Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions

Preliminary Environmental Information Report

Volume 3

Appendix 20.1 - Water Framework Directive Compliance Assessment

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Glossary of Acronyms

A/HMWB	Artificial or Heavily Modified Water Body
Cefas	Centre for Environment, Fisheries and Aquaculture Science
DCO	Development Consent Order
DEFRA	Department for the Environment and Rural Affairs
DEP	Dudgeon Extension Project
DwPAs	Drinking Water Protected Areas
EC	European Commission
EU	European Union
GEP	Good Ecological Potential
GES	Good Ecological Status
GWDTEs	Groundwater Dependent Terrestrial Ecosystems
HDD	Horizontal Directional Drilling
HVAC	High-Voltage Alternating Current
IDB	Internal Drainage Board
INNS	Invasive Non-Native Species
MCZ	Marine Conservation Zone
NVZ	Nitrate Vulnerable Zone
PEIR	Preliminary Environmental Information Report
PPG	Planning Practice Guidance
PPP	Pollution Prevention Plan
RBMP	River Basin Management Plan
SAC	Special Area of Conservation
SEP	Sheringham Shoal Extension Project
SPZ	Source Protection Zone
WFD	Water Framework Directive

Glossary of Terms

The Applicant	Equinor New Energy Limited
DCO boundary	Final application boundary based on a 60m wide onshore cable corridor, one substation location and landfall within which the onshore infrastructure will be located.
Dudgeon Offshore Wind Farm Extension site	The Dudgeon Offshore Wind Farm Extension offshore wind farm boundary.
The Dudgeon Offshore Wind Farm Extension Project (DEP)	The Dudgeon Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure.
Haul road	The track along the onshore ECC which the construction traffic would use to access work fronts.
Horizontal directional drilling (HDD) zones	The areas within the onshore cable corridor which would house HDD entry or exit points.
Hydromorphology	The hydrological (flow) and physical (bed, banks and substrate) characteristics of a body of water.
High Voltage Alternating Current (HVAC)	High voltage alternating current is the bulk transmission of electricity by alternating current (AC), whereby the flow of electric charge periodically reverses direction.
Jointing bays	Underground structures constructed at regular intervals along the onshore cable corridor to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	The point at the coastline at which the offshore export cables are brought onshore, connecting to the onshore cables at the transition joint bay above mean high water
Landfall area	The areas being considered within which the landfall would be located. A single landfall location will be identified prior to submission of the Preliminary Environmental Information Report (PEIR).
Onshore Substation Zone	Parcels of land within the wider onshore substation search area identified as suitable for development of the onshore substation. Two substation zones (A and B) have been identified as having the greatest potential to accommodate the onshore substation.
Onshore substation sites'	Parcels of land identified as the most suitable location for development of the onshore substation. Two sites have been identified for further assessment within the PEIR.'

PEIR boundary	Area subject to survey and assessment to inform PEIR. Typically based on a 200m wide onshore cable corridor (wider than 200m in several locations), two substation site options and landfall. The PEIR boundary will be refined down to the final DCO boundary ahead of the application for development consent.
Study area	Area where potential impacts from the project could occur, as defined for each individual EIA topic.
Sheringham Shoal Offshore Wind Farm Extension site	Sheringham Shoal Offshore Wind Farm Extension offshore wind farm boundary.
The Sheringham Shoal Offshore Wind Farm Extension Project (SEP)	The Sheringham Shoal Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure.
Trenchless techniques	Also referred to as trenchless crossing techniques or trenchless methods. These techniques include HDD, thrust boring, auger boring, and pipe ramming, which allow ducts to be installed under an obstruction without breaking open the ground and digging a trench.

20.1 WFD COMPLIANCE ASSESSMENT

20.1.1 Introduction

20.1.1.1 Project Background

1. Equinor New Energy Limited (hereafter Equinor) is proposing to extend the existing operational Dudgeon and Sheringham Shoal Offshore Wind Farms named the Dudgeon Offshore Wind Farm Extension Project (hereafter DEP) and the Sheringham Shoal Offshore Wind Farm Extension Project (hereafter SEP). DEP and SEP will include a number of offshore and onshore elements including offshore wind turbines, export cables to landfall, and connection to the electricity transmission network via onshore export cables.
2. Royal HaskoningDHV was commissioned to undertake a Water Framework Directive (WFD) Compliance Assessment for DEP and SEP. This assessment encompasses the offshore and onshore project areas and includes the following elements:
    - Offshore cable installation and offshore cable protection;
    - Landfall;
    - Onshore cable corridor including haul road and temporary construction compounds;
    - Onshore substation sites; and
    - 400kV connection to the existing National Grid substation at Norwich Main.
3. Note that the offshore arrays and interlink cables are, at the nearest point, located 14km offshore of the WFD coastal water body boundaries and therefore are not considered further within this compliance assessment.

20.1.1.2 Aims and objectives

4. This assessment aims to determine whether the construction, operation or decommissioning activities associated with DEP and SEP are compliant with the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, which continues to enforce Directive of the European Parliament and of the Council 2000/60/EC establishing a framework for community action in the field of water policy (generally known as the Water Framework Directive (WFD)) following implementation of the European Union (Withdrawal) Act 2018.
5. The objectives of this compliance assessment are to:
    - Identify water bodies that could potentially be affected by DEP and SEP;
    - Identify DEP and SEP construction and operation activities that could affect these WFD water bodies;
    - Assess the potential for the activities to result in a deterioration in the status of WFD water bodies, or prevent status objectives being achieved in the future; and
    - Determine the compliance of DEP and SEP with the requirements of the WFD.

6. This assessment is an appendix to **Chapter 20 Water Resources and Flood Risk** of the Preliminary Environmental Information Report (PEIR). This assessment also supports **Chapter 8 Marine Geology, Oceanography and Physical Processes**, **Chapter 9 Marine Water and Sediment Quality** and **Chapter 10 Marine Ecology**.

20.1.1.3 Legislative background

20.1.1.3.1 The Water Framework Directive

7. The WFD was adopted by the European Commission in December 2000. The WFD requires that all EU Member States must prevent deterioration and protect and enhance the status of aquatic ecosystems. This means that Member States must ensure that new schemes do not adversely impact upon the status of aquatic ecosystems, and that historical modifications that are already impacting it need to be addressed.

8. Unlike the EU Birds and Habitats Directives (EC Directive on the Conservation of Wild Birds (2009/147/EC) and EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC), respectively), which apply only to designated sites, the WFD applies to all bodies of water, including those that are man-made.

9. There are two separate classifications for surface water bodies (rivers, lakes, estuaries and coastal waters); ecological and chemical. The ecological status of a surface water body is assessed according to the condition of the:

- Biological quality elements, including fish, benthic invertebrates and aquatic flora;
- Physico-chemical quality elements, including thermal conditions, salinity, pH, nutrient concentrations and concentrations of specific pollutants such as copper; and
- Hydromorphological quality elements, including morphological conditions, hydrological regime and tidal regime.

10. River water bodies are defined in the appropriate River Basin Management Plan (RBMP) on the basis of surface hydrological catchments with an area of greater than $5km^2$. Smaller water bodies within these catchments are considered to be part of the water body into which they drain for the purposes of WFD monitoring and management.

11. The ecological status of surface waters is recorded on a scale of “high”, “good”, “moderate”, “poor” and “bad”. The ecological status of a water body is determined by the worst scoring quality element, which means that the condition of a single quality element can cause a water body to fail to reach its WFD classification objectives. The overall environmental objective of reaching Good Ecological Status (GES) applies to these water bodies.

12. The chemical status of surface waters is assessed by compliance with environmental standards that are listed in the Environmental Quality Standards Directive (2008/105/EC). These chemicals include priority substances and priority hazardous substances. Chemical status is recorded as either “good” or “fail” and is determined by the lowest scoring chemical.

13. Where the hydromorphology of a surface water body has been significantly altered as a result of anthropogenic activities, it can be designated as an Artificial or Heavily Modified Water Body (A/HMWB). An alternative environmental objective, Good Ecological Potential (GEP), applies in these cases.

14. Groundwaters are assessed in a different way to surface waters and are classified as either "good" or "poor" in terms of quantity (groundwater levels, flow directions) and chemical quality (pollutant concentrations and conductivity).

20.1.1.3.2 UK legislation

15. The WFD was transposed into national law in the UK by means of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003). These regulations were revoked and replaced by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. The 2017 Regulations currently remain in force in England following the UK's departure from the European Union under the provisions of the European Union (Withdrawal Agreement) Act 2020. The Regulations provide for the implementation of the WFD, from designation of all surface waters (rivers, lakes, estuarine waters, coastal waters and ground waters) as water bodies, and set objectives for the achievement of Good Ecological Status (GES) or Good Ecological Potential (GEP).

16. The standards used to determine the ecological or chemical status of a water body are listed in the Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015. This includes the thresholds for determining the status of the biological, hydromorphological, physico-chemical and chemical status of surface water bodies, and the quantitative and chemical status of groundwater bodies.

20.1.1.4 Report Structure

17. This report is divided into the following sections:

- **Section 20.1.1** provides an introduction to the report;
- **Section 20.1.2** provides a description of DEP and SEP;
- **Section 20.1.3** presents the WFD compliance assessment methodology used to inform the assessment;
- **Section 20.1.4** – Section 20.1.6 presents the results of the WFD compliance assessment; and
- **Section 20.1.7** presents a summary of proposed mitigation, improvements and monitoring requirements.

20.1.2 Project Description

18. DEP and SEP include both offshore and onshore elements with the exception of the offshore arrays and associated infrastructure due to the distance from the arrays to the WFD water body boundaries. DEP and SEP will be connected to the shore by offshore export cables installed within the offshore cable corridor. This assessment considers both the offshore and onshore construction and operation activities of DEP and SEP, and their impact on compliance with the Water Framework Directive. A detailed project description can be found in **Chapter 5 Project Description** of the PEIR.

20.1.2.1 Study Area

19. The WFD compliance assessment study area comprises PEIR boundary which includes the landfall, the onshore cable corridor and two preferred onshore substation sites near to the existing National Grid substation at Norwich Main.

20.1.2.2 Construction Scenarios

20. This assessment considers three construction scenarios for DEP and SEP (further detail of the three construction scenarios is provided in **Chapter 5 Project Description** of the PEIR):

- Scenario 1: Build DEP or build SEP in isolation;
- Scenario 2: Build DEP and SEP concurrently – reflecting the maximum peak effects; and
- Scenario 3: Build one project followed by the other with a gap of up to one year (sequential) – reflecting the maximum duration of effects.

21. The following principles set out the framework for how DEP and SEP may be constructed:

- DEP and SEP may be constructed at the same time, or at different times;
- If built at the same time both Projects could be constructed in four years;
- If built at different times, either Project could be built first;
- If built at different times the first Project would require a four-year period of construction including a three year onshore construction period. The second Project would require a three-year period of construction;
- If built at different times, the duration of the gap between end of onshore construction of the first Project, and the start of onshore construction of the second Project may vary from 0 to 1 year;
- Assuming maximum construction periods, and taking the above into account, the maximum period over which the construction of both Projects could take place is 7 years; and
- The earliest construction start date is 2025 and the latest is 2028.

22. The impacts of construction of DEP and SEP in isolation or together, on WFD compliance, will be discussed in Stage 3: Detailed Compliance Assessment (**Section 20.1.6**).

20.1.2.3 Operation Scenarios

23. Operation scenarios are described in detail in **Chapter 5 Project Description**. The assessment considers the following three scenarios:

- Only DEP in operation;
- Only SEP in operation; and
- DEP and SEP operating at the same time, with a gap of up to three years between each project commencing operation.

24. The operational lifetime of each project is expected to be 35 years.

20.1.2.4 Decommissioning Scenarios

25. Decommissioning scenarios are described in detail in **Chapter 5 Project Description**. Decommissioning arrangements will be agreed through the submission of a Decommissioning Plan prior to construction, however for the purpose of this assessment it is assumed that decommissioning of DEP and SEP could be conducted separately, or at the same time.

20.1.2.5 Offshore Construction Activities

20.1.2.5.1 Pre-installation Works

26. A pre-lay grapnel run would be undertaken to clear any identified debris in advance of any cable installation during each phase..

20.1.2.5.2 Installation and Burial

27. Following the pre-installation works, the cables would be installed and buried. The following methods may be used for cable burial and would be dependent on the results of the pre-construction survey and post-consent procurement of the cable installation contractor:

- Ploughing;
- Trenching or cutting; or
- Jetting.

20.1.2.5.3 *Offshore cable protection*

28. There are certain situations where the use of external cable protection may be required. These are:

- Where an adequate degree of protection has not been achieved from the burial process. This may be as a result of challenging grounds conditions, or unforeseen circumstances with the burial process, such as break down of the burial tool/s;
- At cable crossings (there are no cable crossings required inside the CSCB MCZ);
- At the HDD exit pit; and
- In the event that cables become unburied as a result of seabed mobility during the operation of the wind farms or (where necessary) in the event of making a cable repair. If these works were required, they would be the subject of a separate marine licence application and therefore are not included in the project design envelope.

29. The offshore cable protection requirements are currently subject to a burial risk assessment and further discussions with regard to the Cromer Shoal Chalk Beds Marine Conservation Zone (MCZ). Remedial protection will be required using one or a combination of the following options:

- Rock or gravel protection;
- Mattresses;

- Protective aprons or coverings (solid structures of varying shapes, typically pre-fabricated in concrete or similar);
- Bagged solutions, (including geotextile sand containers, rock-filled gabion bags or nets, and grout bags, filled with material sourced from the site or elsewhere).

30. Protection measures may be placed alone or in combination and may be secured to the seabed where appropriate. Cable clips (also known as cable anchors, or anchor clamps) may also be utilised to secure cables to the seabed, where required.
31. Prior to cable corridor burial assessment surveys, it is assumed that a 6m wide x 1m high trapezoidal area of rock berm protection will be used.

20.1.2.5.4 *Offshore cable protection for existing cable/pipeline crossings*

32. The offshore export cables will cross existing Dudgeon wind farm cables and Hornsea Three wind farm cables. It is currently expected there will be a total of four crossings protected by one or a combination of the following options:
    - Pre-lay and post-lay concrete mattresses;
    - Pre-lay and post-lay rock dumping; and
    - Pre-lay cable with Uraduct protection and post -lay rock dumping/rock bags.

20.1.2.6 Landfall

33. The offshore export cables will make landfall at Weybourne with the study area comprising an approximately 3km stretch of coastline which is predominantly used for agriculture. To facilitate construction, a temporary compound will be required to accommodate drilling rigs, ducting and welfare facilities. The compound will be set back between 100m to 150m from the cliff edge and would be up to 75m long by 75m wide.
34. Offshore export cables will be installed using trenchless (horizontal directional drilling (HDD)) techniques. Each offshore export cable will require one HDD, i.e. up to two in total, with a third HDD included for contingency (in the unlikely event of a drill failure). Each drill will start from an onshore construction compound, travel beneath the beach, and will exit in the subtidal zone at a suitable water depth.
35. A pilot hole would be drilled from the onshore landfall compound and advanced in stages, guided by sensors, until the drill head emerges at the exit point out at sea. Once the pilot hole is completed, the hole is progressively enlarged to enable duct installation. Ducts would be typically floated into position at the offshore exit point via barges. The ducts would then be flooded with water and pulled into the reamed drill hole from the entry pit. Alternatively, the ducts could be welded in sections onshore and pulled from the offshore side.
36. Following completion of the duct installation, the landfall compound would be demobilised, drilling rigs and welfare would be removed from site and the land reinstated.
37. As stated in **Section 20.1.2.2** there are three construction scenarios for DEP and SEP. For each scenario, different worst case parameters are required for each component of Landfall construction, and are presented below in **Table 0-1**.

Table 0-1: Landfall construction parameters

Landfall	Worst case parameters		
	DEP/SEP alone	DEP/SEP together concurrent	DEP/SEP together - sequential
Number of HDD drills	Up to 2	Up to 4	Up to 4
Number of joint transition bays	1	1	2
Transition bay dimensions (length x width)	10m x 15m	15m x 15m	2 x (10m x 15m)
Transition bay dimensions depth	Up to 2m	Up to 2m	Up to 2m
Landfall HDD compound size	Up to 5,750m²	Up to 5,750m²	2 x up to 5,750m²
Length of HDD	Up to 1,250m	Up to 1,250m	Up to 1,250m
Approximate distance inland from cliff edge of transition bay(s)	100m – 150m	100m – 150m	100m – 150m

20.1.2.6.1 *Subtidal HDD exit point*

38. The HDD will exit in the subtidal, approximately 1,000m from the coastline (up to 1,250m from the onshore entry point). At the HDD exit point in the subtidal there is a requirement for a transition zone between where the ducts exit the seabed and the point at which it is possible for the burial tool to start the process of burying the cables. There are two options for the transition zone. The first would involve the excavation of an initial trench up to 20m wide, 30m long and 1m deep, with a further transition zone trench of up to 50m in length, 1m wide and up to 1m deep per cable at the end of which the burial tool would be able to take over the cable burial process.

20.1.2.6.2 *Transition bays*

39. The offshore and onshore cables will be jointed together in one or two underground transition bays located onshore within the landfall compound. This would comprise an excavated area of up to 20m x 30m with a reinforced concrete floor to allow winching during cable pulling and a stable surface to allow jointing.

40. Following cable pulling and jointing activities, the joints would be buried to a depth of 1.2m using stabilised backfill, pre-excavated material or a concrete box. The remainder of the joint transition bay will be backfilled with the pre-excavated material and returned to the pre-construction condition, so far as is reasonably possible.

20.1.2.7 Onshore construction activities

20.1.2.7.1 *Onshore cable corridor*

41. The onshore cable corridor will contain the HVAC onshore export cables within ducts. The PEIR boundary (on which the study area for this WFD compliance assessment is based) is typically 200m in width. Following consultation with stakeholders, landowners and local communities on the PEIR, this width will be refined. The final DCO boundary will include a refined onshore cable corridor up to 45m wide if DEP and SEP are constructed in isolation and up to 60m wide if DEP and SEP are constructed concurrently. At trenchless crossings, the cable corridor will be up to 100m wide. The length of the onshore cable corridor will be approximately 60km with several temporary construction areas along the corridor.

42. The cable corridor continues south, passing the villages of Oulton and Cawston, and crosses the River Wensum near Attlebridge and the A47 between Hockering and Easton. From this point the onshore cable corridor heads south east, crossing the A11 at Ketteringham, and eventually reaches the onshore substation sites near the existing Norwich Main substation.

43. The installation of the onshore export cable is expected to take up to 24 months in total (for the single project in isolation or two projects together concurrent scenarios); or two separate periods of 24 months for the two projects together sequential scenario). Construction may be carried out by up to ten teams (one per 1km section) along the export cable corridor at the same time. Each team typically working on a 400m length of the corridor on any given day, and within that length the extent of open trenches would typically be between 50-100m on any given day, with the trench being excavated at one end and backfilled at the other as works progress along that section.

44. Once the cable ducts have been installed in each section and the trench reinstated, the workfront will move onto the next section to minimise the amount of land worked on at any one time. Construction may be carried out by multiple teams at more than one location along the export cable corridor at the same time.

45. Tracked excavators will be required to excavate open cut trenches at approximately 1m width by 1.2m depth. Topsoil and subsoil will be stripped from the section to be worked on and stored separately within the working width. Cable ducts (1.2m deep) would be buried to a minimum depth of 1.05m (from top of duct to surface). Bedding material such as cement bound sand (CBS) will be compacted to form the base layer of the trench to encase the ducting. Each excavated section will then be backfilled in stages with the stored subsoil previously excavated from the trench. The stored topsoil would then be replaced on top of the backfilled subsoil to reinstate the trench to pre-construction condition, so far as reasonably possible.

46. Within the working width of the cable corridor, a 60km haul road will be constructed to enable delivery of equipment to the workfronts from construction compounds, storage areas for topsoil and subsoil and drainage. The haul road would be up to 6m wide and as a worst case it is assumed it may be required along the full length of the cable corridor. The haul road would be installed in stages as each workfront progresses. It would be formed of protective matting, temporary metal road or permeable gravel aggregate dependant on the ground conditions, vehicle requirements and any necessary protection for underground services.

47. Where the onshore export cable must traverse Main Rivers, trenchless (HDD) crossings would be used. The cable would be installed at least 2m below the bed of the watercourse and, although ground disturbance will occur at entry and exit points, there would be no direct disturbance to the watercourses crossed using a trenchless technique. Trenchless techniques will also be used to traverse any WFD water bodies that are classified as Ordinary Watercourses (e.g. watercourses that were designated as Main Rivers when river water bodies were identified in the second RBMP, but have since been reclassified and are no longer considered to be Main Rivers).

48. Trenched crossings would be carried out on the majority of the Ordinary Watercourses (including some IDB-maintained watercourses, depending upon their width, depth and environmental sensitivity). Trenched crossings of watercourses involve installing temporary dams (composed of sand bags, straw bales and ditching clay, or another suitable technique) upstream and downstream of the crossing point. The cable trench is then excavated in the dry area of river bed between the two dams with the river flow maintained using a temporary pump or flume. The different watercourse crossings within each WFD surface water catchment are listed in **Table 0-2**.

Table 0-2: Water body crossings in surface water catchments

Catchment	River water body catchment	Sensitivity	Main River crossings (HDD)	Ordinary Watercourse crossings (trenched)	
				IDB Drains	Other Ordinary Watercourses
North Norfolk Rivers	Spring Beck	Low	0	0	1
	River Glaven	Medium	0	0	0
	Coastal catchment	Low	0	0	0
River Bure	Scarrow Beck	Medium	0	0	0
	River Bure	Medium	1	0	2
	Mermaid Stream	Medium	0	0	0
River Wensum	Blackwater Drain	High	0	0	0

Catchment	River water body catchment	Sensitivity	Main River crossings (HDD)	Ordinary Watercourse crossings (trenched)	
				IDB Drains	Other Ordinary Watercourses
	Swannington Beck	High	1	0	3
	River Wensum	High	1	1	2
	River Tud	High	1	0	0
River Yare	River Yare	Medium	1	0	3
	River Tiffey	Medium	1	0	3
	Intwood Stream	Medium	1	0	3
	River Tas	Medium	0	0	0

49. To maintain haul road access at Ordinary Watercourse crossings, an appropriately sized culvert would be installed within the ditch and the haul road would be installed over the top of the culvert to main access along the cable corridor either side of the ditch. The culvert would be installed in the channel bed so as to avoid upstream impoundment and would be sized to accommodate reasonable 'worst-case' water volumes and flows. These culverts may remain in place for the duration of the cable duct installation, i.e. up to 24 months.

50. At crossings of Main Rivers, no culverts will be used and temporary bridges such as bailey bridges or similar will be employed to allow continuation of the haul road. At sensitive locations such as some river crossings, the haul road would effectively stop and would re-start on the opposite side. When duct installation is completed, the haul road would be removed and the ground reinstated using the stored topsoil.

51. Cables would be pulled through the pre-laid ducts from jointing bays, at a later stage of the construction programme. Approximately 120 jointing bays installed at least 1m below ground (every circa 500m) will be required along the corridor. During the cable pull and jointing works, the joint bay would need to be temporarily re-excavated. All excavation and reinstatement activities for the joint bays would be conducted as in the same manner as those described for the cable trenching activities.

52. Link boxes are required in proximity to some jointing bay locations (up to one every 500m) to enable the cables to be bonded to earth to maximise cable ratings. Each link box (buried to ground level) would require periodic access for inspection and testing during operation.

53. **Table 0-3** shows the onshore cable corridor construction parameters for each of the construction scenarios.

Table 0-3: Onshore cable corridor construction parameters.

	Worst case parameters		
	DEP/SEP alone	**DEP/SEP together - concurrent**	**DEP/SEP together - sequential**
Onshore cable length	60km	60km	60km + 60km
Onshore haul road length	60km	60km	60km + 60km
Number of work fronts	5 to 10	5 to 10	2 x (5 to 10)
Total number of work compounds	10 (including 2 primary site compounds and 8 intermediate)	10 (including 2 primary site compounds and 8 intermediate)	10 (including 2 primary site compounds and 8 intermediate)
Size of primary compound	60,000m^2	60,000m^2	2 x 60,000m^2
Size of secondary compounds	2,500m^2	2,500m^2	2,500m^2
Cable corridor width	45m	45m	60m
Cable corridor at trenchless crossings	Up to 100m	Up to 100m	Up to 100m
No of trenches	1	1 wide or 2 single trenches	1 + 1
Cable burial depth (minimum)	1.2m	1.2m	1.2m
Approximate volume of trench excavated material	180,000m^3	360,000m^3	360,000m^3
Approximate volume of trench excavated material to be disposed of.	36,000m^3	72,000m^3	72,000m^3
Trenchless (HDD) crossings	TBC	TBC	TBC
Trenchless (HDD) crossings compound (length x width)	1,500 - 4,500m^2	1,500 - 4,500m^2	1,500 - 4,500m^2
Typical jointing bay frequency	Up to every 500m	Up to every 500m	Up to every 500m
Total No. jointing bays	120	120	2 x 120

	Worst case parameters		
	DEP/SEP alone	**DEP/SEP together - concurrent**	**DEP/SEP together - sequential**
Jointing bay (length x width x height)	Up to 12 x 4 x 2m	Up to 12 x 4 x 2m	Up to 12 x 4 x 2m
Depth to top of jointing bay (m)	> 1m	> 1m	> 1m
Link box frequency	Up to every 500m	Up to every 500m	Up to every 500m
Link box (length x width)	Up to 2 x 2m	Up to 2 x 2m	Up to 2 x 2m
Total No. link boxes	120	120	2 x 120

20.1.2.7.2 *Onshore substation construction*

54. Two substation sites have been identified and assessed within the PEIR – each option is of sufficient size to accommodate the maximum footprint required for both DEP and SEP. Only one substation site will be taken forward for the DCO application.

55. The onshore substation will be constructed to accommodate the connection of both DEP and SEP to the transmission grid. If only one project comes forward the substation will be 3.25ha in size. If both DEP and SEP are taken forward a single substation will be constructed to accommodate both connections and will be 6.25ha in size.

56. **Table 0-4** presents the main construction parameters for the onshore substation under each scenario.

Table 0-4: Onshore substation construction parameters.

Onshore cable corridor	Worst case parameters		
	DEP or SEP alone	**DEP and SEP together - concurrent**	**DEP and SEP together - sequential**
Construction compound (length x width)	Up to 1ha	Up to 1ha	Up to 1ha
Operational compound	Up to 3.25ha	Up to 6.25ha	Up to 6.25ha
Building height	Up to 15m	Up to 15m	Up to 15m
External equipment height	Up to 30m	Up to 30m	Up to 30m

57. The two onshore substation sites are located in arable land south of the existing Norwich Main substation. Site 1 is located approximately 150m south west of Norwich Main and approximately 1km east of the nearest village (Swardeston). Site 2 is located approximately 250m south of Norwich Main, immediately west of the Norwich to Ipswich rail line, and approximately 600m north of the nearest village (Swainsthorpe).

58. This will require conversion from existing agricultural land to hard standing surface. The facility will comprise of a control building and SVC building and electrical transmission equipment, as well as ancillary infrastructure such as a car park and welfare facilities. A dedicated access road for operation and maintenance access to equipment, will also be constructed.

59. The construction programme for the onshore substation would be expected to be approximately 24 to 30 months.

20.1.2.8 Operational Activities

20.1.2.8.1 *Offshore operational maintenance activities*

60. There will be a requirement for operational maintenance activities to the offshore export cable. Based on current knowledge and technology the estimated rate of cable failure for DEP and SEP is approximately one failure for every 1,000km of cable per year. On this basis there will be one export cable repair every 10 years (including one in the Cromer Shoal Chalk Beds MCZ). As the cable repair is anticipated to be very small scale and infrequent and potentially only occasionally near the boundary of the WFD water body this activity is not considered further in this assessment.

20.1.2.8.2 *Onshore operational maintenance activities*

61. There will be a requirement for unspecified operational maintenance activities at the onshore substation and along the onshore cable corridor for activities such as periodic link box inspection and testing. When required, repairs will be undertaken throughout the operational phase. Inspections will be carried out to ensure the cables remain buried and have no risk of exposure and re-burial works will be undertaken in locations at risk of becoming exposed.

20.1.2.9 Decommissioning

62. No decision has yet been made regarding the final decommissioning policies for either DEP or SEP as it is recognised that industry best practice, rules and legislation change over time. It is likely the cables would be removed from the ducts and recycled, with the transition pits and ducts capped and sealed then left in situ.

63. The detail and scope of decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator with a decommissioning plan provided.

64. It is anticipated that impacts from decommissioning will be equal to or less than impacts from construction. Each decommissioning activity will be subject to separate compliance assessments.

20.1.3 Assessment Method

20.1.3.1 Overall Approach

65. There is no detailed published methodology undertaking WFD compliance assessments across all types of water bodies. However, the following relevant guidance exists to support the assessment of various water body types:

- 'Advice Note 18' (Planning Inspectorate, 2017): This Advice Notes provides an overview of the WFD and provides an outline methodology for considering the WFD as part of the DCO process;
- 'Clearing the waters for all' (Environment Agency, 2017): Outlines a detailed methodology for assessing impacts on transitional and coastal water bodies;
- 'WFD risk assessment' (Environment Agency, 2016a): This provides information on how to assess the risk of your activity, as well as guidance for proposed developments planning to undertake activities that would require a flood risk activity permit; and
- 'Protecting and improving the water environment' (Environment Agency, 2016b): Provides guidance on the WFD compliance of physical works (Environment Agency 2016c) and other activities in river water bodies.

66. For the purposes of this assessment, the broad methodologies outlined in the guidance documents listed above have been brought together to develop an assessment methodology that can be used for all types of water bodies. The methodology used in this assessment therefore covers the following three stages, which are described in more detail in the subsequent sections:

- Stage 1 (Section 20.1.4): Screening Assessment;
- Stage 2 (Section 20.1.5): Scoping Assessment; and
- Stage 3 (Section 20.1.6): Detailed Compliance Assessment.

20.1.3.2 Stage 1: Screening Assessment

67. The first stage consists of an initial screening exercise to identify relevant water bodies which have the potential to be affected by the construction, operation and decommissioning of DEP and SEP. Water bodies have been selected for inclusion in the early stages of the compliance assessment using the following criteria, with reference to the 2015 Anglian River Basin Management Plan (RBMP) (as presented in the online Catchment Data Explorer (Environment Agency, 2020):

- All surface water body catchments that contain DEP and SEP infrastructure.
- Any surface water bodies that have direct connectivity (e.g. upstream and downstream) that could potentially be affected by DEP and SEP infrastructure.
- Any groundwater bodies that underlie, or are potentially hydrologically connected to, DEP and SEP infrastructure.

20.1.3.3 Stage 2: Scoping Assessment

68. This stage identifies whether there is potential for deterioration in water body status or failure to comply with WFD objectives for any of the water bodies identified in Stage 1. This stage considers potential non-temporary impacts and impacts on critical or sensitive habitats in relation to each water body and activity. At this stage, water bodies and activities can be scoped out of further assessment if it can be satisfactorily demonstrated that there will be no impacts. If impacts are predicted, it will be necessary to undertake a detailed compliance assessment (Stage 3).

69. The Stage 2 assessment considers the potential for each activity planned as part of the proposed project to affect each quality element in turn, based on a series of scoping questions for the quality elements that are applicable in each type of water body. The scoping questions are set out in detail in **Section 20.1.5**.

70. Where an activity and water body is not scoped out, they will be progressed to the detailed compliance assessment (Stage 3), but only for those quality elements that could potentially be impacted.

20.1.3.4 Stage 3: Detailed Compliance Assessment

20.1.3.4.1 Overview of method

71. The Stage 3 assessment determines whether any project activities that have been put forward from Stage 2 will cause deterioration and whether this deterioration will have a significant non-temporary effect on the status of one or more WFD quality elements at water body level. For priority substances, the process requires the assessment to consider whether the activity is likely to cause the quality element to achieve good chemical status. If it is established that an activity or project component is likely to affect status at water body level (that is, by causing deterioration in status or by preventing achievement of WFD objectives and the implementation of mitigation measures for HMWBs), or that an opportunity may exist to contribute to improving status at a water body level, potential measures to avoid the effect or achieve improvement that can be reasonably delivered within the scope of the proposed project will be investigated. Where applicable to a development, this stage considers such measures and, where necessary, evaluates them in terms of cost and proportionality in relation to the scale of DEP and SEP and the nature of any impacts. Note that this stage is referred to as a WFD Impact Assessment in the Planning Inspectorate guidance (Planning Inspectorate, 2017).

20.1.3.4.2 Determination of deterioration

72. The Environment Agency has not issued guidance on how deterioration in the status of water bodies should be assessed. The assessment therefore draws upon the following guidance documents:

- The WFD (Standards and Classification) Directions (England and Wales (2017): Provides the most up to date standards used to determine the ecological and chemical status of surface water bodies, and the quantitative and chemical status of groundwater;
- UKTAG (2011) Defining and Reporting on Groundwater Bodies: Provides information on the approaches used to classify groundwater bodies;

- Joint Defra / EA Flood and Coastal Erosion Risk Management Research and Development Programme (2009) WFD Expert Assessment of Flood Management Impacts: Provides a framework for the assessment of changes to hydromorphology;
- UKTAG (2003) Guidance on Morphological Alterations and the Pressures and Impacts Analyses: Provides additional information on hydromorphological pressures;
- Internal Environment Agency guidance on WFD deterioration and risk to the status objectives of river water bodies (Environment Agency, 2016c): Provides an assessment of the level of risk of deterioration in water body status associated with different activities, based upon activity type and risk screening thresholds; and
- Water Framework Directive Assessment: Estuarine and Coastal Waters (Environment Agency, 2017): Provides guidance on assessing the impact of activities in estuarine (transitional) and coastal waters for the Water Framework Directive (WFD). The guidance is also called 'Clearing the Waters for All'.

73. The assessment considers the potential for deterioration in water body status between classes, within classes, and including temporary deterioration. Where deterioration is not predicted, the activity will also be considered against the water body objectives to ensure status objectives (i.e. GES or GEP) will not be prevented.

20.1.3.4.3 Article 4.7

74. In the unlikely event that no suitable measures can be identified to mitigate potential adverse impacts of DEP and SEP, it may be necessary to present a case for a derogation under Article 4.7 of the WFD. It should be noted that the DEP and SEP would look to prevent deterioration in water body status in the first instance (e.g. through project design and, where necessary, the adoption of further mitigation measures) therefore avoiding the need for an application for an exemption under Article 4.7. To determine the scope of any assessment required to demonstrate compliance with the requirements of Article 4.7, consultation with the Environment Agency would be required. However, at this stage, it is envisaged that this assessment would include an assessment of whether:

- DEP and SEP can be classified as being of imperative overriding public interest and whether the benefits to society resulting from DEP and SEP outweigh the local benefits of WFD implementation;
- All practicable steps to avoid adverse impacts have been taken. These steps are defined as those that are technically feasible, not disproportionately costly, and compatible with the overall requirements of the proposed project (as defined under the WFD); and
- DEP and SEP can be delivered by an alternative, environmentally better option (as defined under the WFD and discussed in the Planning Inspectorate (2017)

guidance). This option will need to be technically feasible and not disproportionately costly to be feasible.

20.1.4 Stage 1: Screening Assessment

20.1.4.1 Purpose of this Section

75. The first stage consists of an initial screening exercise to identify the individual activities that could potentially impact on WFD compliance parameters. It then identifies the relevant water bodies that could be affected by the construction and operation of DEP and SEP. The baseline characteristics of each water body are presented, and each water body is assessed for inclusion into the scoping assessment.

20.1.4.2 Identification of Activities to be considered

76. A summary of the activities screened in and the potential risks to WFD compliance parameters are presented in **Table 0-5**. These will be considered in more detail in **Section 20.1.6.**

Table 0-5: Summary of activities for consideration within the WFD scoping assessment and WFD parameters at risk

Phase	Activity	Potential impacts on WFD water bodies	WFD compliance parameter potentially at risk
Coastal water bodies			
Construction	Offshore export cable installation and burial	Potential temporary impact associated with resuspension of sediment.	Physico-chemistry and biology (habitats and fish)
	Subtidal HDD exit point	Potential temporary impact associated with resuspension of sediment as a result of HDD methodology.	Physico-chemistry and biology (habitats and fish)
Operation	Presence of offshore cable protection	Potential hydrodynamic impacts associated with the presence of the offshore cable protection and subsequent loss of habitat.	Hydromorphology and biology

Phase	Activity	Potential impacts on WFD water bodies	WFD compliance parameter potentially at risk
	Presence of cable protection for existing cable/pipeline crossings	Potential hydrodynamic impacts associated with the presence of the offshore cable protection and subsequent loss of habitat.	Hydromorphology and biology
River and groundwater bodies			
Construction	Landfall and installation of onshore export cables	Changes in surface water and groundwater quality, quantity and distribution associated with land use change	Hydromorphology and physico-chemistry, groundwater quality and quantity
	Cable crossing of Main Rivers and IDB-maintained Ordinary Watercourses using trenchless technique (HDD method)	Changes to water quality associated with any leakage or accidental spills and physico-chemical changes	Physico-chemistry and priority substances, biological elements, groundwater quality
	Cable crossing of Ordinary Watercourses using trenching technique	Indirect impacts from changes to hydromorphology, surface water hydrology, and water quality of ordinary watercourses.	Hydromorphology, biological elements, physico-chemistry
	Haul road construction	Changes to volume and distribution of surface water flows, changes to water quality associated with leakage or accidental spills	Hydromorphology, biological elements and physico-chemistry

Phase	Activity	Potential impacts on WFD water bodies	WFD compliance parameter potentially at risk
	Temporary haul road crossings of Main Rivers using bailey bridges or equivalent.	Changes to hydromorphology, surface water conveyance and changes in water quality associated with leakage or accidental spills	Hydromorphology, biological elements, physico-chemistry and priority substances, groundwater quality
	Temporary haul road crossings of Ordinary Watercourses using culverts.	Indirect impacts from changes to hydromorphology, surface water hydrology, and water quality of ordinary watercourses.	Hydromorphology, biological elements, physico-chemistry
Operation	Presence of landfall and cable ducting	Changes in infiltration to the groundwater body. Presence of an impermeable barrier may change subsurface flow routes.	Groundwater quantity
	Presence of permanent infrastructure along the cable corridor and at the onshore substation	Changes to volume and distribution of surface water flows, changes to water quality associated with runoff and leakage/accidental spills of contaminants.	Hydromorphology, physico-chemistry and priority substances, biological elements
	Operational activities at the substation and maintenance of onshore cable corridor	Changes to water quality associated with runoff and leakage/accidental spills of contaminants. Increase in fine sediment runoff into the water body.	Physico-chemistry and priority substances, hydromorphology, biological elements.

20.1.4.3 Identification of Water Bodies

77. **Table 0-6** presents the coastal surface water (**Figure 20.1.1**), river and lake surface water **(Figure 20.1.2),** and ground water bodies (**Figure 20.1.3**) that could potentially be affected by the proposed construction and operation of DEP and SEP. The water bodies were identified using the Environment Agency's Catchment Data Explorer (Environment Agency, 2019). As such the following water bodies are considered in this stage of the assessment:

- Norfolk East (Coastal);
- Norfolk North (Coastal);
- Blakeney Spit Lagoon (Coastal);
- Glaven (River);
- Scarrow Beck (River);
- Bure (u/s confluence with Scarrow Beck) (River);
- Bure (Scarrow Beck to Horstead Mill) (River);
- Blackwater Drain (Wensum) (River);
- Mermaid Stream (River);
- Swannington Beck (River);
- Hevingham Watercourse (River);
- Wensum US Norwich (River);
- Wensum DS Norwich (River);
- Tud (River);
- Yare (u/s confluence with Tiffey – Lower) (River);
- Yare (Tiffey to Wensum) (River);
- Tiffey (River);
- Intwood Stream (River);
- Tas (Tasburgh to R. Yare) (River);
- Chet (River);
- Costessey Pits (Lake);
- North Norfolk Chalk (Groundwater);
- Broadland Rivers Chalk and Crag (Groundwater); and
- Cam and Ely Ouse Chalk (Groundwater).

Table 0-6: WFD water bodies (Environment Agency, 2020) screened into the WFD compliance assessment.

Water body name and reference	Water body ID	Water body type	Status and Description	Screen into Stage 2?
Norfolk East	GB650503520003	Coastal	Heavily modified for flood and coastal protection. The water body is currently at Moderate Ecological Potential as a result of elevated concentrations of dissolved inorganic nitrogen due to continuous sewage discharge and arable land management practices.	Yes. The proposed works will take place within the water body and there is therefore potential for direct impact on WFD quality elements.
Norfolk North	GB640503300000	Coastal	Heavily modified for flood protection. The water body is currently at Moderate Ecological Potential as a result of elevated concentrations of dissolved inorganic nitrogen.	Yes. The proposed works will take place within the water body and there is therefore potential for direct impact on WFD quality elements.
Blakeney Spit Lagoon	GB610050082000	Coastal (lagoon)	Designated as an artificial water body. The water body is currently at Good Ecological Status.	No. The proposed offshore works are located 1.7km to the west of the water body. This distance of separation means that there is no mechanism for impact on the water body.

Water body name and reference	Water body ID	Water body type	Status and Description	Screen into Stage 2?
Glaven	GB105034055780	River	Not designated artificial or heavily modified. ‘Moderate’ due to pressures on macrophytes and phytobenthos.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Scarrow Beck	GB105034055740	River	Heavily modified due to land drainage activity. ‘Moderate Ecological Potential as a result of in-channel morphological diversity measure not in place due to disproportionate burdens.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Bure (u/s confluence with Scarrow Beck)	GB105034055690	River	Not designated artificial or heavily modified. ‘Poor’ due to pressures on macrophytes and phytobenthos, and fish.	Yes., The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.

Water body name and reference	Water body ID	Water body type	Status and Description	Screen into Stage 2?
Bure (Scarrow Beck to Horstead Mill)	GB105034050932	River	Heavily modified due to designated recreation use and barriers causing ecological discontinuity. The water body is currently at 'Moderate Ecological Potential' due to the Mitigation Measures Assessment classed as 'Moderate or less'.	No. The proposed onshore works are located approximately 7km upstream of the water body. The nature of the proposed activities and the distance of separation means that any changes to the hydromorphology, physico-chemistry or chemistry of the upstream water body are unlikely to propagate sufficiently far downstream to affect this water body.
Blackwater Drain (Wensum)	GB105034051120	River	Heavily modified due to land drainage activity. The water body is currently at 'Moderate Ecological Potential' due to the Mitigation Measures Assessment classed as 'Moderate or less'.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.

Water body name and reference	Water body ID	Water body type	Status and Description	Screen into Stage 2?
Mermaid Stream	GB105034050900	River	Heavily modified due to land drainage activities and barriers causing ecological discontinuity. The water body is currently at 'Moderate Ecological Potential' due to hydromorphological modifications and pressures on fish, macrophytes and phytobenthos.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Swannington Beck	GB105034051070	River	Heavily modified due to land drainage and flood protection designations. The water body is currently at 'Moderate Ecological Potential' due to pressures on fish.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Hevingham Watercourse	GB105034051070	River	Heavily modified due to flood protection and agriculture. 'Moderate Ecological Potential' due to mitigation measures assessment at moderate or less and fish at moderate status.	No. No construction or operational activities will take place within this water body catchment. Furthermore, although the Hevingham Watercourse drains into the River Bure, there is no mechanism for any changes to the Bure to propagate upstream and affect this water body.

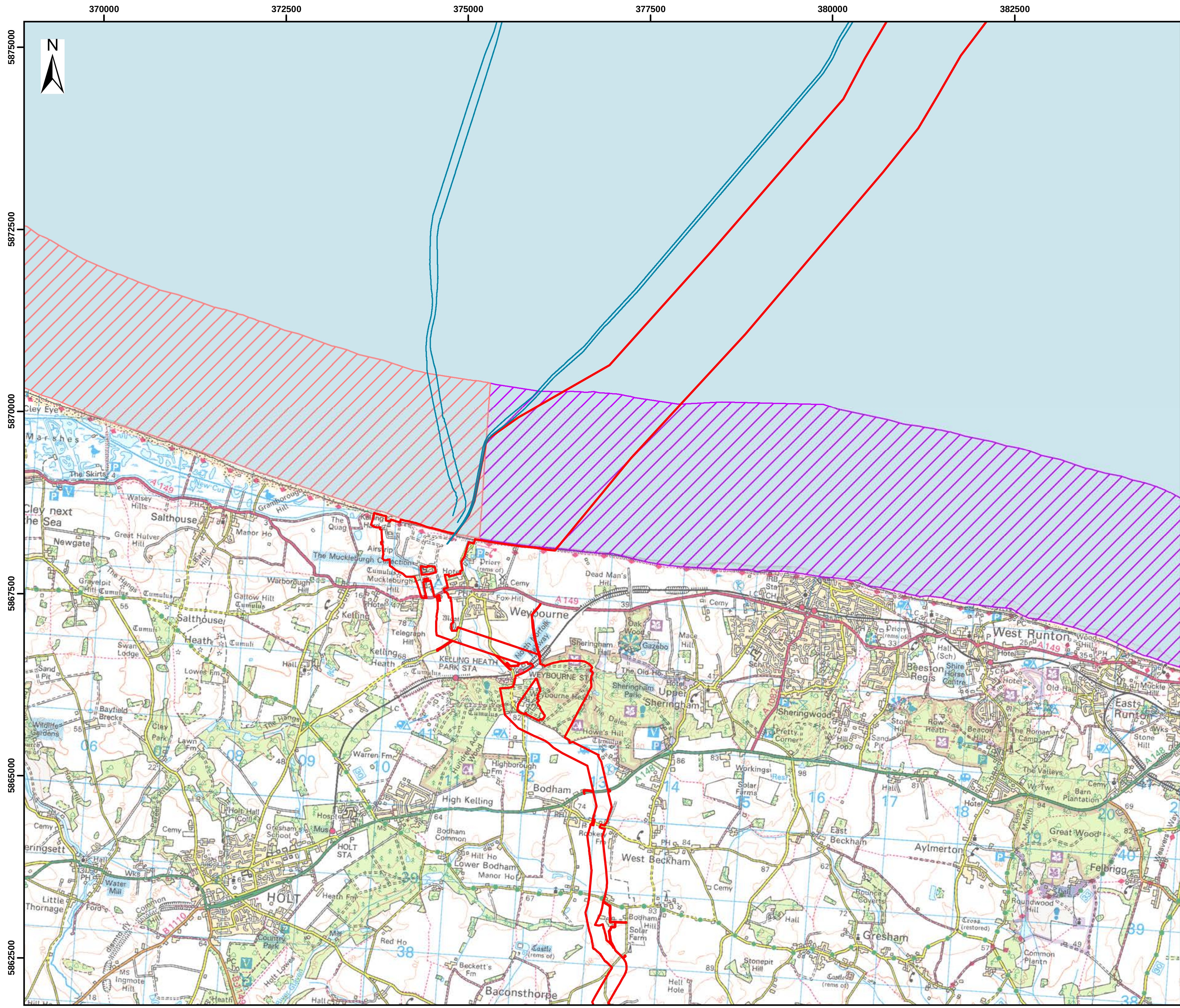
Water body name and reference	Water body ID	Water body type	Status and Description	Screen into Stage 2?
				There is no mechanism for impact
Wensum US Norwich	GB105034055881	River	Heavily modified due to flood protection, navigation and recreation designations. The water body is currently at 'Moderate Ecological Potential' due to pressures on phytobenthos and hydromorphological modifications.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Wensum DS Norwich	GB105034055882	River	Heavily modified due to flood protection, navigation and recreation designations. The water body is currently at 'Moderate Ecological Potential' due to pressure on macrophytes and phytobenthos.	No. The proposed onshore works are located approximately 8km upstream of the water body. The nature of the proposed activities and the distance of separation means that any changes to the hydromorphology, physico-chemistry or chemistry of the upstream water body are unlikely to propagate sufficiently far downstream to affect this water body.

Water body name and reference	Water body ID	Water body type	Status and Description	Screen into Stage 2?
Tud	GB105034051000	River	Heavily modified. The water body is currently at 'Moderate Ecological Potential' as a result of moderate phosphate and moderate or less mitigation measures assessment.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Yare (u/s confluence with Tiffey – Lower)	GB105034051290	River	Not designated artificial or heavily modified water body. 'Moderate' status due to moderate macrophytes and phytobenthos.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Yare (Tiffey to Wensum)	GB105034051281	River	Heavily modified due to land drainage and flood protection designations. The water body is currently at 'Moderate Ecological Potential' due to moderate macrophytes and phytobenthos and mitigation measure assessment.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Tiffey	GB105034051282	River	Heavily modified due to land drainage and flood protection designations. The water body is currently at 'Moderate Ecological Potential' due to pressures on fish and a moderate or less mitigation measures assessment.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.

Water body name and reference	Water body ID	Water body type	Status and Description	Screen into Stage 2?
Intwood Stream	GB105034051240	River	Heavily modified due to land drainage and flood protection designations. The water body is currently at 'Moderate Ecological Potential' due to high concentrations of phosphate from sewage discharge and poor soil management.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Tas (Tasburgh to R. Yare)	GB105034051230	River	Heavily modified due to land drainage and flood protection designations. The water body is currently at 'Moderate Ecological Potential' due to high concentrations of phosphate from sewage discharge and poor soil and livestock management.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Chet	GB105034051190	River	Not designated an artificial or heavily modified water body. The water body is at 'Poor' status due to pressures on fish from poor livestock management, poor nutrient management and ecological discontinuity.	No. No construction or operational activities will take place within this water body catchment and there is therefore no mechanism for impact on the water body.

Water body name and reference	Water body ID	Water body type	Status and Description	Screen into Stage 2?
Costessey Pits	GB30536219	Lake	Artificial water body currently at 'Moderate Ecological Potential' due to high nitrogen and phosphorous concentrations.	No. No construction or operational activities will take place within the catchment that directly contributes to the lake and there is therefore no mechanism for impact on the water body.
North Norfolk Chalk	GB40501G400100	Groundwater	Underlies the landfall area of the substation project area. The water body is currently at 'Poor Quantitative Status' and 'Poor Chemical Status' as a result of general chemical testing.	Yes. The proposed works will take place within the water body catchment and there is therefore potential for direct impact on WFD quality elements.
Broadland Rivers Chalk & Crag	GB40501G400300	Groundwater	Underlies the majority of the onshore project area. The water body is currently at 'Poor Quantitative Status' and 'Poor Chemical Status'.	Yes. The proposed works will take place within the groundwater body catchment and there is therefore potential for direct impact on WFD quality elements.

Water body name and reference	Water body ID	Water body type	Status and Description	Screen into Stage 2?
Cam and Ely Ouse Chalk	GB40501G400500	Groundwater	Underlies an area south west of the onshore project area. The water body is currently at ‘Poor Quantitative Status’ due to groundwater abstraction and ‘Poor Chemical Status’ as a result of poor nutrient management and industry.	No. The proposed works will take places outside of the groundwater catchment area, and there is therefore no mechanism for impact on this water body.



Sheringham Shoal and Dudgeon Extension Projects

Figure 20.1.1

Coastal Water Bodies within Landfall and the Offshore Cable Corridor

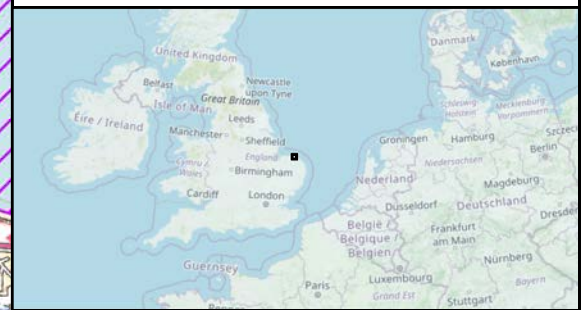
Legend:

- PEIR Boundary
- Existing Offshore Wind Farm Export Cable

WFD Coastal Water Bodies

- Norfolk East
- Norfolk North

Data Sources: Environment Agency, 2020; © Royal HaskoningDHV 2020.



Document No: PB8164-RHD-ZZ-OF-DR-Z-0108

Co-ordinate System: WGS 1984 UTM Zone 31N

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Report:

WFD Compliance Assessment

Preliminary Environmental Information Report (PEIR)

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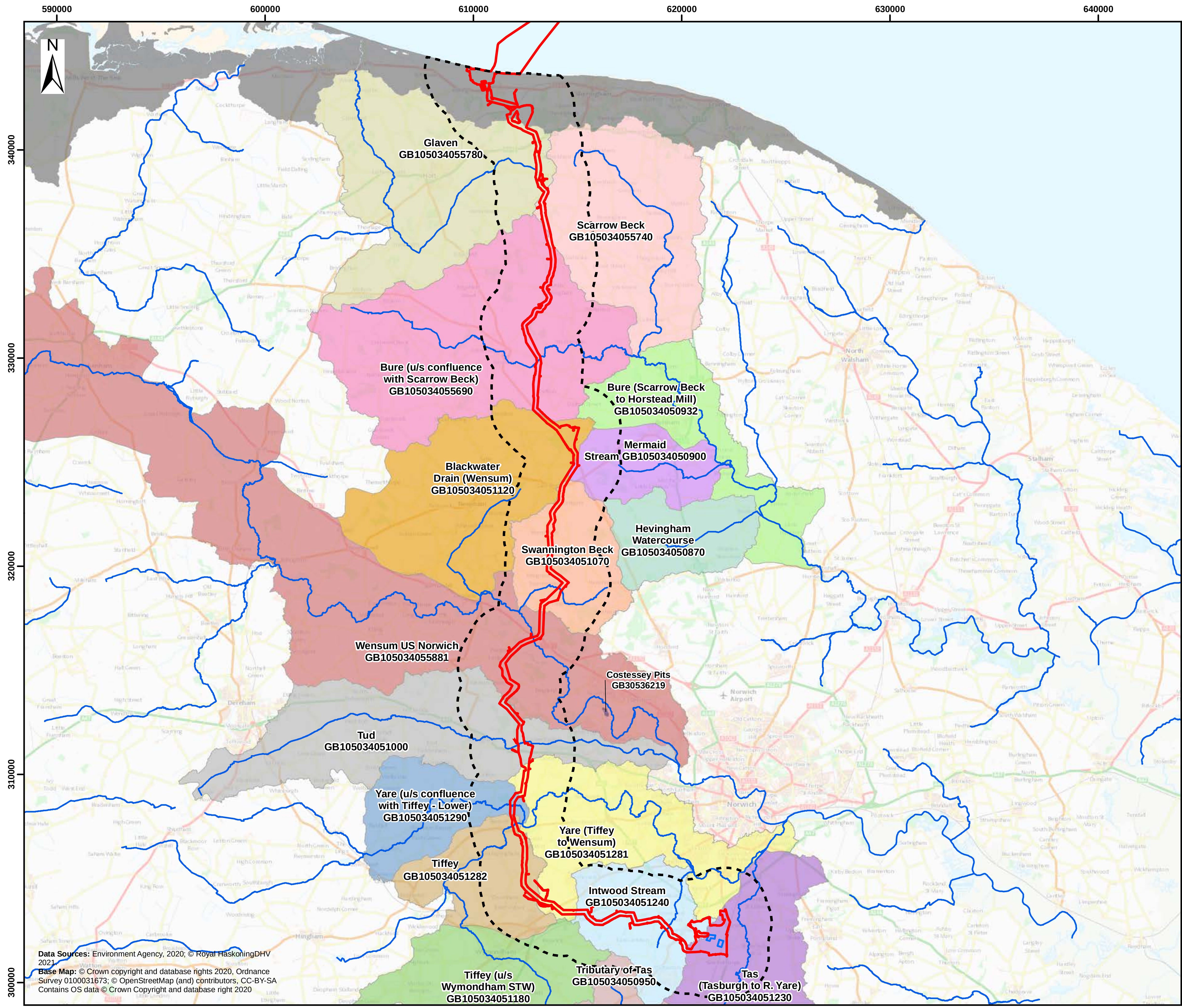
Sheringham Shoal and Dudgeon Extension Projects

Figure 20.1.2

WFD River and Lake Water Bodies within 2km of the Onshore Cable Corridor and Substation



Data Sources: Environment Agency, 2020; © Royal HaskoningDHV 2021

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Legend:

- PEIR Boundary
- Onshore Substation Site
- Onshore Cable Corridor 2km Buffer

WFD River Water Body Catchments

- Blackwater Drain (Wensum)
- Bure (Scarrow Beck to Horstead Mill)
- Bure (u/s confluence with Scarrow Beck)
- Glaven
- Hevingham Watercourse
- Intwood Stream
- Mermaid Stream
- Scarrow Beck
- Swannington Beck
- Tas (Tasburgh to R. Yare)
- Tiffey
- Tiffey (u/s Wymondham STW)
- Tributary of Tas
- Tud
- Wensum US Norwich
- Yare (Tiffey to Wensum)
- Yare (u/s confluence with Tiffey - Lower)
- Not part of a river WB catchment
- WFD River Water Bodies

WFD Lake Water Body Catchment

- Costessey Pits

Document No: PB8164-RHD-ZZ-ON-DR-Z-0070

Co-ordinate System: British National Grid

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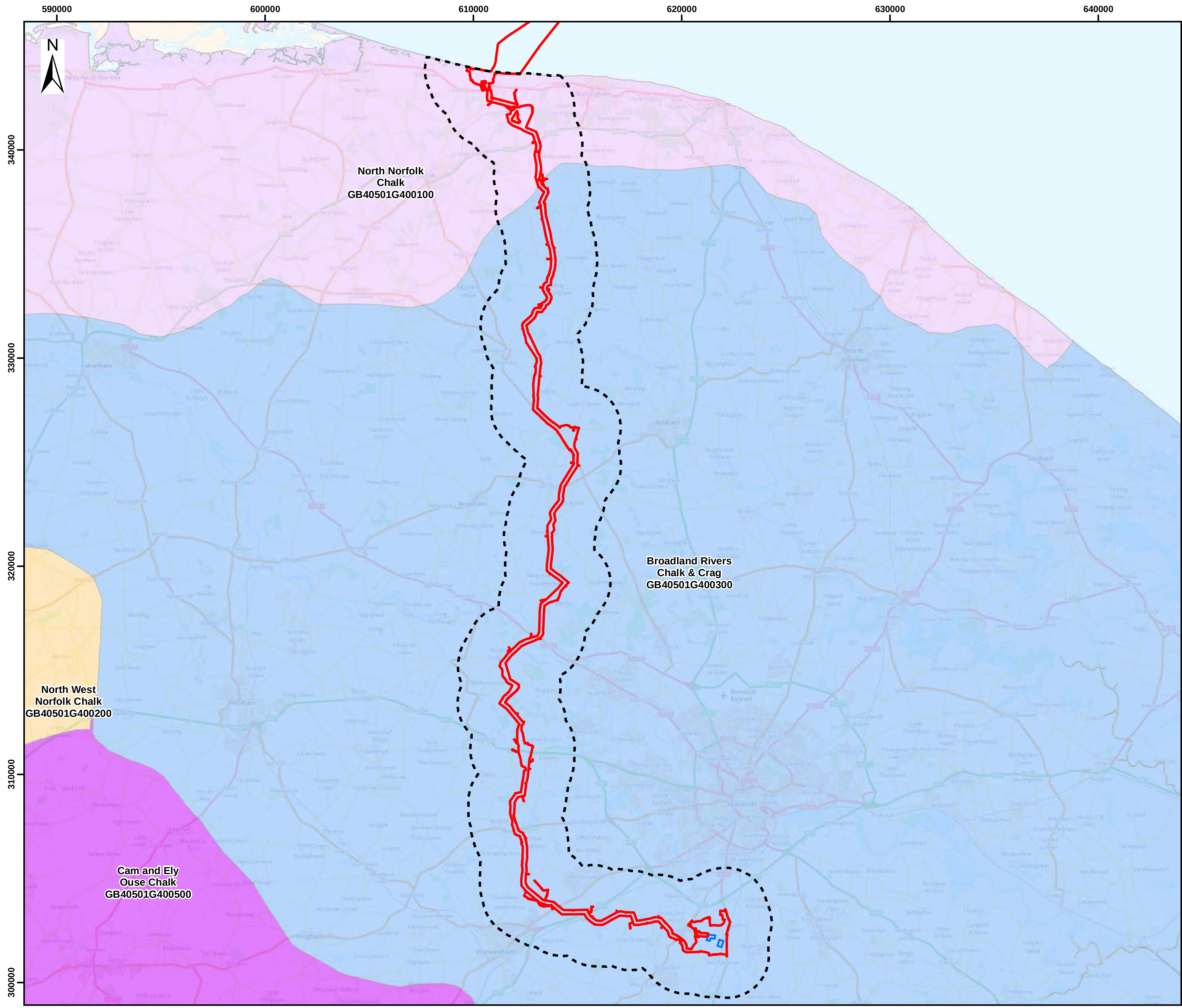

Sheringham Shoal and Dudgeon Extension Projects

Figure 20.1.3

WFD Groundwater Bodies within the Onshore Cable Corridor and Substation

Legend:

- PEIR Boundary
- Onshore Substation Site
- Onshore Cable Corridor 2km Buffer

WFD Groundwater Body

- Broadland Rivers Chalk & Crag
- Cam and Ely Ouse Chalk
- North Norfolk Chalk
- North West Norfolk Chalk

Data Sources: Environment Agency, 2020; © Royal HaskoningDHV 2020.
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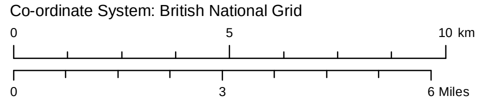
Document No: PB8164-RHD-ZZ-ON-DR-Z-0078

Co-ordinate System: British National Grid



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20.1.5 Stage 2: Scoping Assessment

78. The WFD scoping assessment determines potential impacts on quality elements, the temporary and non-temporary impacts on improvements and mitigation measures, the impacts on protected areas and critical habitats, and any impacts on Invasive Non-Native Species. This stage will therefore determine the scope for the detailed compliance assessment (**Section 20.1.6**) which may be required for DEP and SEP.

79. The aim of this section is to highlight the quality elements within each coastal, river and groundwater water body that have the potential be impacted by the proposed construction and operation activities associated with DEP and SEP, as identified in Stage 1 of the WFD compliance assessment (**Table 0-5**).

80. The results of the scoping assessment for the identified coastal, river and groundwater water body quality elements are presented in the Annexes of this assessment. A summary of the outcomes of the tables is presented in the below sections.

20.1.5.1 Impacts on coastal water bodies

81. Scoping has been undertaken using the Environment Agency's impact assessment template, obtained from https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters (Environment Agency, 2016f). The assessment is presented in **Annex 2** split into the construction phase and the operational phase for both water bodies and considers the following activities:

- Construction – Installation of the offshore export cables and subtidal HDD exit point.
- Operation – Presence of offshore cable protection.

82. Scoping assessment tables are presented in **Annex 2**. The scoping phase confirms that the construction and operational activities have the potential to impact upon the biological (higher sensitivity habitats chalk reef) quality elements of screened in water bodies within the offshore WFD scoping area. The impact on these quality elements will be considered at detailed assessment for the following coastal water bodies:

- Norfolk East; and
- Norfolk North.

20.1.5.2 Impacts on river water bodies

83. The WFD scoping assessment tables for river water bodies are presented in **Annex 3** of this document. The onshore construction and operation activities have potential to impact upon the hydromorphology (hydrological regime, morphological conditions), physico-chemistry (general, specific pollutants) and biological (aquatic flora, benthic invertebrates, fish) quality elements of screened in water bodies within the onshore WFD scoping area. The impact on these quality elements will be considered at detailed assessment for the following water bodies:

- Glaven;
- Bure (u/s confluence with Scarrow Beck);
- Swannington Beck;
- Wensum US Norwich;

- Tud;
- Yare (u/s confluence with Tiffey – Lower);
- Yare (Tiffey to Wensum);
- Tiffey; and
- Intwood Stream.

84. The WFD scoping assessment determined there to be four water bodies to be scoped out from detailed assessment in Stage 3 due to distance from the water body to the onshore cable corridor and proposed substation sites and the associated lack of hydrological connectivity. These water bodies are listed below:

- Distance from cable corridor and lack of connectivity:
  - Scarrow Beck;
  - Blackwater Drain (Wensum);
  - Mermaid Stream; and
  - Tas (Tasburgh to R. Yare).
- Distance from proposed substation zones and lack of connectivity:
  - Tas (Tasburgh to R. Yare)

20.1.5.3 Impacts on groundwater water bodies

85. The WFD scoping assessment table for groundwater bodies is presented in **Annex 4** of this document. This assessment determined that onshore construction activities will not impact upon the groundwater quantity elements of North Norfolk Chalk groundwater body and Broadland Rivers Chalk and Crag groundwater body, but there is the potential for impacts on both water bodies for the following groundwater quality elements:

- Groundwater Dependent Terrestrial Ecosystems (GWDTEs);
- Deterioration in water quality; and
- Increasing pollution concentrations.

86. Operational activities and the presence of permanent onshore infrastructure were deemed to have no mechanisms for impact upon the quantity or quality of groundwater elements. The size of the cable ducting in relation to the size of the groundwater bodies would prevent any risk to both groundwater bodies achieving good status.

20.1.5.4 Impacts on improvement and mitigation measures

87. Within the RBMP, Mitigation Measures are specifically set for A/HMWBs and improvement measures are defined for natural water bodies. These measures were identified for each of the water bodies screened into the Stage 2: Scoping Assessment. **Table 0-7** outlines whether there will be any impact on the current measures that are in place and those not yet in place for each water body catchment. It then determines whether further assessment is needed for in the Stage 3 Detailed Compliance Assessment. The assessment determined there to be no impact on the improvement measures and mitigation measures in place, and delivery of those measures not yet in place throughout each identified WFD water body. There will therefore be no requirement for further assessment.

Table 0-7: Impact on RBMP improvement and mitigation measures in place or not in place within each river and groundwater water body.

Water body	RBMP improvement measure/HMWB mitigation measures in place	Are the activities likely to impact on one of the RBMP improvement or mitigation measures in place?	RBMP improvement measure/HMWB mitigation measures not in place	Are the activities likely to impact on one of the RBMP improvement or mitigation measures not yet in place?
Glaven GB105034055780	No measures identified.	N/A	No measures identified.	N/A
Bure (u/s confluence with Scarrow Beck) GB105034055690	No measures identified.	N/A	No measures identified.	N/A
Swannington Beck GB105034051070 (HMWB)	• Maintenance – prevent sediment transfer • Selective vegetation control • Vegetation control • Vegetation control timing • Invasive species techniques • Sediment management strategy	No mechanisms to reduce the effectiveness of mitigation measures in place have been identified.	No additional measures identified.	N/A

Water body	RBMP improvement measure/HMWB mitigation measures in place	Are the activities likely to impact on one of the RBMP improvement or mitigation measures in place?	RBMP improvement measure/HMWB mitigation measures not in place	Are the activities likely to impact on one of the RBMP improvement or mitigation measures not yet in place?
Wensum US Norwich GB105034055881 (HMWB)	• Maintenance – minimise habitat impact • Maintenance – prevent sediment transfer • Vegetation control • Vegetation control timing • Invasive species techniques • Retain habitats	No mechanisms to reduce the effectiveness of mitigation measures in place have been identified.	• Flood bunds • Set-back embankments • Floodplain connectivity • Fish passes • Remove obsolete structure • Changes to locks etc. • Water level management • Sediment management strategy • In-channel morph diversity	No mechanisms to prevent the future implementation of these measures have been identified

Water body	RBMP improvement measure/HMWB mitigation measures in place	Are the activities likely to impact on one of the RBMP improvement or mitigation measures in place?	RBMP improvement measure/HMWB mitigation measures not in place	Are the activities likely to impact on one of the RBMP improvement or mitigation measures not yet in place?
Tud GB105034051000 (HMWB)	• Selective vegetation control • Vegetation control • Vegetation control timing • Invasive species techniques • Sediment management strategy • Maintenance – prevent sediment transfer	No mechanisms to reduce the effectiveness of mitigation measures in place have been identified.	No additional measures identified	N/A

Water body	RBMP improvement measure/HMWB mitigation measures in place	Are the activities likely to impact on one of the RBMP improvement or mitigation measures in place?	RBMP improvement measure/HMWB mitigation measures not in place	Are the activities likely to impact on one of the RBMP improvement or mitigation measures not yet in place?
Yare (u/s confluence with Tiffey – Lower) GB105034051290	Measures are in place to prevent or control the input of pollution from urban areas, transport and built infrastructure	No. Any potential increase in pollutants associated with construction and operational activities are likely to be short term and localised within this water body catchment.	No additional measures identified.	N/A
Yare (Tiffey to Wensum) GB105034051281 (HMWB)	• Maintenance – minimise habitat impact • Maintenance – prevent sediment transfer • Selective vegetation control • Vegetation control • Vegetation control timing	No mechanisms to reduce the effectiveness of mitigation measures in place have been identified.	• Set-back embankments • Floodplain connectivity • Fish passes • Changes to locks etc. • In-channel morph diversity	No mechanisms to prevent the future implementation of these measures have been identified

Water body	RBMP improvement measure/HMWB mitigation measures in place	Are the activities likely to impact on one of the RBMP improvement or mitigation measures in place?	RBMP improvement measure/HMWB mitigation measures not in place	Are the activities likely to impact on one of the RBMP improvement or mitigation measures not yet in place?
	• Invasive species techniques • Retain habitats • Sediment management strategy			
Tiffey GB105034051282 (HMWB)	• Maintenance – minimise habitat impact • Maintenance – prevent sediment transfer • Selective vegetation control • Vegetation control • Vegetation control timing • Invasive species techniques • Retain habitats	No mechanisms to reduce the effectiveness of mitigation measures in place have been identified.	• Set-back embankments • Floodplain connectivity • Fish passes • Changes to locks etc. • In-channel morph diversity	No mechanisms to prevent the future implementation of these measures have been identified

Water body	RBMP improvement measure/HMWB mitigation measures in place	Are the activities likely to impact on one of the RBMP improvement or mitigation measures in place?	RBMP improvement measure/HMWB mitigation measures not in place	Are the activities likely to impact on one of the RBMP improvement or mitigation measures not yet in place?
	• Sediment management strategy			
Intwood Stream GB105034051240 (HMWB)	• Maintenance – prevent sediment transfer • Selective vegetation control • Vegetation control • Vegetation control timing • Invasive species techniques • Sediment management strategy	No mechanisms to reduce the effectiveness of mitigation measures in place have been identified.	No additional measures identified	N/A

20.1.5.5 Impacts on protected areas and critical habitats

88. Protected areas within each of the WFD water body catchments identified during the screening phase are listed in **Table 0-8** and shown in **Figure 20.1.3**. They cover the following protected area types:

- Bathing Water Directive;
- Nitrates Directive;
- Drinking Water Protected Area;
- Urban Waste Water Treatment Directive;
- Conservation of Wild Birds Directive; and
- Habitats and Species Directive.

89. Each protected area is assessed in **Table 0-8** to identify whether it is within 2km of the onshore WFD study area, and therefore if it should be taken forward for further impact assessment in **Section 20.1.6**.

90. Note that potential impacts on protected areas under the Habitats and Species Directive and the Birds Directive will be considered in the separate Habitat Regulations Assessment, and will not be considered further in this assessment.

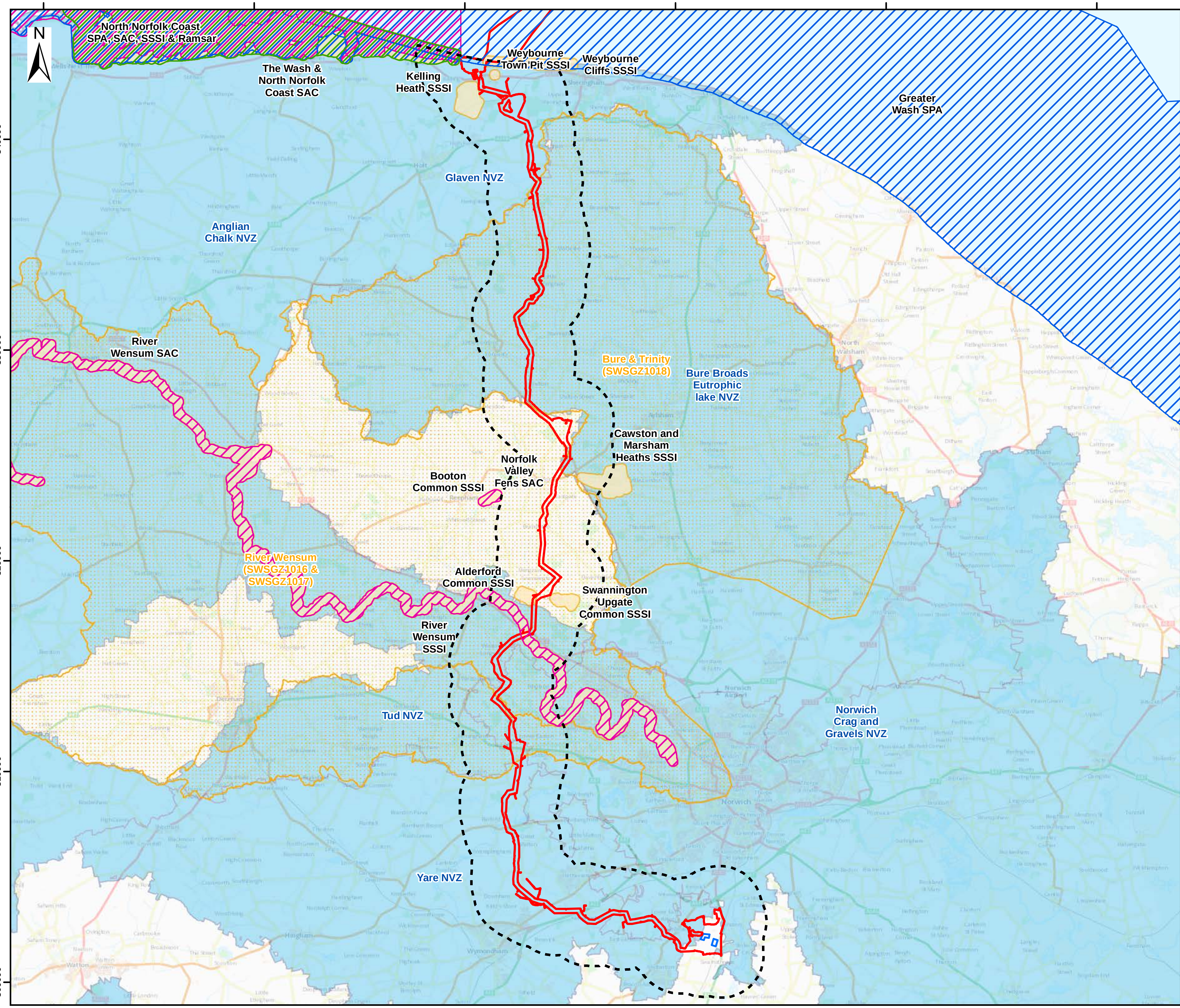
Table 0-8: List of Protected areas within each WFD water body

Water body name	Protected Area Driver	Protected area name	Further assessment required?
Norfolk East	Habitats and Species Directive	North Norfolk Coast SAC	No, potential impacts will be considered in detail in the Habitat Regulations Assessment.
	Birds Directive	North Norfolk Coast SPA	No, potential impacts will be considered in detail in the Habitat Regulations Assessment.
Norfolk North	Habitats and Species Directive	North Norfolk Coast SAC	No, potential impacts will be considered in detail in the Habitat Regulations Assessment.
	Birds Directive	North Norfolk Coast SPA	No, potential impacts will be considered in detail in the Habitat Regulations Assessment.
Glaven	Habitats and Species Directive	Norfolk Valley Fens SAC	Norfolk Valley Fens will not require further assessment as it is more than 2km from the onshore WFD scoping area.
	Nitrates Directive	Glaven Nitrate Vulnerable Zone (NVZ) S402 Anglian Chalk S71 Binham Tributary NVZ S403	Yes, scoped in for further assessment.
Bure (u/s confluence with Scarrow Beck)	Nitrates Directive	Glaven NVZ S402	Yes, scoped in for further assessment.
Blackwater Drain (Wensum)	Habitats and Species Directive	Norfolk Valley Fens	No, more than 2km from onshore WFD scoping area.

Water body name	Protected Area Driver	Protected area name	Further assessment required?
	Nitrates Directive	Norwich Crag and Gravels NVZ	Yes, scoped in for further assessment.
Mermaid Stream	Nitrates Directive	Norwich Crag and Gravels NVZ	Yes, scoped in for further assessment.
Swannington Beck	None	Anglian Chalk NVZ S71	Yes, scoped in for further assessment.
	Nitrates Directive	Norwich Crag and Gravels NVZ	Yes, scoped in for further assessment.
Wensum US Norwich	Drinking Water Protected Area	Wensum US Norwich	Yes, scoped in for further assessment.
	Habitats and Species Directive	River Wensum SAC	No, although the River Wensum SAC is within 2km, potential impacts will be considered separately in the Habitat Regulations Assessment
	Safeguard Zone	SWSGZ1016 SWSGZ1017	No, onshore activities are not within this SGZ.
	Nitrates Directive	Tud NVZ S397 Wendling Beck NVZ S398 Burn NVZ S401	Yes, scoped in for further assessment.
	Urban Waste Water Treatment Directive	River Wensum UKENRI73	No, there will be no mechanism for impact.

Water body name	Protected Area Driver	Protected area name	Further assessment required?
Tud	Habitats and Species Directive	Norfolk Valley Fens SAC River Wensum SAC	No, although the River Wensum SAC is within 2km, potential impacts will be considered separately in the Habitat Regulations Assessment No further assessment is required for Norfolk Valley Fens as this is not within 2km.
	Nitrates Directive	Yare NVZ S400 Tud NVZ S397 Wendling Beck NVZ S398	Yes, scoped in for further assessment.
Yare (u/s confluence with Tiffey – Lower)	Habitats and Species Directive	Norfolk Valley Fens SAC	No, more than 2km from onshore WFD scoping area.
	Nitrates Directive	Yare NVZ S400 Tud NVZ S397	Yes, scoped in for further assessment.
Yare (Tiffey to Wensum)	Nitrates Directive	Yare NVZ S400 Tud NVZ S397	Yes, scoped in for further assessment.
	Urban Waste Water Treatment Directive	River Tiffey & Yare UKENRI89	Yes, scoped in for further assessment
Tiffey	Nitrates Directive	Yare NVZ S400	Yes, scoped in for further assessment.
	Urban Waste Water Treatment Directive	River Tiffey & Yare UKENRI89	Yes, scoped in for further assessment.
Intwood Stream	Nitrates Directive	Yare NVZ S400	Yes, scoped in for further assessment.

Water body name	Protected Area Driver	Protected area name	Further assessment required?
North Norfolk Chalk	Drinking Water Protected Area	North Norfolk Chalk UKGB40501G400100	Yes, scoped in for further assessment.
	Safeguard Zone	Glandford GWSGZ0012	No, onshore activities of the onshore cable corridor and substation will not be within this safeguard zone.
	Nitrates Directive	Saxthorpe G171 Sandringham Sands South G150 Anglian Chalk G71	Yes, scoped in for further assessment.
Broadland Rivers Chalk and Crag	Drinking Water Protected Area	Broadland Rivers Chalk & Crag UKGB40501G400300	Yes, scoped in for further assessment.
	Nitrates Directive	Sandlings and Chelmsford G78 Anglian Chalk G71 Norwich Crag and Gravels G79 Saxthorpe G171	Yes, scoped in for further assessment.



Sheringham Shoal and Dudgeon Extension Projects

Figure 20.1.7

Protected Areas within 2km of the onshore cable corridor and substation

Legend:

- PEIR Boundary
- Onshore Substation Site
- Onshore Cable Corridor 2km Buffer
- Drinking Water Safeguard Zones
- Nitrate Vulnerable Zones

Designated sites

- Ramsar
- Special Protection Areas (SPA)
- Special Area of Conservation (SAC)
- Sites of Special Scientific Interest (SSSI)

Data Sources: Environment Agency, 2020; Natural England, 2020; © Royal HaskoningDHV 2020.
Base Map: © Crown copyright and database rights 2020, Ordnance Survey 0100031673; © OpenStreetMap (and) contributors, CC-BY-SA

Document No: PB8164-RHD-ZZ-ON-DR-Z-0069

Co-ordinate System: British National Grid

0 5 10 km
0 3 6 Miles

A	16/03/2021	1:175,000	A3	JT	NH	MW
REV	DATE	SCALE	SIZE	DRW	CHK	APR

Report:

WFD Compliance Assessment
Preliminary Environmental Information Report (PEIR)

Royal HaskoningDHV
Enhancing Society Together

equinor

20.1.5.6 Impacts on Invasive Non Native Species

91. Any of the proposed construction and operation activities which use equipment that has been present at another site where INNS species are located could potentially be at risk of spreading INNS.

92. Contractors responsible for the construction and operation of DEP and SEP will be required to undertake a biosecurity risk assessment and a management plan put in place to avoid potentially facilitating the spread of non-native species during construction.

93. A general strategy will be to establish a viable vegetation cover quickly, before invasive plant species can become established. Any invasive species that colonise an area during construction will be removed and disposed of as required.

94. Any imported soils will be subject to appropriate control processes to ensure they are free of any seeds/roots/stems of any invasive plant covered under the Wildlife and Countryside Act 1981.

95. The control measures outlined would ensure that impacts on invasive non-native species do not need to be considered in Stage 3 of the assessment.

20.1.5.7 Summary of Stage 2

96. The WFD scoping assessment for river water bodies and groundwater water bodies have shown that the onshore construction and operation activities have the potential to impact upon several WFD quality elements. The quality elements that are to be taken forward with each relevant water body for further assessment in Stage 3, are summarised in **Table 0-9** below. For marine WFD water bodies, biological quality elements in relation to the potential risk to the higher sensitivity habitat 'chalk reef' are scoped in to detailed assessment.

Table 0-9 WFD: quality elements, identified WFD water bodies and protected areas to be scoped in for Stage 3: Detailed assessment

WFD quality element	Water body
Hydromorphology	
Hydrological regime	• Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey
River continuity	
Physico-chemistry	
General	
Specific pollutants	
Biology	
Aquatic flora	
Benthic invertebrates	

WFD quality element	Water body
Fish	• Intwood Stream
Groundwater quality	
GWDTEs	• North Norfolk Chalk, • Broadland Rivers Chalk and Crag
Deterioration in water quality	
Increasing pollution concentrations	
Protected areas	
Nitrates Directive;	• Glaven NVZ S402 • Anglian Chalk S71 • Tud NVZ S397 • Burn NVZ S401 • Yare NVZ S400 • Binham Tributary NVZ S403 • Norwich Crag and Gravels NVZ • Wendling Beck NVZ S398 • Saxthorpe G171 • Sandringham Sands South G150
Drinking Water Protected Area;	• Wensum US Norwich • North Norfolk Chalk UKGB40501G400100 • Broadland Rivers Chalk & Crag UKGB40501G400300
Urban Waste Water Treatment Directive	• River Wensum UKENRI73 • River Tiffey & Yare UKENRI89

20.1.6 Stage 3: Detailed Compliance Assessment

20.1.6.1 Purpose of this Section

97. This section presents the results of the detailed compliance assessment undertaken on the water bodies identified in **Section 20.1.5.7**, using the method outlined in **Section 20.1.3**.

98. The aim of this stage of the assessment is to determine whether DEP and SEP could result in deterioration in the status of the WFD quality elements for all scoped-in water bodies identified in Stage 2.This assessment considers the impact of construction and operation activities on each scoped in quality element and protected areas, considering any changes in impacts for the different construction scenarios of DEP and SEP. To mitigate against the potential impacts, various control measures are set out for implementation during construction and operation.

20.1.6.2 River water bodies

20.1.6.2.1 *Hydromorphology (Hydrological Regime and Morphological Conditions)*

Construction Activities

99. There is the potential for construction activities to alter surface water flows entering river water bodies. An increase in areas of hard-standing land use associated with the haul road, substation and temporary compound areas, could change flow conveyance pathways resulting in localised changes to volume, energy or distribution of flows of the identified water bodies. Such an increase in surface runoff could also potentially increase local bed and bank scour.

100. Greater levels of fine sediment could be released directly into the watercourse, predominantly from ground disturbance and vegetation cover removal associated with construction. This could result in increased sediment deposition and smothering of existing substrates. It is noted that of the water bodies identified, several are chalk rivers (Glaven, Bure and Wensum) where clean, coarse substrates are a key hydromorphological feature. The impact of potential smothering on these substrates would have a greater impact on these water bodies.

101. As stated in **Section 20.1.2.7.1** the onshore cable corridor will use trenchless methods to cross all Main Rivers. Open cut trenching methods will be used to cross all other ordinary watercourses crossed by the cable corridor. In addition, bailey bridges will be used to provide temporary access across all Main Rivers , while temporary culverts will be required at all Ordinary Watercourse crossing points. **Table 0-10** shows the method of watercourse crossing for each watercourse type within the WFD water body catchments.

102. Installation of bailey bridges or similar to enable the temporary haul road to cross WFD water bodies could result in the alteration of local bank morphology and potentially increase levels of fine sediment entering the water body. An increase in fine sediment supply from disturbed ground could cause changes to local geomorphological adjustment rates and therefore impact on any morphological features within the channel. The removal of the bridge crossings following construction could also increase sediment supply into the water body.

Table 0-10: Water body crossings in WFD river water body catchments

WFD River Water Body Catchment	Number of HDD crossings (Main Rivers)	Number of trenched crossings (Ordinary Watercourses)
Glaven	0	1
Bure (u/s confluence with Scarrow Beck)	1	5
Swannington Beck	1	5
Wensum U/S Norwich	1	4
Tud	1	2
Yare (u/s confluence with Tiffey – Lower)	1	3
Yare (Tiffey to Wensum)	0	1
Tiffey	1	3
Intwood Stream	1	6

103. Where HDD methods are used, the cable would be installed at least 2m below the bed of the watercourse and, although ground disturbance will occur at entry and exit points, there will would be no direct disturbance to the watercourses crossed using a trenchless technique. There is therefore no direct mechanism for impacts to occur to the hydrological regime and morphological condition of the WFD water bodies.

104. There is potential for indirect impacts upon the hydrological regime and morphological condition of WFD water bodies from the use of multiple trenched crossings and culverts on Ordinary Watercourses which drain into the main water body. A large number of culverts and trenched crossings in the WFD water body catchment could alter the flow regime, disrupt coarse sediment transport patterns and increase the input of fine sediment into the WFD water body, impacting upon its morphological condition. However, as shown in **Table 0-10** there are a low number of multiple trenched crossings required within each WFD water body catchment. It is therefore likely that hydrological regime and morphological impacts at Ordinary Watercourses, will not have a significant or permanent impact on any downstream WFD water body.

Construction of DEP or SEP in Isolation or Together

105. If DEP and SEP were constructed in isolation, a single cable corridor would be required of one metre width within a working construction corridor of 45m.The use of HDD trenchless crossings to traverse the identified water bodies will prevent direct impacts to hydromorphology from the cable corridor. However, an increase in sediment supply within each identified catchment, has the potential to cause greater fine sediment deposition and river bed smothering.

106. If both DEP and SEP are built, it is considered the concurrent construction scenario would have a greater potential impact on this quality element than the sequential scenario. There would be a greater area of disturbed land at any one time and therefore a increased supply of fine sediment that could potentially runoff into each water body. Additionally, a higher number of vehicle movements to construct concurrently, could lead to higher fine sediment input. If the sequential scenario was undertaken, sediment supply to each water body from construction activities would be reduced as land would be reinstated following completion of the first project and prior to construction of the second project.

Control measures

107. Given the construction works will be confined to a small area of each WFD water body, the potential release of fine sediment is expected to be localised and temporary in nature. To mitigate for any localised hydromorphological impact under either scenario, the following construction control measures will be implemented:

- Trenchless crossing methods where the onshore cable corridor must cross Main Rivers will prevent significant direct changes to the bed and bank conditions within each water body. This method will cause no direct disturbance to the surface water bodies.
- Following removal of the temporary crossings, the banks will be reinstated to their pre-construction condition to ensure localised impacts are not permanent.
- Topsoil and sub-soil removed as part of site preparation will be stored separately within the working width and away from the open-cut trench. Both will be managed to minimise soil erosion.
- Construction drainage will be developed and implemented to minimise water within the cable trench and ensure ongoing drainage of surrounding land. Where water enters the trenches during installation, this will be pumped via settling tanks or ponds to remove sediment, before being discharged into local ditches or drains via temporary interceptor drains.
- Construction drainage will be developed in consultation with landowners, the Lead Local Flood Authority, Environment Agency and relevant Internal Drainage Board.
- Specific drainage measures for each area of land will be specified based on information identified and recorded by a land drainage consultant prior to construction.

- Surface water drainage requirements will be designed to meet the requirements of the National Planning Policy Framework (NPPF). The SuDS (Sustainable Drainage Systems) philosophy will be employed to limit run-off, where feasible, through the use of infiltration techniques which can be accommodated within the area of project.

108. With implementation of each control measure to manage sediment supply and surface runoff, combined with the small scale of direct impacts to each water body, the onshore construction activities cannot be considered under any scenario to cause deterioration in water body status or the prevention of achieving GEP or GES.

Operational Activities

109. The increase in impermeable area from the presence of above ground infrastructure (permanent access tracks, onshore substation) will reduce infiltration and potentially alter surface runoff rates and subsurface flows. This could impact upon surface water volumes to the extent to which rates of bed and bank erosion may increase and could lead to larger scale geomorphological change.

Operation of DEP or SEP in Isolation or Together

110. The extent of the impact to hydrological regime and hydromorphological condition is likely to be dependent on the area of permanent infrastructure (onshore cable corridor, onshore substation and permanent access roads) and the frequency of operational activities within each WFD catchment during operation. If DEP and SEP were built together, the substation operational compound would be 3ha larger than if the DEP and SEP were constructed in isolation. Conversion of 3ha more arable land to hard-standing ground, could lead to greater changes to surface water drainage pathways and increased runoff.

Control measures

111. To ensure impacts are minimal to each water body, the following operational control measure will be in place:

    - Onshore drainage will be designed for all permanent onshore infrastructure. This will include measures to ensure existing land drainage will be reinstated following construction and maintained to retain pre-development discharge rates.

112. With this control measure in place, impacts from the operational activities on the hydrological regime and hydromorphological condition of the WFD water bodies will be very low. There will therefore be no risk of deterioration in water body status or the prevention of achieving GEP or GES.

20.1.6.2.2 *Physico-chemistry (General, Priority substances)*

Construction Activities

113. Construction activities could result in accidental release of lubricants, oils and runoff into nearby water bodies, impacting upon surface water quality. This could occur accidentally from construction machinery (e.g. fuels and lubricants) and construction materials (e.g. concrete) located near water bodies. Vehicle and construction material storage areas could be an additional source of leaks and spills. Additionally, the presence of welfare facilities may potentially lead to foul water runoff into water bodies.

114. An increase in sediment supply from any disturbed soils along the cable corridor and at the substation during construction, could increase surface runoff into the WFD river water bodies. Greater fine sediment in the water body could reduce light penetration and affect local oxygenation and temperature conditions.

115. During construction the presence of temporary culverts and use of open cut trenching methods across Ordinary Watercourses could increase conveyance of pollutants and fine sediment to the downstream WFD water body, impacting on overall dissolved oxygen, pH and temperature.

116. However, as shown in **Table 0-10** there are a low number of multiple trenched crossings required within each WFD water body catchment. It is therefore likely that the above impacts on Ordinary Watercourses will not have a significant or permanent cumulative physico-chemical impact on any WFD water body.

Construction of DEP or SEP in Isolation or Together

117. If both DEP and SEP are built, it is considered the concurrent construction scenario would have a marginally greater potential impact on physico-chemistry than the sequential scenario. If DEP and SEP are built at the same time, greater numbers of construction machinery, materials and personnel will be on site at any one time, compared with the sequential scenario. There are likely to be more vehicle movements with materials along the cable corridor (e.g. across bailey bridges or similar). There would therefore be a greater likelihood of oils, lubricants and fine sediment reaching water bodies and impacting on their physico-chemistry. It is considered the larger area of land take needed for concurrent construction would cause greater alterations to surface water flows, and therefore a higher chance of contaminants and fine sediment reaching the water bodies.

Control measures

118. To prevent the activities from impacting upon both ‘General’ and ‘Priority substances’ parameters, the Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors CIRIA (C650); and CIRIA – SuDS Manual (CIRIA, 2015) will be applied. This will include the following specific control measures:
    - No discharge to surface watercourses will occur without permission from the Environment Agency;
    - Wheel washers and dust suppression measures to be used as appropriate to prevent the migration of pollutants;
    - Regular cleaning of roads of any construction waste and dirt to be carried out;

- Measures will be employed to intercept and treat run-off from the working corridor, for example by using sandbags, settlement tanks and lagoons. After treatment, discharge of any waters will be carried out so as to minimise physical impacts on channel morphology;
- A Pollution Prevention Plan (PPP) will be developed and will include details of an emergency spill procedures. Good practice guidance detailed in the Environment Agency's Pollution Prevention Guidance (PPG) notes (including PPG01, PPG05, PPG08 and PPG21) will be followed where appropriate;
- Oil, chemicals and other potentially harmful liquids will be handled in accordance with The Control of Pollution (Oil Storage) (England) Regulations 2001, refuelling of machinery would be undertaken within designated areas where spillages can be easily contained. Machinery would be routinely checked to ensure it is in good working condition; and any tanks and associated pipe work containing oils and fuels would be double skinned and be provided with intermediate leak detection equipment;
- Areas at risk of spillage, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils and chemicals) will be bunded and carefully sited to minimise the risk of hazardous substances entering the drainage system or the local watercourses;
- All plant machinery and vehicles will be maintained in a good condition to reduce the risk of fuel leaks;
- Post-construction, the working area will be reinstated to pre-existing condition as far as reasonably practical in line with DEFRA 2009 Construction Code of Practice for the Sustainable Use of Soils on Construction Sites PB13298 (Co10); and
- Foul drainage will be collected through a mains connection to existing local authority sewer system if available or septic tank located within the project boundary. The specific approach will be determined during detailed design with consideration for the availability of mains connection and the number of visiting hours for site attendees during operation.

119. Following implementation of the control measures set out, the construction activities will have minimal impacts on the physico-chemical elements of the water bodies. There will be therefore very low risk of deterioration in water body status or the prevention of achieving GEP or GES in the water bodies.

Operational Activities

120. Any routine maintenance along the cable corridor and at the onshore substation that is in proximity to the water bodies, has potential to impact upon the physico-chemistry quality elements. This risk is primarily from maintenance vehicles and the potential for lubricants and oils to runoff into the water bodies.

Operation of DEP and SEP in Isolation or Together

121. The extent of the impact to physico-chemistry is likely to be dependent on the area of permanent infrastructure (onshore cable corridor, onshore substation and permanent access roads) and the frequency of operational activities within each WFD catchment during operation. For the substation, if DEP and SEP were built together, the substation operational compound would be 3ha larger than if DEP and SEP were constructed in isolation. Conversion of 3ha more arable land to hard-standing ground, could lead to greater changes to surface water drainage pathways and increased runoff of contaminants.

Control measures

122. To ensure deterioration in status is prevented, the following operational control measures will be in place:

- PPP will be developed for operational activities, which will include details of emergency spill procedures.
- All machinery and vehicles used for operational maintenance activities will be maintained in a good condition to reduce the risk of fuel leaks.

123. With these control measures in place, the onshore operational activities will have minimal impacts on the physico-chemistry elements of the WFD water bodies. There will be very low risk of deterioration in water body status or the prevention of achieving GEP or GES.

20.1.6.2.3 *Biological (Aquatic Flora, Benthic Invertebrates, Fish)*

Construction Activities

124. The construction activities could impact on aquatic flora, benthic invertebrates and fish fauna based on potential impacts to the hydromorphology and physico-chemistry quality elements. Increased fine sediment in the water body could smother bed habitats, reducing light penetration and dissolved oxygen. Additionally, changes to physico-chemistry could lead to loss or modification of in-channel and riparian habitats. This disturbance would limit the communities of all three biological parameters.

125. During construction the presence of temporary culverts and use of open cut trenching methods across ordinary watercourses could increase conveyance of pollutants and fine sediment to the downstream WFD water body, impacting on species and habitat populations.

126. However, as shown in **Table 0-10** there are a low number of multiple trenched crossings required within each WFD water body catchment. It is therefore likely that impacts at Ordinary Watercourses, will not have a significant or permanent cumulative biological impact on any WFD water body.

Construction of DEP or SEP in Isolation or Together

127. If DEP and SEP were completed concurrently, there would be a greater area of disturbed land at any one time and therefore a higher supply of fine sediment that could potentially runoff into each water body. Although, sequential construction would be the longest form of construction, pressures on biology would be reduced due to reinstatement of exposed land following construction of the first project. Additionally, there are likely to be more vehicle movements with materials along the cable corridor (e.g. crossing Bailey bridges or similar). There would therefore be a greater chance of oils, lubricants and fine sediment reaching water bodies and impacting on their physico-chemistry.

Control measures

128. Given the proposed control measures that will be implemented to prevent construction impacts to hydromorphology and physico-chemistry, these measures will indirectly reduce impacts to biological quality elements, preventing contaminants and fine sediment production from reaching the water bodies and causing risk of deterioration.

Operational Activities

129. The potential risk of contaminant spills from maintenance vehicles would impact on the hydromorphology and physico-chemistry of the water bodies which will ultimately impact upon the supporting biological communities of aquatic flora, benthic invertebrates and fish fauna.

Operation of DEP or SEP in Isolation or Together

130. The extent of the impact to biological elements is likely to be dependent on the area of permanent infrastructure (onshore cable corridor, onshore substation and permanent access roads) and the frequency of operational activities within each WFD catchment during operation. For the substation, If DEP and SEP were built together, the operational compound would be 3ha larger than if DEP and SEP were constructed in isolation. Conversion of 3ha more arable land to hard-standing ground, could lead to greater changes to surface water drainage pathways and increased runoff.
131. The extent of the impact to biological elements is likely to be dependent on the area of permanent infrastructure (onshore cable corridor, onshore substation and permanent access roads) and the frequency of operational activities within each WFD catchment during operation.

Control measures

132. Given the proposed control measures that will be implemented to prevent operational impacts to hydromorphology and physico-chemistry, these measures will indirectly reduce impacts to biological quality elements, preventing contaminants and fine sediment production from reaching the water bodies and causing risk of deterioration.

20.1.6.3 Groundwater quality (GWDTEs, Deterioration in Water Quality, Increasing pollution concentrations)

20.1.6.3.1 *Construction Activities*

133. The use of trenchless crossing techniques will help to avoid any direct impact on the WFD river water bodies, however there is a risk that excavations to facilitate trenchless crossings, could potentially introduce contaminants to the North Norfolk Chalk and Broadland Rivers Chalk and Crag groundwater bodies. Accidental release of lubricants, fuels and oils from construction machinery could occur as a result of spillages, leakage from vehicle storage areas and direct release from construction machinery working directly in or adjacent to water bodies. If not prevented, these contaminants could enter connected groundwaters through run-off. An increase in groundwater contaminant concentrations could subsequently lead to an overall deterioration in groundwater quality. These contaminants could then be transferred to GWDTEs via subsurface flow routes.

20.1.6.3.2 Construction of DEP or SEP in Isolation or Together

134. It is considered that construction of DEP and SEP concurrently is likely to lead to a greater impact on the two groundwater bodies within the PEIR boundary. A greater proportion of land disturbed at any one time to facilitate installation of both cables would place the highest pressure on both groundwater bodies. Under the sequential scenario, land exposed for the first project would be reinstated prior to commencement of the second project. This would reduce the potential for a deterioration in groundwater quality with less construction activity occurring at one time.

20.1.6.3.3 *Control measures*

135. To mitigate against these potential impacts and to prevent deterioration in water body status, the following groundwater control measures will be implemented during construction phase:

- Use of best practice techniques and due diligence regarding the potential for pollution throughout all construction, operation and maintenance, and decommissioning activities. This provides a robust approach to managing pollution incidents on site to reduce the probability and impact of leaks and spills.
- Ground investigations and a hydrogeological risk assessment meeting the requirements of Groundwater Protection Guides (Environment Agency, 2017), will be undertaken at each HDD crossing location.
- A written scheme dealing with contamination of any land and groundwater will be submitted and approved by the Local Planning Authority before construction activities commence.
- No works will be undertaken in SPZ 1 areas to ensure there is no direct impact on sensitive potable abstractions.

20.1.6.4 Coastal WFD water bodies

20.1.6.4.1 *Biology quality elements*

136. The Norfolk East water body contains a chalk reef feature that is a higher sensitivity habitat which is designated under the Cromer Shoal Chalk Beds MCZ. The Norfolk North Waterbody contains a chalk reef feature however it is outside the DEP and SEP offshore export cable corridor and the Cromer Shoal Chalk Beds MCZ, and is more then 500m away from the DEP and SEP offshore export cable.

137. The DEP and SEP subtidal HDD exit point is 1000m offshore, and is approximately 300m further offshore then the chalk reef feature within the Norfolk East waterbody. There will be no cable installation or cable protection inshore of the HDD exit point and therefore there will be no direct overlap between cable installation and cable protection with the chalk reef feature.

138. The export cable installation will cause increased suspended sediment concentrations and sediment deposition, which has the potential to cause in-direct impacts to the chalk reef feature. **Chapter 8 Marine Geology Oceanography and Marine and Physical Processes** of the PEIR states that although suspended sediment concentrations will be elevated due to cable installation and the HDD exit trench, they are likely to be lower than concentrations that would develop in the water column during storm conditions.

139. **Chapter 8 Marine Geology Oceanography and Marine and Physical Processes** of the PEIR also determined that sediment transport is tidally driven where the cable installation and HDD exit trench installation will occur. Tidal ellipses move sediment in a south easterly to north westerly direction which is parallel to the coastline and net sediment transport is south easterly. Therefore, any increased suspended sediments are not expected to be transported in the direction of the of chalk reef feature inshore of the HDD exit point.

140. Given the low increases of suspended sediments predicted, which would be lower than certain natural conditions, and given the direction of sediment transport is not expected to transport increases in suspended sediment inshore, no impacts are expected to the chalk reef higher sensitivity habitats of the Norfolk East or Norfolk North coastal water bodies.

20.1.6.5 Protected Areas

20.1.6.5.1 *Nitrate Vulnerable Zones*

141. The assessment shows that the onshore cable corridor will pass through numerous NVZ boundaries. Impacts from foul drainage from construction and operational welfare facilities will be tankered off site for treatment preventing impacts to NVZs. The construction site drainage systems will also prevent increasing nitrate volumes from entering the surface drainage network following soil excavations. The construction and operation activities are therefore unlikely to significantly alter nitrate concentrations in each NVZ.

20.1.6.5.2 *Drinking Water Protected Areas*

142. The WFD scoping assessment found three Drinking Water Protected Areas (DwPAs) potentially at risk within the onshore WFD scoping area. Given the control measures identified in Stage 3, which will prevent input of contaminants and foul water to river water and groundwater bodies, there will be no mechanism for impact on each DwPA.

20.1.6.5.3 *Urban Waste Water Treatment Directive*

143. The WFD scoping assessment found there to be two protected areas potentially at risk within the onshore WFD scoping area. Given the control measures identified in Stage 3, which will prevent input of contaminants and foul water to river water and groundwater bodies, there will be no mechanism for impact on each DwPA.

20.1.7 Stage 4: Summary of Assessment and Mitigation Requirements

144. The results of the WFD compliance assessment process are summarised in **Table 0-11**.

Table 0-11: Summary of WFD Compliance Assessment

Waters Water body	Stage 2	Stage 3	Deterioration in status	Prevent objectives being achieved
Norfolk East (Coastal);	✓	✓	×	×
Norfolk North (Coastal);	✓	✓	×	×
Blakeney Spit Lagoon (Coastal);	×	×	×	×
Glaven (River);	✓	✓	×	×
Scarrow Beck (River);	✓	×	×	×
Bure (u/s confluence with Scarrow Beck) (River);	✓	✓	×	×
Bure (Scarrow Beck to Horstead Mill) (River);	×	×	×	×
Blackwater Drain (Wensum) (River);	✓	×	×	×
Mermaid Stream (River);	✓	×	×	×
Swannington Beck (River);	✓	✓	×	×
Hevingham Watercourse (River);	×	×	×	×
Wensum US Norwich (River);	✓	✓	×	×

Waters Water body	Stage 2	Stage 3	Deterioration in status	Prevent objectives being achieved
Wensum DS Norwich (River);	×	×	×	×
Tud (River);	✓	✓	×	×
Yare (u/s confluence with Tiffey – Lower) (River);	✓	✓	×	×
Yare (Tiffey to Wensum) (River);	✓	✓	×	×
Tiffey (River);	✓	✓	×	×
Intwood Stream (River);	✓	✓	×	×
Tas (Tasburgh to R. Yare) (River);	✓	×	×	×
Chet (River);	×	×	×	×
Costessey Pits (Lake);	×	×	×	×
North Norfolk Chalk (Groundwater);	✓	✓	×	×
Broadland Rivers Chalk and Crag (Groundwater); and	✓	✓	×	×
Cam and Ely Ouse Chalk (Groundwater).	×	×	×	×

145. Following the implementation of the outlined control measures during construction and operation, there will be no activities that have the potential to cause non-temporary effects (i.e. effects that are not permanent, but could last for the duration or beyond the current River Basin Planning Cycle) to the status of any of the river and groundwater bodies assessed. Construction and operation will also not prevent water body status objectives being achieved in the future. DEP and SEP are therefore considered to be compliant with the requirements of WFD.

20.1.8 References

Planning Inspectorate (2017): Advice Note 18: The Water Framework Directive
Environment Agency (2020). Catchment Data Explorer, [Online], Available: http://environment.data.gov.uk/catchment-planning/ [6th October 2020]
Environment Agency (2017) Clearing the waters for all. Available: https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters
Environment Agency (2016c) Guidance on WFD deterioration and risk to the status objectives of river water bodies.
Environment Agency (2016b). Protecting and improving the water environment – Water Framework Directive compliance of physical works in rivers. Doc No. 488_10.
Environment Agency (2017) Water Framework Directive Assessment: Estuarine and Coastal Waters https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters

Annex 1 Coastal Water Body information

Parameter	Detail
WFD water body name	Norfolk East
Water body ID	GB650503520003
River basin district name	Anglian
Water body type (estuarine or coastal)	Coastal
Water body total area (km^2)	211.1677
Overall water body status (2015)	Moderate
Ecological status	Moderate
Chemical status	Good
Target water body status and deadline	Moderate by 2015
Hydromorphology status of water body	Not assessed
Heavily modified water body and for what use	Yes heavily modified. Coastal Protection and Flood Protection
Higher sensitivity habitats present	Chalk reef (2893.73ha)(also designated as Cromer Shoal Chalk MCZ), Polychaete reef (40.09ha). See **Figure 1** for habitats within the vicinity of the activities
Lower sensitivity habitats present	Cobbles, gravel and shingle (12971.88ha) Intertidal soft sediment (718.96ha), Subtidal rocky reef (2019.66ha) , Subtidal soft sediments (7840.13ha). See **Figure 2** for habitats within the vicinity of the activities
Phytoplankton status	Good
History of harmful algae	Not monitored
WFD protected areas within 2km	The Wash and North Norfolk Coast SAC, North Norfolk Coast SAC, North Norfolk Coast SPA, Greater Wash SPA **(Figure 3)**

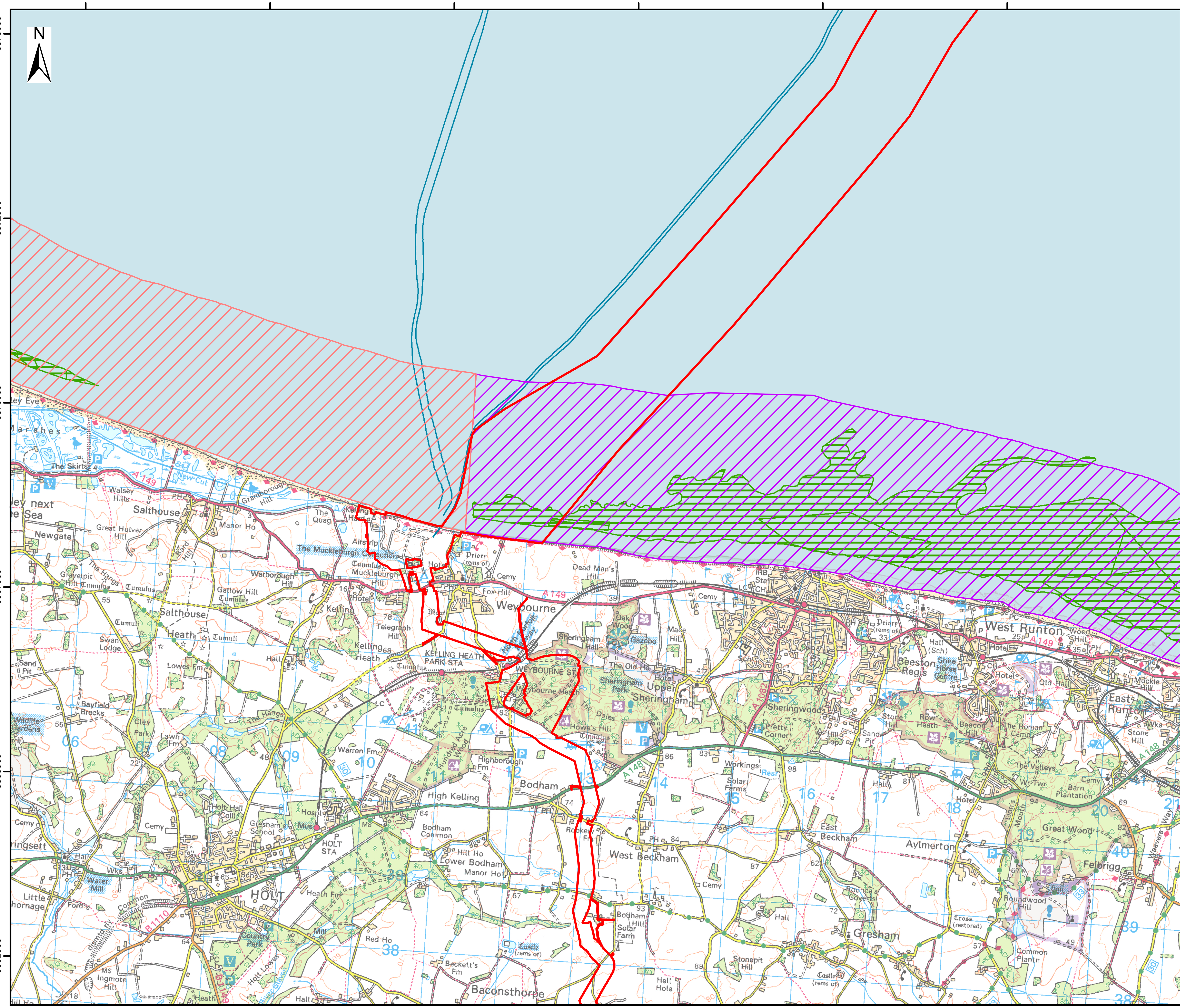
Parameter	Detail
WFD water body name	Norfolk North
Water body ID	GB640503300000
River basin district name	Anglian
Water body type (estuarine or coastal)	Coastal

Parameter	Detail
Water body total area (km^2)	167.118
Overall water body status (2015)	Moderate
Ecological status	Moderate
Chemical status	Fail
Target water body status and deadline	Moderate by 2015
Hydromorphology status of water body	Not assessed
Heavily modified water body and for what use	Yes – Flood protection use, Coast protection use
Higher sensitivity habitats present	Chalk reef (6430.65ha); polychaete reef (8.78ha), mussel beds (10.77ha), saltmarsh (319.46ha). See **Figure 1**.
Lower sensitivity habitats present	Cobbles, gravel and shingle (193.00ha); Intertidal soft sediment (3281.88); Subtidal soft sediments (37098.82ha); Subtidal rocky reef (0.16ha). See **Figure 2**.
Phytoplankton status	Moderate
History of harmful algae	Not monitored
WFD protected areas within 2km	The Wash and North Norfolk Coast SAC, North Norfolk Coast SPA, Greater Wash SPA **(Figure 3).**

Figure 1 Higher sensitivity habitats

Figure 2 Lower sensitivity habitats

Figure 3 Protected areas within 2km



Sheringham Shoal and Dudgeon Extension Projects

Figure 1

Higher sensitivity habitat within Norfolk East and Norfolk North WFD water body

Legend:

- PEIR Boundary
- Existing Offshore Wind Farm Export Cable

WFD Coastal Water Bodies

- Norfolk East
- Norfolk North

WFD Habitats: Higher Sensitivity

- Peat and clay exposures (HOCI 15)
- Subtidal chalk (HOCI 20)

Data Sources: Environment Agency, 2020; Emodnet, 2020; © Royal HaskoningDHV 2020

Base Map: © British Crown and OceanWise, 2021. All rights reserved. License No. EMS-EK001-627782. Not to be used for Navigation; Crown copyright and database rights 2020, Ordnance Survey 0100031673; © OpenStreetMap (and)

Document No: PB8164-RHD-ZZ-OF-DR-Z-0100

Co-ordinate System: WGS 1984 UTM Zone 31N

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Report:

WFD Compliance Assessment

Preliminary Environmental Information Report (PEIR)

Royal HaskoningDHV Enhancing Society Together

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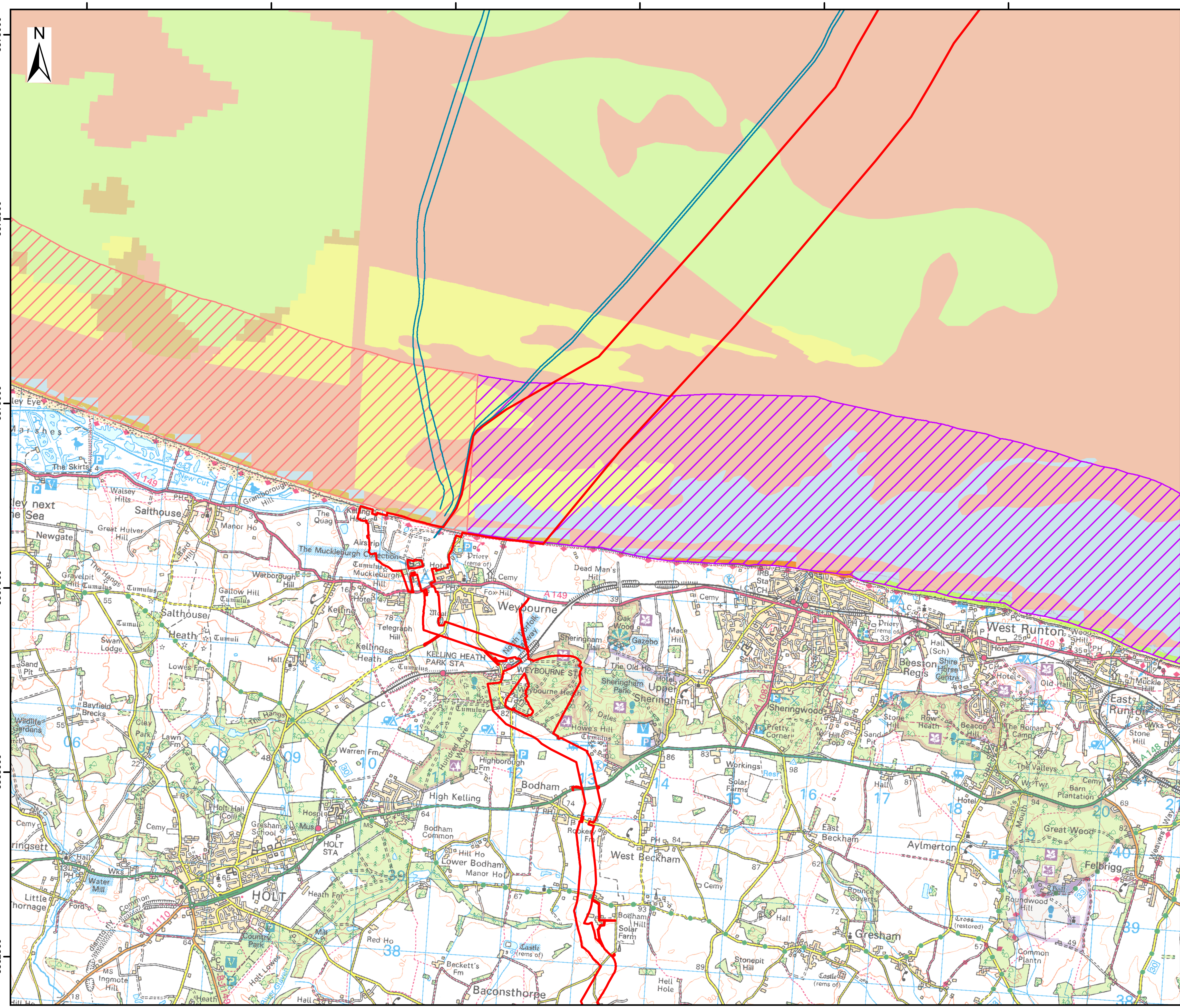

Sheringham Shoal and Dudgeon Extension Projects

Figure 2

Lower sensitivity habitat within Norfolk East and Norfolk North WFD water body

Legend:

- PEIR Boundary
- Existing Offshore Wind Farm Export Cable

WFD Coastal Water Bodies

- Norfolk East
- Norfolk North

WFD Habitats: Lower Sensitivity

- Intertidal coarse sediment (A2.1)
- Intertidal mud (A2.3)
- Intertidal mixed sediments (A2.4)
- Subtidal coarse sediment (A5.1)
- Subtidal sand (A5.2)
- Subtidal mud (A5.3)
- Subtidal mixed sediments (A5.4)

Data Sources: Environment Agency, 2020; Emodnet, 2020; © Royal HaskoningDHV 2020.

Document No: PB8164-RHD-ZZ-OF-DR-Z-0101

Co-ordinate System: WGS 1984 UTM Zone 31N

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Report:

WFD Compliance Assessment

Preliminary Environmental Information Report (PEIR)

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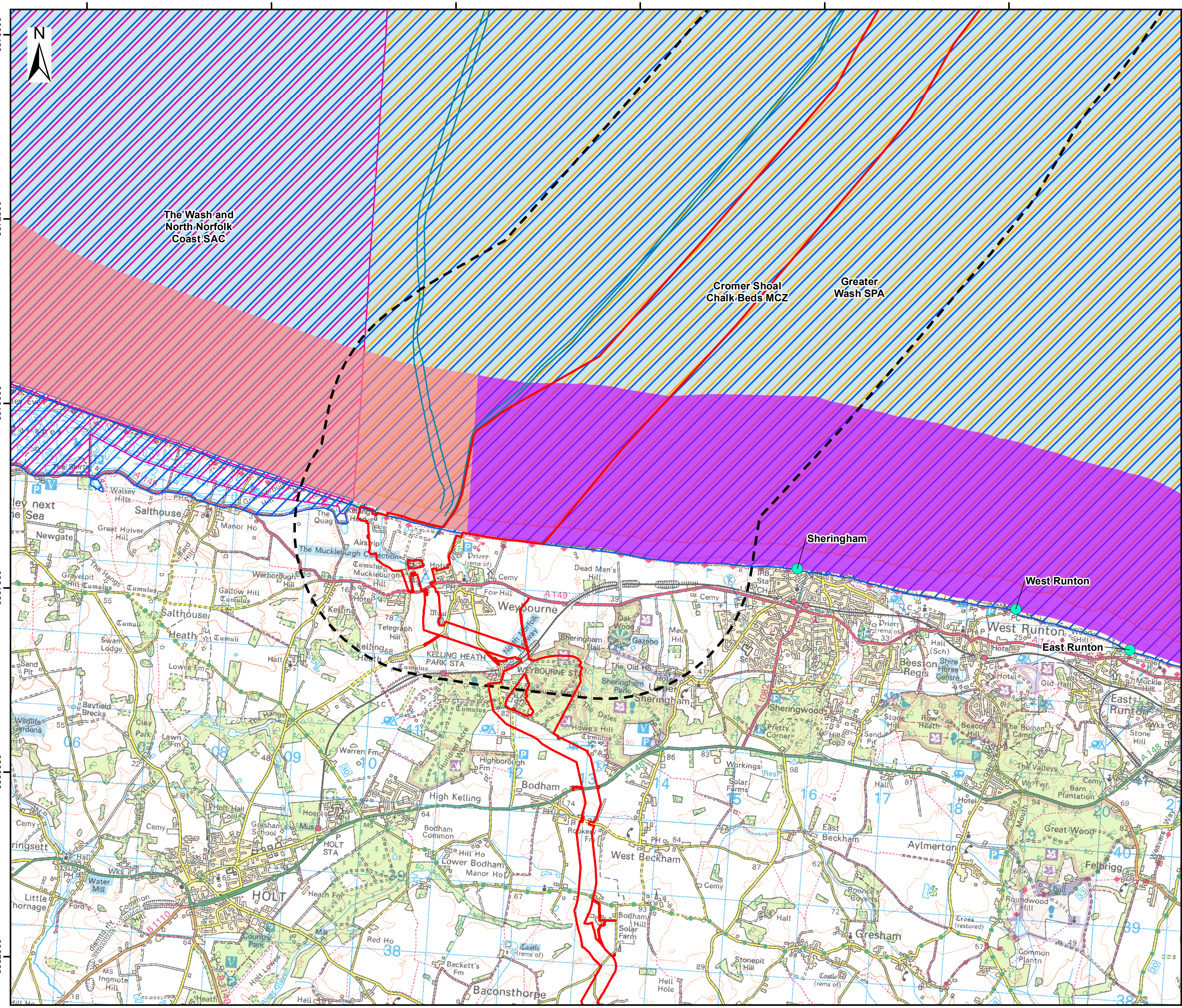

Sheringham Shoal and Dudgeon Extension Projects

Figure 3

Protected Areas within 2km of Landfall and the Offshore Cable Corridor

Legend:
- PEIR Boundary
- Existing Offshore Wind Farm Export Cable
- Offshore Cable Corridor 2km Buffer

WFD Coastal Water Bodies
- Norfolk East
- Norfolk North

Designated sites
- Special Protection Areas (SPA)
- Special Area of Conservation (SAC)
- Marine Conservation Zones (MCZ)

Bathing Water Monitoring Location Classification
- Excellent

Data Sources: Environment Agency, 2020, Natural England, 2020; JNCC, 2020 © Royal HaskoningDHV 2020.
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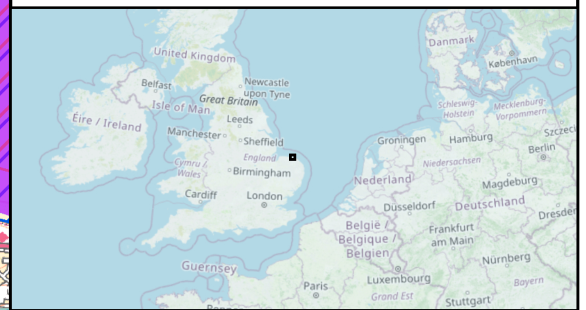

Document No: PB8164-RHD-ZZ-OF-DR-Z-0099

Co-ordinate System: WGS 1984 UTM Zone 31N

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Report:

WFD Compliance Assessment
Preliminary Environmental Information Report (PEIR)

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Annex 2 Scoping of Coastal Water Bodies for Construction and Operational Activities

Construction Activities: Subtidal HDD exit point and Offshore Cable Construction

WFD	Scoping question	Yes	No	Notes
Norfolk East (GB650503520003)				
Hydromorphology	Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status		✓	The water body is not at high status.
	Could significantly impact the hydromorphology of any water body		✓	No, the export cables would be brought ashore and jointed to the onshore cables within transition pits using horizontal directional drilling (HDD) and duct installation. The HDD would then be drilled from an onshore construction compound and will exit the seabed in an exit pit approximately 1km (0.5 nautical miles) from the coast. Given the use of HDD, effects inshore are not predicted. With respect to cable installation between the transition and the boundary of the WFD water body, a number of techniques could potentially be used but cables would be installed and buried where possible to ensure that the cables are protected from damage by external factors. As a result, whilst there would be temporary effects on suspended solid concentrations, these are predicted to be small scale and localised to the cabling activity. Additionally once the cables are installed, all effects would cease (see Chapter 8 Marine Geology, Oceanography and Physical Processes for further detail).

WFD	Scoping question	Yes	No	Notes
	Is in a water body that is heavily modified for the same use as your activity		✓	No – the water body is heavily modified for coastal and flood protection.
Biology (Habitats)	Is the footprint of the activity $0.5km^2$ or larger		✓	The export cable corridor currently covers an area of $4.1557km^2$ in the WFD water body which is larger than $0.5km^2$. However, the actual cable footprint of disturbance is likely to be in the region of $0.011km^2$ (calculated using a trench width of 3m for 852m per cable) once cable locations have been confirmed via geophysical survey work. The HDD exit pit would also be within the WFD water body. The footprint of disturbance due to the HDD exit pit trench would be $978m^2$ for DEP in isolation or $1356m^2$ for DEP and SEP together. Taking both the export cable trench and HDD exit trench, the activity is $0.004km^2$ and smaller than $0.5km^2$.
	Is the area of either activity greater than 1% or more of the water body's area		✓	The export cable corridor currently covers an area of $4.1557km^2$ in the WFD water body. However, the actual cable footprint of disturbance is likely to be in the region of $0.011km^2$ (calculated using a trench width of 3m for 852m per cable) once cable locations have been confirmed via geophysical survey work. The HDD exit pit would also be within the WFD water body. The footprint of disturbance due to the HDD exit pit trench would be $978m^2$ for DEP in isolation or $1356m^2$ for DEP and SEP together. The export cable and HDD exit point cable protection equates to 0.0018% of the WFD. If multiplied by 1.5 as required by the Clearing the Waters for All guidance, the area still does not exceed 1% of the WFD water body.

WFD	Scoping question	Yes	No	Notes
	Within 500m of any higher sensitivity habitat	✓		Yes, the offshore export cable will pass through chalk reef habitat (designated as Cromer Shoal Chalk Beds MCZ).
	1% or more of any lower sensitivity habitat		✓	No. The area to be affected by subtidal HDD exit point and cable installation is likely to very small given that the first 1000m would be installed using HDD. The habitat potentially at risk is subtidal coarse sediment. Given there is 130km^2 of this habitat within the WFD water body and that material would be used as backfill to create a level seabed where possible, the cable installation is unlikely to impact on greater than 1% of this WFD water body.
Biology (Fish)	Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary		✓✓	No. The project is not located within or close to a transitional water body. There will be an increase in suspended sediment concentrations as a result of the transition pit works associated with subtidal HDD exit point and cable burial techniques to facilitate cable installation however this effect will be short-lived and likely to be within natural baselines already experienced in the water body (see Chapter 8 Marine Geology, Oceanography and Physical Processes for further detail). Effects on fish are therefore not predicted (see Chapter 11 Fish and Shellfish Ecology).
	Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)			No. The area of construction work within the water body would be small scale and would occur in an open area of coastline. This would therefore not create a physical barrier to fish.

WFD	Scoping question	Yes	No	Notes
				These activities would also have minimal impact to water and sediment quality and would not affect fish behavior through changes in water chemistry. Changes to morphology from cable installation would be minimal and temporary, resulting in no permanent change to depth or flow.
	Could cause entrainment or impingement of fish		✓	No risk from these activities.
Water quality	Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)		✓	See summary of conclusions in the Fish section above.
	Is in a water body with a phytoplankton status of moderate, poor or bad		✓	No – status is good
	Is in a water body with a history of harmful algae		✓	No
	Does the activity use or release chemicals? If so, are they on the Environmental Quality Standards Directive (EQSD) list		✓	No chemicals to be released during either activity.
	Will the activity disturb sediment with contaminants above Cefas Action Level 1		✓	No. All sediment samples located in or near to the water body did not record any exceedances of Action Level 1 (Chapter 9 Marine and Sediment Water Quality).

WFD	Scoping question	Yes	No	Notes
Protected areas	Is the activity within 2km of any WFD protected area		✓	Yes. However, whilst European Designated sites are located within 2km of the cable corridor, further assessment is not undertaken here as the effects are considered within the accompanying Habitats Regulations Assessment (HRA) to the PEIR (see **Habitat Regulation Assessment**)
Invasive non-native species	Could the activity introduce or spread INNS		✓	Any of the proposed construction and operation activities which use equipment that has been used on another site where INNS species are located could potentially be at risk of spreading INNS. Contractors responsible for the construction and operation of DEP and SEP will be required to undertake a biosecurity risk assessment and a management plan put in place to avoid potentially facilitating the spread of non-native species during construction.
Norfolk North (GB640503300000)				
Hydromorphology	Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status		✓	The water body is not at high status.
	Could significantly impact the hydromorphology of any water body		✓	No, the export cables would be brought ashore and jointed to the onshore cables within transition pits using horizontal directional drilling (HDD) and duct installation. The HDD would then be drilled from an onshore construction compound and will exit the seabed in an exit pit about 1,000m from the coast. Given the very small overlap with

WFD	Scoping question	Yes	No	Notes
				this WFD water body inshore where HDD would occur, effects are not predicted.
	Is in a water body that is heavily modified for the same use as your activity		✓	No – the water body is heavily modified for coastal and flood protection.
Biology (Habitats)	Is the footprint of the activity 0.5km^2 or larger		✓	No, the footprint of the cable corridor in this water body is 0.14m^2.
	Is the area of either activity greater than 1% or more of the water body's area		✓	No, the footprint of the cable corridor in this water body is 0.14m^2 which equates to 0.08% of the WFD water body.
	Within 500m of any higher sensitivity habitat	✓		Yes, the offshore cable will pass through chalk reef habitat. (designated as Cromer Shoal Chalk Beds MCZ).
	1% or more of any lower sensitivity habitat		✓	No. The cable corridor area of overlap within this WFD water is very small and installation is likely to be via HDD inshore. As a result, effects are not predicted.
Biology (Fish)	Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary		✓	No. The project is not located within or close to a transitional water body. There will be an increase in suspended sediment concentrations as a result of the transition pit works associated with the subtidal HDD exit point, and cable burial techniques to facilitate cable installation. This effect will be short-lived and likely to be within natural baselines

WFD	Scoping question	Yes	No	Notes
	Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)			already experienced in the water body (see Chapter 8 Marine Geology, Oceanography and Physical Processes for further detail). Effects on fish are therefore not predicted (see Chapter 11 Fish and Shellfish Ecology).
	Could cause entrainment or impingement of fish		✓	No risk
Water quality	Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)		✓	See summary of conclusions in the Fish section above.
	Is in a water body with a phytoplankton status of moderate, poor or bad		✓	Whilst the status is moderate, the proposed activities are unlikely to impact on phytoplankton given the temporary and small scale effects predicted on water quality (see Chapter 9 Marine Water and Sediment Quality) and use of HDD in the inshore.
	Is in a water body with a history of harmful algae		✓	No
	Does the activity use or release chemicals? If so are they on the Environmental Quality Standards Directive (EQSD) list		✓	No chemicals to be released during either activity.

WFD	Scoping question	Yes	No	Notes
	Will the activity disturb sediment with contaminants above Cefas Action Level 1		✓	No. All sediment samples located in or near to the water body did not record any exceedances of Action Level 1 (Chapter 9 Marine and Sediment Water Quality).
Protected areas	Is the activity within 2km of any WFD protected area		✓	Yes. However, whilst European Designated sites are located within 2km of the cable corridor, further assessment is not undertaken here as the effects are considered within the accompanying Habitats Regulations Assessment (HRA) to the PEIR (see **Habitat Regulation Assessment**)
Invasive non-native species	Could the activity introduce or spread INNS		✓	Any of the proposed construction and operation activities which use equipment that has been used on another site where INNS species are located could potentially be at risk of spreading INNS. Contractors responsible for the construction and operation of DEP and SEP will be required to undertake a biosecurity risk assessment and a management plan put in place to avoid potentially facilitating the spread of non-native species during construction.

Operational Activity: Cable Protection

WFD	Scoping question	Yes	No	Notes
Norfolk East (GB650503520003)				
Hydromorphology	Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status		✓	The water body is not at high status.
	Could significantly impact the hydromorphology of any water body		✓	Estimates are for 100m of cable protection for each cable in the Marine Conservation Zone (MCZ) so 2x100m for both projects, with a width of 6m equating to an area of 600m^2 for DEP or SEP in isolation and 1,200m^2 for DEP and SEP together. The HDD exit pit will also require cable protection equating to an area of 300m^2 for DEP or SEP in isolation and 600m^2 for DEP and SEP together. Therefore, there will be a total of 900m^2 of cable protection in the MCZ for DEP or SEP and 1,800m^2 for DEP and SEP together. The MCZ boundary however stretches further offshore than the 1 nautical mile therefore the area requiring cable protection within the WFD water body is likely to be considerably less. The main effects identified in Chapter 8 Marine Geology, Oceanography and Physical Processes primarily relate to the potential for interruption of sediment transport processes and the footprint they present on the sea bed. In recognition of these potential effects, considerable effort has been given to selecting an appropriate export cable route within the offshore cable corridor to minimise

WFD	Scoping question	Yes	No	Notes
				sediment transport effects as far as practicably achievable. Additionally, a commitment has also been made to install the export cable using HDD techniques, thus minimising disturbance and avoiding the need for cable protection in the intertidal and shallowest nearshore zones. It is likely that the HDD pop-out location would be in water depths of approximately 9-10m below LAT. Hence, there would be no interruption to sediment transport pathways close to the coast because the export cables would be buried. Significant effects on hydromorphological parameters of the WFD water body are therefore not predicted.
	Is in a water body that is heavily modified for the same use as your activity		✓	No – the water body is heavily modified for coastal and flood protection.
Biology (Habitats)	Is the footprint of the activity $0.5km^2$ or larger		✓	As outlined above, estimates are for 100m of cable protection for each cable in the MCZ so 2x100m for both projects equating to an area of $600m^2$ for DEP or SEP in isolation and $1,200m^2$ for DEP and SEP together. The HDD exit pit will also require cable protection equating to an area of $300m^2$ for DEP or SEP in isolation and $600m^2$ for DEP and SEP together. Therefore, there will be a total of $900m^2$ of cable protection in the MCZ for DEP or SEP and $1,800m^2$ for DEP and SEP together. The MCZ boundary however stretches further offshore than the 1 nautical mile therefore the area requiring cable protection within the WFD water body is likely to be considerably less.

WFD	Scoping question	Yes	No	Notes
	Is the area of either activity greater than 1% or more of the water body's area		✓	The WFD water body area is 4.16km^2. The area of cable protection for both DEP and SEP together is 0.0018km^2 which equates to 0.001% of the WFD water body
	Within 500m of any higher sensitivity habitat	✓		Yes, cable protection could be located within 500m of the high sensitivity Chalk reef habitat.
	1% or more of any lower sensitivity habitat		✓	No, as outlined above, the area to be affected is very small and therefore unlikely to represent 1% or more of lower sensitivity habitats located within the WFD water body.
Biology (Fish)	Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary		✓	No. DEP and SEP is not located within or close to a transitional water body. Given the relatively small scale effects outlined in hydromorphology, effects on environmental parameters that could impact on fish are not predicted.
	Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)			
	Could cause entrainment or impingement of fish		✓	No risk identified.
Water quality	Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)		✓	No - the presence of cable protection will not impact on water quality.

WFD	Scoping question	Yes	No	Notes
	Is in a water body with a phytoplankton status of moderate, poor or bad		✓	No – status is good.
	Is in a water body with a history of harmful algae		✓	No
	Does the activity use or release chemicals? If so are they on the Environmental Quality Standards Directive (EQSD) list		✓	No chemicals are to be released.
	Will the activity disturb sediment with contaminants above Cefas Action Level 1			No. The presence of cable protection would not significantly disturb sediments.
Protected areas	Is the activity within 2km of any WFD protected area		✓	Whilst there are European Designated sites located within 2km of the cable corridor, further assessment is not undertaken here as the effects are considered within the accompanying Habitats Regulations Assessment (HRA) to the PEIR (see **Habitat Regulation Assessment**)
Invasive non-native species	Could the activity introduce or spread INNS		✓	To be controlled via measures to ensure INNS are not introduced or spread within the marine environment.
Norfolk North (GB640503300000)				
Hydromorphology	Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status		✓	The water body is not at high status.

WFD	Scoping question	Yes	No	Notes
	Could significantly impact the hydromorphology of any water body		✓	Cable protection unlikely to be required in this water body given the very small overlap with the cable corridor.
	Is in a water body that is heavily modified for the same use as your activity		✓	No – the water body is heavily modified for coastal and flood protection.
Biology (Habitats)	Is the footprint of the activity 0.5km^2 or larger		✓	Cable protection unlikely to be required in this water body given the very small overlap with the cable corridor.
	Is the area of either activity greater than 1% or more of the water body's area			
	Within 500m of any higher sensitivity habitat			
	1% or more of any lower sensitivity habitat			
Biology (Fish)	Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary		✓	Cable protection unlikely to be required in this water body given the very small overlap with the cable corridor.
	Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)			

WFD	Scoping question	Yes	No	Notes
	Could cause entrainment or impingement of fish			
Water quality	Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)		✓	No -the presence of cable protection will not impact on water quality.
	Is in a water body with a phytoplankton status of moderate, poor or bad		✓	No – status is good.
	Is in a water body with a history of harmful algae		✓	No
	Does the activity use or release chemicals? If so are they on the Environmental Quality Standards Directive (EQSD) list		✓	No chemicals are to be released.
	Will the activity disturb sediment with contaminants above Cefas Action Level 1		✓	No - the presence of cable protection will not impact on water quality.
Protected areas	Is the activity within 2km of any WFD protected area		✓	Whilst there are European Designated sites located within 2km of the cable corridor, further assessment is not undertaken here as the effects are considered within the accompanying Habitats Regulations Assessment (HRA) to the PEIR (see **Habitat Regulation Assessment**).

WFD	Scoping question	Yes	No	Notes
Invasive non-native species	Could the activity introduce or spread INNS		✓	Control measures to be put in place.

Annex 3 Scoping of River Water Bodies for Construction and Operational Activities

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Hydrological regime	Could the activity change the volume, energy or distribution of flows in the water body?	Construction	Yes. Ground disturbance for cable trenching (open-cut and HDD) and changes to land use from construction of a haul road, temporary construction areas and an onshore substation could potentially alter the hydrological regime of river water bodies screened into the assessment. Greater impermeable surfaces and disturbed ground could alter surface water drainage pathways throughout each catchment, resulting in changes to volume, energy or distribution of flows. Watercourse crossings) (i.e. bailey bridges or similar to enable haul road construction) could also impact upon flow conveyance and distribution due to disturbance of the banks during construction.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey Intwood Stream

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Hydrological regime	Could the activity change the volume, energy or distribution of flows in the water body?	Operation	The permanent onshore infrastructure could change surface water drainage patterns which has the potential to affect the hydrological regime of nearby WFD water bodies.	

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Morphological conditions	Could the activity change the width, depth, bank conditions, bed substrates and structure of the riparian zone?	Construction	Yes. Ground disturbance for cable trenching (open-cut and HDD) and changes to land use from construction of a haul road, temporary construction areas and an onshore substation are likely to increase fine sediment input into water bodies which could impact on morphology. The installation of temporary watercourse crossings (i.e. bailey bridges or similar to enable haul road construction) could also increase fine sediment input and alter the bank conditions. This impact could alter the morphology of the WFD water bodies along the cable corridor. An increase in surface runoff also has the potential to increase localised scour to the bed and banks.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream •

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Morphological conditions	Could the activity change the width, depth, bank conditions, bed substrates and structure of the riparian zone?	Operation	The permanent onshore infrastructure could change surface water drainage patterns have the potential to affect the morphological conditions of nearby WFD water bodies through increased bed and bank erosion. Morphology of water bodies could also be impacted by increased sediment supply via runoff from any planned or unplanned operational maintenance activities.	

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
River continuity	Could the activity create a permanent barrier to the downstream movement of water and/or sediment, or the upstream movement of fish?	Construction	No. There will be no permanent barriers to river continuity.	None, there is no potential for permanent effects on water body status from this quality element.
River continuity	Could the activity create a permanent barrier to the downstream movement of water and/or sediment, or the upstream movement of fish?	Operation		
Physico -chemical				

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
General	Could the activity change the temperature, pH, oxygenation, salinity or nutrient concentrations in the water body?	Construction	Yes, there is potential for increased sediment supply to the WFD water bodies which could impact on turbidity levels and oxygenation within the water body. There will also be increased risk of contaminant supply to water bodies, from accidental spillage or leakage of fuel oils or lubricants from construction vehicles. This has potential to impact on physico chemistry.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream
		Operation	Yes, maintenance of the onshore cable infrastructure (cable corridor and onshore substation) at operational sites could increase sediment supply to the water bodies. There is also a risk of contaminants and spillage from vehicles during operation.	

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Specific pollutants	Could the activity release dangerous chemicals into the water body?	Construction	Yes. Onshore construction activities could potentially release dangerous chemicals from construction materials (e.g. concrete) and construction machinery (e.g. fuels and lubricants) into river water bodies.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Specific pollutants	Could the activity release dangerous chemicals into the water body?	Operation	Yes. Onshore construction activities could potentially release dangerous chemicals from construction materials (e.g. concrete) and construction machinery (e.g. fuels and lubricants) into river water bodies.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream
Biology				

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Aquatic flora	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of habitats for aquatic plants?	Construction	Yes. Impacts from haul road construction temporary construction compounds and an onshore substation could have potential impacts to morphology and the hydrological regime. Increased fine sediment in the water body could smother bed habitats and reduce light penetration. This could lead to loss or modification of aquatic flora communities. Changes to physico chemistry from proposed onshore area construction activities could also lead to loss or modification of habitats for aquatic plants.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Aquatic flora	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of habitats for aquatic plants?	Operation	Yes. Impacts from operational maintenance activities could have potential impacts to morphology and the hydrological regime. Increased fine sediment via surface runoff to the water body could smother bed habitats and reduce light penetration. This could lead to loss or modification of aquatic flora communities. Changes to physico chemistry from proposed onshore area construction activities could also lead to loss or modification of habitats for aquatic plants.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Benthic invertebrates	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of habitats for aquatic invertebrates?	Construction	Yes. Impacts from haul road construction, temporary construction compounds and an onshore substation could have potential impacts to morphology and the hydrological regime. Increased fine sediment in the water body could smother bed habitats and reduce light penetration. This could lead to the loss or modification of habitats which support benthic invertebrates. Changes to physico-chemistry from onshore area construction activities could also lead to loss or modification of aquatic invertebrate habitat.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Benthic invertebrates	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of habitats for aquatic invertebrates?	Operation	Yes. Impacts from operational maintenance activities could have potential impacts to morphology and the hydrological regime. Increased fine sediment via surface runoff to the water body could smother bed habitats and reduce light penetration. This could lead to loss or modification of aquatic invertebrate communities. Changes to physico chemistry from proposed onshore area construction activities could also lead to loss or modification of habitats for benthic invertebrates.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Fish	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of shelter, feeding and spawning habitats for fish?	Construction	Yes. Impacts from construction of the haul road, temporary construction areas and an onshore substation could have potential impacts to morphology and the hydrological regime. Increased turbidity and alteration of niche habitat could subsequently lead to the loss or modification of shelter, feeding and spawning habitats for fish. Furthermore, potential changes to physico-chemistry could also reduce the capacity of the water body to support feeding and spawning fish.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream

Parameter	Scoping Question	Project Phase	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Fish	Could the activity change the hydromorphology and/or physico-chemistry of the water body, or lead to the direct loss or modification of shelter, feeding and spawning habitats for fish?	Operation	Yes. Impacts from operational maintenance activities could have potential impacts to morphology and the hydrological regime. Increased turbidity and alteration of niche habitat could subsequently lead to the loss or modification of shelter, feeding and spawning habitats for fish. Furthermore, potential changes to physico-chemistry could also reduce the capacity of the water body to support feeding and spawning fish.	The following water bodies can be scoped in for this quality element: • Glaven • Bure (u/s confluence with Scarrow Beck) • Swannington Beck • Wensum US Norwich • Tud • Yare (u/s confluence with Tiffey – Lower) • Yare (Tiffey to Wensum) • Tiffey • Intwood Stream

Annex 4 Scoping of Groundwater Water Bodies for Construction and Operational Activities

Parameter	Scoping Question	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Groundwater quantity			

Parameter	Scoping Question	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Groundwater dependent terrestrial ecosystems (GWDTEs)	Could the activity change groundwater levels, affecting GWDTEs or dependent surface water features?	During construction of the onshore cable corridor, the subsurface HDD method used to traverse watercourses, could have localized changes to groundwater flows. There may be local changes to infiltration rates into the groundwater bodies due to installation of buried infrastructure causing alterations to subsurface flow routes. However, these changes are not expected to have permanent impacts on GEDTEs or dependent surface water features.	None due to potential for only minimal, localized impacts. The size of the cable ducting in comparison to the size of the groundwater bodies which underlie DEP and SEP will result in an insignificant impact upon infiltration rates, groundwater flows, subsurface flow routes and alterations in the distribution of groundwater
Saline intrusion	Could the activity lead to saline intrusion?	No construction or operational activities will abstract any water from the groundwater bodies identified, and therefore will not result in saline intrusion.	None, as no abstraction will occur.
Groundwater abstraction	Could the level of proposed groundwater abstraction (dewatering) exceed recharge at a water body scale?	No construction or operational activities will abstract any water from the groundwater bodies identified.	None, as no abstraction will occur.

Parameter	Scoping Question	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Additional surface water body	Could the activity lead to an additional surface water body that will become non-compliant and lead to failure of the Dependent Surface Water test?	No construction or operational activities will abstract any water from the groundwater bodies identified.	None, as no abstraction will occur.

Parameter	Scoping Question	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Additional abstraction	Could the activity result in additional abstraction that will exceed any groundwater body scale headroom between the fully licensed quantity and the limit imposed by the total recharge?	No construction or operational activities will abstract any water from the groundwater bodies identified.	None, as no abstraction will occur.
Groundwater quality			

Parameter	Scoping Question	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Water body scale pollution	Could the activities have the potential to result in or exacerbate widespread diffuse pollution at a water body scale?	No. If any pollution from project construction (onshore cable corridor, temporary construction areas and substation) and operation does occur, this will be limited to a small proportion of both groundwater bodies identified.	None, as potential impacts will be highly localized.
GWDTEs	Could the activities have the potential to result in pollution of GWDTEs or other dependent surface water features?	The activities such as HDD and open cut trench excavations to construct the 60km onshore cable corridor could potentially introduce contaminants into the groundwater bodies identified, which could subsequently be transferred to GWDTEs.	North Norfolk Chalk, Broadland Rivers Chalk and Crag
Saline intrusion	Could the activity lead to saline intrusion?	No construction or operational activities will abstract any water from the groundwater bodies identified.	None, as no abstraction will occur.

Parameter	Scoping Question	Potential for permanent effects on water body status?	Water bodies scoped in for further assessment
Deterioration in water quality	Could the activities have the potential to cause deterioration in the quality of a drinking water abstraction?	Yes. Construction of the onshore export cable from open cut trench excavations and HDD could potentially introduce contaminants into groundwater. This could lead to an increase in pollutant concentrations affecting the quality of licensed and unlicensed abstractions.	North Norfolk Chalk, Broadland Rivers Chalk and Crag
Increasing pollutant concentrations	Could the activities have the potential to result in increasing trends in pollutant concentrations or reduce the ability of the water body being able to reverse significant trends in groundwater pollutants?	Yes. Construction of the onshore export cable from open cut trench excavations and HDD could potentially introduce contaminants into groundwater. This could lead to an increase in pollutant concentrations within the groundwater bodies identified	North Norfolk Chalk, Broadland Rivers Chalk and Crag