

Norfolk Boreas Offshore Wind Farm

Chapter 34

Summary

Environmental Statement

Volume 1

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Glossary of Acronyms

ADR	Air Defence Radar
AEZ	Archaeological Exclusion Zone
AONB	Area of Outstanding Natural Beauty
BAT	Best Available Technology
CAA	Civil Aviation Authority
CMS	Construction Method Statement
CNMP	Construction Noise Management Plan
CoCP	Code of Construction Practice
cSAC	Candidate Special Area of Conservation
CWS	County Wildlife Sites
DCO	Development Consent Order
Defra	Department of Environment, Food and Rural Affairs
EIA	Environmental Impact Assessment
EMF	Electromagnetic field
ES	Environmental Statement
ESS	Environmental Stewardship Scheme
FSA	Formal Safety Assessment
FLOWW	Fishing Liaison with Offshore Wind and Wet Renewables Group
FTE	Full Time Equivalent
HDD	Horizontal Directional Drilling
HE	Historic England
HGV	Heavy Goods Vehicle
HRA	Habitats Regulations Assessment
HVDC	High Voltage Direct Current
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LCT	Landscape Character Types
LCU	Landscape Character Units
LIDAR	Light Detection and Ranging
LVIA	Landscape and Visual Impact Assessment
MCZ	Marine Conservation Zone
MMO	Marine Management Organisation
MoD	Ministry of Defence
MW	megawatts
NATS	National Air Traffic Service
NCC HES	Norfolk County Council Historic Environment Service
NERL	NATS En Route Limited
NRA	Navigation Risk Assessment
NSL	NATS (Services) Limited
NV	Norfolk Vanguard
O&M	Operation and Maintenance
OLEMS	Outline Landscape and Ecological Management Strategy
SAC	Special Area of Conservation
SMP	Soils Management Plan
SMS	Safety Management System

SNCB	Statutory Nature Conservation Body
SNS	Southern North Sea
SPZ	Source Protection Zones
SSSI	Site of Special Scientific Interest
TMP	Traffic Management Plan
TP	Travel Plan
UXO	Unexploded Ordnance
VWPL	Vattenfall Wind Power Ltd
WCS	Worst Case Scenario
WSI	Written Scheme of Investigation

Glossary of Terminology

Array cables	Cables which link wind turbine to wind turbine, and wind turbine to offshore electrical platforms.
Cable pulling	Installation of cables within pre-installed ducts from jointing pits located along the onshore cable route.
Ducts	A duct is a length of underground piping, which is used to house electrical and communications cables.
Export Cables	Cables that transmit power from an offshore electrical platform to the onshore project substation
Interconnector cables	Offshore cables which link offshore electrical platforms within the Norfolk Boreas site
Jointing pit	Underground structures constructed at regular intervals along the onshore 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 a 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 grid connection location for Norfolk Boreas and Norfolk Vanguard
Norfolk Boreas site	The Norfolk Boreas wind farm boundary. Located offshore, this will contain all the windfarm array.
Norfolk Vanguard	Norfolk Vanguard offshore wind farm, sister project of Norfolk Boreas.
Offshore cable corridor	The corridor of seabed from the Norfolk Boreas site to the landfall site within which the offshore export cables will be located.
Offshore electrical platform	A fixed structure located within the wind farm area, containing electrical equipment to aggregate the power from the wind turbines and convert it into a more suitable form for export to shore.
Offshore export cables	The cables which transmit power from the offshore electrical platform to the landfall.
Offshore project area	The area of the onshore infrastructure (landfall, onshore cable route, accesses, trenchless crossing zones and mobilisation areas; onshore project substation and extension to the Necton National Grid substation and overhead line modifications).

Offshore service platform	A platform to house workers offshore and/or provide helicopter refuelling facilities. An accommodation vessel may be used as an alternative for housing workers.
Onshore 400kV cable route	Buried high-voltage cables linking the onshore project substation to the Necton National Grid substation
Onshore cable route	The up to 35m working width within a 45m wide corridor 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 power and communications from landfall to the onshore project substation
Onshore project area	The area of the onshore infrastructure (landfall, onshore cable route, accesses, trenchless crossing zones and mobilisation areas; onshore project substation and extension to the Necton National Grid substation and overhead line modifications).
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.
Project interconnector cable	Offshore cables which would link either turbines or an offshore electrical platform in the Norfolk Boreas site with an offshore electrical platform in one of the Norfolk Vanguard sites.
Project interconnector search area	The area within which the project interconnector cables would be installed.
Running track	The track along the onshore cable route which the construction traffic would use to access workfronts.
Safety zones	An area around a vessel which should be avoided during offshore construction.
Scour protection	Protective materials to avoid sediment being eroded away from the base of the foundations as a result of the flow of water.
The Applicant	Norfolk Boreas Limited
The project	Norfolk Boreas 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
Trenchless crossing compound	Pairs of compounds at each trenchless crossing zone to allow boring to take place from either side of the crossing.
Trenchless crossing zone (e.g. HDD)	Areas within the onshore cable route which will house trenchless crossing entry and exit points.
Workfront	A length of onshore cable route within which duct installation works will occur, approximately 150m.

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34 SUMMARY

34.1 Introduction

1. Norfolk Boreas Limited ('the Applicant', an affiliate company of Vattenfall Wind Power Ltd (VWPL)) is seeking a Development Consent Order (DCO) for Norfolk Boreas Offshore Wind Farm (herein 'Norfolk Boreas' or 'the project').
2. This chapter provides a summary of the potential impacts associated with the construction, operation and maintenance (O&M), and decommissioning of Norfolk Boreas based on the assessments undertaken for each receptor, for both offshore and onshore topics as they are presented in the technical chapters of this Environmental Statement (ES) (Chapters 8 to 31). Cumulative and transboundary impacts are also detailed in each technical chapter, where applicable, and are summarised in Chapter 32 Offshore Cumulative and Transboundary Impacts and Chapter 33 Onshore Cumulative Impacts.
3. This ES covers a wide range of physical, ecological and human environmental receptors for which potential impacts have been assessed. The methodology for the Environmental Impact Assessment (EIA) is outlined in Chapter 6 EIA Methodology and detailed further in each technical chapter. Where an impact assessment methodology for a certain receptor deviates from the standard methodology outlined in Chapter 6, this is explained in the relevant chapter. The approach to EIA has largely been informed by consultation which has been undertaken with relevant technical consultees (see Chapter 7 Technical Consultation).

34.1.1 The Project

4. As outlined in Chapter 5 Project Description, the offshore wind farm comprises of a 725km² area located approximately 73km from the Norfolk coastline within which wind turbines will be located. Norfolk Boreas will have a maximum export capacity of 1,800 megawatts (MW). The offshore wind farm will be connected to the shore by offshore export cables installed within the offshore cable corridor from the wind farm to a landfall point at Happisburgh South, Norfolk. From there, onshore cables would transport power over approximately 60km to the onshore project substation near Necton, Norfolk.
5. The key offshore components comprising:
 - Wind turbines;
 - Offshore electrical platforms;
 - Offshore service platform;
 - Meteorological masts (met masts);
 - Measuring equipment (LiDAR and wave buoys);

- Array cables;
 - Interconnector cables or project interconnector cables; and
 - Export cables.
6. The key onshore components of the project are as follows:
- 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 modifications.
7. Vattenfall Wind Power Limited (VWPL) (the parent company of Norfolk Boreas Limited) is also developing Norfolk Vanguard, a ‘sister project’ to Norfolk Boreas. Norfolk Vanguard is of the same maximum capacity and comprises two distinct areas, Norfolk Vanguard East (NV East) and Norfolk Vanguard West (NV West) (‘the Norfolk Vanguard OWF sites’) which are adjacent to the Norfolk Boreas site (Figure 5.1). Norfolk Vanguard’s development schedule is approximately one year ahead of Norfolk Boreas and as such the DCO application was submitted in June 2018.
8. Norfolk Vanguard shares a grid connection location and also much of the offshore and onshore cable route with Norfolk Boreas. Therefore, VWPL has adopted a strategic approach to planning infrastructure for the two projects with the aim of optimising overall design and reducing impacts where practical.
9. In order to minimise impacts associated with onshore construction works for the two projects, Norfolk Vanguard Limited are seeking to obtain consent to undertake enabling works for both projects at the same time. However, Norfolk Boreas needs to consider the possibility that Norfolk Vanguard may not proceed to construction. Thus, consent will be sought for the following two alternative scenarios within the DCO and an assessment of potential impacts has been undertaken for each scenario:
- **Scenario 1** – Norfolk Vanguard proceeds to construction and installs ducts and other shared enabling works for Norfolk Boreas.
 - **Scenario 2** – Norfolk Vanguard does not proceed to construction and Norfolk Boreas proceeds alone. Norfolk Boreas undertakes all works required as an independent project
10. Within the technical chapters of this ES (Chapters 8 to 31), an assessment of potential impacts has been undertaken for each scenario and a summary of the impacts from each technical assessment are presented in section 34.3 for Scenario 1 and section 34.4 for Scenario 2.

11. A full project description is provided in the Chapter 5 Project Description and the worst case assumptions for each receptor are detailed in each technical chapter.

34.1.1.1 Embedded mitigation

12. Norfolk Boreas Limited has committed to a number of mitigation measures which are embedded in the project design and therefore incorporated in the impact assessments. A number of these commitments have been made as a result of public and/or stakeholder consultation. Key commitments include the following and are discussed further in each technical chapter, where relevant:

- Offshore
 - Careful site selection to avoid designated sites and existing infrastructure where possible;
 - Reduction in the maximum number of turbines from 257 to 200;
 - Reduction in the number of offshore export cable trenches from six to two by committing to use High Voltage Direct Current (HVDC) technology;
 - Pre-construction survey prior to cable installation to inform micrositing, where possible, around important seabed features and obstacles;
 - Sort start and ramp up of piling activity;
 - Minimising cable protection by burying cables where possible;
 - Disposing of sediment arising within the Haisborough Hammond; and Winterton Special Area of Conservation (SAC) during cable installation works, back into the SAC to maintain the sandbank features.
- Landfall
 - A Long HDD will be used, avoiding any works on the beach/intertidal zone;
- Onshore
 - Duct installation for Norfolk Boreas and its sister project Norfolk Vanguard will be undertaken in parallel (subject to both projects being consented (Scenario 1)) in order to minimise ongoing disruption;
 - Careful site selection to avoid designated sites and ancient woodlands;
 - Removal of the requirement for a cable relay station due to the commitment to use HVDC technology;
 - Reduction in the cable easement width from 50m to 35m due to the commitment to use HVDC technology;
 - Reduction in cable pulling maximum timescale from three to two years;
 - Trenchless crossings will be undertaken at major watercourses, County Wildlife Sites (CWS) and other key sensitive features;
 - Mitigation planting will be undertaken to screen visual impacts of the project where possible; and

- Reduction in hedgerow crossing gaps to 13m (or 16.5m where a crossing at an angle is required) due to the commitment to use HVDC technology.
13. Where appropriate, further topic specific embedded mitigation and additional mitigation measures would be adopted and these are detailed in each technical chapter.

34.2 Offshore

34.2.1 Chapter 8 Marine Geology, Oceanography and Physical Processes

14. The assessment for marine geology, oceanography and physical processes has been informed by a number of geophysical surveys of the project and wider area, and related modelling.
15. The assessment considers impacts on Marine Geology, Oceanography and Physical Processes receptors which include:
- Haisborough, Hammond and Winterton SAC;
 - North Norfolk Sandbanks and Saturn Reef SAC;
 - Cromer Shoal Chalk Beds Marine Conservation Zone (MCZ).; and
 - 'East Anglia' coastline.
16. Due to the distance from the Norfolk Boreas site to these receptors, they are located remotely from the zones of influence and no pathway has been identified that can link the source to the receptor. Therefore, the ES has concluded **no impact** in relation to works in the Norfolk Boreas site.
17. The offshore cable corridor passes through the Haisborough Hammond and Winterton SAC, approximately 2km to the south of North Norfolk Sandbanks and Saturn Reefs SAC, approximately 60m to the south of the MCZ and makes landfall at Happisburgh South on the East Anglian coast. The impacts associated with these works have been assessed as having, at most, **negligible** significance on these receptors (Table 34.1). Effects on the Haisborough Hammond and Winterton SAC were screened into the Habitats Regulations Assessment (HRA) and have therefore been considered further in the Information for the Habitats Regulations Assessment Report (Document reference 5.3) which has been submitted as part of the DCO application.
18. Chapter 8 also identifies potential effects/changes on marine physical processes for which the receptor is considered in other Chapters (e.g. Chapter 9 Marine Water and Sediment Quality and Chapter 10 Benthic and Intertidal Ecology).

Table 34.1 Summary of potential impacts identified for marine geology, oceanography and physical processes

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Construction						
Impact 1A: Changes in Suspended Sediment Concentrations due to Seabed Preparation for Wind Turbine Gravity Anchor Foundation Installation	Haisborough, Hammond and Winterton SAC	N/A	N/A	No impact	N/A	No impact
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	No impact
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 1B: Changes in Suspended Sediment Concentrations due to Drill Arisings for Installation of Piled Foundations for Wind Turbines	Haisborough, Hammond and Winterton SAC	N/A	N/A	No impact	N/A	No impact
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	No impact
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 2A: Changes in Seabed Level due to Seabed Preparation for Wind	Haisborough, Hammond and Winterton SAC	Negligible	Negligible (far-field)	Negligible	None proposed	Negligible
	North Norfolk Sandbanks and Saturn Reef SAC	Negligible	Negligible (far-field)	Negligible	None proposed	Negligible

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Turbine Gravity Anchor Foundation Installation	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 2B: Changes in Seabed Level due to Drill Arisings for Installation of Piled Foundations for Wind Turbines	Haisborough, Hammond and Winterton SAC	N/A	N/A	No impact	N/A	No impact
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	No impact
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 3: Changes in Suspended Sediment Concentrations during Cable Installation within the Offshore Cable Corridor	Haisborough, Hammond and Winterton SAC	N/A	N/A	No impact	N/A	No impact
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	No impact
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 4A: Changes in Seabed Level due to Cable Installation within the Offshore Cable Corridor	Haisborough, Hammond and Winterton SAC	Negligible	Low (near-field), negligible (far-field)	Negligible	Disposal in SAC	Negligible
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	N/A

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
	Cromer Shoal Chalk Beds MCZ	Negligible	Low (near-field), negligible (far-field)	Negligible	None proposed	Negligible
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 4B: Changes in seabed level due to disposal of sediment from sand wave levelling within the Offshore Cable Corridor	Haisborough, Hammond and Winterton SAC	Negligible	Low (near-field), Negligible (far-field)	Negligible	Disposal in SAC	Negligible
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	No impact
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 4C: Interruptions to Bedload Sediment Transport due to Sand Wave Levelling	Haisborough, Hammond and Winterton SAC	Negligible	Low (near-field), negligible (far-field)	Negligible	Disposal in SAC	Negligible
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	No impact
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 5: Changes in Suspended Sediment Concentrations during Cable Installation within the Norfolk Boreas site and	Haisborough, Hammond and Winterton SAC	N/A	N/A	No impact	N/A	No impact
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	No impact

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Project Interconnector Search Area	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 6: Changes in Seabed Level due to Cable Installation within the Norfolk Boreas site and Project Interconnector Search Area	Haisborough, Hammond and Winterton SAC	Negligible	Negligible (far-field)	Negligible	None proposed	Negligible
	North Norfolk Sandbanks and Saturn Reef SAC	Negligible	Negligible (far-field)	Negligible	None proposed	Negligible
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 7: Indentations on the Seabed due to Installation Vessels	Haisborough, Hammond and Winterton SAC	N/A	N/A	No impact	N/A	No impact
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	No impact
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Operation						
Impact 1: Changes to the Tidal Regime due to the	Haisborough, Hammond and Winterton SAC	N/A	N/A	No impact	N/A	N/A

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Presence of Wind Turbine Structures	North Norfolk Sandbanks and Saturn Reef SAC	Negligible	Low (near-field), negligible (far-field)	Negligible (southern part of SAC)	None proposed	Negligible
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 2: Changes to the Wave Regime due to the Presence of Wind Turbine Structures	Haisborough, Hammond and Winterton SAC	Negligible	Low (near-field), negligible (far-field)	Negligible (south-east extreme of SAC)	None proposed	Negligible
	North Norfolk Sandbanks and Saturn Reef SAC	Negligible	Low (near-field), negligible (far-field)	Negligible (south-east extreme of SAC)	None proposed	Negligible
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 3: Changes to the Sediment Transport Regime due to the Presence of Wind Turbine Foundation Structures	Haisborough, Hammond and Winterton SAC	Negligible	Low (near-field), negligible (far-field)	Negligible (south-east extreme of SAC)	None proposed	Negligible
	North Norfolk Sandbanks and Saturn Reef SAC	Negligible	Low (near-field), negligible (far-field)	Negligible (south and south-east extreme of SAC)	None proposed	Negligible
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Impact 4: Loss of Seabed Morphology due to the Footprint of Wind Turbine Foundation Structures	Haisborough, Hammond and Winterton SAC	N/A	N/A	No impact	N/A	No impact
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	No impact
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 5: Morphological and Sediment Transport Effects due to Cable Protection Measures within the Norfolk Boreas site and Project Interconnector Search Area	Haisborough, Hammond and Winterton SAC	N/A	N/A	No impact	N/A	No impact
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	No impact
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 6: Morphological and Sediment Transport Effects due to Cable Protection Measures within the Offshore Cable Corridor	Haisborough, Hammond and Winterton SAC	N/A	N/A	No impact	N/A	No impact
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	No impact
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Impact 7: Cable repairs/reburial and maintenance vessel footprints	Haisborough, Hammond and Winterton SAC	Negligible	Low (near-field), negligible (far-field)	Negligible	None proposed	Negligible
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	No impact
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Decommissioning						
Impact 1: Changes in Suspended Sediment Concentrations due to Wind Turbine Foundation Removal	Haisborough, Hammond and Winterton SAC	N/A	N/A	No impact	N/A	No impact
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	No impact
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 2: Changes in seabed level (morphology) due to wind turbine foundation removal	Haisborough, Hammond and Winterton SAC	Negligible	Negligible (far-field)	Negligible	None proposed	Negligible
	North Norfolk Sandbanks and Saturn Reef SAC	Negligible	Negligible (far-field)	Negligible	None proposed	Negligible
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 3: Changes in Suspended Sediment Concentrations due to Removal of parts of the Array, Interconnector or Project Interconnector Cables	Haisborough, Hammond and Winterton SAC	N/A	N/A	No impact	N/A	No impact
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	No impact
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 4: Changes in seabed level due to removal of parts of the array, interconnector or project interconnector cables	Haisborough, Hammond and Winterton SAC	Negligible	Negligible (far-field)	Negligible	None proposed	Negligible
	North Norfolk Sandbanks and Saturn Reef SAC	Negligible	Negligible (far-field)	Negligible	None proposed	Negligible
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 5: Changes in suspended sediment concentrations due to removal of parts of the export cables (including nearshore and at the coastal landfall)	Haisborough, Hammond and Winterton SAC	Negligible	Low (near-field), negligible (far-field)	Negligible	None proposed	Negligible
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	N/A
	Cromer Shoal Chalk Beds MCZ	Negligible	Low (near-field), negligible (far-field)	Negligible	None proposed	Negligible

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
	East Anglian coast	N/A	N/A	No impact	N/A	N/A
Impact 6: Indentations on the Seabed due to Decommissioning Activities	Haisborough, Hammond and Winterton SAC	N/A	N/A	No impact	N/A	No impact
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	No impact
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact

34.2.2 Chapter 9 Marine Water and Sediment Quality

19. The assessment for Marine Water and Sediment Quality has been informed by contaminants analysis of seabed sediment samples collected during a site characterisation survey in 2017, as well as considering available regional information and data collected for the former East Anglia Zone.
20. The effects associated with marine physical processes identified in Chapter 8 also inform the impact assessment for Marine Water and Sediment Quality. The assessment considers impacts on the Norfolk East coastal water body, protected by the Water Framework Directive (WFD), and bathing waters.
21. The impact assessment and embedded mitigation has taken into account the requirements of key European and national legislation and policy concerning environmental quality standards for chemical contaminants and guideline values to determine sediment quality. Through the commitment to embedded mitigation, impacts have been assessed as **negligible** or **minor adverse** significance (Table 34.2).
22. Changes to water quality have the potential to affect ecological receptors and are therefore considered further in the relevant chapters (e.g. Chapter 10 Benthic and Intertidal Ecology, Chapter 11 Fish and Shellfish Ecology, and Chapter 12 Marine Mammals).

Table 34.2 Summary of potential impacts identified for marine water and sediment quality

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Construction						
Impact 1A: Deterioration in offshore water quality due to increased suspended sediment concentrations created by seabed preparation during foundation installation	Water Quality	Low	Low	Minor	None proposed	Minor adverse
Impact1B: Deterioration in offshore water quality due to increased suspended sediment concentrations due to drill arisings for installation of piled foundations.	Water Quality	Low	Low	Minor	None proposed	Minor adverse
Impact 2: Deterioration in water quality due to increased suspended sediment concentrations during installation of cables within the offshore cable corridor	Water Quality	Low	Low	Minor	None proposed	Minor adverse
Impact 3: Deterioration in offshore water quality due to increased suspended sediment concentrations during cable installation within the Norfolk Boreas site and Project Interconnector Search Area.	Water Quality	Low	Low	Minor	None proposed	Minor adverse
Impact 4: Deterioration in water and bathing water quality due to	Water Quality	Low	Low	Minor	None proposed	Minor adverse

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
works at the offshore export cable landfall						
Impact 5: Deterioration in water quality (offshore and nearshore) due to re-suspension of sediment bound contaminants	Water Quality	Low	Negligible	Negligible	None proposed	Negligible
Operational						
Impact 1: Deterioration in water quality due to increased suspended sediment concentrations due to cable repairs/reburial	Water Quality	Low	Negligible	Negligible	None proposed	Negligible
Impact 2: Deterioration in water quality due to maintenance visits	Water Quality	Low	Negligible	Negligible	None proposed	Negligible
Decommissioning						
Impact 1: Deterioration in water quality due to increased suspended sediment concentrations during foundation removal of accessible installed components	As for construction					

34.2.3 Chapter 10 Benthic and Intertidal Ecology

23. A broad scale survey of the seabed ecology of the former East Anglia Zone (within which the Norfolk Boreas site is located) was conducted in 2010 and 2011. In addition, a survey of the Norfolk Boreas site was undertaken in 2017 and a survey of the offshore cable corridor and project interconnector search area was completed in 2016. These studies included a combination of samples taken from the seabed using a grabbing device and underwater video imagery.
24. The effects associated with marine physical processes as identified in Chapter 8 and marine water and sediment quality in Chapter 9 also inform the impact assessment for Benthic Ecology, and the approach closely follows the standard methodology outlined in Chapter 6.
25. The impacts on benthic ecology associated with construction, O&M and decommissioning are anticipated to result in changes of **minor adverse** or **negligible** significance (Table 34.3).
26. Due to the commitment to use long HDD at the landfall, there would be no works in the intertidal zone and therefore **no impact** on intertidal ecology.
27. Effects on the Haisborough Hammond and Winterton SAC were screened into the Habitats Regulations Assessment (HRA) and therefore have been considered further in the Information for the Habitats Regulations Assessment Report (Document reference 5.3) which has been submitted as part of the DCO application.

Table 34.3 Summary of potential impacts identified for benthic ecology

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Construction						
Temporary habitat loss / disturbance	Habitats and species within the Norfolk Boreas Site	Low to Medium	Low	Minor Adverse	Nothing further to embedded mitigation	Minor Adverse
	Habitats and species within Offshore cable corridor	Low to Medium	Low	Minor Adverse	Nothing further to embedded mitigation	Minor Adverse
	The Haisborough, Hammond and Winterton SAC	Medium	Low	Minor Adverse	SIP for the SAC (document reference 8.20)	Minor Adverse
	Habitats and species within the Project interconnector search area	Low	Low	Minor Adverse	Nothing further to embedded	Minor Adverse
	Intertidal benthic ecology	No receptors present	N/A	No impact	None	No impact
Temporary increase in suspended sediment concentrations and associated sediment deposition.	Habitats and species within the Norfolk Boreas site	Medium	low	Minor Adverse	Nothing further to embedded mitigation	Minor Adverse
	Habitats and species within Offshore cable corridor	Medium	Low	Minor Adverse	Nothing further to embedded mitigation	Minor Adverse
	Haisborough, Hammond and Winterton SAC	Medium	Low	Minor Adverse	Nothing further to embedded mitigation	Minor Adverse
	Cromer Shoal Chalk Beds MCZ	Low	Negligible	Negligible significance	Nothing further to embedded mitigation	Minor Adverse
	Habitats and species within the project interconnector search area	Medium	Low	Minor Adverse	Nothing further to embedded mitigation	Minor Adverse

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Changes to water quality due to re-mobilisation of contaminated sediments	Habitats and species within the offshore project area			No impact	None	No impact
Underwater noise and vibration	Habitats within the Norfolk Boreas offshore project area	Medium	Low	Minor adverse	Nothing further to embedded mitigation	Minor Adverse
Operation						
Permanent loss of seabed habitat through the presence of seabed infrastructure	Habitats within the Norfolk Boreas site	Medium	Low	Minor Adverse	Nothing further to embedded mitigation	Minor Adverse
	Habitats and species within the offshore cable corridor	Medium to High	Negligible	Minor adverse	Nothing further to embedded mitigation	Minor adverse
	Haisborough, Hammond and Winterton SAC	Medium to High	Negligible	Minor Adverse	SIP for the SAC (document reference 8.20)	Minor adverse
	Habitats within the project interconnector search area	Medium to High	Negligible	Minor Adverse	Nothing further to embedded mitigation	Minor adverse
Temporary seabed disturbances from maintenance operations	Habitats and species within the Norfolk Boreas site	Medium	Low	Minor adverse	Nothing further to embedded mitigation	Minor adverse
	Habitats and species within the offshore cable corridor	Medium	Low	Minor adverse	Nothing further to embedded mitigation	Minor adverse
	Habitats and species within the project interconnector search area	Medium	Low	Minor adverse	Nothing further to embedded mitigation	Minor adverse
Colonisation of turbines/cable protection/scour protection	Habitats and species within the offshore project area	Medium	Low	Minor adverse	Nothing further to embedded mitigation	Minor adverse

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Electromagnetic Fields (EMF) from installed inter-array and export cables	Habitats and species within the offshore project area	Negligible	Negligible	Negligible	Nothing further to embedded mitigation	Negligible
Underwater noise and vibration	Habitats within the Norfolk Boreas offshore project area	Medium	Negligible	Minor adverse	Nothing further to embedded mitigation	Minor adverse
Decommissioning						
Impact 1: Changes in Suspended Sediment Concentrations due to Wind Turbine Foundation Removal	Haisborough, Hammond and Winterton SAC	N/A	N/A	No impact	N/A	No impact
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	No impact
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 2: Changes in seabed level (morphology) due to wind turbine foundation removal	Haisborough, Hammond and Winterton SAC	Negligible	Negligible (far-field)	Negligible	None proposed	Negligible
	North Norfolk Sandbanks and Saturn Reef SAC	Negligible	Negligible (far-field)	Negligible	None proposed	Negligible
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 3: Changes in Suspended Sediment	Haisborough, Hammond and Winterton SAC	N/A	N/A	No impact	N/A	No impact

Concentrations due to Removal of parts of the Array, Interconnector or Project Interconnector Cables	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	No impact
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 4: Changes in seabed level due to removal of parts of the array, interconnector or project interconnector cables	Haisborough, Hammond and Winterton SAC	Negligible	Negligible (far-field)	Negligible	None proposed	Negligible
	North Norfolk Sandbanks and Saturn Reef SAC	Negligible	Negligible (far-field)	Negligible	None proposed	Negligible
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact
Impact 5: Changes in suspended sediment concentrations due to removal of parts of the export cables (including nearshore and at the coastal landfall)	Haisborough, Hammond and Winterton SAC	Negligible	Low (near-field), negligible (far field)	Negligible	None proposed	Negligible
	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	N/A
	Cromer Shoal Chalk Beds MCZ	Negligible	Low (near-field), negligible (far-field)	Negligible	None proposed	Negligible
	East Anglian coast	N/A	N/A	No impact	N/A	N/A
	Haisborough, Hammond and Winterton SAC	N/A	N/A	No impact	N/A	No impact

Impact 6: Indentations on the Seabed due to Decommissioning Activities	North Norfolk Sandbanks and Saturn Reef SAC	N/A	N/A	No impact	N/A	No impact
	Cromer Shoal Chalk Beds MCZ	N/A	N/A	No impact	N/A	No impact
	East Anglian coast	N/A	N/A	No impact	N/A	No impact

34.2.4 Chapter 11 Fish and Shellfish Ecology

28. Various existing data sources, including surveys of the former East Anglia Zone have been used to characterise the species of fish and shellfish that could be impacted by Norfolk Boreas. It was agreed during consultation with Natural England and the Marine Management Organisation (MMO), that no further site specific surveys were required for fish due to the ability to characterise the site appropriately using existing data.
29. The effects on fish and shellfish ecology associated with construction, O&M and decommissioning are anticipated to have impacts of **negligible** or **minor adverse** significance to all receptors (Table 34.4).

Table 34.4 Summary of potential impacts identified for fish ecology

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Construction						
Physical disturbance and temporary loss of seabed habitat	Fish in general	Low	Low	Minor adverse	N/A	Minor adverse
	Sandeels	Medium	Low	Minor adverse	N/A	Minor adverse
	Herring	Low	Low	Minor adverse	N/A	Minor adverse
	Thornback ray	Low	Low	Minor adverse	N/A	Minor adverse
	Shellfish	Medium	Low	Minor adverse	N/A	Minor adverse
Increased SSCs and sediment re-deposition	Adult and juvenile fish in general	Low	Low	Minor adverse	N/A	Minor adverse
	Sandeels	Medium	Low	Minor adverse	N/A	Minor adverse
	Herring	Low	Low	Minor adverse	N/A	Minor adverse
	Other species with spawning grounds in the offshore project area	Low	Low	Minor adverse	N/A	Minor adverse
	Shellfish	Low	Low	Minor adverse	N/A	Minor adverse
Underwater noise from piling (mortality/recoverable injury) (F: Fleeing animal modelling) (S: Stationary animal modelling)	Fish with no swim bladder	Low - general	Negligible (F/S)	Negligible (F/S)	N/A	Negligible (F/S)
		Medium -sandeels	Negligible	Minor adverse (F/S)	N/A	Minor adverse (F/S)
	Fish with swim bladder not involved in hearing	Low -general	Negligible (F) Low (S)	Negligible (F) Minor adverse (S)	N/A	Negligible (F) Minor adverse (S)

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
		Medium- Gobies	Negligible	Minor adverse (F/S)	N/A	Minor adverse (F/S)
	Fish with swim bladder involved in hearing	Low	Negligible (F) Low (S)	Negligible (F) Minor adverse (S)	N/A	Negligible (F) Minor adverse (S)
	Eggs and larvae	Medium	Negligible (F) Low (S)	Minor adverse (F/S)	N/A	Minor adverse (F/S)
	Shellfish	Medium	Negligible	Minor adverse	N/A	Minor adverse
Underwater noise from piling (TTS and behavioural) *outcomes of the assessment apply to both a fleeing animal or stationary animal modelling scenario.	Sole, plaice, lemon sole and mackerel	Low	Low	Minor adverse	N/A	Minor adverse
	Sandeels	Medium	Low	Minor adverse	N/A	Minor adverse
	Sea bass	Low	Low	Minor adverse	N/A	Minor adverse
	Cod, whiting and sprat	Low	Low	Minor adverse	N/A	Minor adverse
	Herring	Medium	Low	Minor adverse	N/A	Minor adverse
	Elasmobranchs	Low	Low	Minor adverse	N/A	Minor adverse
	Diadromous species	Low	Low	Minor adverse	N/A	Minor adverse
Indirect impacts on fish species as a result of behavioural disturbance to prey species associated with construction noise	Piscivorous fish	Low	Low	Minor adverse	N/A	Minor adverse
Underwater noise from other construction activities	Fish and shellfish in general	Low	Low	Minor adverse	N/A	Minor adverse

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Noise from unexploded ordnance (UXO) clearance	Fish and shellfish in general	Medium	Low	Minor adverse	N/A	Minor adverse
Operation						
Permanent loss of seabed habitat	Fish and shellfish in general	Low	Low	Minor adverse	N/A	Minor adverse
	Sandeels	Medium	Low	Minor adverse	N/A	Minor adverse
	Herring	Low	Low	Minor adverse	N/A	Minor adverse
Introduction of hard substrate	Fish and shellfish in general	Low	Low	Minor adverse	N/A	Minor adverse
Underwater noise during operation	Fish and shellfish in general	Low	Low	Minor adverse	N/A	Minor adverse
EMFs	Elasmobranchs	Medium	Low	Minor adverse	N/A	Minor adverse
	Lamprey	Low	Low	Minor adverse	N/A	Minor adverse
	Salmon and sea trout	Low	Low	Minor adverse	N/A	Minor adverse
	European eel	Low	Low	Minor adverse	N/A	Minor adverse
	Other fish species	Low	Low	Minor adverse	N/A	Minor adverse
	Shellfish	Low	Low	Minor adverse	N/A	Minor adverse
Changes in fishing activity	Commercially targeted stocks	Low	Low	Minor adverse	N/A	Minor adverse
Decommissioning						
Physical disturbance and temporary loss of habitat	As above for the construction phase and likely less					

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Increased SSCs and sediment re-deposition	As above for the construction phase and likely less					
Underwater noise from foundation removal	As above for the construction phase and likely less					
Underwater noise from other decommissioning activities	As above for the construction phase and likely less					

34.2.5 Chapter 12 Marine Mammal Ecology

30. Marine mammals were recorded during high resolution aerial surveys conducted over 18 months (August 2016 to January 2018) across the Norfolk Boreas site (including a 4km buffer) covering an area of 1,223km². The site specific surveys recorded low numbers of marine mammals, such that only three species occurred in numbers sufficient to justify assessment. The species assessed were harbour porpoise, grey seal and harbour seal.
31. Effects on marine mammal ecology associated with construction, O&M and decommissioning are anticipated to result in impacts of **negligible** to **minor adverse** significance following the implementation of embedded mitigation, such as piling soft-start and ramp up, as well as additional mitigation that would be implemented through a Marine Mammal Mitigation Protocol (MMMP) and a Norfolk Boreas Southern North Sea (SNS) Candidate Special Area of Conservation/ Site of community importance (cSAC/SCI) Site Integrity Plan (SIP). The MMMP and SIP will be developed in consultation with relevant Statutory Nature Conservation Bodies (SNCBs) and the MMO prior to construction in accordance with the draft MMMP for Piling and In Principle SIP which has been submitted with the DCO application.
32. Effects on the SNS cSAC/SCI were screened into the Habitats Regulations Assessment (HRA) and therefore have been considered further in the Information for the Habitats Regulations Assessment Report (Document reference 5.3) which has been submitted as part of the DCO application.

Table 34.5 Summary of potential impacts for marine mammals

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Construction						
Impact 1: Underwater UXO Clearance						
Permanent auditory injury	Harbour porpoise	High	Medium	Major	MMMP for UXO clearance.	Minor adverse
	Grey seal	High	Medium to Negligible	Major to Minor		Minor adverse
	Harbour seal	High	Low to Negligible	Moderate to Minor		Minor adverse
TTS and fleeing response	Harbour porpoise, grey seal & harbour seal	Medium	Negligible	Minor	MMMP for UXO clearance.	Minor adverse
Disturbance	Harbour porpoise	Medium	Negligible	Minor	MMMP for UXO clearance and SIP for SNS SAC	Minor adverse
	Grey seal	Medium	Low to Negligible	Minor		Minor adverse
	Harbour seal	Medium	Negligible	Minor		Minor adverse
Impact 2: Underwater Noise during Piling						
PTS from single strike of starting hammer energy	Harbour porpoise, grey seal & harbour seal	High	Negligible	Minor	MMMP for piling	Minor adverse
PTS from single strike of maximum hammer energy	Harbour porpoise, grey seal & harbour seal	High	Negligible	Minor	MMMP for piling including embedded mitigation	Minor adverse
PTS from Cumulative SEL	Harbour porpoise	High	Negligible	Minor	MMMP for piling including embedded mitigation	Minor adverse
	Grey seal & harbour seal	High	Negligible	Minor		Minor adverse
TTS and fleeing response	Harbour porpoise, grey seal & harbour seal	Medium	Negligible	Minor	MMMP for piling including embedded mitigation	Minor adverse

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Disturbance during piling for single installation	Harbour porpoise, grey seal & harbour seal	Medium	Negligible	Minor	SIP for SNS SAC	Minor adverse
Disturbance during concurrent piling	Harbour porpoise	Medium	Low	Minor		Minor adverse
	Grey seal & harbour seal	Medium	Negligible	Minor		Minor adverse
Possible behavioural	Harbour porpoise	Low	Negligible	Negligible		Negligible
Impact 3: Underwater Noise during Other Construction Activities						
PTS from Cumulative SEL	Harbour porpoise, grey seal & harbour seal	Medium	Negligible	Minor	No mitigation required	Minor adverse
Possible behavioural response	Harbour porpoise	Medium	Negligible	Minor		Minor adverse
Impact 4: Vessel Underwater Noise and Disturbance						
PTS from Cumulative SEL	Harbour porpoise, grey seal & harbour seal	Low	Negligible	Negligible	No mitigation required	Negligible
Possible behavioural response	Harbour porpoise	Low	Negligible	Negligible		Negligible
Impact 5: Barrier Effects from Underwater Noise						
Disturbance	Harbour porpoise	Medium	Low	Minor	MMMP for piling including embedded mitigation and SIP for SNS SAC	Minor adverse
	Grey seal & harbour seal	Medium	Negligible	Minor		Minor adverse
Impact 6: Vessel Collision Risk						
Increased collision risk	Harbour porpoise	Low	Medium	Minor		Minor adverse
	Grey seal	Low	Low to Medium	Minor		Minor adverse

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
	Harbour seal	Low	Low	Minor	No further mitigation proposed other than good practice	Minor adverse
Impact 7: Disturbance at Seal Haul-Out Sites						
Disturbance	Grey seal & harbour seal	Low	Negligible	Negligible	No mitigation required	Negligible
Impact 8: Changes to Prey Resource						
Displacement	Harbour porpoise	Low to Medium	Negligible	Negligible to Minor	No further mitigation currently required, beyond embedded mitigation to reduce piling noise impacts	Negligible to Minor adverse
	Grey seal & harbour seal	Low	Negligible	Negligible		Negligible
Operation						
Impact 9: Underwater Noise from Operational Turbines						
Disturbance	Harbour porpoise, grey seal & harbour seal	Low	Negligible	Negligible	No mitigation required	Negligible
Impact 10: Underwater Noise from Maintenance Activities						
Disturbance	Harbour porpoise, grey seal & harbour seal	Medium	Negligible	Minor	No mitigation required	Minor adverse
Impact 11: Vessel Underwater Noise and Disturbance during Operation and Maintenance						
Disturbance	Harbour porpoise, grey seal & harbour seal	Low	Negligible	Negligible	No mitigation required	Negligible

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Impact 12: Vessel Collision Risk						
Increased collision risk	Harbour porpoise	Low	Negligible	Negligible	No further mitigation proposed other than good practice	Negligible
	Grey seal	Low	Negligible	Negligible		Negligible
	Harbour seal	Low	Negligible	Negligible		Negligible
Impact 13: Disturbance at Seal Haul-Out Sites						
Disturbance	Grey seal & harbour seal	Low	Negligible	Negligible	No mitigation required	Negligible
Impact 14: Changes to Prey Resource during Operation and Maintenance						
Displacement	Harbour porpoise	Low to Medium	Negligible	Negligible to Minor	No mitigation required	Negligible to Minor adverse
	Grey seal & harbour seal	Low	Negligible	Negligible		Negligible
Decommissioning						
Impact 15: Underwater Noise						
Disturbance	Harbour porpoise, grey seal & harbour seal	Medium	Negligible	Minor	No further mitigation required	Minor adverse
Impact 16: Barrier Effects from Underwater Noise						
Disturbance	Harbour porpoise	Medium	Low	Minor	No mitigation required	Minor adverse
	Grey seal & harbour seal	Medium	Negligible	Minor adverse		Minor adverse

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Impact 17: Vessel Underwater Noise and Disturbance						
PTS from Cumulative SEL	Harbour porpoise, grey seal & harbour seal	Low	Negligible	Minor	No mitigation required	Minor adverse
Possible behavioural response	Harbour porpoise	Low	Negligible	Minor		Minor adverse
Impact 18: Vessel Collision Risk						
Increased collision risk	Harbour porpoise	Low	Medium	Minor	No further mitigation proposed other than good practice	Minor adverse
	Grey seal	Low	Low to Medium	Minor		Minor adverse
	Harbour seal	Low	Low	Minor		Minor adverse
Impact 19: Disturbance at Seal Haul-Out Sites						
Disturbance	Grey seal & harbour seal	Low	Negligible	Negligible	No mitigation required	Negligible
Impact 20: Changes to Prey Resource						
Displacement	Harbour porpoise	Low to Medium	Negligible	Negligible to Minor	No mitigation required	Negligible to Minor adverse
	Grey seal	Low	Negligible	Negligible		Negligible

34.2.6 Chapter 13 Offshore Ornithology

33. Use of the Norfolk Boreas site by seabirds was characterised using high resolution aerial surveys conducted over 18 months (including a 4km buffer around each site). The results of these surveys have been used to estimate the abundance and assemblage of birds using or passing across the area.
34. Effects on offshore ornithology associated with construction, O&M and decommissioning are anticipated to result in impacts of **negligible to minor adverse** significance (Table 34.6).
35. Effects on the Greater Wash SPA, Alde-Ore Estuary SPA and Ramsar and Flamborough and Filey Coast pSPA have been screened into the HRA (Appendix 10.3) and will therefore be considered further in the Information for the Habitats Regulations Assessment Report (Document reference 5.3) which has been submitted as part of the DCO application.

Table 34.6 Summary of potential impacts for offshore ornithology

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Construction						
Disturbance and displacement from increased vessel traffic	Common scoter	High	Negligible / no change	Negligible to minor adverse	NA	Negligible to minor adverse
	Red-throated diver	High	Negligible	Minor adverse	NA	Minor adverse
	Razorbill	Medium	Negligible	Minor adverse	NA	Minor adverse
	Guillemot	Medium	Negligible	Minor adverse	NA	Minor adverse
	Commic tern	Medium	Negligible	Minor adverse	NA	Minor adverse
Indirect effects due to prey species displacement	All species	Low to high	Negligible	Negligible to minor adverse	NA	Negligible to minor adverse
Operation						
Disturbance and displacement	Red-throated diver	High	Negligible	Minor adverse	NA	Minor adverse
	Gannet	Low	Negligible	Negligible to minor adverse	NA	Negligible
	Razorbill	Medium	Negligible	Minor adverse	NA	Minor adverse
	Guillemot	Medium	Negligible	Minor adverse	NA	Minor adverse
Indirect effects due to impacts on habitats and prey species displacement	All species	Low to high	Negligible	Negligible to minor adverse	NA	Negligible to minor adverse
Collision Risk - seabirds	Gannet	Low to medium	Negligible	Negligible to minor adverse	NA	Negligible to minor adverse
	Kittiwake	Low to medium	Negligible	Negligible to minor adverse	NA	Negligible to minor adverse

	Lesser black-backed gull	Low to medium	Negligible	Negligible to minor adverse	NA	Negligible to minor adverse
	Herring gull	Low to medium	Negligible	Negligible to minor adverse	NA	Negligible to minor adverse
	Great black-backed gull	Low to medium	Negligible	Negligible to minor adverse	NA	Negligible to minor adverse
Collision risk – migrant seabirds	Arctic skua	Low to medium	Negligible	Negligible to minor	NA	Negligible to minor
	Great skua	Low to medium	Negligible	Negligible to minor	NA	Negligible to minor
	Arctic tern	Low to medium	Negligible	Negligible to minor	NA	Negligible to minor
	Common tern	Low to medium	Negligible	Negligible to minor	NA	Negligible to minor
	Little gull	Low to medium	Negligible	Negligible to minor	NA	Negligible to minor
Collision risk – nonseabird migrants	All species	Low to high	Negligible	Negligible	NA	Negligible
Barrier effects	All species	Low to high	Negligible	Negligible	NA	Negligible
Decommissioning						
Direct disturbance and displacement	All species	Low to high	Negligible	Negligible to minor	NA	Negligible to minor
Indirect impacts through effects on habitats and prey	All species	Low to high	Negligible	Negligible to minor	NA	Negligible to minor

34.2.7 Chapter 14 Commercial Fisheries

36. Various datasets were used to characterise the baseline and assess the potential impacts of Norfolk Boreas on commercial fisheries receptors, including United Kingdom (UK) MMO fisheries statistics, surveillance sightings satellite tracking data and equivalent data from various EU countries (including the Netherlands, Belgium, Denmark, and France).
37. Fisheries activities of relevance to Norfolk Boreas include Dutch vessels undertaking trawling (including UK flagged but Dutch owned beam trawlers) and seine netting and local UK static gear fisheries.
38. The key species for the trawlers include Dover sole and plaice, whilst the local fishermen target lobster, edible crab and whelks.
39. Effects on commercial fisheries associated with construction, O&M and decommissioning are anticipated to result in impacts of **negligible** to **minor adverse** significance (Table 34.7).
40. Effects on safety on commercial fisheries are considered based on the outcomes of the Shipping and Navigation Assessment (explained further in section 34.2.8 and Chapter 15). These have been assessed as 'within acceptable limits'.

Table 34.7 Summary of potential impacts for commercial fisheries

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Construction						
Impact 1: Potential Impacts on commercially exploited fish and shellfish populations	All commercial fisheries	See Chapter 11 Fish and Shellfish Ecology		Minor adverse	See Chapter 11 Fish and Shellfish Ecology	Minor adverse
Impact 2: Temporary loss or restricted access to traditional fishing grounds	Dutch beam trawling	Low	Low	Minor adverse	N/A	Minor adverse
	Dutch seine netting	Low	Low	Minor adverse	N/A	Minor adverse
	Belgian beam trawling	Low	Low	Minor adverse	N/A	Minor adverse
	Belgian demersal otter trawling and seine netting	Low	Negligible	Negligible	N/A	Negligible
	UK Local inshore vessels	Medium	Low	Minor adverse	Implementation of evidence based mitigation in line with FLOWW (Fishing Liaison with Offshore Wind and Wet Renewables Group) guidelines, where appropriate	Minor adverse
	UK beam trawlers (Anglo-Dutch)	Low	Low	Minor adverse	N/A	Minor adverse
	UK beam trawlers (south-west ports)	Low	Negligible	Negligible	N/A	Negligible
	UK demersal trawlers	Low	Negligible	Negligible	N/A	Negligible

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
	French demersal and pelagic trawlers	Low	Low	Minor adverse	N/A	Minor adverse
	Danish industrial sandeel and pelagic trawlers	Low	Negligible	Negligible	N/A	Negligible
	German fishing vessels	Low	Negligible	Negligible	N/A	Negligible
Impact 3: Displacement of fishing activity into other areas	Static Gear	Medium	Negligible	Negligible	N/A	Negligible
	All towed gear methods	Low to Medium	Negligible to Low	Negligible to Minor Adverse	N/A	Negligible to Minor Adverse
Impact 4; Increased steaming times to fishing grounds	All commercial fishing vessels	Negligible	Negligible	Negligible		Negligible
Impact 5: Interference with fishing activities	Static gear	Medium	Low	Minor Adverse	N/A	Minor Adverse
	Mobile Gear	Low	Negligible	Negligible	N/A	Negligible
Impact 6: Safety issues for fishing vessels	All commercial fishing vessels	N/A	N/A	Within acceptable limits	N/A	Within acceptable limits
Impact 7: Obstacles on the seabed	All commercial fishing vessels	N/A	N/A	Within acceptable limits	N/A	Within acceptable limits
Operation						
Impact 8: Potential Impacts on commercially exploited fish and shellfish populations	All commercial fisheries	See Chapter 11 Fish and Shellfish Ecology		Minor adverse	See Chapter 11 Fish and Shellfish Ecology	Minor adverse
Impact 9: Complete loss or restricted access to traditional fishing grounds	Dutch beam trawling	Low	Low to Medium	Minor adverse	N/A	Minor adverse
	Dutch seine netting	Low	Medium	Minor adverse	N/A	Minor adverse
	Belgian beam trawling	Low	Low	Minor adverse	N/A	Minor adverse

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
	Belgian demersal otter trawling and seine netting	Low	Negligible	Negligible	N/A	Negligible
	UK Local inshore vessels	Medium	Low	Minor adverse	N/A	Minor adverse
	UK beam trawlers (Anglo-Dutch)	Low	Low to Medium	Minor adverse	N/A	Minor adverse
	UK beam trawlers (south-west ports)	Low	Negligible	Negligible	N/A	Negligible
	UK demersal trawlers	Low	Negligible	Negligible	N/A	Negligible
	French demersal and pelagic trawlers	Low	Low	Minor adverse	N/A	Minor adverse
	Danish industrial sandeel and pelagic trawlers	Low	Negligible	Negligible	N/A	Negligible
	German fishing vessels	Low	Negligible	Negligible	N/A	Negligible
Impact 10: Displacement of fishing activity into other areas	Static gear vessels	Medium	Low	Minor adverse	N/A	Minor adverse
	Towed gear vessels	Low to Medium	Negligible to Medium	Negligible to Minor adverse	N/A	Negligible to Minor adverse
Impact 11: Increased steaming times to fishing grounds	All commercial fishing vessels	Negligible	Negligible	Negligible	N/A	Negligible
Impact 12: Interference with fishing activities	Static Gear fleets	Medium	Negligible	Minor adverse	N/A	Minor adverse
	Mobile gear fleets	Low	Negligible	Negligible	N/A	Negligible

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Impact 13: Safety issues for fishing vessels	All commercial fishing vessels	N/A	N/A	Within acceptable limits	N/A	Within acceptable limits
Impact 14: Obstacles on the seabed	All commercial fishing vessels	N/A	N/A	Within acceptable limits	N/A	Within acceptable limits
Decommissioning						
Impact 1 to Impact 7 These impacts are assumed to be the same as during the construction phase	The sensitivity of the receptors is considered to be the same to that identified for the construction phase. The magnitude of effect is considered to be no greater, and in all probability less, than in the construction phase. Therefore, it is anticipated that any decommissioning impacts would be no greater, and probably less than that assessed for the construction phase.					

34.2.8 Chapter 15 Shipping and Navigation

41. Summer and winter shipping surveys were undertaken in 2017/18 to inform the impact assessment. A Navigation Risk Assessment (NRA) (Appendix 15.1) was undertaken for the project which informs the EIA. The NRA includes the required Formal Safety Assessment (FSA) to meet Maritime and Coastguard Agency (MCA) guidance for all phases of the project, as well as an assessment of cumulative effects.
42. Shipping and navigation impacts have been assessed using the International Maritime Organization FSA (IMO, 2002) process, as required by the MCA. The approach is broadly similar to that used for the wider EIA (see Chapter 6 EIA Methodology), however impact significance is categorised under the FSA approach as “no impact/no perceptible effect”; “broadly acceptable”; “tolerable (with or without mitigation)” or “unacceptable”. Further information on the methodology for assessing shipping and navigation impacts is provided in section 15.4.1 of Chapter 15.
43. Through the implementation of embedded mitigation, such as shipping safety zones during construction as well as lighting and marking of offshore infrastructure to comply with appropriate standards and as agreed with Trinity House and the MCA, the impacts of Norfolk Boreas are deemed to range from **no perceptible effect** to **tolerable** with mitigation (Table 34.8).

Table 34.8 Summary of potential impacts for shipping and navigation

Potential Impact	Receptor	Frequency of Occurrence	Severity of Consequence	Significance	Mitigation	Residual Impact
Construction						
Vessel Displacement – Norfolk Boreas Site	Commercial Vessels	Reasonably Probable	Minor	Tolerable	n/a	Tolerable
	Recreational Vessels	--	--	No impact	n/a	No impact
	Fishing Vessels	Remote	Negligible	Broadly Acceptable	n/a	Broadly Acceptable
Vessel Displacement – Offshore Cable Corridor	Commercial Vessels	--	--	No impact	n/a	No impact
	Recreational Vessels	--	--	No impact	n/a	No impact
	Fishing Vessels	--	--	No impact	n/a	No impact
Restriction of Adverse Weather Routeing – Norfolk Boreas Site	Commercial Vessels	Remote	Moderate	Tolerable	n/a	Tolerable
	Recreational Vessels	Negligible	Moderate	Broadly Acceptable	n/a	Broadly Acceptable
	Fishing Vessels	Extremely Unlikely	Moderate	Broadly Acceptable	n/a	Broadly Acceptable
Restriction of Adverse Weather Routeing – Offshore Cable Corridor	Commercial Vessels	--	--	No impact	n/a	No impact
	Recreational Vessels	--	--	No impact	n/a	No impact
	Fishing Vessels	--	--	No impact	n/a	No impact
Increased Vessel to Vessel Collision Risk – Norfolk Boreas Site	Commercial Vessels	Reasonably Probable	Minor	Tolerable	Management of construction traffic.	Tolerable with mitigation
	Recreational Vessels	--	--	No impact	n/a	No impact
	Fishing Vessels	--	--	No impact	n/a	No impact
Increased Vessel to Vessel Collision Risk –	Commercial Vessels	Remote	Minor	Broadly Acceptable	n/a	Broadly Acceptable

Potential Impact	Receptor	Frequency of Occurrence	Severity of Consequence	Significance	Mitigation	Residual Impact
Offshore Cable Corridor	Recreational Vessels	--	--	No impact	n/a	No impact
	Fishing Vessels	--	--	No impact	n/a	No impact
Vessel to Structure Allision Risk – Norfolk Boreas Site	Commercial Vessels	Extremely Unlikely	Minor	Broadly Acceptable	n/a	Broadly Acceptable
	Recreational Vessels	Negligible	Minor	Broadly Acceptable	n/a	Broadly Acceptable
	Fishing Vessels	Extremely Unlikely	Moderate	Broadly Acceptable	n/a	Broadly Acceptable
Vessel to Structure Allision Risk – Offshore Cable Corridor	Commercial Vessels	--	--	No impact	n/a	No impact
	Recreational Vessels	--	--	No impact	n/a	No impact
	Fishing Vessels	--	--	No impact	n/a	No impact
Anchor Interaction and Snagging Risk – Norfolk Boreas Site	Commercial Vessels	Remote	Minor	Broadly Acceptable	n/a	Broadly Acceptable
	Recreational Vessels	Negligible	Negligible	Broadly Acceptable	n/a	Broadly Acceptable
	Fishing Vessels	Remote	Minor	Broadly Acceptable	n/a	Broadly Acceptable
Anchor Interaction and Snagging Risk – Offshore Cable Corridor	Commercial Vessels	Remote	Minor	Broadly Acceptable	n/a	Broadly Acceptable
	Recreational Vessels	Extremely Unlikely	Negligible	Broadly Acceptable	n/a	Broadly Acceptable
	Fishing Vessels	Remote	Minor	Broadly Acceptable	n/a	Broadly Acceptable

Potential Impact	Receptor	Frequency of Occurrence	Severity of Consequence	Significance	Mitigation	Residual Impact
Effects on Emergency Response Resources – Norfolk Boreas Site	Emergency Response Resources	Remote	Moderate	Tolerable	n/a	Tolerable
Effects on Emergency Response Resources – Offshore Cable Corridor	Emergency Response Resources	--	--	No impact	n/a	No impact
Operation						
Vessel Displacement – Norfolk Boreas Site	Commercial Vessels	Reasonably Probable	Minor	Tolerable	n/a	Tolerable
	Recreational Vessels	--	--	No impact	n/a	No impact
	Fishing Vessels	Remote	Negligible	Broadly Acceptable	n/a	Broadly Acceptable
Vessel Displacement – Offshore Cable Corridor	Commercial Vessels	--	--	No impact	n/a	No impact
	Recreational Vessels	--	--	No impact	n/a	No impact
	Fishing Vessels	--	--	No impact	n/a	No impact
Restriction of Adverse Weather Routeing – Norfolk Boreas Site	Commercial Vessels	Remote	Moderate	Tolerable	n/a	Tolerable
	Recreational Vessels	Negligible	Moderate	Broadly Acceptable	n/a	Broadly Acceptable
	Fishing Vessels	Extremely Unlikely	Moderate	Broadly Acceptable	n/a	Broadly Acceptable
Restriction of Adverse Weather Routeing – Offshore Cable Corridor	Commercial Vessels	--	--	No impact	n/a	No impact
	Recreational Vessels	--	--	No impact	n/a	No impact
	Fishing Vessels	--	--	No impact	n/a	No impact
	Commercial Vessels	Remote	Minor	Broadly Acceptable	n/a	Broadly Acceptable

Potential Impact	Receptor	Frequency of Occurrence	Severity of Consequence	Significance	Mitigation	Residual Impact
Increased Vessel to Vessel Collision Risk – Norfolk Boreas Site	Recreational Vessels	--	--	No impact	n/a	No impact
	Fishing Vessels	--	--	No impact	n/a	No impact
Increased Vessel to Vessel Collision Risk – Offshore Cable Corridor	Commercial Vessels	--	--	No impact	n/a	No impact
	Recreational Vessels	--	--	No impact	n/a	No impact
	Fishing Vessels	--	--	No impact	n/a	No impact
Vessel to Structure Allision Risk – Norfolk Boreas Site	Commercial Vessels	Remote	Minor	Broadly Acceptable	n/a	Broadly Acceptable
	Recreational Vessels	Extremely Unlikely	Moderate	Broadly Acceptable	n/a	Broadly Acceptable
	Fishing Vessels	Remote	Moderate	Tolerable	Further mitigation may be required depending upon foundation type selected.	Tolerable with mitigation
Anchor Interaction and Snagging Risk – Norfolk Boreas Site	Commercial Vessels	Extremely Unlikely	Negligible	No impact	n/a	No impact
	Recreational Vessels	Negligible	Negligible	No impact	n/a	No impact
	Fishing Vessels	Extremely Unlikely	Minor	No impact	n/a	No impact
Anchor Interaction and Snagging Risk – Offshore Cable Corridor	Commercial Vessels	Remote	Minor	Broadly Acceptable	n/a	Broadly Acceptable
	Recreational Vessels	Remote	Minor	Broadly Acceptable	n/a	Broadly Acceptable
	Fishing Vessels	Remote	Minor	Broadly Acceptable	n/a	Broadly Acceptable

Potential Impact	Receptor	Frequency of Occurrence	Severity of Consequence	Significance	Mitigation	Residual Impact
Effects on Emergency Response Resources – Norfolk Boreas Site	Emergency Response Resources	Extremely Unlikely	Minor	Broadly Acceptable	n/a	Broadly Acceptable
Effects on Emergency Response Resources – Norfolk Boreas Site	Emergency Response Resources	--	--	Broadly Acceptable	n/a	Broadly Acceptable
Decommissioning						
Vessel Displacement – Norfolk Boreas Site	Commercial Vessels	Reasonably Probable	Minor	Tolerable	n/a	Tolerable
	Recreational Vessels	--	--	No impact	n/a	No impact
	Fishing Vessels	Remote	Negligible	Broadly Acceptable	n/a	Broadly Acceptable
Vessel Displacement – Offshore Cable Corridor	Commercial Vessels	--	--	No impact	n/a	No impact
	Recreational Vessels	--	--	No impact	n/a	No impact
	Fishing Vessels	--	--	No impact	n/a	No impact
Restriction of Adverse Weather Routeing – Norfolk Boreas Site	Commercial Vessels	Remote	Moderate	Tolerable	n/a	Tolerable
	Recreational Vessels	Negligible	Moderate	Broadly Acceptable	n/a	Broadly Acceptable
	Fishing Vessels	Extremely Unlikely	Moderate	Broadly Acceptable	n/a	Broadly Acceptable
Restriction of Adverse Weather Routeing – Offshore Cable Corridor	Commercial Vessels	--	--	No impact	n/a	No impact
	Recreational Vessels	--	--	No impact	n/a	No impact
	Fishing Vessels	--	--	No impact	n/a	No impact
Increased Vessel to Vessel Collision Risk – Norfolk Boreas Site	Commercial Vessels	Reasonably Probable	Minor	Tolerable	Management of decommissioning traffic	Tolerable with mitigation

Potential Impact	Receptor	Frequency of Occurrence	Severity of Consequence	Significance	Mitigation	Residual Impact
	Recreational Vessels	--	--	No impact	n/a	No impact
	Fishing Vessels	--	--	No impact	n/a	No impact
Increased Vessel to Vessel Collision Risk – Offshore Cable Corridor	Commercial Vessels	--	--	No impact	n/a	No impact
	Recreational Vessels	--	--	No impact	n/a	No impact
	Fishing Vessels	--	--	No impact	n/a	No impact
Vessel to Structure Allision Risk – Norfolk Boreas Site	Commercial Vessels	Extremely Unlikely	Minor	Broadly Acceptable	n/a	Broadly Acceptable
	Recreational Vessels	Negligible	Minor	Broadly Acceptable	n/a	Broadly Acceptable
	Fishing Vessels	Extremely Unlikely	Moderate	Broadly Acceptable	n/a	Broadly Acceptable
Vessel to Structure Allision Risk – Offshore Cable Corridor	Commercial Vessels	--	--	No impact	n/a	No impact
	Recreational Vessels	--	--	No impact	n/a	No impact
	Fishing Vessels	--	--	No impact	n/a	No impact
Anchor Interaction and Snagging Risk – Norfolk Boreas Site	Commercial Vessels	Extremely Unlikely	Minor	Broadly Acceptable	n/a	Broadly Acceptable
	Recreational Vessels	Extremely Unlikely	Minor	Broadly Acceptable	n/a	Broadly Acceptable
	Fishing Vessels	Remote	Minor	Broadly Acceptable	n/a	Broadly Acceptable
Anchor Interaction and Snagging Risk – Offshore Cable Corridor	Commercial Vessels	Remote	Minor	Broadly Acceptable	n/a	Broadly Acceptable
	Recreational Vessels	Extremely Unlikely	Negligible	Broadly Acceptable	n/a	Broadly Acceptable

Potential Impact	Receptor	Frequency of Occurrence	Severity of Consequence	Significance	Mitigation	Residual Impact
	Fishing Vessels	Remote	Minor	Broadly Acceptable	n/a	Broadly Acceptable
Effects on Emergency Response Resources – Norfolk Boreas Site	Emergency Response Resources	Remote	Moderate	Tolerable	n/a	Tolerable
Effects on Emergency Response Resources – Offshore Cable Corridor	Emergency Response Resources	--	--	No impact	n/a	No impact

34.2.9 Chapter 16 Aviation and Radar

44. The aviation interests considered of relevance to Norfolk Boreas include those of the UK Civil Aviation Authority (CAA), Ministry of Defence (MOD), regional airports, local aerodromes and National Air Traffic Service (NATS) (that currently comprises NATS (En-Route) plc [NERL] and NATS (Services) Limited [NSL]), other UK aviation stakeholders and, where necessary, overseas authorities. The assessment includes a description of the potential effects on aviation activities with respect to effects on radar and physical effects in both UK and overseas airspace.
45. In assessing the significance of impacts on aviation operations, the aviation industry is highly regulated and subject to numerous mandatory standards, checks and safety requirements. The sensitivity and magnitude of the impact on operations can only be identified by the appropriate aviation organisation conforming to the Risk Classification Scheme used to quantify and qualify the severity and likelihood of a hazard occurring. The Risk Classification Scheme is a fundamental element of an aviation organisation's Safety Management System (SMS), which must be acceptable to, and approved by, the UK CAA or the Military Aviation Authority (MAA), as appropriate. As such, for the purposes of the Aviation and Radar assessment, no detailed grading has been made of the magnitude of the impact or sensitivity of the receptor on the basis that any potential reduction in aviation safety cannot be tolerated. Instead, definitions of basic significance have been identified.
46. **No significant** impacts were identified for Norfolk Boreas following implementation of appropriate mitigation (i.e. charting, marking and lighting of all wind turbines consistent with UK regulations) and radar mitigation to be agreed with the MOD (Table 34.9).

Table 34.9 Summary of potential impacts for aviation and radar

Potential Impact	Receptor	Significance	Mitigation	Residual Impact
Construction				
Impact 1: Creation of an aviation obstacle	Aircraft undertaking low flying operations Oil and Gas platform operators and the use of specific helicopter operations to / from offshore oil and gas platforms.	Not significant	Norfolk Boreas Limited has undertaken consultation with all relevant Offshore Platform and helicopter Operators, during which no specific concerns were raised and it is expected that users could co-exist. This will be managed through coexistence agreements where necessary.	Not Significant
Impact 2: Wind turbines causing permanent interference to civil and military radar	NATS Cromer PSR MoD Trimmingham ADR	No change	N/A	N/A
Impact 3: Increased air traffic in the area related to wind farm activities	Aircraft undertaking low flying operations. Helicopters operating offshore.	Not significant	N/A	N/A
Operation				
Impact 1: Creation of an aviation obstacle	Aircraft undertaking low flying operations. Oil and Gas platform operators and the use of specific helicopter operations to / from offshore oil and gas platforms.	Not significant	Norfolk Boreas Limited has undertaken consultation with all relevant Offshore Platform and helicopter Operators, during which no specific concerns were raised and it is expected that users could co-exist. This will be managed through coexistence agreements where necessary.	Not significant
Impact 2: Wind turbines causing permanent	NATS Cromer PSR	Major Significance	A mitigation agreement between Norfolk Boreas Limited and NATS has been entered into. NATS are	Not Significant

Potential Impact	Receptor	Significance	Mitigation	Residual Impact
interference to civil and military radar	MoD Trimmingham ADR		considering all options for mitigation and have submitted a request for an Airspace Change Proposal to the UK regulator (the CAA) which will be subject to regulatory approval. Mitigation of the Trimmingham ADR will be agreed with the MoD which will remove the impact created by Norfolk Boreas.	
Impact 3: Increased air traffic in the area related to wind farm activities	Helicopters operating in support of Norfolk Boreas.	Not significant	N/A	N/A
Decommissioning				
Impact 1: Creation of an aviation obstacle	Aircraft undertaking low flying operations. Oil and Gas platform operators and the use of specific helicopter operations to / from offshore oil and gas platforms.	Not Significant	Norfolk Boreas Limited has undertaken consultation with all relevant Offshore Platform and helicopter Operators, during which no specific concerns were raised and it is expected that users could co-exist. This will be managed through coexistence agreements where necessary.	Not significant
Impact 2: Wind turbines causing permanent interference to civil and military radar	NATS Cromer PSR MoD Trimmingham ADR	No change	N/A	N/A
Impact 3: Increased air traffic in the area related to wind farm activities	Helicopters operating in support of Norfolk Boreas.	Not significant	N/A	N/A

34.2.10 Chapter 17 Offshore and Intertidal Archaeology and Cultural Heritage

47. The existing offshore and intertidal archaeological baseline has been established through a desk-based assessment and a review of site specific geophysical survey data collected in 2017.
48. Through the implementation of embedded mitigation, the effects on offshore archaeology associated with construction, O&M and decommissioning are anticipated to result in impacts of **negligible** or **minor adverse** significance (Table 34.10). Embedded mitigation measures include Archaeological Exclusion Zones (AEZs) to avoid important archaeological features, ensuring that direct impacts will not occur as well as watching briefs during intrusive works where sediment is brought to the surface. No works in the intertidal zone will be undertaken due to the commitment to undertake long HDD and a watching brief would be carried out during the HDD works.
49. Mitigation measures will be developed within the framework of a Written Scheme of Investigation (WSI), in consultation with Historic England and the MMO. A draft outline WSI (Document reference 8.6) setting out the principles for all proposed embedded mitigation has been submitted alongside the DCO application for the project.

Table 34.10 Summary of potential impacts for offshore archaeology

Potential Impact	Receptor	Value/Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Construction						
Direct impact to known heritage assets	Wrecks and Anomalies (A1)	High	High	Major adverse	50m AEZs	No impact
	A3 wrecks	High	High	Major adverse	50m AEZs/Avoid location	No impact
	Additional anomalies (A2)	High	High	Major adverse	Avoid location	No impact
	Intertidal assets	Low	No impact	No impact	None	No impact
Direct impact to potential heritage assets	In situ prehistoric, maritime or aviation sites	High	High	Major adverse	Further assessment	Minor adverse
	In situ intertidal sites	High	Negligible	Minor adverse	Further (geoarchaeological) assessment	Minor adverse
	High	Low	Moderate adverse	Moderate adverse	Protocol to be established	Minor adverse
	Isolated finds	Medium	Low	Minor adverse	Protocol to be established	Minor adverse
Indirect impact to heritage assets from changes to physical processes	Known and potential heritage assets	Low to High	Negligible	Negligible to Minor	None	Negligible to Minor adverse/beneficial
Impacts to the setting of heritage assets and historic seascape character	Temporary changes to setting and historic seascape character from construction activities are not considered to result in harm to the significance of heritage assets within the study area.					
Impacts to site preservation conditions from drilling fluid breakout	Intertidal assets	Low	Negligible / No impact	Negligible	None	Negligible

Potential Impact	Receptor	Value/Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Operation						
Direct impact to known heritage assets	As for construction					No impact
Direct impact to potential heritage assets	In situ prehistoric, maritime or aviation sites	High	High	Major adverse	Further assessment	Minor adverse
Indirect impact to heritage assets from changes to physical processes	Known and potential heritage assets	Low to High	Negligible	No impact to Negligible	None	No impact to Negligible
Impacts to the setting of heritage assets and historic seascape character	Changes to setting and historic seascape character during operation are not considered to result in harm to the significance of heritage assets within the study area.					
Impacts to site preservation conditions from heat loss from installed cables	Known and potential heritage assets	Low to High	No impact	No impact	None	No impact
Decommissioning						
Direct impact to known heritage assets	As for construction					No impact
Direct impact to potential heritage assets	In situ prehistoric, maritime or aviation sites	High	High	Major adverse	Further assessment	Minor adverse
Indirect impact to heritage assets from changes to physical processes	As for construction (or less)					Negligible to Minor adverse/beneficial
Impacts to the setting of heritage assets and historic seascape character	Temporary changes to setting and historic seascape character from decommissioning activities are not considered to result in harm to the significance of heritage assets within the study area.					

34.2.11 Chapter 18 Infrastructure and Other Users

50. This assessment considered offshore wind farm projects, oil and gas activity, marine aggregate extraction, marine disposal sites, military exercise areas (note military aviation is addressed in Chapter 16 Aviation and Radar), telecommunications and electricity cables, pipelines, port developments, capital and maintenance dredging, a coal and brine consultation area and unexploded ordnance (UXO).

51. Potential impacts during construction, O&M and decommissioning include impacts on subsea cable and pipelines, aggregate dredging activities disposal sites, and oil and gas exploration and production and these were assessed as **negligible to minor adverse** significance (Table 34.11). Agreements with relevant operators would be put in place as embedded mitigation and ongoing consultation with developers would ensure impacts would remain of low significance.

Table 34.11 Summary of potential impacts for infrastructure and other users

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Construction						
Impacts on oil and gas operations	Infrastructure	Low	Negligible	No change	Agreements with operators would be put in place as embedded mitigation.	No change
Impacts on oil and gas exploration	Infrastructure	Medium	Negligible	Minor adverse	Ongoing consultation with developers	Minor
Physical impacts on subsea cables and pipelines	Infrastructure	High	Negligible	Minor adverse	Agreements with operators would be put in place as embedded mitigation.	Minor
Operation						
Impacts with oil and gas operations	Infrastructure	High	Negligible	Minor adverse	Agreements with operators would be put in place as embedded mitigation.	Minor
Impacts on oil and gas exploration	Infrastructure	Medium	Negligible	Negligible	Ongoing consultation with developers	No change
Decommissioning						
Impacts on oil and gas operations	Infrastructure	Low	Negligible	No change	Agreements with operators would be put in place as embedded mitigation.	No change
Impacts on oil and gas exploration	Infrastructure	Medium	Negligible	Minor adverse	Ongoing consultation with developers	Minor

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Physical impacts on subsea cables and pipelines	Infrastructure	High	Negligible	Minor adverse	Agreements with operators would be put in place as embedded mitigation.	Minor

34.3 Scenario 1 Onshore

34.3.1 Chapter 19 Ground Conditions and Contamination

52. The majority of the onshore project area is located in agricultural land, where significant contamination is not expected. The ground conditions assessment included a desk-based review of the current conditions found within the onshore project area, and identified mitigation measures where appropriate for those significant effects that may potentially arise as part of the project.
53. The impacts assessed include the potential for contamination leaks and spills from construction plant, potential for existing contaminant release during any works and impacts on groundwater quality and mineral resources availability. A Code of Construction Practice (CoCP) will be produced, which will provide details of the industry best practice measures that would be undertaken to reduce potential construction impacts onshore.
54. Under Scenario 1, with the application of mitigation measures the project is predicted to have no greater than **minor adverse** impacts in relation to ground conditions and contamination.

Table 34.12 Summary of potential impacts identified for ground conditions and contamination under Scenario 1

Potential impact	Receptor	Value/ sensitivity	Magnitude	Significance	Additional Mitigation	Residual impact	
Construction							
1	Impacts to coastline, including designated geological sites	Coastline and designated geological sites	High	No change.	No impact	N/A	No impact
2	Contamination of secondary aquifers as a result of construction activities	Secondary aquifers	Low to Medium	Low	Minor adverse	CoCP - minimise exposure to potentially harmful substances	Negligible
3	Impacts on groundwater quality in the principal aquifer (including Source Protection Zones (SPZ)) as a result of shallow excavation construction activities	Principal aquifer including at SPZ areas	High	Low	Moderate adverse	CoCP - minimise exposure to potentially harmful substances	Minor adverse
4	Impacts on groundwater quality in the principal aquifer (including SPZ areas), resulting from trenchless crossing techniques and piling.	Principal aquifer including at SPZ areas	High	Low	Moderate adverse	Hydrogeological risk assessment to be conducted pre-construction	Minor adverse
5	Impacts of construction may affect the quality of surface waters fed by groundwater	Surface water	Low to High	Negligible	Negligible to Minor adverse	Embedded mitigation only	Negligible to Minor adverse

Potential impact	Receptor	Value/ sensitivity	Magnitude	Significance	Additional Mitigation	Residual impact	
6	Impacts to human health, including construction workers and general public during any excavations associated with construction.	Human health.	High	Low	Moderate adverse	CoCP – Site and Excavated Waste Management Plan	Minor adverse
7	Sterilisation of mineral resources.	Mineral safeguard areas.	Medium	Negligible	Minor adverse	CoCP – Materials Management Plan	Minor adverse
8	Impacts on shallow groundwater due to changes to the hydraulic regime as a result of changes to soil compaction along the cable route	Shallow groundwater	Medium	Negligible	Minor adverse	Embedded mitigation only	Minor adverse
Operation							
Impacts during operation are scoped out of the EIA in accordance with the Norfolk Boreas EIA Scoping Report.							
Decommissioning							
It is anticipated that the decommissioning impacts will be similar in nature to those of construction.							

34.3.2 Chapter 20 Water Resources and Flood Risk

55. To inform the impact assessment, a desk based review of publicly available data and data obtained from the Environment Agency and Internal Drainage Boards was undertaken. In addition, a geomorphological walkover survey of the locations where the onshore cable route would cross watercourses was also undertaken.
56. The study area for the assessment was categorised by three main surface water catchments: the River Bure catchment, the River Wensum catchment, and the River Wissey catchment. The River Bure and River Wensum are designated as a Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI), and several of their tributaries, including the King's Beck, North Walsham and Dilham Canal, Wendling Beck and Blackwater Drain will be crossed by the proposed onshore cable route. The grid connection at the existing Necton National Grid substation will be located within the River Wissey headwaters. Due to the designated status of the River Bure and River Wensum, these watercourses and their tributaries are considered to be receptors of high value.
57. The impact assessment considered potential impacts upon receptors including direct disturbance of surface water bodies, increased flood risk, increased sediment input to watercourses, and accidental spills of fuels, oils and lubricants during construction.
58. Under Scenario 1, with the application of mitigation measures the project is predicted to have no greater than **minor adverse** impacts in relation to water resources and flood risk.

Table 34.13 Summary of potential impacts identified for water resources and flood risk under Scenario 1

Potential Impact	Receptor	Sub-catchment	Value/ Sensitivity ¹	Magnitude	Significance	Additional Mitigation	Residual Impact		
Construction									
Impact 1: Direct disturbance of surface water bodies	River Bure catchment	North Walsham and Dilham Canal	Low / Low	Negligible	Minor adverse	Measures to minimise the impact of temporary culverts.	Negligible		
		East Ruston Stream	High / High	Negligible	Minor adverse		Minor adverse		
		River Bure	Medium / High	Medium	Major adverse		Minor adverse		
		King's Beck	Medium / High	Negligible	Minor adverse		Minor adverse		
	River Wensum catchment	Penny Spot Beck	High / High	Low	Moderate adverse		Minor adverse		
		Blackwater Drain	High / High	Negligible	Minor adverse		Minor adverse		
		Wending Beck	High / High	Low	Moderate adverse		Minor adverse		
	River Wissey catchment	Upper River Wissey	Medium / Medium	Negligible	Minor adverse		Minor adverse		
	Impact 2: Increased sediment supply	River Bure catchment	North Walsham and Dilham Canal	Low / Low	Negligible		Negligible	Embedded measures plus additional construction best practice measures to manage sediment and	Negligible
			East Ruston Stream	High / High	Negligible		Minor adverse		Minor adverse
New Cut			Low / High	Negligible	Negligible	Negligible			
River Bure			Medium / High	Negligible	Minor adverse	Minor adverse			
King's Beck			Medium / High	Negligible	Minor adverse	Minor adverse			
Mermaid Stream			Medium / High	Negligible	Minor adverse	Minor adverse			

¹ Please note this is the highest sensitivity/value of receptor assessed per impact.

Potential Impact	Receptor	Sub-catchment	Value/ Sensitivity ¹	Magnitude	Significance	Additional Mitigation	Residual Impact
	River Wensum catchment	River Wensum & Penny Spot Beck	High / High	Negligible	Minor adverse	surface drainage.	Minor adverse
		Blackwater Drain	High / High	Negligible	Minor adverse		Minor adverse
		Wendling Beck	High / High	Negligible	Minor adverse		Minor adverse
	River Wissey catchment	Upper River Wissey	Medium / Medium	Negligible	Minor adverse	Embedded measures plus additional construction best practice measures to manage sediment and surface drainage.	Minor adverse
	Impact 3: Accidental release of fuels, oils, lubricants, foul waters and construction materials	River Bure catchment	North Walsham and Dilham Canal	Low / Low	Negligible	Negligible	Embedded measures plus development of a CMS with best practice pollution control measures.
East Ruston Stream			High / High	Negligible	Minor adverse	Minor adverse	
New Cut			Low / High	Negligible	Negligible	Negligible	
River Bure			Medium / High	Negligible	Minor adverse	Minor adverse	
King's Beck			Medium / High	Negligible	Minor adverse	Minor adverse	
Mermaid Stream			Medium / High	Negligible	Minor adverse	Minor adverse	
River Wensum catchment		River Wensum & Penny Spot Beck	High / High	Negligible	Minor adverse	Minor adverse	
		Blackwater Drain	High / High	Negligible	Minor adverse	Minor adverse	
		Wendling Beck	High / High	Negligible	Minor adverse	Minor adverse	

Potential Impact	Receptor	Sub-catchment	Value/ Sensitivity ¹	Magnitude	Significance	Additional Mitigation	Residual Impact
	River Wissey catchment	Upper River Wissey	Medium / Medium	Low	Minor adverse	Embedded measures plus development of a CMS with best practice pollution control measures.	Minor adverse
	Groundwater	The Broadland Rivers Chalk & Crag, Cam and Ely Ouse Chalk, and North Norfolk Chalk	High / High	Low	Moderate adverse	Embedded measures plus development of a CMS with best practice pollution control measures.	Minor adverse
Impact 4: Changes to surface water runoff and flood risk	River Bure catchment	North Walsham and Dilham Canal	Low / Low	Negligible	Negligible	Measures to minimise the impact of temporary culverts.	Negligible
		East Ruston Stream	High / High	Negligible	Minor adverse		Minor adverse
		New Cut	High / High	Negligible	Minor adverse		Minor adverse
		River Bure	Medium / High	Low	Minor adverse		Minor adverse
		King's Beck	Medium / High	Negligible	Minor adverse		Minor adverse
		Mermaid Stream	Medium / High	Negligible	Minor adverse		Minor adverse
	River Wensum catchment	River Wensum & Penny Spot Beck	High / High	Low	Moderate adverse		Minor adverse
		Blackwater Drain	High / High	Negligible	Minor adverse		Minor adverse

Potential Impact	Receptor	Sub-catchment	Value/ Sensitivity ¹	Magnitude	Significance	Additional Mitigation	Residual Impact
		Wendling Beck	High / High	Low	Moderate adverse		Minor adverse
	River Wissey catchment	Upper River Wissey	Medium / Medium	Medium	Moderate adverse	Embedded measures plus development of a surface water drainage plan.	Minor adverse
Operation							
Impact 1: Increased surface water runoff, altered groundwater flows, and changes to flood risk	River Bure catchment	North Walsham and Dilham Canal	Low / Low	Negligible	Negligible	Embedded measures plus development of a surface water drainage plan.	Negligible
		East Roston Stream	High / High	Negligible	Minor adverse		Minor adverse
		New Cut	Low / High	Negligible	Negligible adverse		Minor adverse
		River Bure	Medium / High	Negligible	Minor adverse		Minor adverse
		King's Beck	Medium / High	Negligible	Minor adverse		Minor adverse
		Mermaid Stream	Medium / High	Negligible	Minor adverse		Minor adverse
	River Wensum catchment	River Wensum & Penny Spot Beck	High / High	Negligible	Minor adverse	Minor adverse	
		Blackwater Drain	High / High	Negligible	Minor adverse	Minor adverse	
		Wendling Beck	High / High	Negligible	Minor adverse	Minor adverse	
	River Wissey catchment	Upper River Wissey	Medium / Medium	Low	Minor Adverse	Embedded measures plus development	Negligible

Potential Impact	Receptor	Sub-catchment	Value/ Sensitivity ¹	Magnitude	Significance	Additional Mitigation	Residual Impact
						of a surface water drainage plan.	
	Groundwater bodies	The Broadland Rivers Chalk & Crag, Cam and Ely Ouse Chalk, and North Norfolk Chalk	High / High	Negligible	Minor adverse	Embedded measures plus development of a surface water drainage plan.	Minor adverse
Impact 2: Supply of fine sediment and other contaminants	River Bure catchment	North Walsham and Dilham Canal	Low / Low	Negligible	Negligible	Embedded measures only.	Negligible
		East Ruston Stream	High / High	Negligible	Minor adverse		Minor adverse
		New Cut	Low / High	Negligible	Negligible		Minor adverse
		River Bure	Medium / High	Negligible	Minor adverse		Minor adverse
		King's Beck	Medium / High	Negligible	Minor adverse		Minor adverse
		Mermaid Stream	Medium / High	Negligible	Minor adverse		Minor adverse
	River Wensum catchment	River Wensum	High / High	Negligible	Minor adverse	Embedded measures only.	Minor adverse
		Blackwater Drain	High / High	Negligible	Minor adverse		Minor adverse
		Wendling Beck	High / High	Negligible	Minor adverse		Minor adverse
	River Wissey catchment	Upper River Wissey	Medium / Medium	Low	Minor adverse	Embedded measures plus best practice pollution control measures.	Minor adverse

Potential Impact	Receptor	Sub-catchment	Value/ Sensitivity ¹	Magnitude	Significance	Additional Mitigation	Residual Impact
	Groundwater bodies	The Broadland Rivers Chalk & Crag, Cam and Ely Ouse Chalk, and North Norfolk Chalk	High / High	Negligible	Minor adverse	Embedded measures plus best practice pollution control measures.	Minor adverse
Decommissioning							
Impacts similar to those during construction							

34.3.3 Chapter 21 Land Use and Agriculture

59. To inform the land use and agriculture impact assessment, a desk-based literature review of existing reports and survey data was undertaken to provide indicative baseline conditions for land use. Additionally, consultation has been undertaken with relevant Local Authorities and feedback has been sought from landowners and occupiers within the study area to provide information on agricultural practices.
60. The assessment considered the potential impacts of the project on drainage, agricultural land, soil quality, Environmental Stewardship Schemes (ESS) and utilities.
61. Under Scenario 1, with the application of mitigation measures the project is predicted to have no greater than **minor adverse** impacts in relation to land use and agriculture. Mitigation measures include the use of an Agricultural Liaison Officer, ensuring agricultural field drains are maintained, and employing best practice measures through a Soils Management Plan (SMP) and CoCP.

Table 34.14 Summary of potential impacts identified for land use and agriculture under Scenario 1

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Additional mitigation	Residual impact
Construction						
1	Drainage	Medium	Low	Minor adverse	Yes – Drainage contractors, Drainage Plan, CoCP	Negligible
2	Land taken out of existing use/disruption to agricultural activities	High	Low	Moderate adverse	Yes – SMP, private agreements	Minor adverse
3	Degradation of natural resources - soil	Low	Negligible	Negligible	Yes – SMP, private agreements	Negligible
4	Loss of soil resource – soil erosion	Low	Low	Minor adverse	Yes – private agreements	Negligible
5	ESSs	Medium	Negligible	Minor adverse	Yes – private agreements	Negligible
6	Utilities	N/A	N/A	No impact	N/A	No impact
Operation						
1	Drainage	N/A	N/A	No impact	N/A	No impact
2	Permanent land use change	High	Low	Moderate adverse	Yes – private agreements	Minor adverse
3	ESSs	Medium	Negligible	Minor adverse	Yes – private agreements	Minor adverse
4	Utilities	N/A	N/A	No impact	N/A	No impact
Decommissioning						
It is anticipated that the decommissioning impacts will be no worse than those for construction.						

34.3.4 Chapter 22 Onshore Ecology

62. The Onshore Ecology assessment has been informed by an extensive suite of ecological surveys was undertaken throughout 2017 and 2018 to describe the ecological baseline. The scope of these surveys was agreed in advance with Natural England through consultation on the Onshore Ecology and Ornithology Method Statement.
63. It was not possible to survey the entire onshore project area due to landowner access restrictions, impenetrable habitat or other restrictions and therefore, the assessment has been supplemented by a desk-based study. For areas where project specific 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 areas where suitable habitat is present. 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. Any impacts concluded for the unsurveyed areas are, therefore, considered to be the worst case.
64. Impacts assessed include direct and indirect effects on designated sites, habitats and species. Key receptors identified within the onshore project area and zone of influence are listed in Table 34.15.
65. Under Scenario 1, with the application of mitigation measures the project is predicted to have no greater than **minor adverse** impacts in relation to onshore ecology.
66. Mitigation measures would be developed in consultation with the relevant Statutory Nature Conservation Body (SNCB) and Local Authority through the Ecological Management Plan in accordance with the Outline Landscape and Environmental Management Strategy (OLEMS) which has been submitted with the DCO application.

Table 34.15 Summary of potential impacts identified for onshore ecology under Scenario 1

Potential Impact	Receptor	Importance	Significance (without mitigation) ²		Additional Mitigation	Residual Impact	
			Surveyed areas	Unsurveyed areas		Surveyed areas	Unsurveyed areas
Construction							
1	Statutory designated sites	High	Moderate adverse	N/A	OLEMS – including hedgerow replacement	Minor adverse	N/A
2	Non-statutory designated sites	Medium	Minor adverse	N/A	OLEMS – including hedgerow replacement	Minor adverse	N/A
3	Arable land	High	Minor adverse	N/A	OLEMS – reinstatement of arable field margins	Minor adverse	N/A
4	Woodland, trees and scrub	Negligible	No impact	N/A	OLEMS – tree protection	No impact	N/A
5	Hedgerows	High	Moderate adverse	N/A	OLEMS – hedgerow replacement	Minor adverse	N/A
6	Grassland	High	No impact	N/A	OLEMS – reinstatement	No impact	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	OLEMS – reinstatement	Minor adverse	N/A
9	Badgers	Low	Minor adverse	N/A	OLEMS – Agreement with Natural England	Negligible	N/A

² 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 (without mitigation) ²		Additional Mitigation	Residual Impact	
			Surveyed areas	Unsurveyed areas		Surveyed areas	Unsurveyed areas
10	Bats	High	Major adverse	N/A	OLEMS – hedgerow replacement	Minor adverse	N/A
11	Water vole	Medium	Minor adverse	N/A	OLEMS - displacement	Minor adverse	N/A
12	Otter	High	Minor adverse	N/A	OLEMS – introduction of mammal ramps	Minor adverse	N/A
13	Great crested newts	High	Minor adverse	Major adverse	OLEMS – updated surveys and adherence to Natural England standing advice	Minor adverse	Minor adverse
14	Reptiles	Medium	Minor adverse	N/A	OLEMS – Precautionary Method of Working	Minor adverse	N/A
15	White-clawed crayfish	High	No impact	N/A	N/A	No impact	N/A
16	Other invertebrates	High	No impact	N/A	OLEMS – pre-construction survey of River Wensum. Reinstatement of habitats	No impact	N/A
17	Fish	High	Moderate adverse	N/A	OLEMS – survey and monitoring	Minor adverse	N/A
18	Protected flora	High	No impact	N/A	N/A	No impact	N/A

Potential Impact	Receptor	Importance	Significance (without mitigation) ²		Additional Mitigation	Residual Impact	
			Surveyed areas	Unsurveyed areas		Surveyed areas	Unsurveyed areas
19	Invasive non-native species	Medium	Moderate adverse	Moderate adverse	CoCP - Invasive Species Management Plan	Minor adverse	Minor adverse
Operation							
1	Habitat and species during maintenance	High	Minor adverse	N/A	N/A	Minor adverse	N/A
2	Fauna during operational lighting and noise	High	Minor adverse	N/A	Yes	Minor adverse	N/A
Decommissioning							
Impacts no worse than those during construction							

34.3.5 Chapter 23 Onshore Ornithology

67. Information was gathered through a combination of desk-based assessment and a programme of field surveys (wintering bird and breeding bird surveys) of the onshore study area conducted between 2016 and 2017.
68. The potential for temporary habitat and disturbance of birds during construction was assessed, along with potential noise and light disturbance during operation associated with the onshore project substation.
69. Under Scenario 1, with the application of mitigation measures the project is predicted to have no greater than **minor adverse** impacts in relation to onshore ornithology. Mitigation measures include removing vegetation prior to bird breeding seasons, reinstatement of removed hedgerows following construction, and an operational lighting scheme at the onshore project substation that conforms to recommendations regarding birds set out in the Bat Conservation Trust's *Artificial Lighting And Wildlife Guidance*.

Table 34.16 Summary of potential impacts identified for onshore ornithology under Scenario 1

Potential Impact	Receptor	Importance	Magnitude	Significance	Additional Mitigation	Residual Impact
Construction						
1	Designated sites	Low	Low	Minor adverse	OLEMS – reinstatement of habitats	Minor adverse
2	Wintering / on passage bird species	Medium	Low	Minor adverse	OLEMS - reinstatement of habitats and timing of works in certain areas for lapwing	Minor adverse
3	Breeding bird species	Medium	Medium	Moderate adverse	OLEMS – reinstatement of habitats and set aside areas for ground nesting species	Minor adverse
Operation						
1	Disturbance to habitat and species from maintenance activities	Medium	Negligible	Minor adverse	None required.	Minor adverse
2	Disturbance to onshore ornithology from operational lighting and noise	Medium	Negligible	Minor adverse	Operational lighting scheme that conforms to guidance set out in the Bat Conservation Trust's Guidance.	Minor adverse
Decommissioning						
Impacts similar or less than those during construction						

34.3.6 Chapter 24 Traffic and Transport

70. The traffic and transport assessment for the Scenario 1 is based on forecasts of background levels of traffic for 2026 as these represent the main construction years. Transport requirements were determined through a series of desk based assessments utilising open source data obtained from the Department for Transport and the relevant Highway Authorities. Further traffic data was obtained via commissioned onsite Automatic Traffic Count surveys undertaken in 2017.
71. A total of 108 highway links within the traffic and transport study area have been assessed for the effects of severance, pedestrian amenity, road safety and driver delay. Under Scenario 1, with the application of mitigation measures, the project is predicted to have no greater than **minor adverse** impacts in relation to traffic and transport.
72. A Traffic Management Plan (TMP) and Travel Plan (TP) containing specific commitments to managing HGV movements and employee traffic will be developed for the project and outline plans have been submitted with the DCO application.

Table 34.17 Summary of potential impacts identified for traffic and transport under Scenario 1

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Additional Mitigation	Residual Impact
Construction						
Impact 1: Severance	10, 13a, 13b, 16, 17, 18, 21, 22, 23, 25, 29, 32, 33, 34, 35a, 35b, 36, 40b, 41, 42, 46, 47b, 47c, 49, 52, 54, 55, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79 and A to V	Low – High	Very Low	Negligible to Minor adverse	None required.	Negligible to Minor adverse
Impact 2: Pedestrian Amenity	10, 13a, 13b, 16, 17, 18, 21, 22, 23, 25, 29, 32, 33, 34, 35a, 35b, 36, 40b, 41, 42, 46, 47b, 47c, 49, 52, 54, 55, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79 and A to V	Low – High	Low – High	Minor to Moderate adverse	Specific targeted TMP measures.	Minor adverse
Impact 3: Road Safety	Clusters 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21.	Negligible - Low	Low - Medium	Minor adverse	None required.	Minor adverse
Impact 4: Driver Delay	Junctions: 1, 2, 3, 4	High	Low – Very Low	Minor adverse	None required.	Minor adverse

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Additional Mitigation	Residual Impact
Operation						
All impacts	All links	Low - High	Very Low	Negligible , or up to localised minor adverse	None required.	Negligible , or up to localised minor adverse
Decommissioning						
Impacts upon those links serving the cable route works would be significantly less than the construction phase whilst impacts upon those links primarily serving the onshore project substation (link 1) would be no worse than construction. Therefore, the overall magnitude of effect would be negligible to minor adverse and where appropriate similar mitigation strategies as presented for construction would be valid.						

34.3.7 Chapter 25 Noise and Vibration

73. To inform the noise and vibration impact assessment, a baseline noise survey (Appendix 25.1) was undertaken to quantify the existing noise environment in the vicinity of proposed onshore project area. Noise modelling was undertaken to inform several subsequent assessments in order to determine any potential impacts relating to the construction and operation of the project at receptor location, agreed through consultation on the Norfolk Boreas Noise and Vibration Method Statement.
74. Under Scenario 1, potential impacts from noise were identified as arising from construction works in a small number of locations along the onshore cable route and at one location at the landfall during night-time working. With the application of mitigation measures the project is predicted to have **negligible** impacts in relation to noise during construction works and **minor adverse** for traffic.
75. The only sources of noise during the operation of the project are those associated with the onshore project substation. Operational phase impacts were predicted to be **moderate adverse** at assessed sensitive receptors without mitigation. Noise reduction technologies and potential design approaches have been considered as part of the assessment and there are many proven mitigation options that, through the detailed design process, can be combined to create a design that will adhere to the required noise limits. With the incorporation of suitable mitigation residual impacts are predicted to reduce to **negligible** at identified receptors.
76. Norfolk Boreas Limited will provide a final design of the project which will not exceed the noise limits (at the nearest noise sensitive receptors) already imposed on the existing Dudgeon substation.

Table 34.18 Summary of potential impacts identified for noise and vibration under Scenario 1

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Additional Mitigation	Residual Impact Significance
Construction						
Landfall Daytime	Residential	Medium	No Impact	Negligible	CNMP	Negligible
Landfall Evening and weekends	Residential	Medium	No Impact	Negligible	CNMP	Negligible
Landfall night-time	Residential	Medium	No Impact to Minor Adverse	Negligible to Minor Adverse	CNMP + Enhanced mitigation (localised screening and increased separation distances).	Negligible
Onshore cable route Daytime	Residential	Medium	No Impact to Major Adverse	No Impact to Major Adverse	CNMP + Enhanced mitigation (localised screening and increased separation distances).	Negligible
Onshore project substation and National Grid substation extension receptors Daytime (in-combination)	Residential	Medium	No Impact	Negligible	CNMP	Negligible
Traffic	Residential	Medium	No Change to Minor	Negligible to Minor Adverse	TMP (refer to chapter 24 Traffic and Transport)	Minor Adverse
Vibration	Residential	Medium	No impact	Negligible	None required.	Negligible
Operation						
Operational noise	Residential	Medium	No Impact to Moderate Adverse	Negligible to Moderate Adverse	Designed to prevent significant adverse	Negligible

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Additional Mitigation	Residual Impact Significance
					impacts, BAT. (see section 25.8.6.2).	
Decommissioning						
Considering the worst case scenario it is anticipated that the impacts would be no worse than those during construction.						

34.3.8 Chapter 26 Air Quality

77. A desk-based assessment was carried out using air quality monitoring data collected by Local Authorities within the study area, as well as pollution maps provided by the Department of Environment, Food and Rural Affairs (Defra), to establish existing pollution levels.
78. The aim of the air quality assessment is to prevent exceedance of Local Air Quality Management (LAQM) thresholds at receptors and therefore impacts should be categorised as either significant or not significant. The air quality assessment considered the potential impacts associated with onshore construction phase dust and road traffic emissions only, in accordance with the Scoping Opinion.
79. In accordance with air quality guidance, a suite of best-practice mitigation measures has been identified (such as dampening down the running track during dry periods to minimise dust generation), which are commensurate with the level of dust risk of the construction activities. Under Scenario 1, with the implementation of the mitigation measures, dust impacts and road traffic emissions can be considered to be **not significant** at both human and ecological receptors.

Table 34.19 Summary of potential impacts identified for air quality under Scenario 1

Potential impact	Receptor	Value/ sensitivity	Magnitude	Significance	Additional Mitigation	Residual impact
Construction						
1. Construction dust and fine particulate matter	Human receptors within 350m of onshore project area.	Dust Soiling: Medium sensitivity	Medium	Assessment methodology does not assign significance before mitigation.	Measures as recommended by the Institute of Air Quality Management (IAQM).	Not significant
		Human Health: Low sensitivity				
2. Construction vehicle exhaust emissions	Residential properties, schools, hospitals and care homes within 200m of roads taking more than 100 HGVs per day.	High	The maximum increase in NO ₂ concentrations at a receptor was 0.72µg.m ⁻³ at receptor R30	Overall not significant , negligible impacts at all receptors.	No additional mitigation measures required.	Not significant
	Designated ecological sites.	High	Pollutant concentrations at or below 1% of Critical Load.	Not Significant	No additional mitigation measures required.	Not Significant
Operation						
Operational impacts on air quality have been scoped out.						
Decommissioning						
As per construction.						

34.3.9 Chapter 27 Human Health

80. The human health effects that were considered to have potential to impact on physical or mental health included: construction and operational noise, air quality, exposure to contaminated land or water, disrupted journeys or access, employment during construction and operation, exposure to electromagnetic fields (EMF) during operation, and affordability of electricity.
81. Chapter 27 therefore considers the findings of the following impact assessments, in population health terms:
 - Water Resources and Flood Risk (Chapter 20 and section 34.3.2);
 - Land Use and Agriculture (Chapter 21 and section 34.3.3);
 - Traffic and Transport (Chapter 24 and section 34.3.6);
 - Noise and Vibration (Chapter 25 and section 34.3.7);
 - Air Quality (Chapter 26 and section 34.3.8);
 - Landscape and Visual Impact Assessment (Chapter 29 and section 34.3.11);
 - Tourism and Recreation (Chapter 30 and section 34.3.12); and
 - Socio-economics (Chapter 31 and section 34.3.13);
82. The onshore infrastructure is largely routed through agricultural land and away from population centres and sensitive receptors, thus the potential number of receptors has been reduced through site selection and project design embedded mitigation.
83. The buried cable systems will produce EMFs. Public Health England has produced guidelines identifying EMF thresholds above which there is the potential for human health effects. The level of EMFs produced by the Norfolk Boreas buried cable systems is approximately 1% of the value Public Health England has identified as a safe level. As such, the conclusion of the assessment is that there would be no effect to population health due to EMFs during operation.
84. In addition, potential beneficial impacts have been identified due to an increase in local employment and training opportunities and as a result of increasing energy security in the long term, through renewable generation which may reduce electricity bills.
85. Following best practice, Chapter 27 considers health effects with regards to the general population and vulnerable population groups (Table 34.20). Vulnerable population groups include children and young people; older people; people with existing poor health; and people living in deprivation.
86. Under Scenario 1, with the implementation of the mitigation measures identified within the separate topics sections listed above (such as measures to minimise

construction noise and to minimise the risk of dust generation), potentially adverse impacts are predicted to be of **negligible** or **minor adverse** significance.

Table 34.20: Summary of potential human health effects identified under Scenario 1

Potential effects	Temporal scope	Probability of effect	Sensitivity of		Magnitude of effect	Significance of effect on	
			General population	Vulnerable population		General population	Vulnerable population
Construction							
Noise	Mainly short term	Plausible	Low	High	Low	Negligible	Minor adverse
Air quality	Mainly short term	Plausible	Low	High	Low	Negligible	Minor adverse
Ground/ water contamination	Short term	Plausible but improbable	Medium	High	Low	Negligible	Negligible
Physical activity	Very short term	Likely	Medium	High	None	Negligible	Negligible
Journey times or reduced access	Short term	Likely	Low	High	Low	Negligible	Minor adverse
Construction and Operation							
Employment	Medium to long term	Likely	Medium	High	Low	Negligible	Minor beneficial
Operation							
Noise	Long term	Low probability	Low	High	None	No effect	No effect
EMF and public understanding of risk	Medium term	Low probability	Medium	High	None	No effect	No effect
Decommissioning							
The possible health effects arising from the decommissioning of the project are considered to be no worse than those considered for construction.							

34.3.10 Chapter 28 Onshore Archaeology and Cultural Heritage

87. The existing onshore archaeology and cultural heritage baseline has been established by a desk based exercise and supplemented by a programme of aerial photographic surveys and non-intrusive field surveys to identify potential archaeological features underground.
88. Designated heritage assets (e.g. Scheduled Monuments) have been avoided as part of the site selection process and as such, no direct physical impacts are anticipated to occur. Indirect impacts do, however, have the potential to occur, such as impacts to the setting of a heritage asset.
89. Non-designated heritage assets may be subject to direct and / or indirect impacts as a result of the project. Direct impacts may arise as the result of ground excavation during construction.
90. Under Scenario 1, prior to the implementation of additional site-specific mitigation requirements, impacts are predicted to occur ranging between **no impact** and **moderate adverse** impact significance levels (as a worst case scenario (WCS)). However, it is anticipated that, following the application of the initial informative stages of mitigation and additional site-specific mitigation measures (as and where required, to be agreed in consultation with Norfolk County Council Historic Environment Service (NCC HES) and Historic England (HE)) to be undertaken post-consent, the significance of any impacts, where relevant, will be reduced or offset to levels considered **non-significant** in EIA terms (**negligible** or **minor adverse**).
91. As part of the additional mitigation, a project-specific draft outline WSI (Document reference 8.5) has been submitted as part of the DCO application, prepared in adherence to previous discussions with NCC HES and HE, which outlines a commitment to undertake initial informative stages of mitigation post-consent. This will inform further decisions regarding the subsequent archaeological mitigation strategy so that the historic environment resource can be safe-guarded in a manner that is both appropriate and proportionate to the significance of the archaeological remains identified and present.

Table 34.21 Summary of potential impacts identified for onshore archaeology and cultural heritage under Scenario 1

Potential impact	Heritage asset type	Heritage significance	Magnitude of effect	Impact significance	Additional Mitigation	Residual impact
Construction						
(1) Direct impact on (permanent change to) buried archaeological remains	Buried (sub-surface) archaeological remains	Low to High	Negligible to High (as a WCS)	Negligible to Moderate adverse (as a WCS)	<p><u>Landfall, onshore project substation and National Grid extension:</u></p> <p>1) Additional project-wide geophysical survey to further ascertain presence / absence and likely extent of buried archaeological remains, <i>where not undertaken as part of the priority programme.</i></p> <p>2) Targeted metal detecting and field walking, if / where required.</p> <p>3) Trial trenching (i.e. ground truthing).</p> <p>Followed by the most appropriate subsequent mitigation approaches to be agreed with NCC HES / HE:</p> <ul style="list-style-type: none"> • Preservation in situ; • Set-piece excavation; • Strip, map and sample excavation; and • Targeted and general monitoring / watching brief. <p><u>Cable route:</u></p> <p>1) Screening of the proposed locations of the link boxes, once known, during the detailed design phase against the recorded location of potential subsurface archaeological remains;</p>	<p>Predicted to be non-significant in EIA terms following the application of: embedded mitigation; initial informative stages of mitigation; and additional mitigation measures, where required (to be agreed in consultation with NCC HES / HE).</p> <p>This further information regarding potential sub-surface remains will be gathered post-consent, and will directly inform decisions made around any further opportunities for preservation in-situ and where required and necessary preservation by record, ensuring that the residual impact significance is offset to levels considered non-significant in EIA terms.</p>

Potential impact	Heritage asset type	Heritage significance	Magnitude of effect	Impact significance	Additional Mitigation	Residual impact
					<p>2) The implementation of 'The Protocol for Archaeological Discoveries' during link box installation; and</p> <p>3) A bespoke programme of archaeological monitoring and recording, where required.</p>	
(2) Direct impact on (permanent change to) above ground archaeological remains e.g. historic earthworks (including the Historic Landscape Character)	Above ground archaeological remains (e.g. extant structures / features, buildings and earthworks)	Low to Medium	Low	Minor adverse (as a WCS)	<p><u>Landfall, onshore project substation and National Grid extension:</u></p> <p>None required.</p> <p><u>Cable route:</u></p> <p>1) Screening of the proposed locations of the link boxes, once known, during the detailed design phase against the recorded location of potential above ground archaeological remains.</p> <p>2) Targeted earthwork condition or built heritage / historic building survey and recording, where necessary, followed by the most appropriate subsequent mitigation approaches (e.g. additional backfilling, reinstatement and sensitive conservation/ restoration requirements), where required on an area by area, site by site and case by case basis.</p>	<p>Predicted to be non-significant in EIA terms following the application of: embedded mitigation; initial informative stages of mitigation; and additional mitigation measures, where required (to be agreed in consultation with NCC HES / HE).</p> <p>As such it is anticipated that such impacts can be reduced or offset to levels considered non-significant in EIA terms.</p>
(3) Indirect impact on the setting of heritage assets (both designated and non-designated)	Designated and certain non-designated heritage assets	Low to High	Negligible	Negligible to Minor adverse (as a WCS)	<p><u>Landfall, onshore project substation and National Grid extension:</u></p> <p>None required.</p> <p><u>Cable route:</u></p> <p>None required.</p>	Minor adverse (as a WCS)

Potential impact	Heritage asset type	Heritage significance	Magnitude of effect	Impact significance	Additional Mitigation	Residual impact
					<p>Other than due care, attention and diligence should link box excavation, jointing pit excavation and / or cable pulling activities take place in the proximity of the designated and non-designated heritage assets identified in section 28.7.5 of Chapter 28, throughout the duration of construction.</p> <p>Certain assets (e.g. the Old Quaker Burial Ground at North Walsham - 1408) may require associated signage and temporary barriers in order to avoid any accidental damage or physical interactions occurring. This is set out in the project specific Outline WSI (document reference 8.5) and will ultimately need including and detailing in a Construction Stage Plan(s), Contractor Environmental Management Plan(s), or similar.</p>	
(4) Impact on potential geoarchaeological / palaeoenvironmental remains, potentially indicative of former land surfaces	Palaeoenvironmental and geoarchaeological deposits / remains	High (as a WCS)	Negligible	Negligible to Minor adverse (as a WCS)	Potential / currently unrecorded geoarchaeological / palaeoenvironmental remains will be mitigated by means of implementing the embedded mitigation measures and commitments, set-out in the project-specific Outline WSI (document reference 8.5), which will include reference to a project-wide approach to geoarchaeological assessment / palaeoenvironmental survey, which will be planned and undertaken in the post-	Negligible (non-significant in EIA terms): Following the application of: embedded mitigation; initial informative stages of mitigation; and additional mitigation measures (to be agreed in consultation with NCC HES and HE), as required.

Potential impact	Heritage asset type	Heritage significance	Magnitude of effect	Impact significance	Additional Mitigation	Residual impact
					consent stages, in agreement and ongoing consultation with NCC HES and HE. Specifically in relation to transition and jointing pit excavation under Scenario 1, this may include a requirement for additional archaeological / geoarchaeological monitoring or sampling, where required, on a case-by-case basis.	
(5) Impacts to site preservation conditions from drilling fluid breakout	Palaeoenvironmental and geoarchaeological deposits / buried archaeological remains	Low to High	Negligible	Negligible to Minor adverse (as a WCS)	<u>Landfall:</u> Fluid pressures are to be monitored throughout the drilling process to minimise the potential for breakout of the drilling fluid and an action plan will be developed and procedures adopted during the drilling activity to respond appropriately to any drilling fluid breakout. <u>Cable route, onshore project substation and National Grid extension:</u> None required.	Anticipated to be Negligible .
Operation						
(1) Indirect impact on the setting of heritage assets (designated and non-designated)	Designated and certain non-designated heritage assets	High	Negligible	Minor adverse (as a WCS), but generally No impact	None required. Church of St. Andrew, Bradenham (34) may be subject to consideration in relation to the possibility of off-site mitigation planting during the post-consent phase, in order to potentially reduce this impact significance.	Minor adverse (as a WCS), but generally No impact .
(2) Impacts to site preservation	Palaeoenvironmental and	Negligible to High	N/A	No impact	None required.	No impact .

Potential impact	Heritage asset type	Heritage significance	Magnitude of effect	Impact significance	Additional Mitigation	Residual impact
conditions from heat loss from installed cables	geoarchaeological deposits / buried archaeological remains					
Decommissioning						
(1) Direct impact on (permanent change to) buried archaeological remains	Buried (sub-surface) archaeological remains	Negligible to High	Negligible	Minor adverse (as a WCS)	The decommissioning methodology would need to be finalised nearer to the end of the lifetime of the project so as to be in line with latest and current guidance, policy and legislation at that point. Any such methodology would be agreed with the relevant authorities and statutory consultees. The decommissioning works could be subject to a separate licencing approach, which may require EIA, including any requisite archaeological and cultural heritage impact assessment.	It is anticipated that appropriate and proportionate mitigation can be applied, as required at the time, which will reduce / off-set impact significance to levels considered non-significant in EIA terms.
(2) Indirect impact on the setting of heritage assets (designated and non-designated)	Designated and certain non-designated heritage assets	Low to High	Negligible to Low	Negligible to Minor adverse (as a WCS)	None required. Indirect impacts associated with decommissioning and the setting of heritage assets are not considered likely to be any worse than those identified for the construction and operation and maintenance stages.	Minor adverse (as a WCS) Although a full EIA may be carried out ahead of any decommissioning works to be undertaken.

34.3.11 Chapter 29 Landscape and Visual Impact Assessment

92. The potential effects of the onshore components of the project were assessed for landscape and visual receptors during the construction, operation and decommissioning phases of the project. The visibility of the offshore works was scoped out of the assessment owing to its distance offshore and that it will not be visible from the coast.
93. In accordance with relevant guidance, the Landscape and Visual Impact Assessment (LVIA) methodology aims to determine whether impacts on the landscape as a resource (i.e. landscape elements of the site or the landscape character of the site and surroundings), or on views and visual amenity are significant or non-significant.
94. The LVIA demonstrated that despite the scale of the project, any significant effects would occur in relatively contained areas only, with the majority of landscape and visual receptors either undergoing **non-significant effects** or **no effect**.
95. Under Scenario 1, **no significant effects** on landscape and visual receptors in respect of the onshore cable route construction are anticipated owing to the very small-scale, localised and short term nature of the works. **Significant** effects would occur at the landfall during the construction phase, these effects would be short term and reversible in relation to the construction works. During the operational phase, no significant effects are anticipated as the majority of infrastructure will be buried below ground.
96. During the operational phase of the onshore project substation and National Grid substation extension would not significantly affect landscape character, apart from in the localised areas of the Settled Tributary Farmland landscape character types (LCT) – River Wissey Tributary Farmland LCU and Plateau Farmland LCT – Beeston Plateau LCU and Pickenham Plateau LCU in which the onshore project substation or National Grid substation extension would be located or would have a close range influence.
97. In respect of representative viewpoints, **significant effects** would be experienced by walkers on Lodge Lane to the immediate south of the site, and by road-users on a very localised section of Ivy Todd Road to the south-west and a section of the A47 to the north. These effects would all occur within approximately 1.2km of the onshore project substation, making them localised. There would be **no significant effects** on the views of residents at Ivy Todd and Necton.
98. Mitigation planting will be introduced and has been designed with the aim of reducing these identified impacts. The planting includes areas of fast growing woodland species as this will provide the height required, as well as the density, to ensure effective screening. The commitment to mitigation measures is secured

through a Landscaping Management Scheme in accordance with the OLEMS which has been submitted with the DCO application.

Table 34.22 Summary of potential significant impacts for landscape and visual receptors under Scenario 1

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Construction - Landfall						
Potential impact on landscape character relating to landfall construction.	Coastal Plain LCT – Bacton to Sea Palling.	Medium to high	Medium to high or medium between the ridge on which Happisburgh Lighthouse sits in the north and PRoW Happisburgh RB22 in the south. Low or no effect across remainder of LCU.	Significant between the ridge on which Happisburgh Lighthouse sits in the north and PRoW Happisburgh RB22 in the south. Not significant across remainder of LCU.	Land reinstated post construction.	None. Effect short term and reversible, relating to construction phase.
Potential impact on visual amenity of walkers relating to landfall construction.	Walkers on Norfolk Coastal Path	High	Medium to high or medium between Happisburgh coastal car park and PRoW Happisburgh RB22. No effect across remainder of path.	Significant between Happisburgh coastal car park and PRoW Happisburgh RB22. Not significant across remainder of path.	Land reinstated post construction.	None. Effect short term and reversible, relating to construction phase.
Potential impact on visual amenity of residents relating to landfall construction.	Residents in Happisburgh	Medium to high	Medium on Lighthouse Lane. Low or no effect across remaining parts.	Significant on Lighthouse Lane. Not significant across remaining parts of settlement.	Land reinstated post construction.	None. Effect short term and reversible, relating to construction phase.
Potential impact on visual amenity of walkers relating to landfall construction.	Walkers on PRoW RB22	Medium to high	Medium to high along length of PRoW.	Significant along length of PRoW.	Land reinstated post construction.	None. Effect short term and reversible, relating to construction phase.

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Construction - Onshore Cable Route						
This assessment concludes that there would be no significant effects on landscape and visual receptors in respect of Scenario 1 of the onshore cable route construction owing to the very small-scale, localised and short term nature of the works.						
Construction – Onshore Project Substation and National Grid substation extension						
Potential impact on landscape character relating to project construction.	Plateau Farmland LCT: Pickenham Plateau LCU	Medium	High or medium within local area of spur. Low or no effect across remainder of LCU.	Significant in local area of spur. Not significant across remainder of LCU.	Mitigation planting implemented post construction at latest. Hedgerows replanted post construction – 3-5 years to infill gaps.	None. Effect medium term and reversible.
Potential impact on landscape character relating to project construction.	Settled Tributary Farmland LCT: River Wissey LCU	Medium	High or medium in the area defined by the A47 to the north, Great Wood and Smuggler’s Lane to the east, Necton National Grid Substation and the Necton ridgeline to the west and Ivy Todd Road to the south. Low or no effect across remainder of LCU.	Significant in the area defined by the A47 to the north, Great Wood and Smuggler’s Lane to the east, Necton National Grid Substation and the Necton ridgeline to the west and Ivy Todd Road to the south. Not significant across remainder of LCU.	Mitigation planting implemented after construction at latest. Hedgerows replanted post construction – 3-5 years to infill gaps.	None. Effect medium term and reversible.
Potential impact on landscape character relating to project construction.	Plateau Farmland LCT: Beeston Plateau	Medium	High or medium in the area extending to the A47 to the north, Great Wood and Smuggler’s Lane to the east, and the LCU boundary to the west and south. Low or no effect across remainder of LCU.	Significant in the area extending to the A47 to the north, Great Wood and Smuggler’s Lane to the east, and the LCU boundary to the west and south. Not significant across remainder of LCU.	Mitigation planting implemented post construction at latest. Hedgerows replanted post construction – 3-5 years to infill gaps.	None. Effect medium term and reversible.

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Potential impact on visual amenity of road-users relating to project construction.	VP1 Ivy Todd Road (west)	Medium	Medium to high over approximate 10m section. Low or no effect across wider extent of road.	Significant over approximate 10m section. Not significant across wider extent of road.	Mitigation planting implemented post construction at latest. Hedgerows replanted post construction – 3-5 years to infill gaps.	None. Effect medium term and reversible.
Potential impact on visual amenity of walkers relating to project construction.	VP2 Lodge Lane (south)	Medium	High over approximate 400m southern section of lane.	Significant over approximate 400m southern section of lane.	Mitigation planting implemented post construction at latest. Hedgerows replanted post construction – 3-5 years to infill gaps.	None. Effect medium term and reversible.
Potential impact on visual amenity of walkers relating to project construction.	VP3 Lodge Lane (north)	Medium	Medium over approximate 250m northern section of lane.	Significant over approximate 250m northern section of lane.	Mitigation planting implemented post construction at latest. Hedgerows replanted post construction – 3-5 years to infill gaps.	None. Effect medium term and reversible.
Potential impact on visual amenity of A47 road-users relating to project construction.	VP4 A47 Necton Substation	Medium	Medium over approximate 250m section of A47. Low or no effect across other adjacent sections.	Significant over approximate 250m section of A47. Not significant across remainder of A47.	Existing mitigation planting associated with Dudgeon Substation located to south of A47.	None. Effect medium term and reversible over approximate 300m section.
Potential impact on visual amenity of A47 road-users relating to project construction.	VP5 A47 Spicer's Corner	Medium	Medium to high over approximate 300m section of A47. Low or no effect across other adjacent sections.	Significant over approximate 300m section of A47. Not significant across remainder of A47.	Trees replanted post construction – 10 years to infill gaps. Existing mitigation planting associated with	None after 10 years. Significant effect long term (10 years) and reversible over

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
					Dudgeon Substation located to south of A47.	approximate 300m section.
Operation – Onshore Project Substation and National Grid substation extension						
Potential impact on landscape character relating to project operation.	Plateau Farmland LCT: Pickenham Plateau LCU	Medium	High or medium within local area of spur. Low or no effect across remainder of LCU.	Significant in local area of spur. Not significant across remainder of LCU.	Mitigation planting would gradually reduce effect to not significant over first 20 years of indicative design life.	None after 20 years. Significant effect long term (20 years) and reversible in localised area.
Potential impact on landscape character relating to project operation.	Settled Tributary Farmland LCT: River Wissey LCU	Medium	High or medium in the area defined by the A47 to the north, Great Wood and Smuggler's Lane to the east, Necton National Grid Substation and the Necton ridgeline to the west and Ivy Todd Road to the south. Low or no effect across remainder of LCU.	Significant in the area defined by the A47 to the north, Great Wood and Smuggler's Lane to the east, Necton National Grid Substation and the Necton ridgeline to the west and Ivy Todd Road to the south. Not significant across remainder of LCU.	Mitigation planting would gradually reduce effect to not significant over first 20 years of indicative design life.	None after 20 years. Significant effect long term (20 years) and reversible in localised area.
Potential impact on landscape character relating to project operation.	Plateau Farmland LCT: Beeston Plateau	Medium	High or medium in the area extending to the A47 to the north, Great Wood and Smuggler's Lane to the east, and the LCU boundary to the west and south. Low or no effect across remainder of LCU.	Significant in the area extending to the A47 to the north, Great Wood and Smuggler's Lane to the east, and the LCU boundary to the west and south. Not significant across remainder of LCU.	Mitigation planting would gradually reduce effect to not significant over first 20 years of indicative design life.	None after 20 years. Significant effect long term (20 years) and reversible in localised area.

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Potential impact on visual amenity of road-users relating to project operation.	VP1 Ivy Todd Road (west)	Medium	Medium to high over an approximate 10m section of the road. Low or no effect over wider extent of road.	Significant over an approximate 10m section of the road. Not significant across wider extent of road.	Mitigation planting would gradually reduce effect to not significant during the first 25 years of indicative design life.	None after 25 years. Significant effect long term (25 years) and reversible over 10m section.
Potential impact on visual amenity of walkers relating to project operation.	VP2 Lodge Lane (south)	Medium	Medium to high along approximate 400m southern section. Low or no effect over remaining parts of lane.	Significant along approximate 400m southern section.	Mitigation planting would gradually reduce effect to not significant over first 20 years of indicative design life.	None after 20 years. Significant effect long term (20 years) and reversible over 400m section. Beneficial effect for remaining 10 years.
Potential impact on visual amenity of A47 road-users relating to project operation.	VP5 A47 Spicer's Corner	Medium	Medium to high over approximate 300m section of A47 reducing to low as mitigation planting matures. Low or no effect across other adjacent sections.	Significant over approximate 300m section of A47 reducing to not significant as mitigation planting matures. Not significant across adjacent sections.	Mitigation planting would gradually reduce effect to not significant after 10 years Existing mitigation planting associated with Dudgeon Substation located to south of A47.	None after 10 years. Significant effect long term (10 years) and reversible over 50m section. Beneficial effect for remaining 20 years.
Potential impact on visual amenity of A47 road-users relating to project operation.	VP5 A47 Spicer's Corner	Medium	Medium to high over approximate 300m section of A47 reducing to low as mitigation planting matures.	Significant over approximate 300m section of A47 reducing to not significant as mitigation planting matures.	Mitigation planting would gradually reduce effect to not significant after 10 years Existing mitigation planting associated with	None after 10 years. Significant effect long term (10 years) and reversible over 50m section.

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
			Low or no effect across other adjacent sections.	Not significant across adjacent sections.	Dudgeon Substation located to south of A47.	Beneficial effect for remaining 20 years.
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, impacts during the decommissioning stage are assumed to be no worse than those identified during the construction stage.						

34.3.12 Chapter 30 Tourism and Recreation

99. A desk-based assessment, combined with consultation, was undertaken to enable identification of the important recreational and tourism features within the study area.
100. Under Scenario 1 the assessment concluded that following mitigation the residual potential impacts on tourism and recreation range from **no impact** to **minor adverse**.
101. These impacts are driven mainly by the increased traffic density during construction and the visual impact of construction in a rural area. The construction impacts have a greater likely to be more significant closer to the coast because the density of tourism and recreational receptors increases with proximity to the coast. This is to be as expected because the Norfolk Coast Area of Outstanding Natural Beauty (AONB) is one of the main drivers of tourism in the area. However, these impacts are temporary, short term due to the sequential nature of the construction, and fully reversible once construction is complete. Therefore, it is unlikely that they would result in a negative impact to the tourism industry in the area.
102. During operation, there are not expected to be any impacts to tourist visitors or the tourist industry. This is because the onshore cable is buried and the offshore wind turbines are far enough from the coast to not be visible. It is likely that there will be a long term change to the landscape at the onshore project substation and National Grid Substation. However, due to the low density of tourism receptors here it is unlikely to have an impact on the tourism industry. Recreational users may have some negative perceptions of the presence of a substation but the significance of physical impacts combined with observations seen in previous studies indicate that it is unlikely that they would change their behaviour or stop using the area for recreational purposes.
103. It should be highlighted that where **minor adverse** impacts have been assessed that they are localised and Norfolk Boreas Limited will work to mitigate the determinants of the impacts by development of a CoCP and TMP to ensure all potential impacts are managed to an acceptable level; outline versions of these documents have been submitted with the DCO Application.

Table 34.23 Summary of potential impacts identified for tourism and recreation under Scenario 1

Potential impact	Receptor	Value/ sensitivity	Magnitude	Significance	Additional Mitigation	Residual impact
Construction						
Impact 1: Increased marine construction traffic affecting attractiveness of the coastline for Tourism and recreation.	Tourists	Low	Negligible	Negligible	None	Negligible
Impact 2: Disruption of marine recreational activities including sailing and other water sports	Recreational marine users	Low	Low	Negligible	None	Negligible
Impact 3: Deterioration to Bathing Water / Blue Flag beaches and resulting effect on Tourism and Recreation	Visitors to blue Flag beaches and associated local businesses	Low	Negligible	Negligible	None	Negligible
Impact 4: Disruption to onshore coastal recreational and tourism assets	Tourism and recreation assets	Medium	Low	Minor adverse	OLEMS CoCP TMP	Negligible
Impact 5: Visual impacts of construction activity	Tourists and local communities using the area recreationally	Medium	Low	Minor adverse	OLEMS CoCP	Minor adverse
Impact 6: Reduction of tourist accommodation availability due to non-resident work force	Hotels and other accommodation	Low	Negligible	Negligible	None	Negligible
Impact 7: Obstruction or disturbance to inland tourism and recreation assets	Tourism and recreation assets	Medium	Low	Minor adverse	CoCP	Minor adverse

Potential impact	Receptor	Value/ sensitivity	Magnitude	Significance	Additional Mitigation	Residual impact
Impact 8: Obstruction or disturbance to users of paths or non-motorised routes	Tourists and local communities using the area recreationally	Medium to high	Negligible	Minor adverse	CoCP	Negligible
Impact 9: Increased traffic affecting tourism and recreation	Pedestrian severance and amenity	Low to High (see Chapter 24)	Low	Minor adverse	TMP CoCP	Minor adverse
Impact 10: Disruption or impacts to open access or public land	Open or public land areas	None interacted with	No impact	No impact	None	No impact
Operation						
Impact 1: obstruction of disturbance to marine recreation	Recreational marine users	Low	Negligible	Negligible	None	Negligible
Impact 2: Visual and noise impacts on land-based tourism and recreation assets	Tourists	Low	Low	Minor adverse	Planting and bunding	Negligible
Impact 3: Permanent closure of paths or non-motorised routes	Recreational users	Negligible	No Impact	No Impact	None	No Impact
Impact 4: Reduction in visitor numbers due to tourist perceptions of wind farms	Potential visitors to Norfolk	Low	No Impact	No Impact	None	No Impact
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. As such, impacts during the decommissioning stage are assumed to be no worse than those identified during the construction stage.						

34.3.13 Chapter 31 Socio-economics

104. A review of policy, strategy, and business analysis was undertaken that showed that the offshore wind industry in East Anglia is growing quickly, with Vattenfall seen as a significant contributor in this growth. Under Scenario 1 the project may directly create up to 425 full time equivalent (FTE) jobs during construction and up to 245 FTE jobs during operation. These would create a **major beneficial** impact for the region as it is assessed that the relevant stakeholders are preparing to develop skills to supply them.
105. An additional 224 FTE jobs may be created due to indirect and induced employment under Scenario 1. This would create a beneficial impact of a smaller magnitude because it is assessed that a larger labour market would be involved in supplying the demand.
106. Cumulatively, construction employment in the offshore wind sector is assessed to create a major beneficial impact due to a continuous pipeline of projects over the next 10 years.
107. The location of communities and the infrastructure that provides services to communities has been reviewed. It was found that there would be no direct impact to community infrastructure. Indirect impacts would not be significant (**negligible to minor adverse**) and managed through the proposed mitigation measures.

Table 34.24 Summary of potential beneficial impacts identified for socio-economics under Scenario 1

Potential impact	Receptor	Value/ sensitivity	Magnitude	Significance	Additional Enhancements	Likely long term effect
Construction						
Direct job creation	Regional labour market	Medium	High	Major beneficial	Enable local supply-chain	Application of enhancement likely to result in a long term major beneficial effect due to total employment
Indirect job creation	Regional labour market	Medium	Low	Minor beneficial	Enable local supply-chain	
Operation						
Direct and Supply chain employment	Regional labour market	Medium	Medium	Moderate beneficial	Local supply chain plan and investment in local human resources	Application of enhancement likely to result in a long term major beneficial effect due to total employment over a 30-year period
Indirect and supply chain job creation	Regional labour market	Medium	Low	Minor beneficial	Local supply chain plan and investment in local human resources	
Decommissioning – expected to be similar to construction or lower						
Onshore Direct Employment and Supply Chain Job Creation	Regional labour market	Low	Low	Minor beneficial	Enable local supply-chain	Negligible

Table 34.25 Summary of potential adverse impacts identified for socio-economics under Scenario 1

Potential Impact	Receptor	Value/ sensitivity	Magnitude	Significance	Mitigation	Residual impact
Construction						
Effects on community infrastructure	Community infrastructure assets	Low	Low	Minor adverse	Noise and visual management described in other chapters	Minor adverse
Operation						
Effects on community infrastructure	Community infrastructure assets	Low	Negligible	Negligible	Visual impacts outline in Chapter 29 Landscape and Visual Impact Assessment	Negligible
Decommissioning – expected to be similar to construction or lower						
Effects on community infrastructure	Community infrastructure assets	Low	Low	Minor adverse	Noise and visual management described in other chapters	Minor adverse

34.4 Scenario 2 Onshore

34.4.1 Chapter 19 Ground Conditions and Contamination

108. The impacts assessed include the potential for contamination leaks and spills from construction plant, potential for existing contaminant release during any works and impacts on groundwater quality and mineral resources availability. The approach and information used for the assessment are as outlined for Scenario 1 (see section 34.3.1).
109. Under Scenario 2, with the application of mitigation measures the project is predicted to have no greater than **minor adverse** impacts in relation to ground conditions and contamination.
110. A CoCP will be produced, which will provide details of the industry best practice measures that would be undertaken to reduce potential construction impacts onshore.

Table 34.26 Summary of potential impacts identified for ground conditions and contamination under Scenario 2

Potential impact	Receptor	Value/ sensitivity	Magnitude	Significance	Additional Mitigation	Residual impact	
Construction							
1	Impacts to coastline, including designated geological sites	Coastline and designated geological sites	High	No change	No impact	None required.	No impact
2	Contamination of secondary aquifers as a result of construction activities	Secondary aquifers	Low to Medium	Low	Minor adverse	CoCP - minimise exposure to potentially harmful substances	Negligible
3	Impacts on groundwater quality in the principal aquifer (including SPZ areas) as a result of shallow excavation construction activities	Principal aquifer including at SPZ areas	High	Low	Moderate adverse	CoCP - minimise exposure to potentially harmful substances	Minor adverse
4	Impacts on groundwater quality in the principal aquifer (including SPZ areas), resulting from trenchless crossing techniques and piling.	Principal aquifer including at SPZ areas	High	Medium	Major adverse	Hydrogeological risk assessment to be conducted pre-construction	Minor adverse
5	Impacts of construction may affect the quantity and quality of surface waters fed by groundwater	Surface water	Low to High	Negligible	Negligible to minor adverse	Embedded mitigation only	Negligible to minor adverse

Potential impact	Receptor	Value/ sensitivity	Magnitude	Significance	Additional Mitigation	Residual impact	
6	Impacts to human health, including construction workers and general public during any excavations associated with construction.	Human health.	High	Low	Moderate adverse	CoCP – Site and Excavated Waste Management Plan	Minor adverse
7	Sterilisation of mineral resources.	Mineral safeguard areas.	Medium	High	Major adverse	CoCP – Materials Management Plan	Minor adverse
8	Impacts on shallow groundwater due to changes to the hydraulic regime as a result of changes to soil compaction along the cable route	Shallow groundwater	Medium	Low	Minor adverse	Embedded mitigation only	Minor adverse
Operation							
Impacts during operation are scoped out of the ES in accordance with the Norfolk Boreas EIA Scoping Report.							
Decommissioning							
It is anticipated that the decommissioning impacts will be similar in nature to those of construction.							

34.4.2 Chapter 20 Water resources and Flood Risk

111. The impact assessment considered potential impacts upon receptors including direct disturbance of surface water bodies, increased flood risk, increased sediment input to watercourses, and accidental spills of fuels, oils and lubricants during construction. The approach and information used for the assessment are as outlined for Scenario 1 (see section 34.3.2).
112. Under Scenario 2, **moderate adverse** residual impacts are predicted on the River Bure catchment and River Wensum catchment as a worst case where permanent culverts are used, and due to increased sediment supply when assessed on a worse case sub-catchment basis. It is important to note that this assessment is based on the cumulative effect of multiple crossings within each sub-catchment, rather than the impacts associated with any single crossing. Whilst the worst case of permanent culverts are considered to result in some significant impacts, where permanent culverts can be avoided any changes occur as a result of temporary crossings will be temporary and reversible and, with mitigation would not result in significant residual impacts.
113. With the application of mitigation measures all other assessed impacts for water resources and flood risk are **negligible to minor adverse**.

Table 27 Summary of potential impacts identified for water resources and flood risk under Scenario 2

Potential Impact	Receptor	Sub-catchment	Sensitivity/ Value ³	Magnitude	Significance	Additional Mitigation	Residual Impact	
Construction								
Impact 1: Direct disturbance of surface water bodies	River Bure catchment	North Walsham and Dilham Canal	Low / Low	Negligible to low	Negligible to Minor adverse	Embedded mitigation plus additional measures to manage direct disturbance from culverting and dam and divert methods.	Negligible	
		East Ruston Stream	High / High	Low	Moderate adverse		Minor adverse	
		River Bure	Medium / High	Negligible to Medium	Minor to Major adverse		Moderate adverse	
		King's Beck	Medium / High	Negligible to Low	Minor to Moderate adverse		Minor adverse	
	River Wensum	River Wensum	High / High	Negligible	Negligible	Minor adverse	Embedded mitigation plus additional measures to manage direct disturbance from culverting and dam and divert methods.	Minor adverse
		Blackwater Drain	High / High	Negligible to High	Negligible to High	Minor to Major adverse		Moderate adverse
		Wendling Beck	High / High	Negligible to Medium	Negligible to Medium	Minor to Major adverse		Moderate adverse
		Penny Spot Beck	High / High	Negligible to Medium	Negligible to Medium	Minor Major adverse		Moderate adverse
	River Wissey	Upper River Wissey	Medium / Medium	Low to Medium	Low to Medium	Minor adverse	Embedded mitigation plus additional	Minor adverse

³ Please note this is the highest sensitivity/value of receptor assessed per impact.

Potential Impact	Receptor	Sub-catchment	Sensitivity/ Value ³	Magnitude	Significance	Additional Mitigation	Residual Impact
						measures to manage direct disturbance from culverting and dam and divert methods.	
Impact 2: Increased sediment supply	River Bure catchment	North Walsham and Dilham Canal	Low / Low	Negligible	Negligible	Embedded measures plus additional construction best practice measures to manage sediment and surface drainage.	Negligible
		East Ruston Stream	High / High	Low	Moderate adverse		Moderate adverse
		New Cut	Low / High	Negligible	Minor adverse		Minor adverse
		River Bure	Medium / High	Low	Moderate adverse		Moderate adverse
		King's Beck	Medium / High	Negligible	Minor adverse		Minor adverse
		Mermaid Stream	Medium / High	Negligible	Minor adverse		Minor adverse
	River Wensum catchment	River Wensum & Penny Spot Beck	High / High	Negligible	Minor adverse	Embedded measures plus additional construction best practice measures to manage sediment and surface drainage.	Minor adverse
		Blackwater Drain	High / High	Low	Moderate adverse		Moderate adverse
		Wendling Beck	High / High	Low	Moderate adverse		Moderate adverse

Potential Impact	Receptor	Sub-catchment	Sensitivity/ Value ³	Magnitude	Significance	Additional Mitigation	Residual Impact
	River Wissey catchment	Upper River Wissey	Medium / Medium	Medium	Moderate adverse	Embedded measures plus additional construction best practice measures to manage sediment and surface drainage.	Minor adverse
Impact 3: Accidental release of fuels, oils, lubricants, foul waters and construction materials	River Bure catchment	North Walsham and Dilham Canal	Low / Low	Low	Minor adverse	Embedded measures plus development of a CMS with best practice pollution control measures.	Negligible
		East Ruston Stream	High / High	Medium	Major adverse		Minor adverse
		New Cut	Low / High	Medium	Major adverse		Minor adverse
		River Bure	Medium / High	Low	Moderate adverse		Minor adverse
		King's Beck	Medium / High	Low	Moderate adverse		Minor adverse
		Mermaid Stream	Medium / High	Low	Moderate adverse		Minor adverse
	River Wensum catchment	River Wensum & Penny Spot Beck	High / High	Low	Moderate adverse	Embedded measures plus development of a CMS with best practice pollution control measures.	Minor adverse
		Blackwater Drain	High / High	Medium	Major adverse		Minor adverse
		Wendling Beck	High / High	Medium	Major adverse		Minor adverse

Potential Impact	Receptor	Sub-catchment	Sensitivity/ Value ³	Magnitude	Significance	Additional Mitigation	Residual Impact
	River Wissey catchment	Upper River Wissey	Medium / Medium	Low	Minor adverse	Embedded measures plus development of a CMS with best practice pollution control measures.	Minor adverse
	Groundwater	The Broadland Rivers Chalk & Crag, Cam and Ely Ouse Chalk, and North Norfolk Chalk	High / High	Medium	Major adverse	Embedded measures plus development of a CMS with best practice pollution control measures.	Minor adverse
Impact 4: Increased surface water runoff and flood risk	River Bure catchment	North Walsham and Dilham Canal	Low / Low	Low	Minor adverse	Embedded measures plus development of a surface water drainage plan.	Negligible
		East Ruston Stream	High / High	Low	Moderate adverse		Minor adverse
		New Cut	Low / High	Low	Moderate adverse		Minor adverse
		River Bure	Medium / High	Low	Moderate adverse		Minor adverse
		King's Beck	Medium / High	Low	Moderate adverse		Minor adverse
		Mermaid Stream	Medium / High	Low	Moderate adverse		Minor adverse

Potential Impact	Receptor	Sub-catchment	Sensitivity/ Value ³	Magnitude	Significance	Additional Mitigation	Residual Impact
	River Wensum catchment	River Wensum & Penny Spot Beck	High / High	Low	Moderate adverse	Embedded measures plus development of a surface water drainage plan.	Minor adverse
		Blackwater Drain	High / High	Low	Moderate adverse		Minor adverse
		Wendling Beck	High / High	Low	Moderate adverse		Minor adverse
	River Wissey catchment	Upper River Wissey	Medium / Medium	Medium	Moderate adverse	Embedded measures plus development of a surface water drainage plan.	Minor adverse
Operation							
Impact 1: Increased surface water runoff, altered groundwater flows, and changes to flood risk	River Bure catchment	North Walsham and Dilham Canal	Low / Low	Negligible	Minor adverse	Embedded measures plus development of a surface water drainage plan.	Negligible
		East Ruston Stream	High / High	Negligible	Moderate adverse		Minor adverse
		New Cut	Low / High	Negligible	Moderate adverse		Minor adverse
		River Bure	Medium / High	Negligible	Moderate adverse		Minor adverse
		King's Beck	Medium / High	Negligible	Moderate adverse		Minor adverse
		Mermaid Stream	Medium / High	Negligible	Moderate adverse		Minor adverse

Potential Impact	Receptor	Sub-catchment	Sensitivity/ Value ³	Magnitude	Significance	Additional Mitigation	Residual Impact
	River Wensum catchment	River Wensum & Penny Spot Beck	High / High	Negligible	Moderate adverse		Minor adverse
		Blackwater Drain	High / High	Negligible	Moderate adverse		Minor adverse
		Wendling Beck	High / High	Negligible	Moderate adverse		Minor adverse
	River Wissey catchment	Upper River Wissey	Medium / Medium	Low	Minor adverse	Embedded measures plus development of a surface water drainage plan.	Negligible
	Groundwater bodies	The Broadland Rivers Chalk & Crag, Cam and Ely Ouse Chalk, and North Norfolk Chalk	High / High	Low	Moderate adverse	Embedded measures plus development of a surface water drainage plan.	Minor adverse
	Impact 2: Supply of fine sediment and other contaminants	River Bure catchment	North Walsham and Dilham Canal	Low / Low	Negligible	Negligible	Embedded measures only.
East Ruston Stream			High / High	Negligible	Minor adverse	Minor adverse	
New Cut			Low / High	Negligible	Minor adverse	Minor adverse	
River Bure			Medium / High	Negligible	Minor adverse	Minor adverse	
King's Beck			Medium / High	Negligible	Minor adverse	Minor adverse	
Mermaid Stream			Medium / High	Negligible	Minor adverse	Minor adverse	

Potential Impact	Receptor	Sub-catchment	Sensitivity/ Value ³	Magnitude	Significance	Additional Mitigation	Residual Impact
	River Wensum catchment	River Wensum	High / High	Negligible	Minor adverse	Embedded measures only.	Minor adverse
		Blackwater Drain	High / High	Negligible	Minor adverse		Minor adverse
		Wendling Beck	High / High	Negligible	Minor adverse		Minor adverse
	River Wissey catchment	Upper River Wissey	Medium / Medium	Low	Minor adverse	Embedded measures plus best practice pollution control measures.	Minor adverse
	Groundwater bodies	The Broadland Rivers Chalk & Crag, Cam and Ely Ouse Chalk, and North Norfolk Chalk	High / High	Negligible	Minor adverse	Embedded measures plus best practice pollution control measures.	Minor adverse
	Decommissioning						
Impacts no worse than those during construction							

34.4.3 Chapter 21 Land Use and Agriculture

114. The assessment considered the potential impacts of the project on drainage, agricultural land, soil quality, Environmental Stewardship Schemes and utilities. The approach and information used for the assessment are as outlined for Scenario 1 (see section 34.3.3).
115. Under Scenario 2, with the application of mitigation measures the project is predicted to have no greater than **minor adverse** impacts in relation to land use and agriculture.

Table 34.28 Summary of potential impacts identified for land use and agriculture under Scenario 2

Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Additional mitigation	Residual impact
Construction						
1	Drainage	Medium	Low	Minor adverse	Yes – Drainage contractor, Drainage Plan, CoCP	Negligible
2	Land taken out of existing use/disruption to agricultural activities	High	Medium	Major adverse	Yes – SMP, private agreements	Minor adverse
3	Degradation of natural resources - soil	Low	Low	Minor adverse	Yes – SMP, private agreements	Negligible
4	Loss of soil resources – soil erosion	Low	Medium	Minor adverse	Yes – private agreements	Negligible
5	ESSs	Medium	Negligible	Minor adverse	Yes – private agreements	Negligible
6	Utilities	N/A.	N/A	No impact	N/A	No impact
Operation						
1	Drainage	N/A	N/A	No impact	N/A	No impact
2	Permanent land use change	High	Low	Moderate adverse	Yes – private agreements	Minor adverse
3	ESSs	Medium	Negligible	Minor adverse	Yes – private agreements	Minor adverse
4	Utilities	N/A	N/A	No impact	N/A	No impact
Decommissioning						
It is anticipated that the decommissioning impacts will be no worse than those for construction.						

34.4.4 Chapter 22 Onshore Ecology

116. Impacts assessed include direct and indirect effects on designated sites, habitats and species. Key receptors identified within the onshore project area and zone of influence are listed in Table 34.29. The approach and information used for the assessment are as outlined for Scenario 1 (see section 34.3.4).
117. Under Scenario 2, the potential significance in surveyed areas with the application of mitigation is deemed to be no greater than **minor adverse** for most species. Potential **moderate adverse** impacts have been identified for bats and hedgerows, however, these impacts will reduce over time as replacement hedgerows mature.
118. In unsurveyed areas, the potential significance is also deemed to be not greater than **minor adverse** for most species following mitigation. Potential **moderate adverse** impacts have been identified for bats. For all unsurveyed areas where potential impacts have been identified, pre-construction ecological surveys will be undertaken and, where the presence of these species is confirmed, appropriate mitigation measures would be developed, adhering to Natural England Standing Advice, to reduce impacts.
119. Mitigation measures would be developed in consultation with the relevant SNCB and Local Authority through the Ecological Management Plan in accordance with the Outline Landscape and Environmental Management Strategy (OLEMS) which has been submitted with the DCO application.

Table 34.29 Summary of potential impacts identified for onshore ecology under Scenario 2

Potential Impact	Receptor	Importance	Significance ⁴		Additional Mitigation	Residual Impact	
			Surveyed areas	Unsurveyed areas		Surveyed areas	Unsurveyed areas
Construction							
1	Statutory designated sites	High	Moderate adverse	N/A	OLEMS – including hedgerow replacement	Minor adverse	N/A
2	Non-statutory designated sites	Medium	Minor adverse	N/A	OLEMS – including hedgerow replacement	Minor adverse	N/A
3	Arable land	High	Minor adverse	N/A	OLEMS – reinstatement of arable field margins	Minor adverse	N/A
4	Woodland, trees and scrub	Negligible	Negligible	N/A	OLEMS – tree protection	Negligible	N/A
5	Hedgerows	High	Moderate adverse	N/A	OLEMS – hedgerow replacement	Moderate adverse	N/A
6	Grassland	High	Minor adverse	N/A	OLEMS – reinstatement	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	OLEMS – reinstatement	Minor adverse	N/A
9	Badgers	Low	Minor adverse	Minor adverse	OLEMS – Agreement with Natural England	Minor adverse	Minor adverse

⁴ 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 ⁴		Additional Mitigation	Residual Impact	
			Surveyed areas	Unsurveyed areas		Surveyed areas	Unsurveyed areas
10	Bats	High	Major adverse	Major adverse	OLEMS – hedgerow replacement	Moderate adverse	Moderate adverse
11	Water vole	Medium	Moderate adverse	Moderate adverse	OLEMS - displacement	Minor adverse	Minor adverse
12	Otter	High	Minor adverse	N/A	OLEMS – introduction of mammal ramps	Minor adverse	N/A
13	Great crested newts	High	Minor adverse	Major adverse	OLEMS – updated surveys and adherence to Natural England standing advice	Minor adverse	Minor adverse
14	Reptiles	Medium	Minor adverse	Moderate adverse	OLEMS – Precautionary Method of Working	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	N/A	OLEMS – pre-construction survey of River Wensum. Reinstatement of habitats	No impact	N/A
17	Fish	High	Moderate adverse	N/A	OLEMS – survey and monitoring	Minor adverse	N/A
18	Protected flora	High	No impact	N/A	N/A	No impact	N/A

Potential Impact	Receptor	Importance	Significance ⁴		Additional Mitigation	Residual Impact	
			Surveyed areas	Unsurveyed areas		Surveyed areas	Unsurveyed areas
19	Invasive non-native species	Medium	Moderate adverse	Moderate adverse	CoCP - Invasive Species Management Plan	Minor adverse	Minor adverse
Operation							
1	Habitat and species during maintenance	High	Minor adverse	N/A	N/A	Minor adverse	N/A
2	Fauna during operational lighting and noise	High	Minor adverse	N/A	Yes	Minor adverse	N/A
Decommissioning							
Impacts similar to those during construction							

34.4.5 Chapter 23 Onshore Ornithology

120. The potential for temporary habitat and disturbance of birds during construction was assessed, along with potential noise and light disturbance during operation associated with the onshore project substation. The approach and information used for the assessment are as outlined for Scenario 1 (see section 34.3.5).

121. Under Scenario 2, with the application of mitigation measures the project is predicted to have no greater than **minor adverse** impacts in relation to onshore ornithology. Mitigation measures include removing vegetation prior to bird breeding seasons, reinstatement of removed hedgerows following construction, and an operational lighting scheme at the onshore project substation that conforms to recommendations regarding birds set out in the Bat Conservation Trust's *Artificial Lighting And Wildlife Guidance*.

Table 34.30 Summary of potential impacts identified for onshore ornithology under Scenario 2

Potential Impact	Receptor	Importance	Magnitude	Significance	Additional Mitigation	Residual Impact
Construction						
1	Designated sites	Low	Medium	Minor adverse	OLEMS – reinstatement of habitats	Minor adverse
2	Wintering / on passage bird species	Medium	Low	Minor adverse	OLEMS - reinstatement of habitats and timing of works in certain areas for lapwing	Minor adverse
3	Breeding bird species	Medium	Medium	Moderate adverse	OLEMS – reinstatement of habitats and set aside areas for ground nesting species	Minor adverse
Operation						
1	Disturbance to habitat and species from maintenance activities	Medium	Negligible	Minor adverse	None required.	Minor adverse
2	Disturbance to onshore ornithology from operational lighting and noise	Medium	Negligible	Minor adverse	Operational lighting scheme that conforms to guidance set out in the Bat Conservation Trust's Guidance.	Minor adverse
Decommissioning						
Impacts similar or less than those during construction						

34.4.6 Chapter 24 Traffic and Transport

122. The traffic and transport assessment for the Scenario 2 is based on forecasts of background levels of traffic for 2023 as these represent the main construction years. Transport requirements were determined through a series of desk based assessments utilising open source data obtained from the Department for Transport and the relevant Highway Authorities. Further traffic data was obtained via commissioned onsite Automatic Traffic Count surveys undertaken in 2017.
123. A total of 108 highway links within the traffic and transport study area have been assessed for the effects of severance, pedestrian amenity, road safety and driver delay. Under Scenario 2, with the application of mitigation measures, the project is predicted to have no greater than **minor adverse** impacts for all highways link, with the exception of link 69 (Little London Road, south of Swafield off the B1145).
124. Under Scenario 2, Link 69 has a mitigated traffic demand of 48 daily HGV movements and the effect is considered to be of low magnitude. However, noting the high sensitivity of the receptor it is expected that the residual impact significance would be 'marginally' **moderate adverse**.
125. The assessed impact is very localised (impacting on a small number of dwellings) and is for a relative short duration. It is considered community engagement to establish clear lines of communication to the appointed contractor would serve to identify periods that are particularly sensitive to HGV movements and that could further mitigate this impact.
126. A Traffic Management Plan (TMP) and Travel Plan (TP) will contain specific commitments to managing HGV movements and employee traffic for the project and outline plans have been submitted with the DCO application. The Outline TMP contains a specific commitment to managing the HGV movements for link 69 and notes the need for community engagement.

Table 34.31 Summary of potential impacts identified for traffic and transport under Scenario 2

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Additional Mitigation	Residual Impact
Construction						
Impact 1: Severance	6, 8, 9, 10, 13a, 13b, 14, 16, 17, 18, 19, 21, 22, 24, 25, 29, 30, 32, 33, 34, 35a, 35b, 36, 37, 40a, 40b, 41, 42, 44a, 44b, 45, 46, 47b, 47c, 49, 52, 53, 54, 55, 56, 57, 58, 59, 60, 64, 65, 66, 67, 68, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79.	Low – High	Very Low	Negligible to Minor adverse	None required.	Negligible to Minor adverse
	69	High	High	Major adverse	Specific targeted TMP measures	Moderate
Impact 2: Pedestrian Amenity	6, 8, 9, 10, 13a, 13b, 14, 16, 17, 18, 19, 21, 22, 24, 25, 29, 30, 32, 33, 34, 35a, 35b, 36, 37, 40a, 40b, 41, 42, 44a, 44b, 45, 46, 47b, 47c, 49, 52, 53, 54, 55, 56, 57, 58, 59, 60, 64, 65, 66, 67, 68, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79.	Low – High	Low – High	Minor to Major adverse	Specific targeted TMP measures.	Minor adverse
	69	High	High	Major adverse	Specific targeted TMP measures	Moderate adverse

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Additional Mitigation	Residual Impact
Impact 3: Road Safety	Clusters 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23.	Negligible - Medium	Low - Medium	Minor adverse	None required	Minor adverse
	10	High	Low	Moderate adverse	Specific targeted TMP measures.	Minor adverse
	13, 17	High	Medium	Major adverse	Specific targeted TMP measures.	Minor adverse
Impact 4: Driver Delay	Junctions: 1, 2, 3, 4	High	Low – Very Low	Minor adverse	None required.	Minor adverse
Operation						
All impacts	All links	Low - High	Very Low	Negligible, or up to localised minor adverse	None required.	Negligible, or up to localised minor adverse
Decommissioning						
Impacts upon those links serving the cable route works would be significantly less than the construction phase whilst impacts upon those links primarily serving the onshore project substation (link 1) would be no worse than construction. Therefore, the overall magnitude of effect would be negligible to minor adverse and where appropriate similar mitigation strategies as presented for construction would be valid.						

34.4.7 Chapter 25 Noise and Vibration

127. To inform the noise and vibration impact assessment, a baseline noise survey (Appendix 25.1) was undertaken to quantify the existing noise environment within the onshore project area. Noise modelling was undertaken to inform several subsequent assessments in order to determine any potential impacts relating to the construction and operation of the project at agreed receptors.
128. Under Scenario 2, potential impacts from noise were identified as arising from construction works in a small number of locations along the onshore cable route and at one location at the landfall during night-time working and at onshore project substation. With the application of mitigation measures the project is predicted to have **negligible** impacts in relation to noise during construction works and **minor adverse** for traffic.
129. The only sources of noise during the operation of the project are those associated with the onshore project substation. Operational phase impacts were predicted to be **moderate adverse** at assessed sensitive receptors without mitigation. Noise reduction technologies and potential design approaches have been considered as part of the assessment and there are many proven mitigation options that, through the detailed design process, can be combined to create a design that will adhere to the required noise limits. With the incorporation of suitable mitigation residual impacts are predicted to reduce to **negligible** at identified receptors.
130. Norfolk Boreas Limited will provide a final design of the project which will not exceed the noise limits (at the nearest noise sensitive receptors) already imposed on the existing Dudgeon substation.

Table 34.32 Summary of potential impacts identified for noise and vibration under Scenario 2

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Additional Mitigation	Residual Impact
Construction						
Landfall Daytime	Residential	Medium	No Impact	Negligible	CNMP	Negligible
Landfall Evening and weekends	Residential	Medium	No Impact	Negligible	CNMP	Negligible
Landfall Night-time	Residential	Medium	Negligible	Negligible	CNMP	Negligible
Onshore cable route Daytime	Residential	Medium	No Impact to Major Adverse	Negligible to Major Adverse	CNMP + Enhanced mitigation (localised screening and increased separation distances).	Negligible
Onshore cable route Evening and weekends	Residential	Medium	No Impact	Negligible	CNMP	Negligible
Onshore cable route Night time	Residential	Medium	No Impact to Major Adverse	Negligible to Major Adverse	CNMP + Enhanced mitigation (localised screening and increased separation distances).	Negligible
Onshore project substation and National Grid substation extension receptors Daytime	Residential	Medium	No Impact	Negligible	CNMP	Negligible
Traffic	Residential	Medium	No Change to Moderate	Negligible to Moderate Adverse Impact	TMP (refer to chapter 24 Traffic and Transport)	Minor Adverse
Vibration	Residential	Medium	No impact	Negligible	None required.	Negligible

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Additional Mitigation	Residual Impact
Operation						
Operational noise	Residential	Medium	No Impact to Moderate Adverse	Negligible to Moderate Adverse	Designed to prevent significant adverse impacts, BAT. (see section 25.8.6.2).	Negligible
Decommissioning						
Whilst details regarding the decommissioning is currently unknown, considering the worst case it is anticipated that the impacts would be no worse than those during construction.						

34.4.8 Chapter 26 Air Quality

131. The air quality assessment considered the potential impacts associated with onshore construction phase dust and road traffic emissions only, in accordance with the Scoping Opinion. The approach and information used for the assessment are as outlined for Scenario 1 (see section 34.3.8).

132. In accordance with air quality guidance, a suite of best-practice mitigation measures has been identified (such as dampening down the running track during dry periods to minimise dust generation), which are commensurate with the level of dust risk of the construction activities. Under Scenario 2, the implementation of the mitigation measures, dust impacts and road traffic emissions can be considered to be **not significant** at both human and ecological receptors.

Table 34.33 Summary of potential impacts identified for air quality under Scenario 2

Potential impact	Receptor	Value/ sensitivity	Magnitude	Significance	Additional Mitigation	Residual impact
Construction						
1. Construction dust and fine particulate matter	Human receptors within 350m of onshore project area.	Dust Soiling: Medium sensitivity	Large	Assessment methodology does not assign significance before mitigation.	Measures as recommended by the Institute of Air Quality Management (IAQM).	Not significant
		Human Health: Low sensitivity				
2. Construction vehicle exhaust emissions	Residential properties, schools, hospitals and care homes within 200m of roads taking more than 100 HGVs per day.	High	The maximum increase in NO ₂ concentrations at a receptor was 1.42µg.m ⁻³ at receptor R30	Overall not significant , negligible impacts at all receptors except slight adverse impact at one receptor (R71).	No additional mitigation measures required.	Not significant
	Designated ecological sites.	High	Pollutant concentrations at or below 1% of Critical Load.	Not significant	No additional mitigation measures required.	Not significant
Operation						
Operational impacts on air quality have been scoped out.						
Decommissioning						
As per construction.						

34.4.9 Chapter 27 Human Health

133. The human health effects that were considered to have potential to impact on physical or mental health included: construction and operational noise, air quality, exposure to contaminated land or water, disrupted journeys or access, employment during construction and operation, exposure to EMF during operation, and affordability of electricity.
134. The approach and information used for the assessment are as outlined for Scenario 1 (see section 34.3.9).
135. The onshore infrastructure is largely routed through agricultural land and away from population centres and sensitive receptors, thus the potential number of receptors has been reduced through site selection and project design embedded mitigation.
136. The buried cable systems will produce EMFs. Public Health England has produced guidelines identifying EMF thresholds above which there is the potential for human health effects. The level of EMFs produced by the Norfolk Boreas buried cable systems is approximately 1% of the value Public Health England has identified as a safe level. As such, the conclusion of the assessment is that there would be no effect to population health due to EMFs during operation.
137. In addition, potential beneficial impacts have been identified due to an increase in local employment and training opportunities and as a result of increasing energy security in the long term, through renewable generation which may reduce electricity bills.
138. Under Scenario 2, with the implementation of the mitigation measures identified within the separate topics sections listed above (such as measures to minimise construction noise and to minimise the risk of dust generation), potentially adverse impacts are predicted to be of **negligible** or **minor adverse** significance.

Table 34.34 Summary of potential human health effects identified under Scenario 2

Potential effects	Temporal scope	Probability of effect	Sensitivity of		Magnitude of effect	Significance of effect on	
			General population	Vulnerable population		General population	Vulnerable population
Construction							
Noise	Mainly short term	Plausible	Low	High	Low	Negligible	Minor adverse
Air quality	Mainly short term	Plausible	Low	High	Low	Negligible	Minor adverse
Ground/water contamination	Short term	Plausible but improbable	Medium	High	Low	Negligible	Negligible
Physical activity	Very short term	Likely	Medium	High	Low	Negligible	Negligible
Journey times or reduced access	Short term	Likely	Low	High	Low	Negligible	Minor adverse
Construction and Operation							
Employment	Medium to long term	Likely	Medium	High	Low	Negligible	Minor beneficial
Operation							
Noise	Long term	Low probability	Low	High	None	No effect	No effect
EMF and public understanding of risk	Medium term	Low probability	Medium	High	None	No effect	No effect
Decommissioning							
The possible health effects arising from the decommissioning of the project are considered to be no worse than those considered for construction.							

34.4.10 Chapter 28 Onshore Archaeology and Cultural Heritage

139. The existing onshore archaeology and cultural heritage baseline has been established by a desk based exercise and supplemented by a programme of aerial photographic surveys and non-intrusive field surveys (such as using ground penetrating radar) to identify potential archaeological features underground.
140. Designated heritage assets (e.g. Scheduled Monuments) have been avoided as part of the site selection process and as such, no direct physical impacts are anticipated to occur. Indirect impacts do, however, have the potential to occur, such as impacts to the setting of a heritage asset.
141. Non-designated heritage assets may be subject to direct and / or indirect impacts as a result of the project. Direct impacts may arise as the result of ground excavation during construction.
142. Under Scenario 2, prior to the implementation of additional site-specific mitigation requirements, impacts are predicted to occur ranging between **no impact** and **major adverse** impact significance levels (as a worst case scenario (WCS)). However, it is anticipated that, following the application of the initial informative stages of mitigation and additional site-specific mitigation measures (as and where required, to be agreed in consultation with Norfolk County Council Historic Environment Service (NCC HES) and Historic England (HE)) to be undertaken post-consent, the significance of any impacts, where relevant, will be reduced or offset to levels considered **non-significant** in EIA terms (**negligible** or **minor adverse**).
143. As part of the additional mitigation, a project-specific draft outline has been submitted as part of the DCO application, prepared in adherence to previous discussions with NCC HES and HE, which outlines a commitment to undertake initial informative stages of mitigation post-consent. This will inform further decisions regarding the subsequent archaeological mitigation strategy so that the historic environment resource can be safe-guarded in a manner that is both appropriate and proportionate to the significance of the archaeological remains identified and present.

Table 34.35 Summary of potential impacts identified for onshore archaeology and cultural heritage under Scenario 2

Potential impact	Heritage asset type	Heritage significance	Magnitude of effect	Impact significance	Next steps: post-consent initial informative stages of mitigation / subsequent mitigation measures (as required)	Residual impact
Construction						
(1) Direct impact on (permanent change to) buried archaeological remains	Buried (sub-surface) archaeological remains	Low to High	Negligible to High (as a WCS)	Negligible to Major adverse (as a WCS)	<p>1) Additional project-wide geophysical survey to further ascertain presence / absence and likely extent of buried archaeological remains, <i>where not undertaken as part of the priority programme</i>.</p> <p>2) Targeted metal detecting and field walking.</p> <p>3) Trial trenching (i.e. ground truthing). Followed by the most appropriate subsequent mitigation approaches to be agreed with NCC HES / HE:</p> <ul style="list-style-type: none"> • Preservation in-situ; • Set-piece excavation; • Strip, map and sample excavation; and • Targeted and general monitoring / watching brief. 	Predicted to be non-significant in EIA terms following the application of: embedded mitigation; initial informative stages of mitigation; and additional mitigation measures, where required (to be agreed in consultation with NCC HES / HE). This further information regarding potential sub-surface remains will be gathered post-consent, and will directly inform decisions made around any further opportunities for preservation in-situ and where required and necessary preservation by record, ensuring that the residual impact significance is offset to levels considered non-significant in EIA terms.
(2) Direct impact on (permanent change to) above ground archaeological remains e.g.	Above ground archaeological remains (e.g. extant structures / features,	Low to Medium	Low to Medium	Minor to Moderate adverse (as a WCS)	Targeted earthwork condition or built heritage / historic building survey and recording, where necessary, followed by the most appropriate subsequent mitigation approaches (e.g. additional backfilling, reinstatement and sensitive conservation/	Predicted to be non-significant in EIA terms following the application of: embedded mitigation; initial informative stages of mitigation; and additional mitigation measures,

Potential impact	Heritage asset type	Heritage significance	Magnitude of effect	Impact significance	Next steps: post-consent initial informative stages of mitigation / subsequent mitigation measures (as required)	Residual impact
historic earthworks (including the Historic Landscape Character)	buildings and earthworks)				restoration requirements), where required on an area by area, site by site and case by case basis. Duct installation works through Blickling Conservation Area are to be sensitively managed and subject to full, thorough and strictly controlled backfilling, and reinstatement of landscape character elements of the Conservation Area.	where required (to be agreed in consultation with NCC HES / HE). As such it is anticipated that such impacts can be reduced or offset to levels considered non-significant in EIA terms.
(3) Indirect impact on the setting of heritage assets (both designated and non-designated)	Designated and certain non-designated heritage assets	Low to High	Negligible	Negligible to Minor adverse (as a WCS)	None required. Other than due care, attention and diligence to the presence and proximity of the designated and non-designated heritage assets identified in section 28.7.5 of Chapter 28, throughout the duration of construction. Certain assets (e.g. the Old Quaker Burial Ground at North Walsham - 1408) may require associated signage and temporary barriers in order to avoid any accidental damage or physical interactions occurring. This is set out in the project specific Outline WSI (document reference 8.5) and will ultimately need including and detailing in a Construction Stage Plan(s), Contractor Environmental Action Plan(s), or similar.	Negligible to Minor adverse (as a WCS).
(4) Impact on potential geoarchaeological	Palaeoenvironmental and geoarchaeologic	High (as a WCS)	Negligible	Negligible to Minor	Potential / currently unrecorded geoarchaeological / palaeoenvironmental remains will be mitigated by means of	Negligible (i.e. non-significant in EIA terms): Following the application of: embedded

Potential impact	Heritage asset type	Heritage significance	Magnitude of effect	Impact significance	Next steps: post-consent initial informative stages of mitigation / subsequent mitigation measures (as required)	Residual impact
/ palaeoenvironmental remains, potentially indicative of former land surfaces	al deposits / remains			adverse (as a WCS)	implementing the embedded mitigation measures and commitments, set-out in a project-specific Outline WSI (document reference 8.5), which will include reference to a project-wide approach to geoarchaeological assessment / palaeoenvironmental survey, which will be planned and undertaken in the post-consent stages, in agreement and ongoing consultation with NCC HES and HE.	mitigation; initial informative stages of mitigation; and additional mitigation measures (to be agreed in consultation with NCC HES and HE), as required.
(5) Impacts to site preservation conditions from drilling fluid breakout	Palaeoenvironmental and geoarchaeological deposits / buried archaeological remains	Low to High	Negligible	Negligible to Minor adverse (as a WCS)	Fluid pressures are to be monitored throughout the drilling process to minimise the potential for breakout of the drilling fluid and an action plan will be developed and procedures adopted during the drilling activity to respond appropriately to any drilling fluid breakout.	Anticipated to be Negligible .
Operation						
(1) Indirect impact on the setting of heritage assets (designated and non-designated)	Designated and certain non-designated heritage assets	High	Negligible	Minor adverse (as a WCS), but generally No Impact	None required. Church of St. Andrew, Bradenham (34) may be subject to consideration in relation to the possibility of off-site mitigation planting during the post-consent phase, in order to potentially reduce this impact significance.	Minor adverse (as a WCS), but generally No impact .
(2) Impacts to site preservation conditions from	Palaeoenvironmental and geoarchaeological deposits /	Negligible to High	N/A	No Impact	None required.	No impact .

Potential impact	Heritage asset type	Heritage significance	Magnitude of effect	Impact significance	Next steps: post-consent initial informative stages of mitigation / subsequent mitigation measures (as required)	Residual impact
heat loss from installed cables	buried archaeological remains					
Decommissioning						
(1) Direct impact on (permanent change to) buried archaeological remains	Buried (sub-surface) archaeological remains	Negligible to High	Negligible	Minor adverse (as a WCS)	The decommissioning methodology would need to be finalised nearer to the end of the lifetime of the project so as to be in line with latest and current guidance, policy and legislation at that point. Any such methodology would be agreed with the relevant authorities and statutory consultees. The decommissioning works could be subject to a separate licencing approach, which may require EIA, including any requisite archaeological and cultural heritage impact assessment.	It is anticipated that appropriate and proportionate mitigation can be applied, as required at the time, which will reduce / offset impact significance to levels considered non-significant in EIA terms.
(2) Indirect impact on the setting of heritage assets (designated and non-designated)	Designated and certain non-designated heritage assets	Low to High	Negligible to Low	Negligible to Minor adverse (as a WCS)	None required. Indirect impacts associated with decommissioning and the setting of heritage assets are not considered likely to be any worse than those identified for the construction and operation and maintenance stages.	Minor adverse (as a WCS). Although a full EIA may be carried out ahead of any decommissioning works to be undertaken.

34.4.11 Chapter 29 Landscape and Visual Impact Assessment

144. The potential effects of the onshore components of the project were assessed for landscape and visual receptors during the construction, operation and decommissioning phases of the project. The approach and information used for the assessment are as outlined for Scenario 2 (see section 34.3.11).
145. The LVIA demonstrated that despite the scale of the project, any significant effects would occur in relatively contained areas only, with the majority of landscape and visual receptors either undergoing **non-significant effects** or **no effect**.
146. Under Scenario 2, in respect of the landfall and onshore cable route, **significant** effects would occur only during the construction phase, with **no significant effects** during the operational phase, as infrastructure will be buried below ground. These effects would be reversible and short term in relation to the construction works, and medium term in relation to the re-establishment of hedgerows.
147. During the operational phase of the onshore project substation and National Grid substation extension would not significantly affect landscape character, apart from in the localised areas of the Settled Tributary Farmland LCT – River Wissey Tributary Farmland LCU and Plateau Farmland LCT – Beeston Plateau LCU and Pickenham Plateau LCU in which the onshore project substation or National Grid substation extension would be located or would have a close range influence.
148. In respect of representative viewpoints, **significant effects** would be experienced by walkers on Lodge Lane to the immediate south of the site, and by road-users on a very localised section of Ivy Todd Road to the south-west and a section of the A47 to the north. These effects would all occur within approximately 1.2km of the onshore project substation, making them localised. There would be **no significant effects** on the views of residents at Ivy Todd and Necton.
149. Mitigation planting will be introduced and has been designed with the aim of reducing these identified impacts. The planting includes areas of fast growing woodland species as this will provide the height required, as well as the density, to ensure effective screening. The commitment to mitigation measures is secured through a Landscaping Management Scheme in accordance with the OLEMS which has been submitted with the DCO application.

Table 34.36 Summary of potential significant impacts for landscape and visual receptors under Scenario 2

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Construction - Landfall						
Potential impact on landscape character relating to landfall construction.	Coastal Plain LCT – Bacton to Sea Palling.	Medium to high	Medium to high or medium between the ridge on which Happisburgh Lighthouse sits in the north and PRoW Happisburgh RB22 in the south. Low or no effect across remainder of LCU.	Significant between the ridge on which Happisburgh Lighthouse sits in the north and PRoW Happisburgh RB22 in the south. Not significant across remainder of LCU.	Land reinstated post construction.	None. Effect short term and reversible, relating to construction phase.
Potential impact on visual amenity of walkers relating to landfall construction.	Walkers on Norfolk Coastal Path	High	Medium to high or medium between Happisburgh coastal car park and PRoW Happisburgh RB22. No effect across remainder of path.	Significant between Happisburgh coastal car park and PRoW Happisburgh RB22. Not significant across remainder of path.	Land reinstated post construction.	None. Effect short term and reversible, relating to construction phase.
Potential impact on visual amenity of residents relating to landfall construction.	Residents in Happisburgh	Medium to high	Medium on Lighthouse Lane. Low or no effect across remaining parts.	Significant on Lighthouse Lane. Not significant across remaining parts of settlement.	Land reinstated post construction.	None. Effect short term and reversible, relating to construction phase.
Potential impact on visual amenity of walkers relating to landfall construction.	Walkers on PRoW RB22	Medium to high	Medium to high along length of PRoW.	Significant along length of PRoW.	Land reinstated post construction.	None. Effect short term and reversible, relating to construction phase.

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Construction - Onshore Cable Route						
Potential impact on landscape element of hedgerows and hedgetrees relating to onshore cable route construction.	Hedgerows and hedgetrees	Medium	Medium to high or medium in respect of mature good quality hedgerows and hedgetrees. Medium to low in respect of poorer quality hedgerows.	Significant where mature good quality hedgerows and hedgetrees are removed. Not significant for all remaining hedgerows.	Land reinstated post construction. Hedgerows replanted post construction – 3-5 years to infill gaps. Hedgetrees could not be replanted over cable easements.	None. Effect short term and reversible in respect of hedgerows and most hedgetrees. Significant where good quality hedgetrees are removed. Long term and reversible effect.
Potential impact on landscape element of trees relating to onshore cable route construction.	Trees	Medium to high	Medium to high or medium in respect of specific good quality trees. Medium to low in respect of poorer quality or isolated trees.	Significant where specific good quality trees are removed. Not significant for all remaining trees.	Land reinstated post construction. Hedgerows replanted post construction – 3-5 years to infill gaps. (Trees could not be replanted over cable easements.)	Significant where good quality trees are removed and cannot be replaced. Long term and reversible effect.
Potential impact on visual amenity of road-users relating to presence of mobilisation area.	Road-users on Dereham Road (west of Scarning)	Medium	Medium over approximate 120m section. Low or no effect across remaining parts.	Significant over approximate 120m section. Not significant for remaining parts.	Land reinstated post construction.	None. Effect short term and reversible.
Potential impact on visual amenity of road-users relating to	Road-users on A47	Medium	Medium over approximate 150m section.	Significant over approximate 150m section.	Land reinstated post construction.	None. Effect short term and reversible.

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
trenchless crossing (e.g. HDD) compounds.	(south-west of Dereham)		Low or no effect across remaining parts.	Not significant for remaining parts.		
Potential impact on visual amenity of road-users relating to mobilisation area.	Road-users on B1146 (north of Dereham)	Medium	Medium to high over approximate 800m section. Low or no effect across remaining parts.	Significant over approximate 800m section. Not significant for remaining parts.	Land reinstated post construction. Hedgerows replanted post construction – 5 - 10 years to infill gaps.	None. Effect short term and reversible.
Potential impact on visual amenity of road-users relating to mobilisation area.	Road-users on B1147 (south of Swanton Morley)	Medium	Medium to high over approximate 200m section. Low or no effect across remaining parts.	Significant over approximate 200m section. Not significant for remaining parts.	Land reinstated post construction. Hedgerows replanted post construction – 5 - 10 years to infill gaps.	None. Effect short term and reversible.
Potential impact on visual amenity of road-users relating to mobilisation area and onshore cable route construction.	Road-users on Lime Kiln Road	Medium	Medium over approximate 1.2km and 200m section. Low or no effect across remaining parts.	Significant over approximate 1.2km and 200m section. Not significant for remaining parts.	Land reinstated post construction. Hedgerows replanted post construction – 3-5 years to infill gaps.	None. Effect short term and reversible.
Potential impact on visual amenity of road-users relating to mobilisation area.	Road-users on A1067 (west of Sparham)	Medium	Medium over approximate 300m section. Low or no effect across remaining parts.	Significant over approximate 300m section. Not significant for remaining parts.	Land reinstated post construction. Hedgerows replanted post construction – 3-5 years to infill gaps.	None. Effect short term and reversible.
Potential impact on visual amenity of road-users relating to onshore cable route construction.	Road-users on B1145 (west of Cawston)	Medium	Medium over approximate 70m section. Low or no effect across remaining parts.	Significant over approximate 70m section. Not significant for remaining parts.	Land reinstated post construction. Hedgerows replanted post construction – 3-5 years to infill gaps.	None. Effect short term and reversible.

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Potential impact on visual amenity of road-users relating to mobilisation area.	Road-users on Heydon Road	Medium	Medium over approximate 150m section. Low or no effect across remaining parts.	Significant over approximate 150m section. Not significant for remaining parts.	Land reinstated post construction.	None. Effect short term and reversible.
Potential impact on visual amenity of road-users relating to mobilisation area.	Road-users on A149	Medium	Medium over approximate 400m section. Low or no effect across remaining parts.	Significant over approximate 400m section. Not significant for remaining parts.	Land reinstated post construction.	None. Effect short term and reversible.
Potential impact on visual amenity of road-users relating to onshore cable route construction.	Walkers on Wensum Way	Medium to high	Medium to high over approximate 550m section next to mobilisation area and 80m section at crossing point. Low or no effect across remaining parts.	Significant over approximate 550m section and 80m section. Not significant for remaining parts.	Land reinstated post construction. Hedgerows replanted post construction – 5-10 years to infill gaps. Trees could not be replanted over cable easements.	None. Effect short term and reversible.
Construction – Onshore Project Substation and National Grid substation extension						
Potential impact on landscape character relating to project construction.	Plateau Farmland LCT: Pickenham Plateau LCU	Medium	High or medium within local area of spur. Low or no effect across remainder of LCU.	Significant in local area of spur. Not significant across remainder of LCU.	Mitigation planting implemented post construction at latest. Hedgerows replanted post construction – 3-5 years to infill gaps.	None. Effect medium term and reversible.
Potential impact on landscape character relating to project construction.	Settled Tributary Farmland LCT: River Wissey LCU	Medium	High or medium in the area defined by the A47 to the north, Great Wood and Smuggler's Lane to the east, Necton National Grid	Significant in the area defined by the A47 to the north, Great Wood and Smuggler's Lane to the east, Necton National Grid	Mitigation planting implemented after construction at latest.	None. Effect medium term and reversible.

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
			Substation and the Necton ridgeline to the west and Ivy Todd Road to the south. Low or no effect across remainder of LCU.	Substation and the Necton ridgeline to the west and Ivy Todd Road to the south. Not significant across remainder of LCU.	Hedgerows replanted post construction – 3-5 years to infill gaps.	
Potential impact on landscape character relating to project construction.	Plateau Farmland LCT: Beeston Plateau	Medium	High or medium in the area extending to the A47 to the north, Great Wood and Smuggler's Lane to the east, and the LCU boundary to the west and south. Low or no effect across remainder of LCU.	Significant in the area extending to the A47 to the north, Great Wood and Smuggler's Lane to the east, and the LCU boundary to the west and south. Not significant across remainder of LCU.	Mitigation planting implemented post construction at latest. Hedgerows replanted post construction – 3-5 years to infill gaps.	None. Effect medium term and reversible.
Potential impact on visual amenity of road-users relating to project construction.	VP1 Ivy Todd Road (west)	Medium	Medium to high over approximate 10m section. Low or no effect across wider extent of road.	Significant over approximate 10m section. Not significant across wider extent of road.	Mitigation planting implemented post construction at latest. Hedgerows replanted post construction – 3-5 years to infill gaps.	None. Effect medium term and reversible.
Potential impact on visual amenity of walkers relating to project construction.	VP2 Lodge Lane (south)	Medium	High over approximate 400m southern section of lane.	Significant over approximate 400m southern section of lane.	Mitigation planting implemented post construction at latest. Hedgerows replanted post construction – 3-5 years to infill gaps.	None. Effect medium term and reversible.
Potential impact on visual amenity of walkers	VP3 Lodge Lane (north)	Medium	Medium over approximate 250m northern section of lane.	Significant over approximate 250m northern section of lane.	Mitigation planting implemented post construction at latest.	None. Effect medium term and reversible.

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
relating to project construction.					Hedgerows replanted post construction – 3-5 years to infill gaps.	
Potential impact on visual amenity of A47 road-users relating to project construction.	VP4 A47 Necton Substation	Medium	Medium over approximate 250m section of A47. Low or no effect across other adjacent sections.	Significant over approximate 250m section of A47. Not significant across remainder of A47.	Existing mitigation planting associated with Dudgeon Substation located to south of A47.	None. Effect medium term and reversible over approximate 300m section.
Potential impact on visual amenity of A47 road-users relating to project construction.	VP5 A47 Spicer's Corner	Medium	Medium to high over approximate 300m section of A47. Low or no effect across other adjacent sections.	Significant over approximate 300m section of A47. Not significant across remainder of A47.	Trees replanted post construction – 10 years to infill gaps. Existing mitigation planting associated with Dudgeon Substation located to south of A47.	None after 10 years. Significant effect long term (10 years) and reversible over approximate 300m section.
Operation – Onshore Project Substation and National Grid substation extension						
Potential impact on landscape character relating to project operation.	Plateau Farmland LCT: Pickenham Plateau LCU	Medium	High or medium within local area of spur. Low or no effect across remainder of LCU.	Significant in local area of spur. Not significant across remainder of LCU.	Mitigation planting would gradually reduce effect to not significant over first 20 years of indicative design life.	None after 20 years. Significant effect long term (20 years) and reversible in localised area.
Potential impact on landscape character relating to project operation.	Settled Tributary Farmland LCT: River Wissey LCU	Medium	High or medium in the area defined by the A47 to the north, Great Wood and Smuggler's Lane to the east, Necton National Grid Substation and the Necton	Significant in the area defined by the A47 to the north, Great Wood and Smuggler's Lane to the east, Necton National Grid Substation and the Necton	Mitigation planting would gradually reduce effect to not significant over first 20 years of indicative design life.	None after 20 years. Significant effect long term (20 years) and reversible in localised area.

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
			ridgeline to the west and Ivy Todd Road to the south. Low or no effect across remainder of LCU.	ridgeline to the west and Ivy Todd Road to the south. Not significant across remainder of LCU.		
Potential impact on landscape character relating to project operation.	Plateau Farmland LCT: Beeston Plateau	Medium	High or medium in the area extending to the A47 to the north, Great Wood and Smuggler's Lane to the east, and the LCU boundary to the west and south. Low or no effect across remainder of LCU.	Significant in the area extending to the A47 to the north, Great Wood and Smuggler's Lane to the east, and the LCU boundary to the west and south. Not significant across remainder of LCU.	Mitigation planting would gradually reduce effect to not significant over first 20 years of indicative design life.	None after 20 years. Significant effect long term (20 years) and reversible in localised area.
Potential impact on visual amenity of road-users relating to project operation.	VP1 Ivy Todd Road (west)	Medium	Medium to high over an approximate 10m section of the road. Low or no effect over wider extent of road.	Significant over an approximate 10m section of the road. Not significant across wider extent of road.	Mitigation planting would gradually reduce effect to not significant during the first 25 years of indicative design life.	None after 25 years. Significant effect long term (25 years) and reversible over 10m section.
Potential impact on visual amenity of walkers relating to project operation.	VP2 Lodge Lane (south)	Medium	Medium to high along approximate 400m southern section. Low or no effect over remaining parts of lane.	Significant along approximate 400m southern section.	Mitigation planting would gradually reduce effect to not significant over first 20 years of indicative design life.	None after 20 years. Significant effect long term (20 years) and reversible over 400m section. Beneficial effect for remaining 10 years.

Potential Impact	Receptor	Value/ Sensitivity	Magnitude	Significance	Mitigation	Residual Impact
Potential impact on visual amenity of A47 road-users relating to project operation.	VP5 A47 Spicer's Corner	Medium	Medium to high over approximate 300m section of A47 reducing to low as mitigation planting matures. Low or no effect across other adjacent sections.	Significant over approximate 300m section of A47 reducing to not significant as mitigation planting matures. Not significant across adjacent sections.	Mitigation planting would gradually reduce effect to not significant after 10 years Existing mitigation planting associated with Dudgeon Substation located to south of A47.	None after 10 years. Significant effect long term (10 years) and reversible over 50m section. Beneficial effect for remaining 20 years.
Potential impact on visual amenity of A47 road-users relating to project operation.	VP5 A47 Spicer's Corner	Medium	Medium to high over approximate 300m section of A47 reducing to low as mitigation planting matures. Low or no effect across other adjacent sections.	Significant over approximate 300m section of A47 reducing to not significant as mitigation planting matures. Not significant across adjacent sections.	Mitigation planting would gradually reduce effect to not significant after 10 years Existing mitigation planting associated with Dudgeon Substation located to south of A47.	None after 10 years. Significant effect long term (10 years) and reversible over 50m section. Beneficial effect for remaining 20 years.
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, impacts during the decommissioning stage are assumed to be no worse than those identified during the construction stage.						

34.4.12 Chapter 30 Tourism and Recreation

150. A desk-based assessment, combined with consultation, was undertaken to enable identification of the important recreational and tourism features within the study area.
151. Under Scenario 2 the assessment concluded that following mitigation the residual potential impacts on tourism and recreation range from **no impact** to **minor adverse**.
152. These impacts are driven mainly by the increased traffic density during construction and the visual impact of construction in a rural area. The construction impacts have a greater likely to be more significant closer to the coast because the density of tourism and recreational receptors increases with proximity to the coast. This is to be as expected because the Norfolk Coast AONB is one of the main drivers of tourism in the area. However, these impacts are temporary, short term due to the sequential nature of the construction, and fully reversible once construction is complete. Therefore, it is unlikely that they would result in a negative impact to the tourism industry in the area.
153. During operation, there are not expected to be any impacts to tourist visitors or the tourist industry. This is because the onshore cable is buried and the offshore wind turbines are far enough from the coast to not be visible. It is likely that there will be a long term change to the landscape at the onshore project substation and National Grid Substation. However, due to the low density of tourism receptors here it is unlikely to have an impact on the tourism industry. Recreational users may have some negative perceptions of the presence of a substation but the significance of physical impacts combined with observations seen in previous studies indicate that it is unlikely that they would change their behaviour or stop using the area for recreational purposes.
154. It should be highlighted that where **minor adverse** impacts have been assessed that they are localised and Norfolk Boreas Limited will work to mitigate the determinants of the impacts by development of a CoCP and TMP, outline versions of which have been submitted with the DCO application, to ensure all potential impacts are managed to an acceptable level.

Table 34.37 Summary of potential impacts identified for tourism and recreation under Scenario 2

Potential impact	Receptor	Value/ sensitivity	Magnitude	Significance	Additional Mitigation	Residual impact
Construction						
Impact 1: Increased marine construction traffic affecting attractiveness of the coastline for tourism and recreation.	Tourists	Low	Negligible	Negligible	None	Negligible
Impact 2: Disruption of marine recreational activities including sailing and other water sports	Marine recreational users	Low	No Cumulative Impact	Negligible	None	Negligible
Impact 3: Deterioration to Bathing Water / Blue Flag beaches and resulting effect on Tourism and Recreation	Visitors to Blue Flag beaches and associated local businesses	IOW	Negligible	Negligible	None	Negligible
Impact 4: Disruption to onshore coastal tourism and recreation assets	Tourism and recreation assets	Low	n/a	Minor adverse	OLEMS CoCP TMP	Negligible
Impact 5: Visual impacts of construction activity to tourism and recreation assets	Tourists and local communities using the area recreationally	Low	Low	Minor adverse	OLEMS CoCP	Minor adverse
Impact 6: Reduction of tourist accommodation availability due to non-resident work force	Hotels and other accommodation	Low	Negligible to medium	Negligible to Minor adverse	Accommodation plan	Negligible to Minor adverse
Impact 7: Obstruction or disturbance to inland tourism and recreation assets	Tourism and recreation assets	Low	Low	Minor adverse	CoCP	Minor adverse

Potential impact	Receptor	Value/ sensitivity	Magnitude	Significance	Additional Mitigation	Residual impact
Impact 8: Obstruction or disturbance to users of PRoW and other non-motorised routes	Tourists and local communities using the area recreationally	Medium to high	Low	Minor adverse	CoCP	Negligible
Impact 9: Increased traffic affecting tourism and recreation	Pedestrian severance and amenity	Low to High (see Chapter 24)	Low to High	Moderate (link 29) to Minor adverse	TMP CoCP	Minor adverse
Impact 10: Disruption or impacts to open access or public land	Open or public land areas	None interacted with	No impact	No impact	None	No impact
Operation						
Impact 1: obstruction of disturbance to marine recreation	Recreational marine users	Low	Negligible	Negligible	None	Negligible
Impact 2: Visual and noise impacts on land-based tourism and recreation assets	Tourists	Low	Low	Minor adverse	Planting and bunding	Negligible
Impact 3: Permanent closure of paths or non-motorised routes	Recreational users	Negligible	No Impact	No impact	None	No impact
Impact 4: Reduction in visitor numbers due to tourist perceptions of wind farms	Potential visitors to Norfolk	Low	No Impact	No impact	None	No impact
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. As such, impacts during the decommissioning stage are assumed to be no worse than those identified during the construction stage.						

34.4.13 Chapter 31 Socio-economics

155. A review of policy, strategy, and business analysis was undertaken that showed that the offshore wind industry in East Anglia is growing quickly, with Vattenfall seen as a significant contributor in this growth.
156. Under Scenario 2 the project may directly create up to 481 full time equivalent (FTE) jobs during construction and up to 245 FTE jobs during operation. These would create a **major beneficial** impact for the region as it is assessed that the relevant stakeholders are preparing to develop skills to supply them.
157. An additional 273 FTE jobs may be created due to indirect and induced employment under Scenario 2. This would create a beneficial impact of a smaller magnitude because it is assessed that a larger labour market would be involved in supplying the demand.
158. Cumulatively, construction employment in the offshore wind sector is assessed to create a major beneficial impact due to a continuous pipeline of projects over the next 10 years.
159. The location of communities and the infrastructure that provides services to communities has been reviewed. It was found that there would be no direct impact to community infrastructure. Indirect impacts would not be significant (**negligible to minor adverse**) and managed through the proposed mitigation measures.

Table 34.38 Summary of potential beneficial impacts identified for socio-economics under Scenario 2

Potential impact	Receptor	Value/ sensitivity	Magnitude	Significance	Additional Mitigation	Likely long term effect
Construction						
Direct job creation	Regional labour market	Medium	High	Major beneficial	Enable local supply-chain	Application of enhancement likely to result in a long term major beneficial effect due to total employment
Indirect job creation	Regional labour market	Medium	Low	Minor beneficial	Enable local supply-chain	
Operation						
Direct and Supply chain employment	Regional labour market	Medium	Medium	Moderate beneficial	Local supply chain plan and investment in local human resources	Application of enhancement likely to result in a long term major beneficial effect due to total employment over a 30-year period
Indirect and supply chain job creation	Regional labour market	Medium	Low	Minor beneficial	Local supply chain plan and investment in local human resources	
Decommissioning – expected to be similar to construction or lower						
Onshore Direct Employment and Supply Chain Job Creation	Regional labour market	Low	Low	Minor beneficial	Enable local supply-chain	Negligible

Table 34.39 Summary of potential adverse impacts identified for socio-economics under Scenario 2

Potential Impact	Receptor	Value/ sensitivity	Magnitude	Significance	Mitigation	Residual impact
Construction						
Effects on community infrastructure	Community infrastructure assets	Low	Low	Minor adverse	Noise and visual management described in other chapters	Minor adverse
Operation						
Effects on community infrastructure	Community infrastructure assets	Low	Negligible	Negligible	Visual impacts outline in Chapter 29 Landscape and Visual Impact Assessment	Negligible
Decommissioning – expected to be similar to construction or lower						
Effects on community infrastructure	Community infrastructure assets	Low	Low	Minor adverse	Noise and visual management described in other chapters	Minor adverse

34.5 Conclusions

160. For all offshore topics, the assessments conclude that the project will not result in significant impacts once appropriate mitigation has been implemented. Consultation to agree mitigation and monitoring will be ongoing throughout the development of the final design of the project to allow the best available practices to be implemented.
161. For onshore topics the assessments conclude that under Scenario 1 the project will not result in significant impacts once appropriate mitigation has been implemented, with the exception of the landscape and visual assessment. This is also the case under Scenario 2, with a small number of additional exceptions. It should be noted that identified significant residual impacts are predominantly localised, temporary effects, which are reversible after the completion of construction or which will reduce to not significant over time, for example as vegetation establishes.
162. Moderate adverse impacts have been identified during construction in Chapter 20 Water Resources and Flood Risk, on the River Bure, King's Beck, Blackwater Drain and Wendling Beck sub-catchments, due to their value and sensitivity. The assessment is based on the cumulative effect of multiple watercourse crossings within each sub-catchment, rather than the impacts associated with any single crossing. Furthermore, this assessment is based on the worst case assumption that it will be necessary to install permanent culverts. However, every effort will be made to minimise the use of permanent culverts; any effects as a result of temporary crossings will be temporary and reversible and, with the implementation of mitigation, would not result in significant residual impacts.
163. Potential significant impacts on bats have been identified in Chapter 20 Onshore Ecology, due to the precautionary approach applied for areas of unsurveyed land. Pre-construction ecological surveys will be undertaken and, where the presence of these species is confirmed, appropriate mitigation measures would be developed, adhering to Natural England Standing Advice, to avoid significant impacts.
164. Impacts on hedgerows have also been identified as potentially significant, due to the duration of the temporary impacts during construction. However, these impacts will reduce over time, becoming non-significant, as replacement hedgerows establish.
165. Potentially significant impacts were also identified on one road within Chapter 24 Traffic and Transport. This is related to severance and pedestrian amenity along a single road during construction. The impact is very localised and is for a relative short duration. A Traffic Management Plan will be developed and agreed with the relevant Highways Authorities with measures for managing the HGV movements on this sensitive highway link implemented.

166. Under both scenarios some potentially significant impacts have been identified in Chapter 29 Landscape and Visual Impact Assessment, within localised extents of certain components of the project. The LVIA has demonstrated that despite the scale of the project, the significant effects would occur in relatively contained parts of each relevant study area, with the majority of landscape and visual receptors in each study area either undergoing not significant effects or no effect.
167. Sensitive site selection alongside embedded and additional topic specific mitigation, as appropriate, will deliver a project that avoids the vast majority of the potential impacts assessed entirely. Potential adverse impacts identified through the worst case assessment are of (minor to moderate) adverse significance and are typically temporally and geographically limited.
168. Positive impacts resulting from the project e.g. direct employment and supply chain job creation are long term and aligned with the Government's Clean Growth Strategy to help to boost productivity, and grow and decarbonise the economy of Norfolk, the East of England and the UK as a whole. Norfolk Boreas alone could meet the equivalent of 2% of the UK's annual energy demand, or 25% of the East of England's electricity demand (domestic, commercial and industrial).