming that water voles are found within the unsurveyed areas, without mitigation, the greatest effect arising from one element of the onshore project area is medium magnitude on a medium importance receptor, resulting in an impact of at worst **moderate adverse** significance.

22.7.6.11.6 *Mitigation*

458. In order to minimise the direct effects upon water voles during the construction phase, the following mitigation measures will be implemented:
- For works at watercourses WV14 and WV15 (both Penny Spot Beck), displacement under licence of the width of the cable route (i.e. 45m) will be conducted prior to works. Displacement will follow the protocol set out in Appendix 1 of the Water Vole Mitigation Handbook (2016). Details of this protocol will be agreed with Natural England in advance of construction.
 - A pre-construction survey will be undertaken prior to work to identify the current distribution of water voles within the habitat and species study area.
 - Post-construction monitoring during breeding season one year after completion

of construction will be undertaken to determine the status of the water vole population.

- Habitats will be fully reinstated following works. The guidelines for habitat restoration set out in Water Vole Mitigation Handbook (2016) will be adhered to.
- For works to habitats immediately adjacent to WV05, a pre-construction survey will be undertaken to ensure that the water vole populations have not changed. If no field signs of water voles are found within 50m of the project, no further mitigation is required.

459. These measures are captured within the OLEMS (document reference 8.7).

Unsurveyed areas

460. A pre-construction survey of the two inaccessible watercourses plus the potential additional eight watercourses will be undertaken post-consent.

461. For all watercourses where signs of water vole activity are found, the mitigation set out above would be adhered to.

22.7.6.11.7 Impact following mitigation

462. Following implementation of these mitigation measures, the potential magnitude of effect on water voles is reduced to at most low, and an impact of **minor adverse** significance would remain following mitigation.

Unsurveyed areas

463. Following implementation of these mitigation measures, the potential magnitude of effect on water voles within the unsurveyed areas is reduced to at most low, and an impact of **minor adverse** significance would remain following mitigation.

22.7.6.12 Impact 12: Otter

22.7.6.12.1 Landfall

464. There are no watercourses or coastal areas within or adjacent to the landfall which are suitable for otter. As such there will be no change upon otter due to the proposed landfall works.

22.7.6.12.2 Onshore cable route

465. No otter holts or resting places were recorded within the habitat and species study area. A total of seven watercourses within the onshore cable route were assessed as being suitable to support commuting otter, with evidence of otter noted at the River Bure, River Wensum (and associated drains) and the North Walsham and Dilham Canal.

466. All seven of these watercourses will be subject to trenchless crossing techniques (e.g. HDD) as part of embedded mitigation to avoid potential impacts at these locations. As a consequence, no direct effects upon otters are anticipated.
467. There is a potential for indirect effects on otters from due to noise and lighting associated with the construction phase works. This will occur for the maximum duration of the trenchless crossing works element of the construction phase (approximately eight weeks) and for a further 16 weeks during the two year cable pull element of the construction phase at any one location. As otter territories are very large (up to 30km) and these effects will be short-term and extremely localised, and not near any confirmed otter resting sites, this is likely to produce an effect of negligible magnitude.

22.7.6.12.3 *Onshore project substation*

468. There are no watercourses within or adjacent to the onshore project substation which are suitable for otters. As such there will be no change upon otters due to the proposed onshore project substation works.

22.7.6.12.4 *National Grid substation extension and overhead line modifications*

469. There is one watercourse adjacent to the National Grid substation extension zone which is assessed as being suitable for otters, with one potentially suitable otter resting place being identified at TN12 (Figure 22.5). No otter field signs were observed at this location, so this is not considered to be an active otter resting place. As such, no direct effects will occur.
470. There is a potential for indirect effects on otters from noise and lighting associated with the construction works. This will occur for a maximum of duration of the National Grid substation extension and overhead line modifications element of the construction phase (up to 30 months). As otter territories are very large (up to 30km) and these effects will be short-term and extremely localised, and not near any confirmed otter resting sites, this is likely to produce an effect of negligible magnitude.

22.7.6.12.5 *Impact without mitigation*

471. Without mitigation, the greatest effect arising from one element of the onshore project area is of negligible magnitude on a high importance receptor, resulting in an impact of at worst **minor adverse** significance.

22.7.6.12.6 *Mitigation*

472. In order to minimise the indirect effects upon otters during the construction phase, the following mitigation measures will be implemented:
- Wherever possible, night-time working near watercourses will be avoided or else minimised; and

- Exit ramps from excavations will be provided at night near watercourses with confirmed presence, so provide otters with a means of escape.

473. The measures are captured within the OLEMS (document reference 8.7).

22.7.6.12.7 *Impact following mitigation*

474. Following implementation of these mitigation measures, the potential magnitude of effect on otters remains negligible, and an impact of **minor adverse** significance remains following mitigation.

22.7.6.13 *Impact 13: Great crested newt*

22.7.6.13.1 *Landfall*

475. There are no standing water bodies within 500m of the landfall works. As such there will be no change upon great crested newts due to the proposed landfall works.

22.7.6.13.2 *Onshore cable route*

476. There is one water body located within the onshore project area which is suitable for supporting great crested newts or in which great crested newts have been found (water body TF9614-154; see Figure 22.6). Embedded mitigation has led to trenchless techniques (e.g. HDD) being proposed at this location. As a consequence, this breeding pond will not be directly affected during the construction phase.

477. There are three water bodies located within 250m of the temporary works along the cable route which have been found to support breeding populations of great crested newts.

478. For water bodies located within 250m of the temporary works, the following impacts may occur:

- Risk of killing or injuring foraging newts during the construction phase;
- Temporary habitat loss of a negligible amount of suitable habitat (<0.1ha) due to physical features in the landscape separating these ponds from the onshore project area (see Figure 22.6) for approximately two years plus a further 16 weeks during the two year cable pull element of the construction phase; and
- Temporary habitat fragmentation of a negligible amount of suitable habitat (<0.1ha) for approximately two years plus a further 16 weeks over three years during the construction phase.

479. The landscape surrounding the three ponds where presence has been found indicates that it is very unlikely that the onshore project area overlaps with the terrestrial ranges of individuals using these breeding ponds. Ponds TF9614-154 and TF9614-155 are separated from the onshore project area by flowing water (the Wendling Beck) and a minor road and TG0721-256 is located approximately 160m from the onshore project area and is located within a domestic garden and

surrounded by localised barrier to movement. In light of this and based on the survey information to date, it is considered unlikely that great crested newts are actively foraging within onshore project area. The low likelihood of impact in addition to the localised and small scale nature of the effect represents an impact of negligible magnitude.

Unsurveyed areas

480. There are six unsurveyed water bodies located within the onshore project area. The location of these water bodies is shown on Figure 22.6. One of these will be avoided through the use of trenchless techniques (TF9614-147).

481. There are a further 114 unsurveyed standing water bodies located within 250m of the temporary works along the cable route. Under a precautionary approach, it is therefore assumed at this time that these water bodies potentially support great crested newts.

482. For the 120 standing water bodies identified above, the following impacts may occur:

- Risk of killing or injuring breeding and foraging newts during the construction phase;
- Permanent habitat loss of up to five potential breeding ponds;
- Temporary habitat loss of approximately 4.65ha of suitable habitat (including grassland foraging habitat, woodland edges for hibernation, areas of scrub and other marginal habitats) for approximately two years plus a further 16 weeks during the two year cable pull element of the construction phase; and
- Temporary habitat fragmentation for approximately two years plus a further 16 weeks over three years during the construction phase.

483. These potential effects, if found to occur, will occur on a large spatial scale across the county. As a consequence this represents a high magnitude of effect.

22.7.6.13.3 Onshore project substation

484. There are no water bodies located within the onshore project substation which are suitable for supporting great crested newts or in which great crested newts have been found.

485. There is one water body located within 500m of the permanent works along at the onshore project substation which has been found to support breeding populations of great crested newts (see Figure 22.6).

486. For this water body located within 500m of the temporary works, the following impacts may occur:

- Risk of killing or injuring foraging newts during the construction phase;

- Temporary loss of a negligible amount of suitable habitat (<0.1ha) due to physical features in the landscape separating these ponds from the onshore project area (see Figure 22.6) for approximately 30 months; and
- Temporary habitat fragmentation of a negligible amount of suitable habitat (<0.1ha) for approximately 30 months.

487. The landscape surrounding the pond where presence has been found indicates that it is very unlikely that the onshore project area overlaps with the territorial ranges of individuals using these breeding ponds. Pond TF9010-50 is located approximately 230m from the onshore substation temporary works area (see Figure 22.6), which is located within arable habitat (suboptimal for foraging newts) and is separated from that area by a hedgerow habitat. In light of this, based on the survey information to date it is considered unlikely that great crested newts are actively foraging within onshore project area. The low likelihood of occurrence in addition to its localised and small scale nature represents an effect of negligible magnitude.

Unsurveyed areas

488. There are no unsurveyed water bodies located within the footprint of the onshore substation.
489. There are two unsurveyed standing water bodies located within 500m of the temporary works at the onshore substation. Under a precautionary approach, it is therefore assumed at this time that these water bodies support great crested newts.
490. For both of these standing water bodies, the following impacts may occur:
- Risk of killing or injuring breeding and foraging newts during the construction phase; and
 - Temporary habitat loss of approximately 30m of suitable habitat (hedgerow foraging habitat) for approximately two years plus a further 16 weeks during the two year cable pull element of the construction phase.
491. The landscape surrounding these two ponds indicates that it is very unlikely that the onshore project area overlaps with the terrestrial ranges of potential great crested newts using these ponds. Pond TF9010-31 is located adjacent to Necton Wood, which represents higher quality foraging and hibernating habitat and 150m from the onshore substation, separated from it by an arable field; TF9009-33 is located approximately 400m from the onshore project area and is surrounded by scrub and hedgerows (see Figure 22.6). On this basis it is considered unlikely that great crested newts are actively foraging within the onshore substation. The low likelihood of great crested newts being present in addition to the localised and small scale nature of the effect represents an effect of negligible magnitude.

22.7.6.13.4 *National Grid substation extension and overhead line modifications*

492. There are no water bodies located within or up to 500m of the National Grid substation extension and overhead line modifications which are suitable for supporting great crested newts or in which great crested newts have been found. As such there will be no change upon great crested newts due to the National Grid substation extension and overhead line modifications.

Unsurveyed areas

493. There are no unsurveyed water bodies located within the National Grid substation extension and overhead line modifications. There are eight unsurveyed water bodies located within 500m of the permanent works at the National Grid substation extension and overhead line modifications. The location of these water bodies is shown on Figure 22.6. Under a precautionary approach, it is therefore assumed at this time that these water bodies support great crested newts.

494. For these eight water bodies, the following impacts may occur:

- Risk of killing or injuring breeding and foraging newts during the construction phase; and
- Temporary habitat loss of approximately 900m of suitable habitat (hedgerow foraging habitat along the A47) for approximately two years plus a further 16 weeks during the two year cable pull window.

495. These potential effects, if realised, would occur on a local scale to one or two discrete populations. As a consequence, this represents a low magnitude of effect.

22.7.6.13.5 *Impact without mitigation*

496. Without mitigation, the greatest magnitude arising from one element of the onshore project area is negligible magnitude on a high importance receptor, resulting in an impact of at worst **minor adverse** significance.

Unsurveyed areas

497. Without mitigation, the greatest potential magnitude arising from one element of the onshore project area is high magnitude on a high importance receptor, results in an impact of at worst **major adverse** significance.

22.7.6.13.6 *Mitigation*

498. A pre-construction presence / absence survey of all water bodies located within 250m of onshore project area and 250m of each confirmed breeding pond will be undertaken post-consent, one year in advance of construction to ensure that the local great crested newt population distribution has not changed. As a presence / absence survey, eDNA methods would be suitable.

499. As the likelihood of encountering great crested newts during construction is low, but a risk of killing or injuring great crested newts exists, a precautionary method of working (PMoW) will be followed during the construction phase in areas within 250m of all confirmed breeding ponds (TF9614-154, TF9614-155, TG0721-256 and TF9010-50). The PMoW will be agreed with Natural England prior to construction, and would include details of the locations of terrestrial habitat affected surrounding identified great crested newt breeding ponds, habitat manipulation and reinstatement required, and ecological supervision of the works.
500. These measures are captured within the OLEMS (document reference 8.7).

Unsurveyed areas

501. Six water bodies located within the onshore project area plus 124 water bodies located within the great crested newt study area (i.e. a total of 130 water bodies) were not surveyed during the 2017 Great Crested Newt Surveys and will be surveyed during the post-consent survey effort to confirm whether they support breeding populations of great crested newts.
502. Should great crested newts be found within these water bodies, then mitigation will be required. Potential worst case mitigation measures which might be required are set out within the Norfolk Vanguard draft great crested newt mitigation licence application, which has been drafted and consulted upon with Natural England. The measures outlined within that draft licence application are in accordance with the Great Crested Newt Mitigation Guidelines (English Nature, 2001) and include:
- A capture and release programme under licence, including the use of exclusion fencing, receptor sites for translocation;
 - Terrestrial and aquatic habitat reinstatement;
 - Ecological supervision of the works; and
 - A programme of post-construction monitoring.
503. Based on the draft great crested newt mitigation licence application, a Letter of No Impediment (dated 29th June 2018) has been provided confirming that Natural England see no impediment to issuing a licence in the future (following submission of a final updated application). The need for a final great crested newt mitigation licence application following post-consent surveys of the 130 unsurveyed water bodies will be agreed with Natural England via consultation post-consent. The agreed approach would be in accordance with the Great Crested Newt Mitigation Guidelines (English Nature, 2001).
504. All ecological management proposals are captured within the OLEMS (document reference 8.7).

505. Following consultation with Natural England held in March 2018, the project has discussed retaining the option to use ‘alternative’ approaches to delivering great crested newt mitigation under Natural England’s new licensing policies (Policies ‘1’ and ‘2’) which have been in place since December 2016 (Natural England, 2016). These policies allow for the opportunity to undertake habitat creation or restoration both onsite and offsite (i.e. away from the development site boundary) as alternative to trapping, translocating and excluding newts, provided it can be proven that this action is more likely to improve the conservation status of the species, and that other criteria set out in the policies can be met. Following these discussions, the project has agreed to retain the option of using alternative approaches to delivering great crested newt mitigation under Natural England’s new licensing policies alongside the ‘traditional’ approach outlined earlier in this section. At this stage, only the principles of such an alternative approach have been proposed. In summary, these are:

- **Breeding ponds:** Where direct impacts on confirmed breeding ponds (of any population size) are anticipated, traditional mitigation methods including fencing and trapping (ring-fencing) will be undertaken. However, rather than recreating the ponds within the onshore project area, it is proposed that habitat enhancement / pond restoration measures are undertaken within 500m of those breeding ponds affected. Further surveys will be required to support this approach.
- **Terrestrial habitats:** Where direct impacts upon terrestrial habitats are anticipated, it is recommended that unless a medium or high population has been recorded, or the pond is located within 50m of the onshore project area, exclusion fencing is not required. Where this is identified, instead habitat enhancement / pond restoration measures are undertaken within 500m of those breeding ponds affected. Further surveys will be required in order to support this approach.
- The location of all offsite mitigation would be identified in partnership with the Norfolk Ponds Project (NPP) and Norfolk Farming and Wildlife Advisory Group (Norfolk FWAG). Where habitat creation is considered, the location of ‘ghost pond’ sites would be considered (Alderton et al., 2017).

506. The final detailed approach to great crested newt mitigation will be agreed with Natural England via consultation over a final great crested newt mitigation licence post-consent.

22.7.6.13.7 *Impact following mitigation*

507. Following implementation of these mitigation measures, the magnitude of effect on great crested newts remains negligible, and an impact of **minor adverse** significance will be expected following mitigation.

Unsurveyed areas

508. Following implementation of these mitigation measures, the potential magnitude of effect on great crested newts is reduced to low, resulting in an impact of **moderate adverse** significance will be expected following mitigation.

22.7.6.14 Impact 14: Reptiles

22.7.6.14.1 Landfall

509. No suitable habitats for reptiles were identified during the 2017 Extended Phase 1 Habitat Survey at the landfall and as such no change upon common reptile species is anticipated to arise due to the proposed landfall works.

22.7.6.14.2 Onshore cable route

510. Small numbers of common reptile species have been recorded using the following five locations within the habitat and species study area: RE01, RE04, RE12, RE13, RE21 (see Figure 22.10). Of these, RE04, RE12 and RE13 are located within the onshore project area. In all three of these locations, the onshore cable route is located outside of the optimal habitat for reptiles (e.g. within arable habitat adjacent to semi-natural broadleaved woodland, in which reptiles had been recorded).
511. The construction phase works could risk killing or injuring reptiles which are active within habitats adjacent to the habitat mosaics within which they have been recorded. These risks will occur for approximately two years (duct installation) plus a further 16 weeks during the following two year cable pull element of the construction phase, and therefore will be long-term for common reptiles' life-cycle. As the populations recorded in all areas of the route are small, the magnitude of impact is anticipated to be low.
512. Habitat loss and habitat fragmentation are considered unlikely to occur given that in all instances where reptiles have been recorded much more suitable habitat is found outside of the onshore project area.

Unsurveyed areas

513. An additional six areas have been identified using the Norfolk Living Map and aerial photography, as potentially providing suitable habitat for reptiles, primarily due to the presence of suitable habitat mosaics. Two areas of habitat mosaics were identified during the 2017 Extended Phase 1 Habitat Survey but due to landowner access restrictions, these areas were unable to be surveyed during the 2017 survey effort. The potential exists therefore for the construction phase works to give rise to the following impacts at these locations:
- A risk of killing or injuring reptiles which are active within habitats within the onshore project area;
 - A risk of habitat loss at eight reptile habitat mosaics; and

- A risk of habitat fragmentation at eight reptile habitat mosaics.

514. The impacts will occur approximately two years (duct installation) plus a further 16 weeks during the following two year cable pull element of the construction phase, and therefore will be long-term for common reptiles' life-cycle. As the populations recorded in all areas of the route are currently unknown and may potentially be high, the magnitude of impact is anticipated to be medium.

22.7.6.14.3 *Onshore project substation*

515. No suitable habitats for reptiles were identified during the 2017 Extended Phase 1 Habitat Survey within or adjacent to the onshore project substation. As such there will be no change to common reptile species due to the proposed onshore project substation works.

22.7.6.14.4 *National Grid substation extension and overhead line modifications*

516. No suitable habitats for reptiles were identified during the 2017 Extended Phase 1 Habitat Survey within or adjacent to the National Grid substation extension zone. As such there will be no change to common reptile species due to the proposed onshore project substation works.

Unsurveyed areas

517. Suitable habitat for common reptiles has not been identified based on the Norfolk Living Map and aerial photography within the unsurveyed areas of the National Grid substation extension and overhead line modifications. As such, no change is anticipated upon reptiles within this area.

22.7.6.14.5 *Impact without mitigation*

518. Without mitigation, the greatest effect arising from one element of the onshore project area is low magnitude on a medium importance receptor, resulting in an impact of at worst **minor adverse** significance.

Unsurveyed areas

519. Without mitigation, the greatest effect arising from one element of the onshore project area is high magnitude on a medium importance receptor, resulting in an impact of at worst **moderate adverse** significance.

22.7.6.14.6 *Mitigation*

520. The numbers of reptiles potentially affected is small but a risk of killing or injuring these reptiles exists. As such, a PMoW will be followed during the construction phase in those locations where reptiles have been recorded. The PMoW will be agreed with Natural England prior to construction, and will include details of pre-construction habitat manipulation, ecological supervision, and post-construction habitat reinstatement.

521. Details of the proposed PMoW are provided within the OLEMS (document reference 8.7).

Unsurveyed areas

522. If small populations of reptiles are found within the unsurveyed areas of suitable habitat mosaics, then the PMoW would also be implemented for these sites. If high populations of reptiles are found, then in addition to the adherence to the PMoW, a capture and release programme would also be implemented. The details of a capture and release programme would be drafted following the Reptile Mitigation Guidelines (Natural England, 2011) and agreed with Natural England in advance of works.
523. This approach to unsurveyed areas is captured within the OLEMS (document reference 8.7).

22.7.6.14.7 Impact following mitigation

524. Following implementation of these mitigation measures, the potential magnitude of effect on common reptiles is reduced to negligible. As a consequence, a residual impact of **minor adverse** significance is expected to remain following mitigation.

Unsurveyed areas

525. Following implementation of these mitigation measures, the potential magnitude of effect on common reptiles is reduced to a negligible. As a consequence, a residual impact of **minor adverse** significance is expected to remain following mitigation.

22.7.6.15 Impact 15: White-clawed crayfish

22.7.6.15.1 Landfall

526. There are no watercourses within or adjacent to the landfall which are suitable for white-clawed crayfish. As such there will be no change upon white-clawed crayfish due to the proposed landfall works.

22.7.6.15.2 Onshore cable route

527. There are two watercourses within the survey area, the River Wensum and the River Bure, which support white-clawed crayfish in reaches outside of the habitat and species study area. Both of these watercourses will be subject to trenchless crossing techniques (e.g. HDD) as part of embedded mitigation to avoid potential impacts at these locations. As such there will be no impact upon white-clawed crayfish associated with the onshore cable route.

22.7.6.15.3 Onshore project substation

528. There are no watercourses within or adjacent to the onshore project substation which are suitable for white-clawed crayfish. As such there will be no impact upon white-clawed crayfish due to the proposed onshore project substation works.

22.7.6.15.4 *National Grid substation extension and overhead line modifications*

529. There are no watercourses within or adjacent to the National Grid substation extension and overhead line modifications which are suitable for white-clawed crayfish. As such there will be no impact upon white-clawed crayfish due to the National Grid substation extension and overhead line modifications.

22.7.6.15.5 *Impact without mitigation*

530. As there is no pathway, there is anticipated to be **no impact** upon this receptor during the construction phase.

22.7.6.15.6 *Mitigation*

531. As there is no impact upon this receptor, no mitigation is proposed.

22.7.6.16 *Impact 16: Other invertebrates*

22.7.6.16.1 *Landfall, onshore project substation, National Grid substation extension and overhead line modifications*

532. There are no suitable habitats within or adjacent to the landfall, onshore project substation, National Grid substation extension and overhead line modifications which are suitable for Desmoulin's whorl snail or the Norfolk hawkers. As such there will be no impact upon these receptors.

22.7.6.16.2 *Onshore cable route*

533. The Desmoulin's whorl snail is a qualifying feature of the River Wensum SAC. Consideration of the potential impacts upon this species is set out in section 22.7.6.1. As detailed in section 22.7.6.1, the 2017 survey did not record the presence of this species and therefore it is considered to be absent from within the onshore project area (i.e. the floodplain habitat on the southern bank of the River Wensum), and as such no impact is anticipated upon this receptor during the construction phase. The HRA Report submitted with the DCO application provides full details of the potential effects upon the River Wensum SAC.

534. The Norfolk Hawker has been recorded in drainage ditches adjacent to the River Bure. The ditch where the Norfolk hawkers has been recorded and other suitable drainage ditches within the floodplain of the River Bure will be crossed using trenchless crossing techniques (e.g. HDD) as part of the embedded mitigation measures to avoid potential impacts to the River Bure. As a consequence, there is anticipated to be no change upon this receptor during the construction phase.

Unsurveyed areas

535. The unsurveyed areas of suitable habitat for Desmoulin's whorl snail adjacent of the River Wensum (i.e. the floodplain habitat on the northern bank) are being avoided through the use of trenchless crossing techniques, therefore direct effects will not occur. Indirect effects are anticipated to be of at most low magnitude. The HRA

Report submitted with the DCO application provides full details of the potential effects upon the River Wensum SAC.

22.7.6.16.3 *Impact without mitigation*

536. As these species are either not present or being avoided through embedded mitigation, **no impact** is anticipated upon these receptors.

Unsurveyed areas

537. If Desmoulin's whorl snails are present in the drains on the northern bank of the River Wensum, there is anticipated to be low magnitude effect on a high value receptor, resulting in **moderate adverse** impact upon this receptor during the construction phase.

22.7.6.16.4 *Mitigation*

Unsurveyed areas

538. A survey of the northern bank of the River Wensum will be undertaken post-consent once landowner access becomes available.
539. The mitigation set out in section 22.7.6.1 will be applied to all works within the River Wensum floodplain (whether or not Desmoulin's Whorl Snail is found within the floodplain habitat on the northern bank).

22.7.6.16.5 *Impact following mitigation*

Unsurveyed areas

540. Following implementation of these mitigation measures, the risk of indirect effects upon the Desmoulin's whorl snail, if present, is reduced to a negligible magnitude. As a consequence, a residual impact of **minor adverse** significance is expected to remain following mitigation.

22.7.6.17 *Impact 17: Fish*

22.7.6.17.1 *Landfall, onshore project substation, National Grid substation extension and overhead line modifications*

541. There are no suitable habitats within or adjacent to the landfall, onshore project substation, National Grid substation extension and overhead line modifications which are suitable for notable fish species. As such there will be no change upon these receptors.

22.7.6.17.2 *Onshore cable route*

542. Notable fish species have been identified in number of watercourses crossing the onshore cable route. The potential effects upon these species are summarised in Table 22.27.

Table 22.27 Potential effects upon notable fish species

Watercourse	Species recorded	Record location	Potential effects
Wendling Beck	Bullhead Brown Trout	Within the habitats and species study area	Avoided through trenchless crossing techniques – indirect effects only
Penny Spot Beck	Bullhead Brown Trout	Within the habitats and species study area	Avoided through trenchless crossing techniques – indirect effects only
River Wensum	Bullhead Brown Trout Brook lamprey	Upstream and downstream of the habitats and species study area	Avoided through trenchless crossing techniques – indirect effects only
Reepham Stream (western branch)	Bullhead	Upstream of the habitats and species study area	Crossed using trenched techniques – potential direct effects
Reepham Stream (eastern branch)	Bullhead	Upstream of the habitats and species study area	Crossed using trenched techniques – potential direct effects
Booton Watercourse	Brown trout	Upstream and downstream of the habitats and species study area	Crossed using trenched techniques – potential direct effects
River Bure	Bullhead Brown Trout Brook lamprey	Upstream and downstream of the habitats and species study area	Avoided through trenchless crossing techniques – indirect effects only
King's Beck	Brown Trout Brook lamprey	Upstream and downstream of the habitats and species study area	Avoided through trenchless crossing techniques – indirect effects only

543. Potential direct effects upon bullhead and brown trout may occur at the following watercourses:

- Reepham Stream (western branch);
- Reepham Stream (eastern branch); and
- Booton Watercourse.

544. These works may potentially give rise to loss of spawning grounds for brown trout and bullhead during the construction phase during trenching works at these three locations. Works will take place over one week at each of these locations, so the potential effect will be short term and localised. The magnitude of the effect is therefore low.

545. Potential indirect effects upon these fish species may occur at the eight watercourses listed in Table 22.27. These include risk of pollutant release and increased sediment runoff from works adjacent to these watercourses. These effects are described in full in section 22.7.6.1. There is a potential effect of indirect magnitude upon these receptors arising from indirect effects.

22.7.6.17.3 *Impact without mitigation*

546. As an effect of at most low magnitude upon at most a high value receptor, and impact of **moderate adverse** significance is anticipated upon these receptors.

22.7.6.17.4 *Mitigation*

547. Prior to construction, a survey of the three locations outlined above will be undertaken to assess the suitability of the substrate at these locations for supporting spawning bullhead and brown trout.
548. If suitable habitat for these species is identified, appropriate mitigation (such as ecological supervision during works, timing of works to avoid sensitive seasons or micro-siting) would be agreed with Natural England post-consent.
549. The mitigation set out in section 22.7.6.1 will be applied to all works adjacent to the watercourses in Table 22.27 in order to mitigate and potential indirect effects.

22.7.6.17.5 *Impact following mitigation*

550. Following implementation of these mitigation measures, the risk of direct and indirect effects upon notable fish species, is reduced to a negligible magnitude. As a consequence, a residual impact of **minor adverse** significance is expected to remain following mitigation.

22.7.6.18 *Impact 18: Protected flora*

22.7.6.18.1 *Landfall, onshore project substation, National Grid substation extension and overhead line modifications*

551. There are no suitable habitats within or adjacent to the landfall, onshore project substation or National Grid substation extension and overhead line modifications which are suitable for the species which support the species of the River Wensum SAC qualifying feature watercourses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation. As such there will be no change upon this receptor.

22.7.6.18.2 *Onshore cable route*

552. The River Wensum will be crossed using trenchless crossing techniques (e.g. HDD) as part of embedded mitigation to avoid potential impacts at these locations. The possibility that the species which support watercourses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation may also be

present in the marginal vegetation within watercourses within the River Wensum floodplain was surveyed as part of the 2017 detailed botanical surveys of these habitats. These species were not found to be present. As a consequence, no change upon this receptor is anticipated. Potential impacts upon this species are described in full in section 22.7.6.1, and within the HRA Report submitted with the DCO application.

22.7.6.18.3 *Impact without mitigation*

553. As notable flora species have not been identified within the habitats and species study area, **no impact** upon these species is anticipated.

22.7.6.18.4 *Mitigation*

554. As there is no impact on this receptor, no mitigation is proposed. Good construction practice measures will be used when working within the River Wensum floodplain, and these are described in section 22.7.6.1.

22.7.6.19 *Impact 19: Invasive non-native species*

22.7.6.19.1 *Landfall*

555. There are no invasive non-native species recorded within or adjacent to the landfall. As the construction will involve bringing in plant and equipment to the habitats and species study area, including plant which will be used in other areas of the onshore project area where presence of invasive species is known to occur, there is a risk of releasing non-native species into the habitats and species study area during the construction phase. The risk of introducing non-native species over the long term is anticipated to have an effect of medium magnitude.

22.7.6.19.2 *Onshore cable route*

556. The invasive species American mink and signal crayfish have been recorded on the River Wensum. There is no risk of releasing American mink into other locations, as this species will not be transferred by construction plant. The River Wensum will be crossed using trenchless crossing techniques (e.g. HDD) as embedded mitigation, and as such there is no risk of releasing signal crayfish into other areas of the habitats and species study area at these locations. The following two watercourses have also been identified within the study area as supporting signal crayfish (see Chapter 20 Water Resources and Flood Risk for locations of these watercourses):

- Blackwater drain; and
- Reephams Stream.

557. These watercourses are proposed to be crossed using trenching methods. As such any plant working in these watercourses will be at risk of transporting and releasing signal crayfish between areas of the cable route, or carrying or transferring crayfish plague. The risk of introducing signal crayfish or crayfish plague to other areas of the

cable route over the long term is anticipated to have an effect of medium magnitude.

558. There is a risk of the construction phase works causing the Japanese knotweed at TN291 (see Figure 22.5) to spread to other areas of the habitats and species study area during construction. The risk of introducing non-native species over the long term is assessed as an effect of medium magnitude.

Unsurveyed areas

559. Approximately 50% of the onshore cable route has been surveyed for invasive non-native species, so the presence of further invasive non-native species cannot be ruled out completely at this stage. If invasive species are found in these areas, the risk of spreading further non-native invasive species to other areas of the habitats and species study area during construction exists, which will also represent in an effect of medium magnitude.

22.7.6.19.3 Onshore project substation

560. There are no invasive non-native species recorded within or adjacent to the onshore project substation. As the construction works will involve bringing in plant and equipment to the habitats and species study area, including plant which will be used in other areas of the onshore project area where presence of invasive species is known to occur, there is a risk of releasing non-native species into the habitats and species study area during the construction phase. The risk of introducing non-native species over the long term is assessed as an effect of medium magnitude.

22.7.6.19.4 National Grid substation extension and overhead line modifications

561. There are no invasive non-native species recorded within or adjacent to the National Grid substation extension and overhead line modifications. As the construction works will involve bringing in plant and equipment to the habitats and species study area, including plant which will be used in other areas of the onshore project area where presence of invasive species is known to occur, there is a risk of releasing non-native species into the habitats and species study area during the construction phase. The risk of introducing non-native species over the long term is assessed as an effect of medium magnitude.

Unsurveyed areas

562. Not all of the National Grid substation extension and overhead line modifications has been surveyed for invasive non-native species, so the presence of invasive non-native species cannot be ruled out. If invasive species are found, the risk of spreading non-native invasive species to other areas of the habitats and species study area during construction exists, which will also represent an effect of medium magnitude.

22.7.6.19.5 *Impact without mitigation*

563. Without mitigation, the greatest effect arising from one element of the onshore project area is medium magnitude on a medium importance receptor, and results in an impact of at worst **moderate adverse** significance.

Unsurveyed areas

564. Without mitigation, the greatest potential effect arising from one element of the onshore project area is medium magnitude on a medium importance receptor, and results in an impact of at worst **moderate adverse** significance.

22.7.6.19.6 *Mitigation*

565. The following mitigation will be undertaken:

- The unsurveyed areas will be surveyed as part of the post-consent survey effort, and the locations of all stands of invasive species will be recorded and their extent mapped.
566. Prior to construction, an Invasive Species Management Plan will be developed. This plan will be agreed with the Environment Agency and Natural England in advance of construction and would include the following:
- A plan of all invasive species locations and extents;
 - A protocol for removing the Japanese knotweed stand east of the River Bure and for managing the waste generated;
 - Good site practice measures for managing the spread of invasive species;
 - Good site practice measures for managing the spread of invasive species during works at watercourses;
 - A requirement for an Ecological Clerk of Works (ECoW) and details of their responsibilities with respect to non-native invasive species.
567. The Invasive Species Management Plan will form part of the project CoCP. Further details of the content of which will go into the Invasive Species Management Plan are set out in the OCoCP (document reference 8.1) provided with the DCO application.

22.7.6.19.7 *Impact following mitigation*

568. Following implementation of these mitigation measures, the risk of spreading invasive species, is reduced to a low magnitude effect. As a consequence, a residual impact of **minor adverse** significance is expected to remain following mitigation.

Unsurveyed areas

569. As above, following implementation of these mitigation measures, the risk of spreading invasive species, is reduced to a low magnitude effect. As a consequence, a residual impact of **minor adverse** significance is expected to remain following mitigation.

22.7.7 Potential Impacts during Operation

22.7.7.1 Impact 1: Disturbance to habitats and species from maintenance activities

22.7.7.1.1 Onshore project substation

570. Routine maintenance of the onshore project substation will require one visit per week, involving a single vehicle and staff during daylight hours. As a consequence, disturbance from noise and human presence (above general operational movements on and off site) is predicted to be of negligible magnitude and to only affect receptors in the immediate vicinity of the onshore project substation.

22.7.7.1.2 National Grid substation extension

571. Routine maintenance of the National Grid substation extension will require one visit per week, involving a single vehicle and staff during daylight hours. As a consequence, disturbance from noise and human presence (above general operational movements on and off site) is predicted to be of negligible magnitude and to only affect receptors in the immediate vicinity of the National Grid substation extension.

22.7.7.1.3 Impact without mitigation

572. Without mitigation, the greatest effect arising from one element of the onshore project area is negligible magnitude on at worst high importance receptors, resulting in an impact of at worst **minor adverse** significance.

22.7.7.1.4 Mitigation

573. Mitigation is not required as the magnitude of effect upon ecological receptors is already negligible.

22.7.7.2 Impact 2: Disturbance to fauna from operational lighting and noise

22.7.7.2.1 Onshore project substation

574. Operational lighting at the onshore project substation will be provided for operations and maintenance activities only, and under normal conditions it will not be lit. As a consequence, disturbance from lighting (above general operational movements on and off site) is predicted to be of negligible magnitude and to only affect receptors in the immediate vicinity of the onshore project substation.

22.7.7.2.2 National Grid substation extension

575. Routine maintenance of the National Grid substation extension will require approximately one visit per month, involving a single vehicle and staff during daylight hours. As a consequence, disturbance from noise and human presence (above general operational movements on and off site) is predicted to be of negligible magnitude and to only affect receptors in the immediate vicinity of the National Grid substation extension.

22.7.7.2.3 *Impact without mitigation*

576. Without mitigation, the greatest effect arising from one element of the onshore project area is negligible magnitude on at worst high importance receptors, resulting in an impact of at worst **minor adverse** significance.

22.7.7.2.4 *Mitigation*

577. A lighting scheme will be designed for the final design for the permanent infrastructure, which will include measures to minimise light spill and be designed in line with the 'Bats and Lighting in the UK' guidance (BCT, 2009).

22.7.7.2.5 *Impact following mitigation*

578. Following implementation of these mitigation measures, the magnitude of effect will remain negligible. As a consequence, a residual impact of **minor adverse** significance is expected to remain following mitigation.

22.7.8 Potential Impacts during Decommissioning

579. This section describes the potential impacts of the decommissioning of the onshore project area with regards to impacts on onshore ecology. The decommissioning of the project will be as required by the requirements in the DCO. Further details are provided in Chapter 5 Project Description.

580. No decision has been made regarding the final decommissioning policy for the onshore cables, as it is recognised that industry best practice, rules and legislation change over time. It is likely the cables will be pulled through the ducts and removed, with the ducts themselves left in situ.

581. In relation to the substation, the programme for decommissioning is expected to be similar in duration to the construction phase. The detailed activities and methodology will be determined later within the project lifetime, but are expected to include:

- Dismantling and removal of outside electrical equipment from site located outside of the onshore project substation buildings;
- Removal of cabling from site;
- Dismantling and removal of electrical equipment from within the onshore project substation buildings;
- Removal of onshore project substation building and minor services equipment;
- Demolition of the support buildings and removal of fencing;
- Landscaping and reinstatement of the site (including land drainage); and
- Removal of areas of hard standing.

582. Whilst details regarding the decommissioning of the onshore project substation are currently unknown, considering the worst case scenario which will be the removal

and reinstatement of the current land use at the site, it is anticipated that the impacts will be similar to those during construction.

583. The decommissioning methodology will need to be finalised nearer to the end of the lifetime of the project so as to be in line with current guidance, policy and legislation at that point. Any such methodology will be agreed with the relevant authorities and statutory consultees. The decommissioning works could be subject to a separate licencing and consenting approach.

22.8 Cumulative Impacts

584. The assessment of cumulative impact has been undertaken here as a two stage process. Firstly, all the impacts from previous sections have been assessed for potential to act cumulatively with other projects. This summary assessment is set out in Table 22.28.

Table 22.28 Potential cumulative impacts

Impact		Potential for cumulative impact	Rationale
Construction			
1	Statutory designated sites	Yes	Impacts to interest features of designated sites may be exacerbated by other projects
2	Non-statutory designated sites	Yes	Impacts to interest features of designated sites may be exacerbated by other projects
3	Arable land	Yes	Loss of habitat due to other projects may increase the cumulative loss of habitat within the county
4	Woodland, trees and scrub	Yes	Loss of habitat due to other projects may increase the cumulative loss of habitat within the county
5	Hedgerows	Yes	Loss of habitat due to other projects may increase the cumulative loss of habitat within the county
6	Grassland	Yes	Loss of habitat due to other projects may increase the cumulative loss of habitat within the county
7	Coastal habitats	No	No impacts have been identified in section 22.7.
8	Watercourses and ponds	Yes	Loss of habitat due to other projects may increase the cumulative loss of habitat within the county
9	Badgers	Yes	Impact to species due to other projects may increase the cumulative impacts to species within the county
10	Bats	Yes	Impact to species due to other projects may increase the cumulative impacts to species within the county
11	Water vole	Yes	Impact to species due to other projects may increase the cumulative impacts to species within the county
12	Otter	Yes	Impact to species due to other projects may increase the cumulative impacts to species within the county

Impact		Potential for cumulative impact	Rationale
13	Great crested newts	Yes	Impact to species due to other projects may increase the cumulative impacts to species within the county
14	Reptiles	Yes	Impact to species due to other projects may increase the cumulative impacts to species within the county
15	White-clawed crayfish	No	No impacts have been identified in section 22.7.
16	Other invertebrates	Yes	Impact to species due to other projects may increase the cumulative impacts to species within the county
17	Protected flora	Yes	Impact to species due to other projects may increase the cumulative impacts to species within the county
18	Invasive non-native species	Yes	Other projects may exacerbate the risk from invasive species within the county
Operation			
1	Habitat and species during maintenance	Yes	Impact to species due to other projects may increase the cumulative impacts to species within the county
2	Fauna during operational lighting and noise	Yes	Impact to species due to other projects may increase the cumulative impacts to species within the county
Decommissioning			
The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage.			

585. The second stage of the CIA is an assessment of whether there is spatial or temporal overlap between the extent of potential effects of the onshore project area and the potential effects of other projects scoped into the CIA upon the same receptors. To identify whether this may occur, the potential nature and extent of effects arising from all projects scoped into the CIA have been identified and any overlaps between these and the effects identified in section 22.7 have also been identified. Where there is an overlap, an assessment of the cumulative magnitude of effect is provided.

586. The projects identified for potential cumulative impacts with Norfolk Vanguard have been discussed during ETG meetings with stakeholders and the full list has been agreed in consultation with local authorities.

Table 22.29 summarises those projects which have been scoped into the CIA due to their temporal or spatial overlap with the potential effects arising from the project. The remainder of the section details the nature of the cumulative impacts against all those receptors scoped in for cumulative assessment.

Table 22.29 Summary of projects considered for the CIA in relation to onshore ecology

Project	Status	Development period	¹² Distance from Norfolk Vanguard (km)	Project definition	Project data status	Included in CIA	Rationale
National Infrastructure Planning							
Norfolk Boreas Offshore Wind Farm	Pre-Application	Expected construction 2026	0 – projects are co-located	Pre-application outline only	High	Yes	Overlapping proposed project boundaries may result in impacts of a direct and / or indirect nature during construction and operation.
Hornsea Project Three Offshore Wind Farm	Pre-Application	Expected construction date 2021	0 - cable intersects project	Full PEIR available: http://hornseaproject3.co.uk/Documents-library/PEIR-Documents	High	Yes	Overlapping proposed project boundaries at Salle Park may result in impacts of a direct and / or indirect nature during construction and operation.
Dudgeon Offshore Wind Farm	Commissioned	Constructed	0	http://dudgeonoffshorewind.co.uk/	High	Yes	Overlapping proposed project boundaries at Necton may result in impacts of a direct and / or indirect nature during operation arising from noise, lighting and visual disturbance.
A47 corridor improvement programme – North Tuddenham to Easton	Pre-application	Expected construction date 2021-23	2.5	https://infrastructure.planninginspectorate.gov.uk/projects/eastern/a47-north-tuddenham-to-easton/	Medium	No	Development is located 2.5km from the project boundary and is therefore outwith the study area(s) identified for onshore ecology. No cumulative impacts are anticipated.
A47 corridor improvement programme – A47 Blofield to North	Pre-application	Expected construction date 2021-22	25	https://infrastructure.planninginspectorate.gov.uk/projects/eastern/a47-	Medium	No	Development is located 25km from the project boundary and is therefore outwith the study area (s) identified for onshore ecology.

¹² Shortest distance between the considered project and Norfolk Vanguard – unless specified otherwise.

Project	Status	Development period	¹² Distance from Norfolk Vanguard (km)	Project definition	Project data status	Included in CIA	Rationale
Burlingham				blofield-to-north-burlingham/			No cumulative impacts are anticipated.
A47 corridor improvement programme – A47 / A11 Thickthorn	Pre-application	Expected construction date 2020-21	18	https://infrastructure.planninginspectorate.gov.uk/projects/eastern/a47a11-thickthorn-junction/	Medium	No	Development is located 18km from the project boundary and is therefore outwith the study area(s) identified for onshore ecology. No cumulative impacts are anticipated.
Norwich Western Link	Pre-application	Expected construction date 2019-22	2.8	https://www.norfolk.gov.uk/roads-and-transport/major-projects-and-improvement-plans/norwich/norwich-western-link/timeline	Medium	No	Development is located 2.8km from the project boundary and is therefore outwith the study area(s) identified for onshore ecology. No cumulative impacts are anticipated.
Third River Crossing (Great Yarmouth)	Pre-application	Expected construction date 2020-23	28	https://www.norfolk.gov.uk/roads-and-transport/major-projects-and-improvement-plans/great-yarmouth/third-river-crossing	Medium	No	Development is located 18km from the project boundary and is therefore outwith the study area(s) identified for onshore ecology. No cumulative impacts are anticipated.
King's Lynn B Power Station	Awaiting	Expected construction	28	https://www.kingsl	High	No	Development is located 18km from the project boundary and is therefore outwith the

Project	Status	Development period	¹² Distance from Norfolk Vanguard (km)	Project definition	Project data status	Included in CIA	Rationale
amendments	decision	date 2018-21		ynnbccgt.co.uk/			study area(s) identified for onshore ecology. No cumulative impacts are anticipated.
North Norfolk							
PF/17/1951 Erection of 43 dwellings and new access with associated landscaping, highways and external works, and amendments to substation)	Awaiting decision	Anticipated Q2 2018	0.7	Application available: https://idoxpa.norfolk.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=_NNORF_DCAPR_92323	High	No	The housing development is proposed on scrubland in an urban setting, therefore no cumulative impacts are anticipated.
Bacton Gas Terminal Extension	Approved	Approved 20/09/2016. Expires 20/09/2019	3.0	Approved PDS available https://idoxpa.norfolk.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=_NNORF_DCAPR_88689	Medium	No	Terminal extension is located 3km from the onshore project area boundary and is therefore outwith the study area(s) identified for onshore ecology. No cumulative impacts are anticipated.
Bacton Gas Terminal Coastal Protection	Approved	Approved 18/11/2016. Expires 18/11/2019	2.5	Approved PDS available	Medium	Yes	Coastal protection scheme may result in changes to coastal habitats at the landfall site

Project	Status	Development period	¹² Distance from Norfolk Vanguard (km)	Project definition	Project data status	Included in CIA	Rationale
Bacton and Walcott Coastal Management Scheme	Approved	Expected construction date 2018	1.0	Public information leaflets available: https://www.north-norfolk.gov.uk/media/3371/bacton-to-walcott-public-information-booklet-july-2017.pdf	Medium	Yes	Coastal protection scheme may result in changes to coastal habitats at the landfall site.
Breckland							
21-31 new dwellings in Necton (BLR/2017/0001/PIP)	Awaiting decision	Not known. Application submitted November 2017.	1.0	http://planning.breckland.gov.uk/OcellaWeb/showDocuments?reference=BLR/2017/0001/PIP&module=pl	Medium	No	Development is located 3km from the project boundary and is located within an existing urban environment. It is also outwith the study area(s) identified for onshore ecology. No cumulative impacts are anticipated.
4-8 new dwellings in Necton (BLR/2017/0002/PIP)	Awaiting decision	Not known. Application submitted November 2017.	1.0	http://planning.breckland.gov.uk/OcellaWeb/showDocuments?reference=BLR/2017/0002/PIP&module=pl	Medium	No	Development is located 3km from the project boundary and is located within an existing urban environment. It is also outwith the study area(s) identified for onshore ecology. No cumulative impacts are anticipated.

Project	Status	Development period	¹² Distance from Norfolk Vanguard (km)	Project definition	Project data status	Included in CIA	Rationale
70 dwellings (3PL/2016/0298/D) (Phase 2 of 3PL/2012/0576/O)	Approved (21/09/16)	Not known. Application submitted March 2016.	6.4	http://planning.breckland.gov.uk/OcellaWeb/planningDetails?reference=3PL/2016/0298/D&from=planningSearch	Medium	No	Development is located 6.4km from the project boundary and is therefore outwith the study area(s) identified for onshore ecology. No cumulative impacts are anticipated.
98 dwellings at Swans Nest with access from Brandon Road (3PL/2017/1351/F) (Phase 3 of 3PL/2012/0576/O)	Awaiting decision (due 30/03/2018)	Not known. Application submitted Jan 2016.	6.4	http://planning.breckland.gov.uk/OcellaWeb/planningDetails?reference=3PL/2017/1351/F&from=planningSearch	Medium	No	Development is located 6.4km from the project boundary and is therefore outwith the study area(s) identified for onshore ecology. No cumulative impacts are anticipated.
175 dwellings with access at land to west of Watton Road, Swaffham (3PL/2016/0068/O) (Swans Nest Phase B)	Awaiting decision (due 13/10/2017)	Not known. Application submitted Jan 2016.	6.4	http://planning.breckland.gov.uk/OcellaWeb/planningDetails?reference=3PL/2016/0068/O	Medium	No	Development is located 6.4km from the project boundary and is therefore outwith the study area(s) identified for onshore ecology. No cumulative impacts are anticipated.

587. As identified in Table 22.29, a subsidiary of Vattenfall Wind Power Ltd is developing the sister project Norfolk Boreas Offshore Wind Farm (herein the ‘Norfolk Boreas project’) to the north of Norfolk Vanguard East, with the DCO application for the Norfolk Boreas project expected to follow approximately a year behind the Norfolk Vanguard DCO application. The development of Norfolk Boreas will use the same onshore cable route as Norfolk Vanguard with the addition of a spur to the Norfolk Boreas onshore project substation, the Norfolk Boreas onshore project substation will be located adjacent to the project substation for Norfolk Vanguard.
588. The worst case scenario for this EclA set out in section 22.7.3 has assumed that the installation of cable ducts for the onshore cable route for the Norfolk Boreas project will be conducted as part of the Norfolk Vanguard project construction (as a worst case). Therefore, the elements of Norfolk Boreas not considered in the assessment conducted in section 22.7 are the cable pull and onshore project substation (including the National Grid substation extension, any landscaping or planting, and the onshore 400kV cable route). Potential cumulative impacts arising from these elements of the Norfolk Boreas project are considered below, alongside all other projects set out in Table 22.29.
589. In summary, the following projects will be assessed for potential cumulative impacts:
- National Infrastructure Planning projects:
 - Norfolk Boreas Offshore Wind Farm;
 - Hornsea Project Three;
 - Dudgeon Offshore Wind Farm;
 - Bacton Gas Terminal Coastal Protection; and
 - Bacton and Walcott Coastal Management Scheme.
590. To avoid confusion between different projects, the Norfolk Vanguard offshore wind farm, previously referred to as ‘the project’, is referred to as ‘the Norfolk Vanguard project’ within this section.

22.8.1 Cumulative Impacts during Construction

22.8.1.1 Cumulative Impact 1: Impacts to statutory designated sites

591. The Norfolk Boreas onshore project substation footprint is located adjacent to the Norfolk Vanguard onshore project substation laydown areas. The onshore project substation is not located within 2km of a statutory designated site. The onshore project substation is located within 500m of ancient woodlands potentially affected by the Norfolk Vanguard project, and therefore has the potential to give rise to cumulative effects by extending the period over which these ancient woodlands will be subject to indirect effects. As this involves only an extension in a duration of effect which is already long term, this will not change the significance of the impact

described above. As such, cumulative effects are of the same significance set out in section 22.7 (**minor adverse**).

592. Of the statutory designated sites considered within section 22.7, Booton Common SSSI (a component of Norfolk Valley Fens SAC) is located both within 2km of the cable route (although outside the habitats and species study area) and adjacent to the Hornsea Project Three area. This site was identified by Norfolk Wildlife Trust as unlikely to be subject to effects arising from the Norfolk Vanguard project, therefore cumulative effects are not anticipated. The River Wensum SAC and SSSI is also crossed by both the onshore project area and the Hornsea Project Three. The locations at which these two projects cross the River Wensum are approximately 10km apart. As trenchless techniques will be used at this site for Norfolk Vanguard, cumulative effects are unlikely to occur. As such, cumulative effects are of the same significance set out in section 22.7 (**minor adverse**).
593. No other statutory designated sites fall within 2km of the project and within 2km of any of the projects listed in Table 22.29. No other ancient woodlands fall within 500m of the project and within 500m of any of the projects listed within 500m of any of the projects listed in Table 22.29. As such, no further cumulative effects upon other statutory designated sites are anticipated to arise, and cumulative effects are of the same significance set out in section 22.7 (**minor adverse**).

22.8.1.2 Cumulative Impact 2: Impacts to non-statutory designated sites

594. The Norfolk Boreas substation footprint is located adjacent to the Norfolk Vanguard onshore project substation laydown area. The onshore project substation is located over 200m from Necton Wood CWS. There is the potential therefore for cumulative effects by extending the period over which this CWS will be subject to indirect effects. As this involves only an extension in a duration of effect which is already long term, this will not change the significance of the impact described above. As such, cumulative effects are of the same significance set out in section 22.7 (**negligible**).
595. Of the non-statutory designated sites considered within section 22.7 five (Necton Wood, Marriott's Way, Salle Common & Adjacent Land, Salle Park, Reephams Meadows) are located within 2km of both the project and projects listed in Table 22.29. Of these, only one (Marriott's Way) is located within 100m of the project and projects listed in Table 22.29. As this site will be crossed by the Norfolk Vanguard project using trenchless techniques, there will be no cumulative effects upon this site. As such, cumulative effects are of the same significance set out in section 22.7 (**negligible**).

22.8.1.3 Cumulative Impact 3: Impacts to arable land

596. The Norfolk Boreas onshore project substation footprint will result in the additional loss of 9.5ha of arable land. The arable habitats within the Norfolk Boreas onshore project substation footprints have been identified as habitats of negligible importance during the Extended Phase 1 Habitat Survey. As such negligible cumulative effects are anticipated to arise as a result of these projects and cumulative effects are of the same significance set out in section 22.7 (**minor adverse**).
597. Cereal field margin habitat, a UKHPI and habitat of high importance is likely to be lost due to Hornsea Project Three simultaneously with the Norfolk Vanguard project. The area of cereal field margin lost due to Hornsea Project Three is not known, but the scale of the impacts is anticipated to be similar to the Norfolk Vanguard project and as such is of a small scale in the context of the 750ha of field margins within Norfolk. As such, the magnitude of the cumulative effect is assessed as negligible and therefore cumulative effects are of the same significance set out in section 22.7 (**minor adverse**).

22.8.1.4 Cumulative Impact 4: Impacts to woodland, trees and scrub

598. No woodland, tree or scrub habitats are located within 50m of both Hornsea Project Three and the Norfolk Vanguard project. As such no change upon these habitats is anticipated and therefore cumulative effects are of the same significance set out in section 22.7 (**negligible**).

22.8.1.5 Cumulative Impact 5: Impacts to hedgerows

599. The Norfolk Boreas onshore project substation footprint will result in the additional loss of 270m of species-poor hedgerow. Hedgerows are a UKHPI and habitat of high importance. The scale of this loss is in proportion to the habitat loss for the Norfolk Vanguard project, and as such cumulative effects are of the same significance set out in section 22.7 (**moderate adverse**).
600. Hedgerow habitat is likely to be lost due to Hornsea Project Three simultaneously with the Norfolk Vanguard project. The area of hedgerow habitat lost due to Hornsea Project Three is not known, but the scale of the effects within 50m of the Norfolk Vanguard project is anticipated to be small in proportion to the up to 3.3km of hedgerow anticipated to be lost as a result of the Norfolk Vanguard project. As such, cumulative effects are of the same significance set out in section 22.7 (**moderate adverse**).

22.8.1.6 Cumulative Impact 6: Impacts to grassland

601. No grassland habitats are located within 50m of both Hornsea Project Three and the Norfolk Vanguard project. As such no change upon these habitats is anticipated and

therefore cumulative effects are of the same significance set out in section 22.7 **(minor adverse)**.

22.8.1.7 Cumulative Impact 7: Impacts to watercourses and ponds

602. Two watercourses crossed by the onshore project area, the River Wensum and the River Bure, are also crossed by the Hornsea Project Three. These watercourses will be crossed using trenchless crossing techniques (e.g. HDD) by Norfolk Vanguard as part of embedded mitigation, and as such there will no change upon these receptors and therefore cumulative effects are of the same significance set out in section 22.7 **(minor adverse)**.

22.8.1.8 Cumulative Impact 8: Impacts to badgers

603. Badgers have not been recorded within the Norfolk Boreas onshore project substation footprint and as such no change upon this receptor is anticipated to arise as a result of cumulative effects. As such, cumulative effects are of the same significance set out in section 22.7 **(minor adverse)**.
604. Badgers have not been recorded in the land within Hornsea Project Three and within 50m of the onshore project area. As such no change upon this receptor is anticipated to arise as a result of cumulative effects, and therefore cumulative effects are of the same significance set out in section 22.7 **(minor adverse)**.

22.8.1.9 Cumulative Impact 9: Impacts to bats

605. The Norfolk Boreas onshore project substation footprint will result in the additional loss of 270m of hedgerows bat commuting and foraging habitat. This loss is of a commensurate scale to the habitat lost under the Norfolk Vanguard project and as such the magnitude of effect is the same. As such, cumulative effects are of the same significance set out in section 22.7 **(moderate adverse)**.
606. No hedgerows which fall within 50m of both Hornsea Project Three and the Norfolk Vanguard project have been identified during the Extended Phase 1 Habitat Survey as suitable commuting or foraging features for bats. As such, cumulative effects are of the same significance set out in section 22.7 **(moderate adverse)**.

22.8.1.10 Cumulative Impact 10: Impacts to water vole

607. There are no watercourses within or adjacent to the Norfolk Boreas landfall works which are suitable for water voles. As such no change upon water vole is anticipated to arise as a result of cumulative effects, and therefore cumulative effects are of the same significance set out in section 22.7 **(minor adverse)**.
608. The Norfolk Boreas substation footprint is located adjacent to the Norfolk Vanguard onshore project substation, and is not located within or adjacent to any suitable water vole habitat. As such no change upon water vole is anticipated to arise as a

result of cumulative effects, and therefore cumulative effects are of the same significance set out in section 22.7 (**minor adverse**).

609. No watercourses suitable for water vole are located within 50m of both Hornsea Project Three and the Norfolk Vanguard project. As such no change upon these species is anticipated to arise as a result of cumulative effects, and therefore cumulative effects are of the same significance set out in section 22.7 (**minor adverse**).

22.8.1.11 Cumulative Impact 11: Impacts to otters

610. No habitats suitable for otter are located within 50m of both Hornsea Project Three and the Norfolk Vanguard project. As such no change upon otter is anticipated to arise as a result of cumulative effects, and therefore cumulative effects are of the same significance set out in section 22.7 (**minor adverse**).
611. Two watercourses which contain habitats suitable for otter are crossed by the onshore project area, the River Wensum and the River Bure, are also crossed by the Hornsea Project Three. These watercourses will be crossed using trenchless crossing techniques (e.g. HDD) by Norfolk Vanguard as part of embedded mitigation, and as such there will be no change upon these receptors. As such, cumulative effects are of the same significance set out in section 22.7 (**minor adverse**).

22.8.1.12 Cumulative Impact 12: Impacts to great crested newts

612. Great crested newts are present within 500m of the Norfolk Boreas onshore project substation. The Norfolk Boreas onshore project substation footprint will result in the additional loss of 270m of hedgerow foraging habitat respectively. This is a likely good foraging habitat for great crested newts breeding at water body TF9010-50. Given the paucity of other good foraging habitat nearby, these features may provide important habitat for great crested newts. This does not raise the significance of the magnitude of the impacts, which remains low following the mitigation set out in section 22.7 and which therefore results in a cumulative effect of the same significance set out in section 22.7 (**minor adverse; moderate adverse for unsurveyed areas**). Norfolk Boreas should consider this cumulative effect when designing mitigation for great crested newts at the Norfolk Boreas onshore project substation.
613. There are no suitable water bodies for supporting great crested newts within 250m of the onshore project area and within Hornsea Project Three. Therefore, no change is anticipated upon this receptor due to this project. As such, cumulative effects are of the same significance set out in section 22.7 (**minor adverse; moderate adverse for unsurveyed areas**).

22.8.1.13 Cumulative Impact 13: Impacts to reptiles

614. No habitats suitable for common reptiles are located within 50m of both Norfolk Boreas or Hornsea Project Three and the Norfolk Vanguard project. As such no change upon these species is anticipated to arise as a result of cumulative effects, and therefore cumulative effects are of the same significance set out in section 22.7 (**minor adverse**).

22.8.1.14 Cumulative Impact 14: Impacts to other invertebrates

615. No habitats suitable for notable invertebrates are located within 50m of both Norfolk Boreas or Hornsea Project Three and the Norfolk Vanguard project. As such no change upon these species is anticipated to arise as a result of cumulative effects, and therefore cumulative effects are of the same significance set out in section 22.7 (**no impact; minor adverse for unsurveyed areas**).

22.8.1.15 Cumulative Impact 15: Impacts to fish

616. There are no notable fish species recorded within the Norfolk Boreas landfall works and onshore project substation footprints. As such no change upon these species is anticipated to arise as a result of cumulative effects, and therefore cumulative effects are of the same significance set out in section 22.7 (**minor adverse**).
617. One watercourse which supports brown trout, bullhead and brook lamprey, the River Wensum, is also crossed by both the onshore project area and the Hornsea Project Three. The locations at which these two projects cross the River Wensum are approximately 10km apart. As trenchless techniques will be used at this site for Norfolk Vanguard, cumulative effects are unlikely to occur. As such, cumulative effects are of the same significance set out in section 22.7 (**minor adverse**).

22.8.1.16 Cumulative Impact 16: Impacts to protected flora

618. There are no notable flora recorded within the Norfolk Boreas onshore project substation footprint. As such no change upon these species is anticipated to arise as a result of cumulative effects, and therefore cumulative effects are of the same significance set out in section 22.7 (**no impact**).
619. There are no notable flora recorded within 50m of both Hornsea Project Three and the Norfolk Vanguard project. As such no change upon these species is anticipated to arise as a result of cumulative effects, and therefore cumulative effects are of the same significance set out in section 22.7 (**no impact**).

22.8.1.17 Cumulative Impact 17: Impacts to invasive non-native species

620. There are no invasive non-native species recorded within or adjacent to the areas which lie within both the Norfolk Vanguard project and projects listed in Table 22.29. However, as the construction of the projects listed in Table 22.29 will involve bringing in plant and equipment to the habitats and species study area, including

plant which will be used in other areas of the country, there is a risk of releasing non-native species along the full extent of the construction phase works for Hornsea Project Three (**minor adverse**).

621. With the mitigation measures set out in section 22.7 adhered to during construction of the Norfolk Vanguard project, this risk is reduced and the magnitude of effect remains low. As such, cumulative effects are of the same significance set out in section 22.7 (**minor adverse**).

22.8.2 Cumulative Impacts during Operation

22.8.2.1 Cumulative Impact 1: Disturbance to habitats and species from maintenance activities

622. The Norfolk Boreas and Dudgeon Offshore Wind Farm are anticipated to have similar maintenance requirements as the Norfolk Vanguard project (i.e. one visit per week, involving a single vehicle and staff during daylight hours), all of which are small in scale. As a consequence, disturbance from noise and human presence (above general operational movements on and off site) is predicted to be of negligible cumulative magnitude and only affect receptors in the immediate vicinity of the onshore project substation. As such, cumulative effects are of the same significance set out in section 22.7 (**negligible**).

22.8.2.2 Cumulative Impact 2: Disturbance to fauna from operational lighting and noise

623. Operation lighting from the Dudgeon Offshore Wind Farm onshore substation is subject to mitigation measures as part of its consent conditions, including screen to minimise the levels of light pollution arising from the site. Operational lighting at the Norfolk Boreas onshore project substation will be provided for operations and maintenance activities only, and under normal conditions it would not be lit. As a consequence, disturbance from lighting (above general operational movements on and off site) is predicted to be of negligible cumulative magnitude and only affect receptors in the immediate vicinity of the onshore project substation. As such, cumulative effects are of the same significance set out in section 22.7 (**negligible**).

22.8.3 Cumulative Impacts during Decommissioning

624. Decommissioning of the Norfolk Boreas and Hornsea Project Three may potentially take place at the same time as the Norfolk Vanguard project. The detail and scope of the decommissioning works for the Norfolk Vanguard project will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage.

22.9 Inter-relationships

625. Table 22.30 lists out the inter-relationships between this chapter and other chapters within the ES.

Table 22.30 Chapter topic inter-relationships

Topic and description	Related Chapter	Where addressed in this Chapter	Rationale
Potential impacts to watercourses and how this will affect the species they support	Chapter 20 Water Resources and Flood Risk	Section 22.7.6.1	Works at watercourses may influence ecological species and habitats
Habitats which support onshore ornithology	Chapter 23 Onshore Ornithology	Section 22.7.6.1 Section 22.7.6.3 - 22.7.6.8	Onshore ornithology may share habitats of importance with onshore ecology
Noise disturbance on protected species	Chapter 25 Noise and Vibration	Section 22.7.6 (all impacts)	Noisy activities associated with construction may disturb protected species
Dust impacts to habitats and species	Chapter 26 Air Quality	Section 22.7.6 (all impacts)	Changes in dust levels in the air may affect ecological habitats and species
Lighting impacts to protected species Landscape mitigation planting	Chapter 29 Landscape and Visual Impact Assessment	Section 22.7.6 (all impacts)	Construction and maintenance lighting (covered in Chapter 29) may cause disturbance to protected species Mitigation planting at the substation has been designed to provide biodiversity benefit

22.10 Interactions

626. The impacts identified and assessed in this chapter have the potential to interact with each other, which could give rise to synergistic impacts as a result of that interaction. The worst case impacts assessed within the chapter take these interactions into account and for the impact assessments are considered conservative and robust. For clarity the areas of interaction between impacts are presented in Table 22.31, along with an indication as to whether the interaction may give rise to synergistic impacts.

Table 22.31 Interaction between impacts

Potential interaction between impacts																			
Construction																			
	1 Statutory designated sites	2 Non-statutory designated sites	3 Arable land	4 Woodland, trees and scrub	5 Hedgerows	6 Grassland	7 Coastal habitats	8 Watercourses and ponds	9 Badgers	10 Bats	11 Water voles	12 Otter	13 Great crested newts	14 Reptiles	15 White-clawed crayfish	16 Other invertebrates	17 Fish	18 Protected flora	19 Invasive non-native species
1 Statutory designated sites	-	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes
2 Non-statutory designated sites	-	-	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No	No	No	No	No	No	Yes
3 Arable land	-	-	-	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
4 Woodland, trees and scrub	-	-	-	-	Yes	No	No	No	No	Yes	No	No	No	Yes	No	No	No	No	Yes
5 Hedgerows	-	-	-	-	-	No	No	No	No	Yes	No	No	Yes	Yes	No	No	No	No	Yes
6 Grassland	-	-	-	-	-	-	No	No	No	Yes	No	No	Yes	Yes	No	No	No	Yes	Yes
7 Coastal habitats	-	-	-	-	-	-	-	No	No	No	No	No	No	No	No	No	No	No	No

Potential interaction between impacts

Construction

	1 Statutory designated sites	2 Non-statutory designated sites	3 Arable land	4 Woodland, trees and scrub	5 Hedgerows	6 Grassland	7 Coastal habitats	8 Watercourses and ponds	9 Badgers	10 Bats	11 Water voles	12 Otter	13 Great crested newts	14 Reptiles	15 White-clawed crayfish	16 Other invertebrates	17 Fish	18 Protected flora	19 Invasive non-native species
8 Watercourses and ponds	-	-	-	-	-	-	-	-	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9 Badgers	-	-	-	-	-	-	-	-	-	No	No	No	No	No	No	No	No	No	No
10 Bats	-	-	-	-	-	-	-	-	-	-	No	No	No	No	No	No	No	No	No
11 Water voles	-	-	-	-	-	-	-	-	-	-	-	No	No	No	No	No	No	No	Yes
12 Otter	-	-	-	-	-	-	-	-	-	-	-	-	No	No	No	No	No	No	No
13 Great crested newts	-	-	-	-	-	-	-	-	-	-	-	-	-	No	No	No	No	No	Yes
14 Reptiles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	No	No	No	No
15 White-clawed crayfish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	No	No	Yes
16 Other invertebrates	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	No	Yes

Potential interaction between impacts

Construction

	1 Statutory designated sites	2 Non-statutory designated sites	3 Arable land	4 Woodland, trees and scrub	5 Hedgerows	6 Grassland	7 Coastal habitats	8 Watercourses and ponds	9 Badgers	10 Bats	11 Water voles	12 Otter	13 Great crested newts	14 Reptiles	15 White-clawed crayfish	16 Other invertebrates	17 Fish	18 Protected flora	19 Invasive non-native species
17 Fish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No	Yes
18 Protected flora	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Yes
19 Invasive non-native species	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Operation

	1 Habitat and species during maintenance	2 Fauna during operational lighting and noise
1 Habitat and species during maintenance	-	No
2 Fauna during operational lighting and noise	-	-

Potential interaction between impacts

Construction

1 Statutory designated sites	2 Non-statutory designated sites	3 Arable land	4 Woodland, trees and scrub	5 Hedgerows	6 Grassland	7 Coastal habitats	8 Watercourses and ponds	9 Badgers	10 Bats	11 Water voles	12 Otter	13 Great crested newts	14 Reptiles	15 White-clawed crayfish	16 Other invertebrates	17 Fish	18 Protected flora	19 Invasive non-native species
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Decommissioning

It is anticipated that the decommissioning impacts will be similar in nature to those of construction.

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22.11 Summary

627. A summary of the impact assessment for onshore ecology is presented in Table 22.32. In accordance with the methodology for assessment presented in section 22.4 this table should only be used in conjunction with the additional narrative explanations provided in section 22.7.

Table 22.32 Potential impacts identified for onshore ecology

Potential Impact	Receptor	Importance	Significance ¹³		Mitigation	Residual Impact	
			Surveyed areas	Unsurveyed areas		Surveyed areas	Unsurveyed areas
Construction							
1	Statutory designated sites	High	Moderate adverse	N/A	Yes	Minor adverse	N/A
2	Non-statutory designated sites	Medium	Minor adverse	N/A	Yes	Negligible	N/A
3	Arable land	High	Moderate adverse	N/A	Yes	Minor adverse	N/A
4	Woodland, trees and scrub	High	Negligible	N/A	Yes	Negligible	N/A
5	Hedgerows	High	Moderate adverse	N/A	Yes	Moderate adverse	N/A
6	Grassland	High	Minor adverse	N/A	Yes	Minor adverse	N/A
7	Coastal habitats	High	No impact	N/A	N/A	No impact	N/A
8	Watercourses and ponds	High	Moderate adverse	N/A	Yes	Minor adverse	N/A
9	Badgers	Low	Minor adverse	Minor adverse	Yes	Minor adverse	Minor adverse
10	Bats	High	Major adverse	Major adverse	Yes	Moderate adverse	Moderate adverse
11	Water vole	Medium	Moderate adverse	Moderate adverse	Yes	Minor adverse	Minor adverse

¹³ Significance is presented for both the impacts predicted based on survey data obtained to date and for the potential impacts which may arise if we assume that a receptor is present within the unsurveyed areas. Where the data obtained to date is adequate to fully described the ecological baseline, 'N/A' is presented within the 'unsurveyed' columns.

Potential Impact	Receptor	Importance	Significance ¹³		Mitigation	Residual Impact	
			Surveyed areas	Unsurveyed areas		Surveyed areas	Unsurveyed areas
12	Otter	High	Minor adverse	N/A	Yes	Minor adverse	N/A
13	Great crested newts	High	Minor adverse	Major adverse	Yes	Minor adverse	Moderate adverse
14	Reptiles	Medium	Minor adverse	Moderate adverse	Yes	Minor adverse	Minor adverse
15	White-clawed crayfish	High	No impact	N/A	N/A	No impact	N/A
16	Other invertebrates	High	No impact	Moderate adverse	Yes	No impact	Minor adverse
17	Fish	High	Moderate adverse	N/A	Yes	Minor adverse	N/A
18	Protected flora	High	No impact	N/A	Yes	No impact	N/A
19	Invasive non-native species	Medium	Moderate adverse	Moderate adverse	Yes	Minor adverse	Minor adverse
Operation							
1	Habitat and species during maintenance	High	Minor adverse	N/A	N/A	Negligible	N/A
2	Fauna during operational lighting and noise	High	Minor adverse	N/A	N/A	Negligible	N/A
Decommissioning							
Impacts similar to those during construction							
Cumulative – construction and operation							
1	Statutory designated sites	As per construction and operation					
2	Non-statutory designated sites	As per construction and operation					
3	Arable land	As per construction and operation					

Potential Impact	Receptor	Importance	Significance ¹³		Mitigation	Residual Impact	
			Surveyed areas	Unsurveyed areas		Surveyed areas	Unsurveyed areas
4	Woodland, trees and scrub	As per construction and operation					
5	Hedgerows	As per construction and operation					
6	Grassland	As per construction and operation					
7	Watercourses and ponds	As per construction and operation					
8	Badgers	As per construction and operation					
9	Bats	As per construction and operation					
10	Water vole	As per construction and operation					
11	Otter	As per construction and operation					
12	Great crested newts	As per construction and operation					
13	Reptiles	As per construction and operation					
15	Other invertebrates	As per construction and operation					
16	Protected flora	As per construction and operation					
17	Invasive non-native species	As per construction and operation					
Cumulative – decommissioning							
The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage.							

22.12 References

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