DOGGER BANK D WIND FARM

Preliminary Environmental Information Report

Volume 1
Chapter 21 Water Resources and Flood Risk

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Glossary

Term	Definition
Additional Mitigation	Measures identified through the EIA process that are required as further action to avoid, prevent, reduce or, if possible, offset likely significant adverse effects to acceptable levels (also known as secondary (foreseeable) mitigation). All additional mitigation measures adopted by the Project are provided in the Commitments Register.
Birkhill Wood Substation	The onshore grid connection point for DBD identified through the Holistic Network Design process. Birkhill Wood Substation is being developed by National Grid Electricity Transmission and does not form part of the Dogger Bank D Project.
Commitment	Refers to any embedded mitigation and additional mitigation, enhancement or monitoring measures identified through the EIA process and those identified outside the EIA process such as through stakeholder engagement and design evolution. All commitments adopted by the Project are provided in the Commitments Register.
Design	All of the decisions that shape a development throughout its design and pre-construction, construction / commissioning, operation and, where relevant, decommissioning phases.
Development Consent Order (DCO)	A consent required under Section 37 of the Planning Act 2008 to authorise the development of a Nationally Significant Infrastructure Project, which is granted by the relevant Secretary of State following an application to the Planning Inspectorate.
Effect	An effect is the consequence of an impact when considered in combination with the receptor's sensitivity / value / importance, defined in terms of significance.
Embedded Mitigation	Embedded mitigation includes: • Measures that form an inherent part of the project design evolution such as modifications to the location or design of the development made during the pre-application phase (also known as primary (inherent) mitigation); and • Measures that will occur regardless of the EIA process as they are imposed by other existing legislative requirements or are considered as standard or best practice to manage commonly occurring environmental impacts (also known as tertiary (inexorable) mitigation). All embedded mitigation measures adopted by the Project are provided in the Commitments Register.
Energy Storage and Balancing Infrastructure (ESBI)	A range of technologies such as battery banks to be co-located with the Onshore Converter Station, which provide valuable services to the electrical grid such as storing energy to meet periods of peak demand and improving overall reliability.

Term	Definition
Enhancement	Measures committed to by the Project to create or enhance positive benefits to the environment or communities as a result of the Project. All enhancement measures adopted by the Project are provided in the Commitments Register.
Environmental Impact Assessment (EIA)	A process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information and includes the publication of an Environmental Statement.
Environmental Statement (ES)	A document reporting the findings of the EIA which describes the measures proposed to mitigate any likely significant effects.
Evidence Plan Process (EPP)	A voluntary consultation process with technical stakeholders which includes a Steering Group and Expert Topic Group (ETG) meetings to encourage upfront agreement on the nature, volume and range of supporting evidence required to inform the EIA and HRA process.
Grid Connection	The offshore and onshore electricity transmission network connection to Birkhill Wood Substation.
Impact	An impact is a change resulting from an activity associated with the Project, defined in terms of magnitude.
Jointing Bays	Underground structures constructed at regular intervals along the onshore export cable corridor to facilitate the joining of discrete lengths of the installation of cables.
Landfall	The area on the coastline, south-east of Skipsea, at which the offshore export cables are brought ashore, connecting to the onshore export cables at the transition joint bay above Mean High Water Springs.
Link Boxes	Structures housing electrical equipment located alongside the jointing bays in the onshore export cable corridor and the transition joint bay at the landfall, which could be located above or below ground.
Mitigation	Any action or process designed to avoid, prevent, reduce or, if possible, offset potentially significant adverse effects of a development. All mitigation measures adopted by the Project are provided in the Commitments Register.
Main River	Main Rivers are usually large rivers or streams that are designated under the Water Resources Act (1991) and are shown on the statutory Main River Map. They are managed by the Environment Agency, who carry out construction, maintenance and improvement works to manage flood risk.

Term	Definition
Monitoring	Measures to ensure the systematic and ongoing collection, analysis and evaluation of data related to the implementation and performance of a development. Monitoring can be undertaken to monitor conditions in the future to verify any environmental effects identified by the EIA, the effectiveness of mitigation or enhancement measures or ensure remedial action are taken should adverse effects above a set threshold occur. All monitoring measures adopted by the Project are provided in the Commitments Register.
Onshore Converter Station (OCS) Zone	The area within which the Onshore Converter Station and Energy Storage and Balancing Infrastructure will be located in vicinity of Birkhill Wood Substation.
Onshore Converter Station (OCS)	A compound containing electrical equipment required to stabilise and convert electricity generated by the wind turbines and transmitted by the export cables into a more suitable voltage for grid connection into Birkhill Wood Substation.
Onshore Development Area	The area in which all onshore infrastructure associated with the Project will be located, including any temporary works area required during construction and permanent land required for mitigation and enhancement areas, which extends landward of Mean Low Water Springs. There is an overlap with the Offshore Development Area in the intertidal zone.
Onshore Export Cable Corridor (ECC)	The area within which the onshore export cables will be located, extending from the landfall to the Onshore Converter Station zone and onwards to Birkhill Wood Substation.
Onshore Export Cables	Cables which bring electricity from the transition joint bay at landfall to the Onshore Converter Station zone (HVDC cables) and from the Onshore Converter Station zone onwards to Birkhill Wood Substation (HVAC cables).
Ordinary Watercourse	Rivers, streams and ditches that are not Main Rivers are called ‘ordinary watercourses’. Lead local flood authorities and internal drainage boards carry out flood risk management work on ordinary watercourses.
Scoping Opinion	A written opinion issued by the Planning Inspectorate on behalf of the Secretary of State regarding the scope and level of detail of the information to be provided in the Applicant’s Environmental Statement. The Scoping Opinion for the Project was adopted by the Secretary of State on 02 August 2024.
Scoping Report	A request by the Applicant made to the Planning Inspectorate for a Scoping Opinion on behalf of the Secretary of State. The Scoping Report for the Project was submitted to the Secretary of State on 24 June 2024.
Study Areas	A geographical area and / or temporal limit defined for each EIA topic to identify sensitive receptors and assess the relevant likely significant effects.

Term	Definition
Temporary Construction Compounds	Areas set aside to facilitate the construction works for the onshore infrastructure, which include the landfall construction compound, main and intermediate construction compounds for onshore export cable works and OCS and ESBI construction compounds.
The Applicant	SSE Renewables and Equinor acting through 'Doggerbank Offshore Wind Farm Project 4 Projco Limited'.
The Project	Dogger Bank D Offshore Wind Farm Project, also referred to as DBD in this PEIR.
Transition Joint Bay (TJB)	An underground structure at the landfall that houses the joints between the offshore and onshore export cables.
Trenching	Open cut method for cable or duct installation.
Trenchless Techniques	Trenchless cable or duct installation methods used to bring offshore export cables ashore at landfall, facilitate crossing major onshore obstacles such as roads, railways and watercourses and where trenching may not be suitable. Trenchless techniques included in the Project Design Envelope include Horizontal Directional Drilling (HDD), auger boring, micro-tunnelling, pipe jacking / ramming and Direct Pipe.

21 Water Resources and Flood Risk

21.1 Introduction

1. This chapter of the Preliminary Environmental Information Report (PEIR) presents the preliminary results of the Environmental Impact Assessment (EIA) of the Dogger Bank D Offshore Wind Farm Project (hereafter 'the Project' or 'DBD') on water resources and flood risk.

2. **Chapter 4 Project Description** provides a description of the key infrastructure components which form part of the Project and the associated construction, operation and maintenance (O&M) and decommissioning activities.

3. The primary purpose of the PEIR is to support the statutory consultation activities required for a Development Consent Order (DCO) application under the Planning Act 2008. The information presented in this PEIR chapter is based on the baseline characterisation and assessment work undertaken to date. The feedback from the statutory consultation will be used to inform the final design where appropriate and presented in an Environmental Statement (ES), which will be submitted with the DCO application.

4. This PEIR chapter:

   - Describes the baseline environment relating to water resources and flood risk;
   - Presents an assessment of the likely significant effects on water resources and flood risk during the construction, O&M and decommissioning phases of the Project;
   - Identifies any assumptions and limitations encountered in compiling the environmental information; and
   - Sets out proposed mitigation measures to avoid, prevent, reduce or, if possible, offset potential significant adverse environmental effects identified during the EIA process and, where relevant, monitoring measures or enhancement measures to create or enhance positive effects.

5. This chapter should be read in conjunction with the following related chapters. Inter-relationships are discussed further in **Section 21.9.1**:

   - **Chapter 19 Geology and Ground Conditions;** and
   - **Chapter 23 Onshore Ecology and Ornithology**.

6. Additional information to support the water resources and flood risk assessment includes:

   - **Volume 2, Appendix 21.1 Consultation Responses for Water Resources and Flood Risk;**
   - **Volume 2, Appendix 21.2 Fluvial Geomorphology Walkover Survey;**
   - **Volume 2, Appendix 21.3 Flood Risk Assessment;** and
   - **Volume 2, Appendix 21.4 Water Environment Regulations Compliance Assessment**.

7. **Volume 2, Appendix 21.4 Water Environment Regulations Compliance Assessment** should be read in conjunction with the following chapters:

   - **Chapter 8 Marine Physical Processes;** and
   - **Chapter 10 Benthic and Intertidal Ecology**.

21.2 Policy and Legislation

21.2.1 National Policy Statements

8. Planning policy on energy National Significant Infrastructure Projects (NSIP) is set out in the National Policy Statements (NPS). The following NPS are relevant to the water resources and flood risk assessment:

   - Overarching NPS for Energy (EN-1) (Department for Energy Security and Net Zero, 2023a);
   - NPS for Renewable Energy Infrastructure (EN-3) (Department for Energy Security and Net Zero, 2023b); and
   - NPS for Electricity Networks Infrastructure (EN-5) (Department for Energy Security and Net Zero, 2023c).

9. The water resources and flood risk chapter has been prepared with reference to specific requirements in the above NPS and are summarised in **Table 21-1**, along with how and where they have been considered in this PEIR chapter.

Table 21-1 Summary of Relevant National Policy Statement Requirements for Water Resources and Flood Risk

NPS Reference and Requirement	How and Where Considered in the PEIR
NPS for Energy (EN-1)	
Paragraphs 5.4.17 to 5.4.24: "Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally, and locally designated sites of ecological or geological conservation importance (including those outside England), on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity, including irreplaceable habitats. The applicant should provide environmental information proportionate to the infrastructure where EIA is not required to help the Secretary of State consider thoroughly the potential effects of a proposed project."	Potential impacts on river channels, which provide physical habitats of importance for ecology, protected species and the conservation of biodiversity, are considered in **Section 21.7**. Impacts on species and habitats are discussed in detail in **Chapter 23 Onshore Ecology and Ornithology**.
Paragraphs 5.4.8 and 5.4.50: "Development on land within or outside a SSSI, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits (including need) of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of SSSIs. The Secretary of State should use requirements and/or planning obligations to mitigate the harmful aspects of the development and, where possible, to ensure the conservation and enhancement of the site's biodiversity or geological interest."	Potential impacts to Sites of Special Scientific Interest (SSSI) are considered in **Section 21.7**. Impacts on SSSI are discussed in detail in **Chapter 23 Onshore Ecology and Ornithology**.
Paragraphs 5.8.13 to 5.8.23: "A site-specific flood risk assessment should be provided for all energy projects in Flood Zones 2 and 3 in England or Zones B and C in Wales. In Flood Zone 1 in England or Zone A in Wales, an assessment should accompany all proposals involving: • Sites of 1 hectare or more; • Land which has been identified by the EA or NRW as having critical drainage problems; • Land identified (for example in a local authority strategic flood risk assessment) as being at increased flood risk in future; and • Land that may be subject to other sources of flooding (for example surface water) where the EA or NRW, Lead Local Flood Authority, Internal Drainage Board or other body have indicated that there may be drainage problems. This should identify and assess the risks of all forms of flooding to and from the Project and demonstrate how these flood risks will be managed, taking climate change into account."	Potential impacts on flood risk are considered in **Section 21.7.1.4** and **Section 21.7.2.2** and **Volume 2, Appendix 21.3 Flood Risk Assessment.**

NPS Reference and Requirement	How and Where Considered in the PEIR
Paragraphs 5.16.3 – 5.16.7: "Where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment, and how this might change due to the impact of climate change on rainfall patterns and consequently water availability across the water environment, as part of the ES or equivalent. The ES should in particular describe: • The existing quality of waters affected by the proposed project and the impacts of the proposed project on water quality, noting any relevant existing discharges, proposed new discharges and proposed changes to discharges. • Existing water resources affected by the proposed project and the impacts of the proposed project on water resources, noting any relevant existing abstraction rates, proposed new abstraction rates and proposed changes to abstraction rates (including any impact on or use of mains supplies and reference to Abstraction Licensing Strategies) and also demonstrate how proposals minimise the use of water resources and water consumption in the first instance. • Existing physical characteristics of the water environment (including quantity and dynamics of flow) affected by the proposed project and any impact of physical modifications to these characteristics. • Any impacts of the proposed project on water bodies or protected areas (including shellfish protected areas) under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 and source protection zones (SPZs) around potable groundwater abstractions. • How climate change could impact any of the above in the future. • Any cumulative effects."	The baseline water environment is described in detail in **Section 21.6**. An assessment of effects during construction, operation and decommissioning of the Project is made in **Section 21.21.7**. Potential impacts on water quality, the physical characteristics of surface watercourses and the quality and quantity of groundwater are considered in **Section 21.7**, and **Volume 2, Appendix 21.4 Water Environment Regulations Compliance Assessment**. Potential impacts on abstraction are assessed in **Section 21.7.1.3**, **Section 21.7.1.4**, **Section 21.7.2.1** and **Section 21.7.2.2**. Impacts on the Hull and East Riding Chalk groundwater body are assessed in **Volume 2, Appendix 21.4 Water Environment Regulations Compliance Assessment**. The existing physical characteristics of watercourses crossed by the Project are described in **Volume 2, Appendix 21.2 Fluvial Geomorphology Survey Report**. The potential for the direct disturbance of surface water bodies is assessed in **Section 21.7.1.1**. Impacts on river water bodies are also assessed in **Volume 2, Appendix 21.4 Water Environment Regulations Compliance Assessment**. Potential impacts on water bodies and associated protected areas are assessed in **Volume 2, Appendix 21.4 Water Environment Regulations Compliance Assessment**. The potential impacts of climate change and higher flows on watercourse crossings is discussed in the context of local geomorphology (as described in **Volume 2, Appendix 21.2 Fluvial Geomorphology Walkover Survey**) in **Section 21.7.1.1.** Climate change allowances in the context of flood risk are used in **Volume 2, Appendix 21.3 Flood Risk Assessment.** Cumulative effects associated with the Project are assessed in **Section 21.8**.
NPS for Renewable Energy Infrastructure (EN-3)	
Paragraph 2.4.8: "Offshore wind farms will not be affected by flooding. However, applicants should demonstrate that any necessary land-side infrastructure (such as cabling and onshore substations) will be appropriately resilient to climate-change induced weather phenomena. Similarly, applicants should particularly set out how the proposal would be resilient to storms."	Potential impacts on flood risk are considered in **Section 21.7.1.4** and **Section 21.7.2.2** and **Volume 2, Appendix 21.3 Flood Risk Assessment**.

NPS Reference and Requirement	How and Where Considered in the PEIR
NPS for Electricity Networks Infrastructure (EN-5)	
Paragraphs 2.3.1 and 2.3.3: "Section 4.9 of EN-1 sets out the generic considerations that applicants and the Secretary of State should take into account in order to ensure that electricity networks infrastructure is resilient to the effects of climate change. As climate change is likely to increase risks to the resilience of some of this infrastructure, from flooding for example, or in situations where it is located near the coast or an estuary or is underground, applicants should in particular set out to what extent the proposed development is expected to be vulnerable, and, as appropriate, how it has been designed to be resilient to: • Flooding, particularly for substations that are vital to the network; and especially in light of changes to groundwater levels resulting from climate change; • The effects of wind and storms on overhead lines; • Higher average temperatures leading to increased transmission losses • Earth movement or subsidence caused by flooding or drought (for underground cables) • Coastal erosion – for the landfall of offshore transmission cables and their associated substations in the inshore and coastal locations respectively. Section 4.9 of EN-1 advises that the resilience of the project to the effects of climate change must be assessed in the ES accompanying an application. For example, future increased risk of flooding would be covered in any flood risk assessment (see sections 5.8 in EN-1)."	Potential impacts on flood risk, including climate change allowances, are considered in **Section 21.7.1.4** and **Section 21.7.2.2** and **Volume 2, Appendix 21.3 Flood Risk Assessment.**

21.2.2 Other Policy and Legislation

10. Other policy and legislation relevant to the water resources and flood risk assessment are summarised in the following sections.

21.2.2.1 National

21.2.2.1.1 The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

11. The Water Framework Directive (WFD) (Council Directive 2000/60/EC) which established a framework for community action in the field of water policy was adopted in 2000. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 transposed the WFD into English and Welsh law. The WFD Regulations remain in force following the UK's withdrawal from the European Union under the Floods and Water (Amendment etc.) (EU Exit) Regulations 2019.

12. Under the Regulations, surface waters are designated as water bodies and are set objectives for achieving Good Ecological Status or Good Ecological Potential (in the case of artificial or heavily modified water bodies). The Environment Agency is required to produce River Basin Management Plans (RBMP) which describe the current state of the water environment within the River Basin District (RBD) and set out the objectives for protecting and improving it.

21.2.2.1.2 The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015

13. The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 set out the standards and thresholds used to determine the ecological and chemical status of water bodies. These are considered in terms of biological, hydromorphological, physico-chemical and chemical status for surface water bodies, and quantitative and chemical status for groundwater bodies.

21.2.2.1.3 National Planning Policy Framework (Ministry of Housing, Communities and Local Government, 2024

14. The National Planning Policy Framework (NPPF) sets out the UK Government planning policies for England and seeks to ensure that flood risk is considered at all stages of the planning and development process. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

15. Strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards.

16. All plans should apply a sequential, risk-based approach to the location of development – taking into account all sources of flood risk and the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property.

21.2.2.1.4 Planning Practice Guidance for Flood Risk and Coastal Change

17. Further guidance on the application of the Sequential Test and Exception Test is provided in the supporting Planning Practice Guidance (PPG) for Flood Risk and Coastal Change (Department for Levelling Up, Housing and Communities, 2022), which was updated on 25th August 2022. This is in terms of all sources of flood risk, Flood Zones and the Vulnerability Classification relevant to the development.

21.2.2.1.5 Planning Practice Guidance for Flood Risk and Coastal Change

18. Further guidance on the application of the Sequential Test and Exception Test is provided in the supporting Planning Practice Guidance (PPG) for Flood Risk and Coastal Change (Department for Levelling Up, Housing and Communities, 2022), which was updated on 25th August 2022. This is in terms of all sources of flood risk, Flood Zones and the Vulnerability Classification relevant to the development.

19. In a recent update to the PPG, it was extended to include clarification on the application of the Sequential Test for all sources of flood risk, not only fluvial and coastal/tidal flooding, as well as summarising an additional consideration with regard to the presence of flood risk management infrastructure.

21.2.2.1.6 Flood and Water Management Act 2010

20. The Flood and Water Management Act 2010 (FWMA) aims to improve the management of flood risk management and water resources by creating clear roles and responsibilities. It gave local authorities the new role of Lead Local Flood Authority (LLFA) under which they take on the responsibility of managing flood risk on a local scale from surface water, groundwater and Ordinary Watercourses. The Environment Agency gained a strategic overview role of all flood risk. The FWMA provides opportunities for a comprehensive, risk-based approach on land use planning and flood risk management by local authorities and other key partners.

21.2.2.2 Local

21.2.2.2.1 Humber River Basin District: River Basin Management Plan (2022)

21. RBMP provide a framework for the protection and enhancement of the benefits provided by the water environment in each River Basin District (RBD) and are produced in order to implement the WFD. As water resources and land use are closely linked, RBMP also inform decisions on land-use planning.

22. The third RBMP for the Humber RBD was finalised by the Department for the Environment, Food and Rural Affairs (Defra) and the Environment Agency in 2022. It provides a baseline classification of the water environment in the Humber RBD and highlights statutory objectives for protected areas such as waters used for drinking water, bathing, and designated sites. It lays out the actions needed to improve the water environment and achieve the objectives of the WFD.

23. Further detail is provided in **Chapter 3 Policy and Legislative Context**.

21.3 Consultation

24. Topic-specific consultation in relation to water resources and flood risk has been undertaken in line with the process set out in **Chapter 7 Consultation**. A Scoping Opinion from the Planning Inspectorate (PINS) was received on 2nd August 2024, which has informed the scope of the assessment presented within this chapter (as outlined in **Section 21.4.2**).

25. Feedback received through the ongoing Evidence Plan Process (EPP) in relation to Expert Topic Group (ETG) meetings and wider technical consultation meetings with relevant stakeholders has also been considered in the preparation of this chapter. Details of technical consultation undertaken to date on water resources and flood risk are provided in **Table 21-2**.

Table 21-2 Technical Consultation Undertaken to Date on Water Resources and Flood Risk

Meeting	Stakeholder(s)	Date(s) of Meeting / Frequency	Purpose of Meeting
ETG Meetings			
ETG10 (Water Resources, Flood Risk and Geology and Ground Conditions) Meeting 02	Environment Agency Beverley and North Holderness Internal Drainage Board (IDB) East Riding of Yorkshire Council (ERYC)	24th September 2024	To discuss comments received in the Scoping Opinion relevant to the water resources and flood risk assessment. The Study Area, approach to baseline characterisation and assessment methodology were agreed with stakeholders at the meeting. The methodology for the geomorphology walkover survey, Water Environment Regulations compliance assessment and Flood Risk Assessment were also agreed at the meeting.
Other Technical Consultation			
Hempholme Pumping Station crossing technical meeting	Environment Agency	26th November 2024	To discuss the Environment Agency's comments related to onshore export cable crossing in vicinity to the Hempholme Pumping Station (see Crossing ID WX-29 in **Volume 2, Appendix 4.3 Crossing Schedule – Onshore**). This resulted in the proposed commitment (see Commitment ID CO104 in **Table 21-4**), which was provisionally agreed by the Environment Agency on 11th February 2025.

26. **Volume 2, Appendix 21.1 Consultation Responses for Water Resources and Flood Risk** summarises how consultation responses received to date are addressed in this chapter.

27. This chapter will be updated based on refinements made to the Project Design Envelope and to consider where appropriate stakeholder feedback on the PEIR. The updated chapter will form part of the ES to be submitted with the DCO application.

21.4 Basis of the Assessment

28. The following sections establish the basis of the assessment of likely significant effects, which is defined by the Study Area, assessment scope, realistic worst-case scenarios and development scenarios.

29. This section should be read in conjunction with **Volume 2, Appendix 1.2 Guide to PEIR**, **Volume 2, Appendix 6.2 Impacts Register** and **Volume 2, Appendix 6.3 Commitments Register**.

21.4.1 Study Area

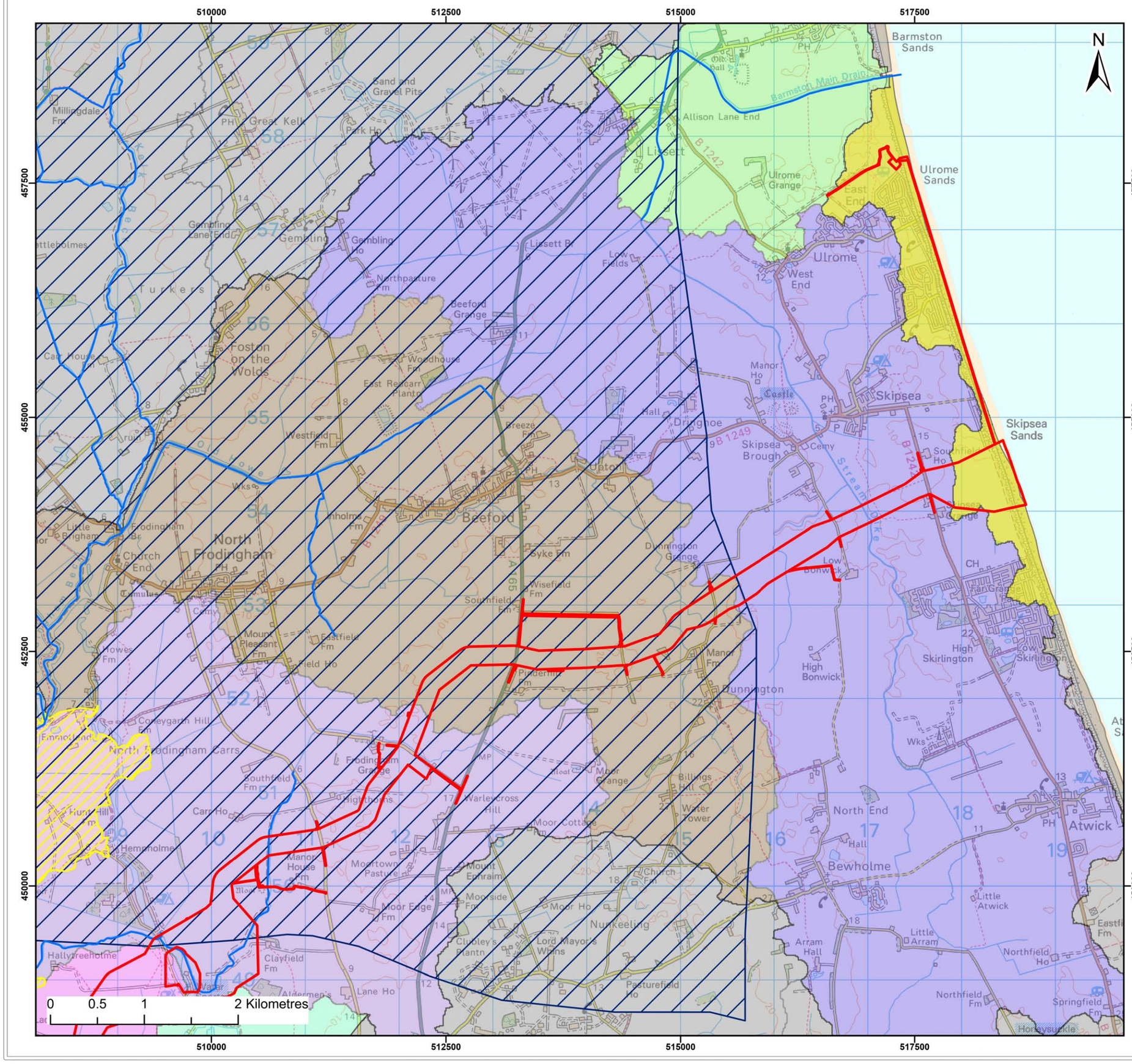
30. The Humber RBMP has been developed to comply with the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 by the Environment Agency (Environment Agency, 2022). The RBMP defines river water body catchments based on surface hydrological catchments with an area of greater than 5km^2. The Study Area for water resources and hydrology has been defined based on these surface hydrological catchments (**Figure 21-1**).

31. Catchments have been included within the Study Area if they are crossed by the Onshore Development Area, or if they are hydrologically connected downstream. Catchments that are hydrologically connected upstream are not considered due to the lack of any mechanism for likely effects to propagate upstream.

32. The Study Area includes a narrow strip of land termed the onshore coastal catchment (**Figure 20-1**). This is land which drains directly to coastal or estuarine waters, rather than through a river water body, i.e. it is not part of a river water body catchment.

33. For this assessment, the onshore coastal catchment extends to Mean High Water Springs (MHWS). Potential impacts in the intertidal zone and on associated protected areas are assessed in **Volume 2, Appendix 21.4 Water Environment Regulations Compliance Assessment** and in **Chapter 8 Marine Physical Processes**.

34. When considering the potential impacts to groundwater, the Study Area is limited to those groundwater bodies that lie directly beneath the Onshore Development Area, which are shown on **Figure 21-2**.



Legend:

- Onshore Development Area
- Main River
- Tophill Low Drinking Water Safeguard Zone Surface Water
- Hull from West Beck to Arram Beck Drinking Water Protected Area

WFD River Water Body Catchments

- Barmston Sea Drain / Skipsea Drain to Conf
- Barmston Sea Drain from Skipsea Drain to N Sea
- Foredyke Stream Lower to Holderness Dr
- Holderness Drain Source to Foredyke Stream
- Hull from West Beck to Arram Beck
- Mickley Dike Catchment
- Old Howe/Frodingham Beck to R Hull
- Coastal
- Catchments Outside of the Study Area

Project:

Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Surface Water Features - Sheet 1 of 3

Figure: 21-1

Drawing No: PC6250-RHD-XX-ON-DR-GS-0118

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid

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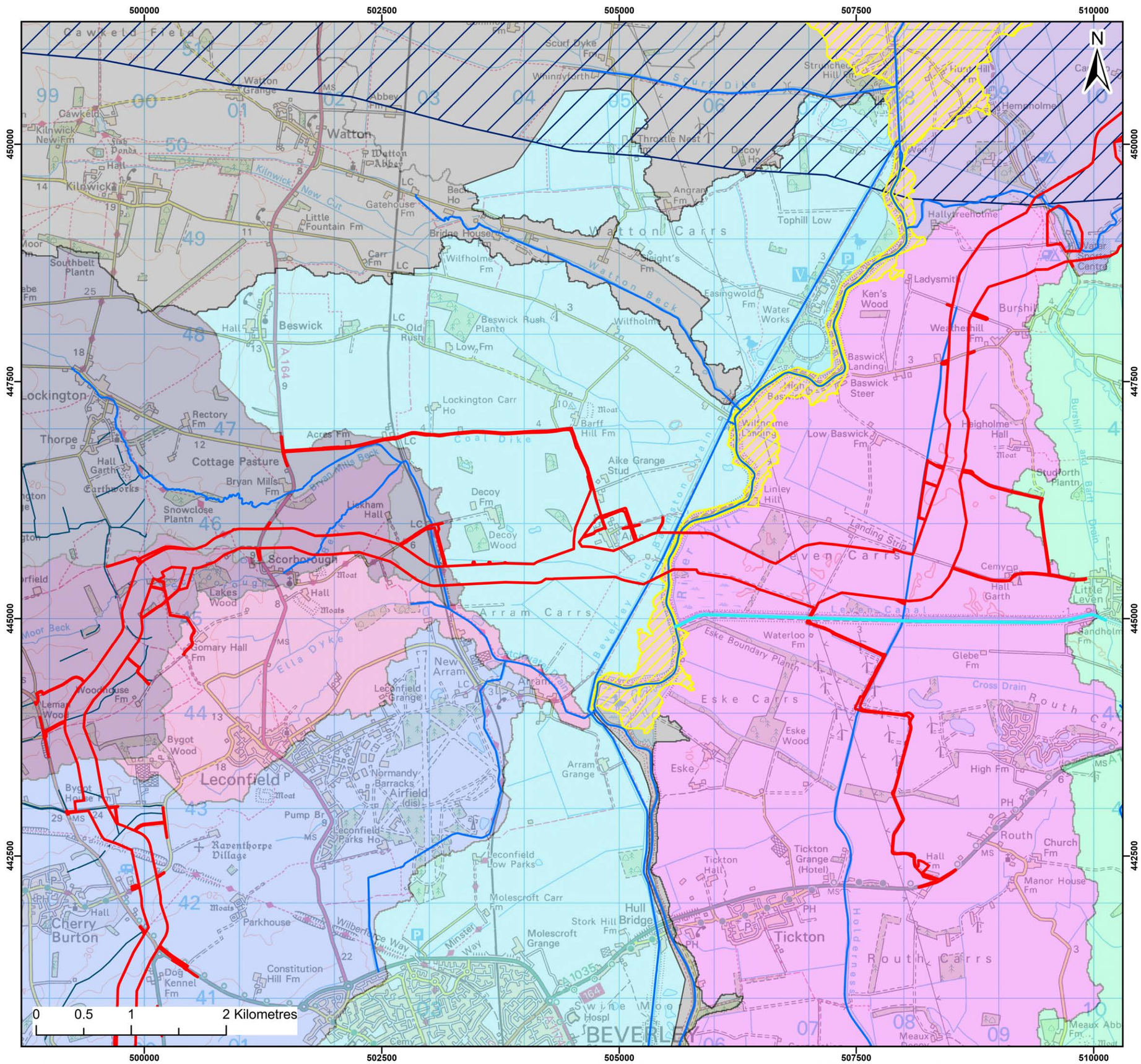

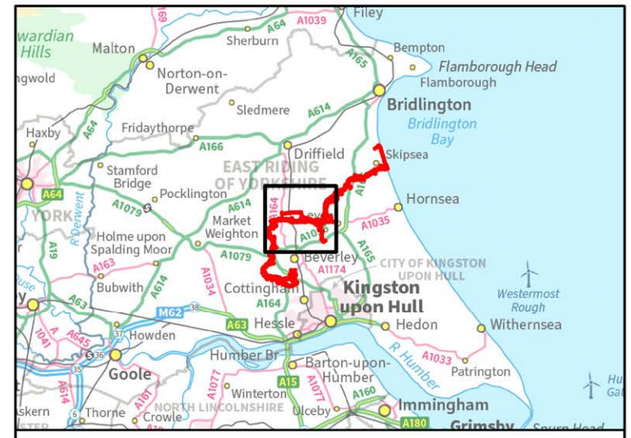

Legend:

- Onshore Development Area
- Main River
- Leven Canal
- Tophill Low Drinking Water Safeguard Zone Surface Water
- Hull from West Beck to Arram Beck Drinking Water Protected Area

WFD River Water Body Catchments

- Beverley and Barmston Drain
- Bryan Mills Beck Source to Bryan Mills Farm
- Ella Dyke
- Foredyke Stream Lower to Holderness Dr
- High Hunsley to Arram Area
- Holderness Drain Source to Foredyke Stream
- Hull from West Beck to Arram Beck
- Mickley Dike Catchment
- Scorborough Beck
- Catchments Outside of the Study Area

Project:

Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Surface Water Features
- Sheet 2 of 3

Figure: 21-1

Drawing No: PC6250-RHD-XX-ON-DR-GS-0118

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
02	16/05/2025	JH	AB	A3	1:40,000
01	19/11/2024	JH	AB	A3	1:40,000

Co-ordinate system: British National Grid

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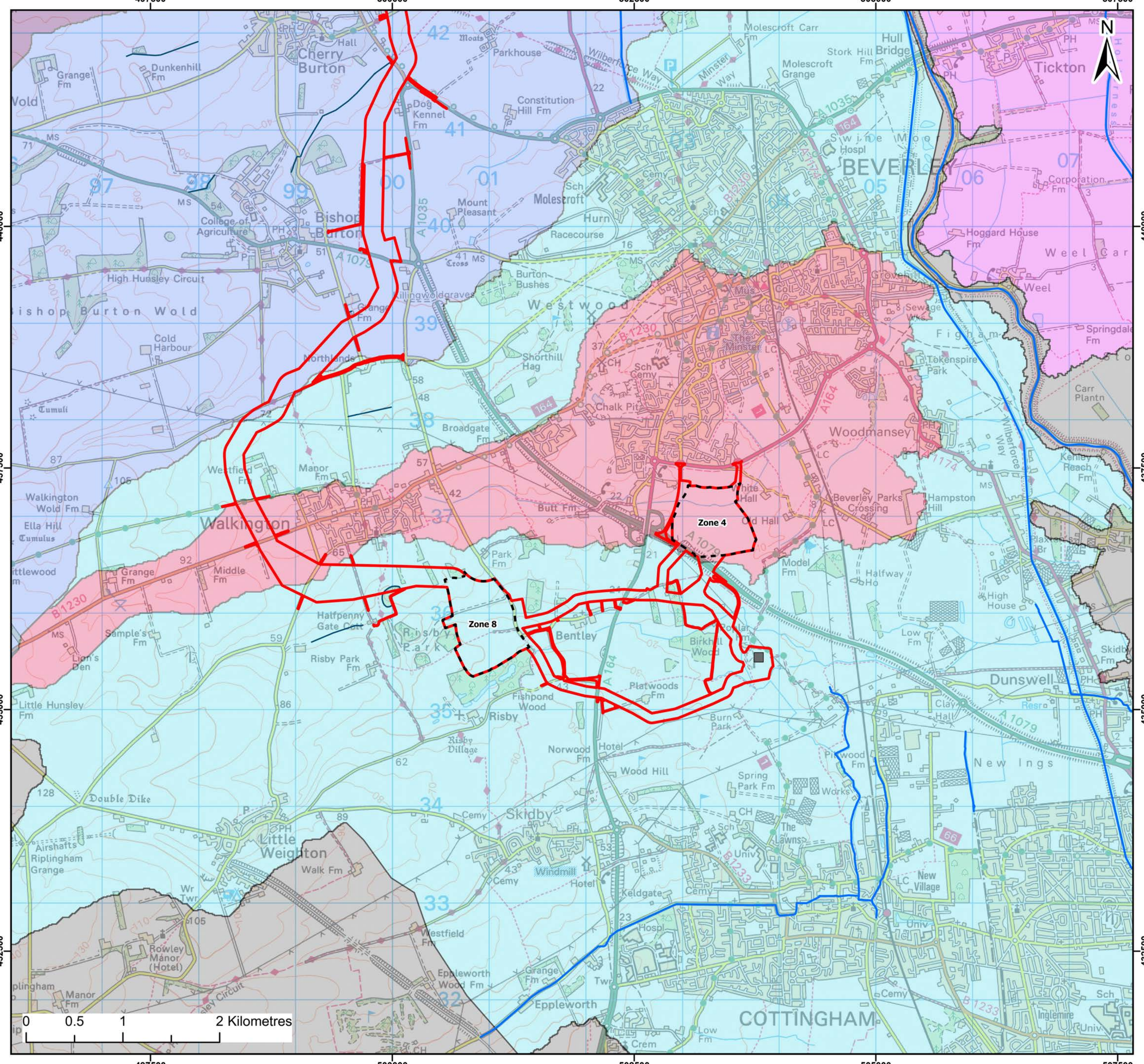

Legend:

- Onshore Development Area
- Onshore Converter Station Options
- Indicative Birkhill Wood Substation Location
- Main River

WFD River Water Body Catchments

- Beverley and Barmston Drain
- High Hunsley to Arram Area
- High Hunsley to Woodmansey Area
- Holderness Drain Source to Foredyke Stream
- Scorborough Beck
- Catchments Outside of the Study Area

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Project: Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title: Surface Water Features - Sheet 3 of 3

Figure:	21-1	Drawing No:	PC6250-RHD-XX-ON-DR-GS-0118		
Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid

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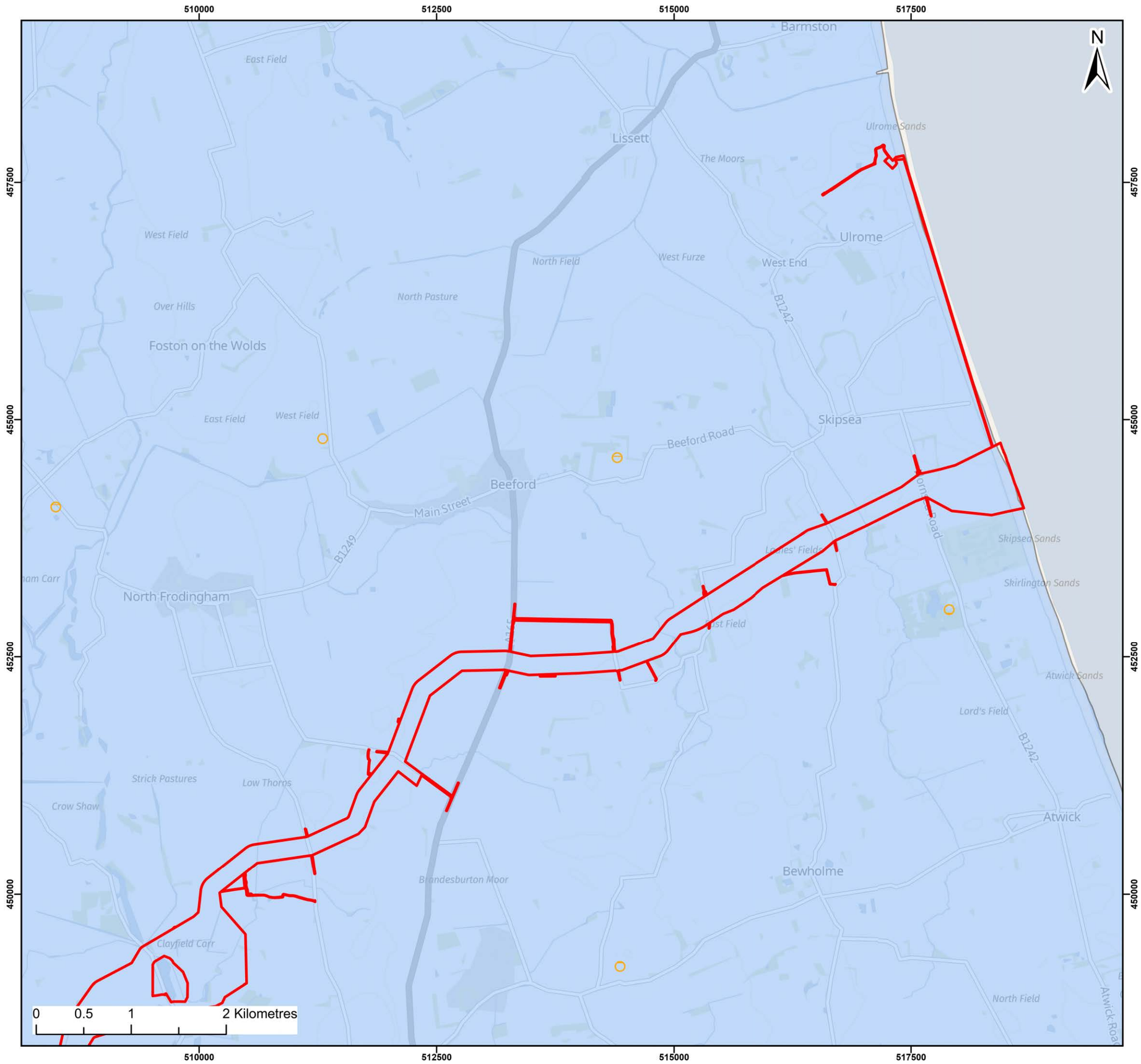

Legend:

Onshore Development Area

WFD Groundwater Bodies

Hull and East Riding Chalk

Source Protection Zone

Zone I - Inner Protection Zone

Project:

Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Groundwater Features
- Sheet 1 of 4

Figure:	Drawing No:
21-2	PC6250-RHD-XX-ON-DR-GS-0119

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid

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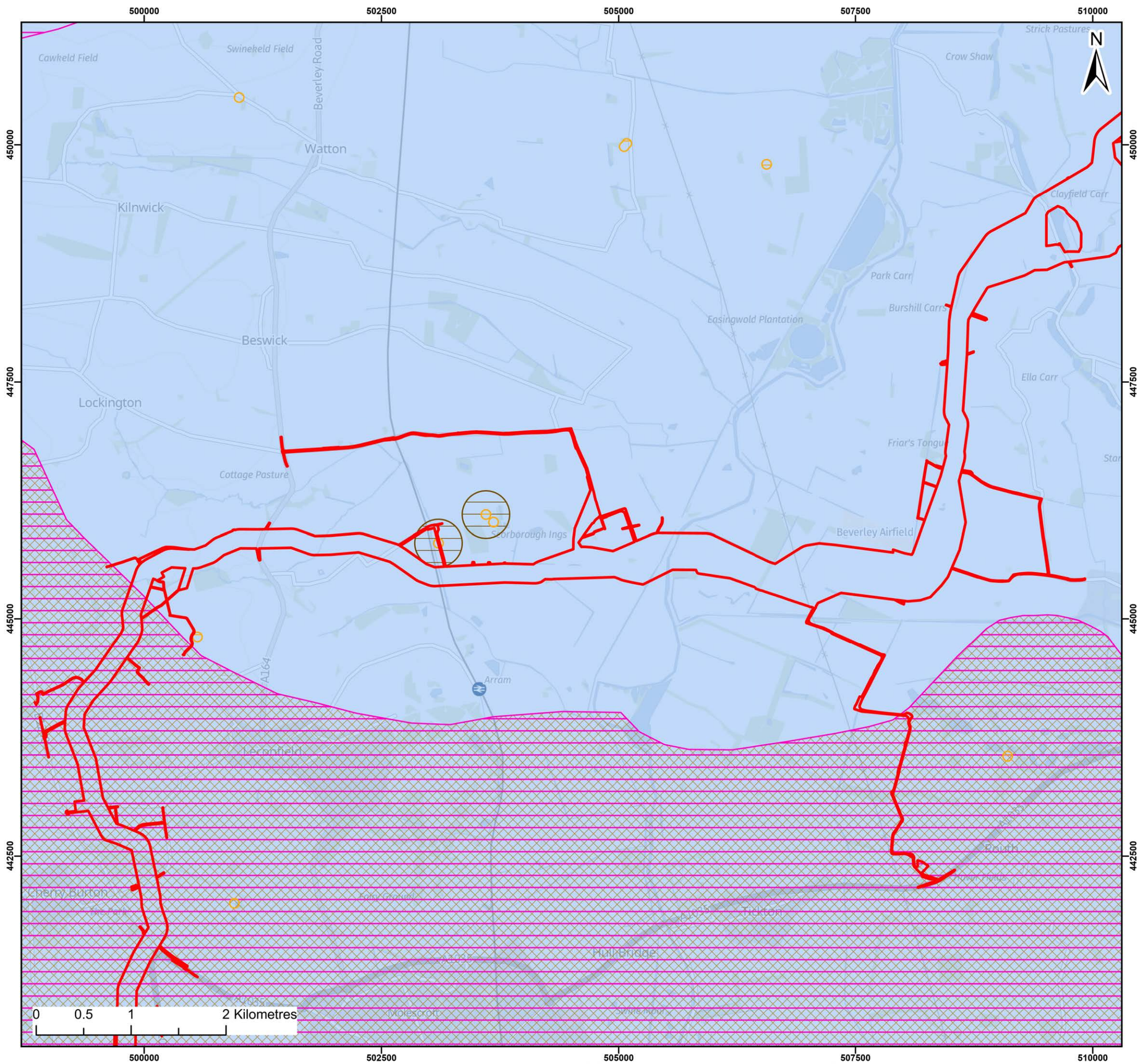

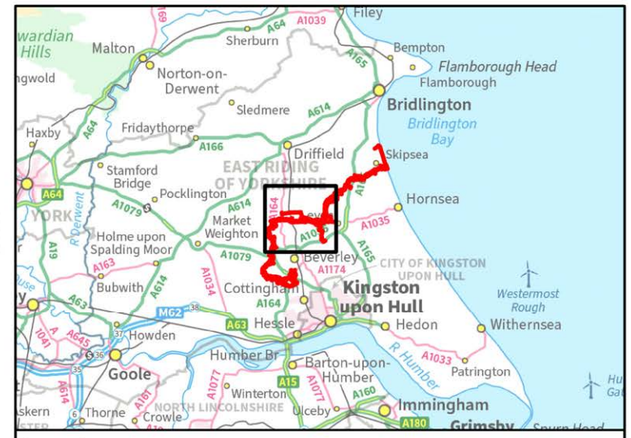

Legend:

- Onshore Development Area
- Cottingham Drinking Water Safeguard Zone (Groundwater)

WFD Groundwater Bodies

- Hull and East Riding Chalk

Source Protection Zone

- Zone I - Inner Protection Zone
- Zone II - Outer Protection Zone
- Zone III - Total Catchment

Project:
Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Groundwater Features
- Sheet 2 of 4

Figure: 21-2

Drawing No: PC6250-RHD-XX-ON-DR-GS-0119

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	19/11/2024	JH	AB	A3	1:40,000

Co-ordinate system: British National Grid

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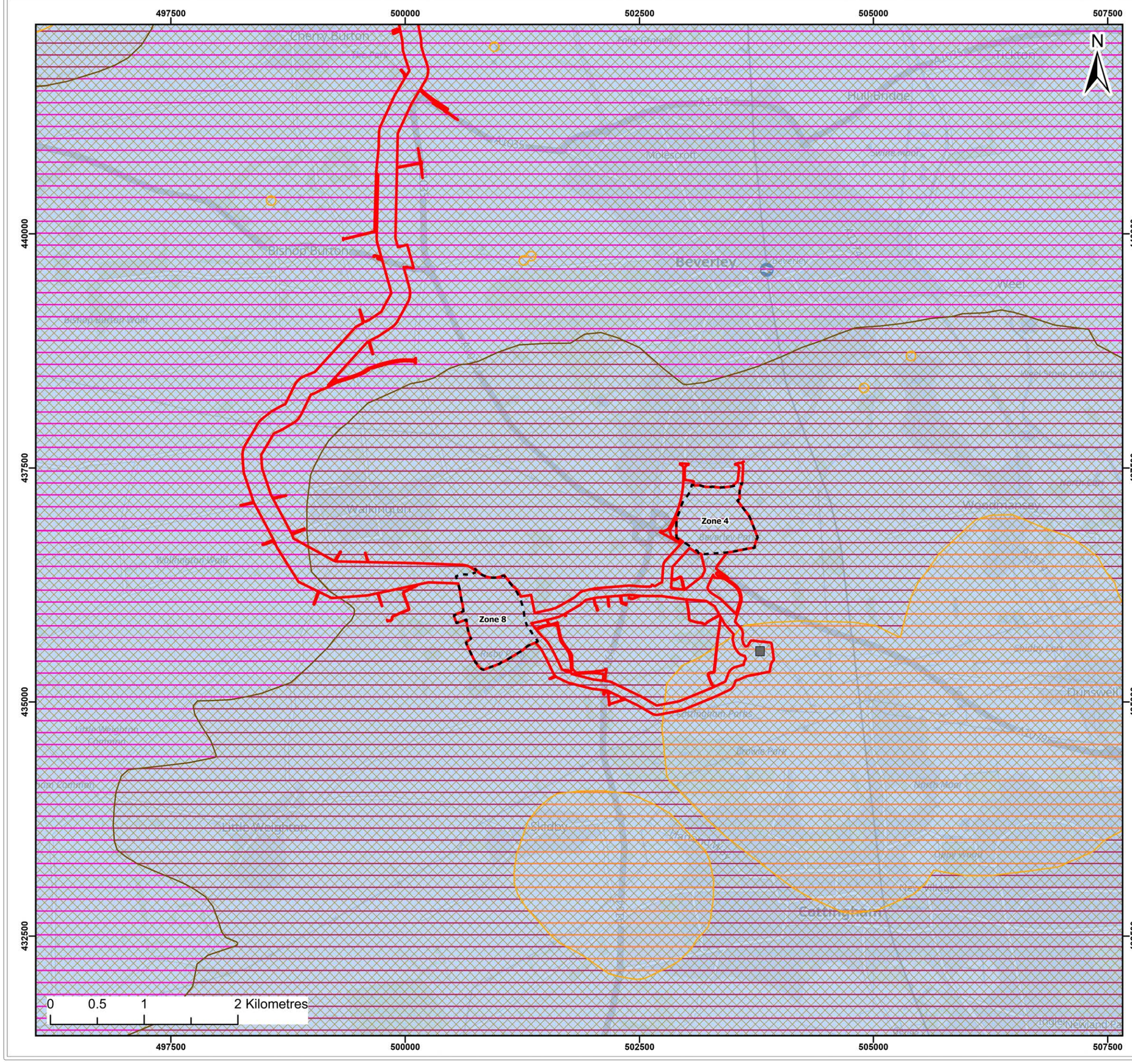

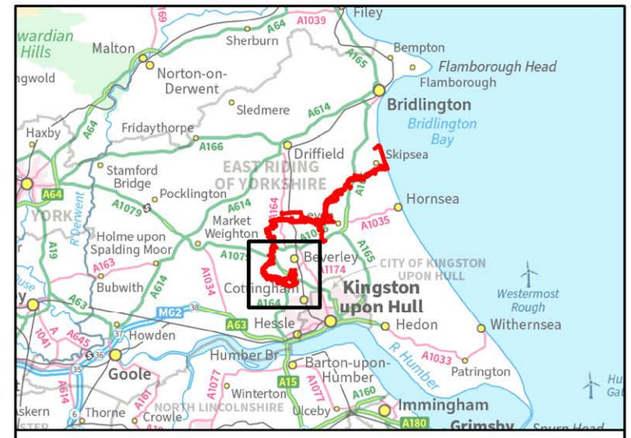

Legend:

- Onshore Development Area
- Onshore Converter Station Options
- Indicative Birkhill Wood Substation Location
- Cottingham Drinking Water Safeguard Zone (Groundwater)

WFD Groundwater Bodies

- Hull and East Riding Chalk

Source Protection Zone

- Zone I - Inner Protection Zone
- Zone II - Outer Protection Zone
- Zone III - Total Catchment

Project:
Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Groundwater Features
- Sheet 3 of 4

Figure: 21-2

Drawing No: PC6250-RHD-XX-ON-DR-GS-0119

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid

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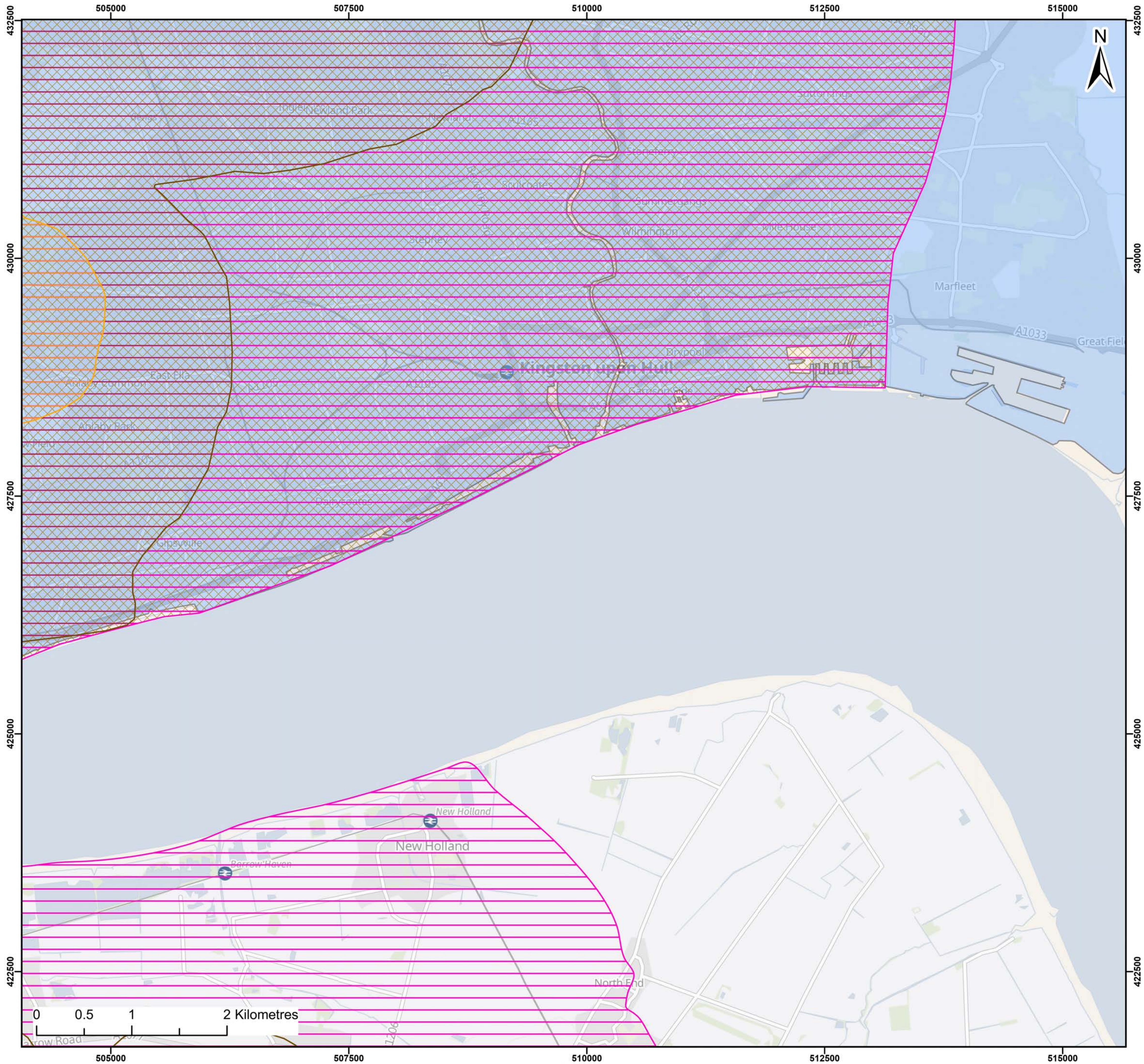

Legend:

Cottingham Drinking Water Safeguard Zone (Groundwater)

WFD Groundwater Bodies

Hull and East Riding Chalk

Source Protection Zone

Zone I - Inner Protection Zone

Zone II - Outer Protection Zone

Zone III - Total Catchment

Project: Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title: Groundwater Features - Sheet 4 of 4

Figure:	21-2	Drawing No:	PC6250-RHD-XX-ON-DR-GS-0119		
Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	19/11/2024	JH	AB	A3	1:40,000

Co-ordinate system: British National Grid

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21.4.2 Scope of the Assessment

35. A number of impacts have been scoped out of the water resources and flood risk assessment. These impacts are outlined in **Volume 2, Appendix 6.2 Impacts Register**, and are in line with the Scoping Opinion (discussed in **Section 21.3**) and the project description outlined in **Chapter 4 Project Description**. A description of how the Impacts Register should be used alongside the PEIR chapter is provided in **Volume 2, Appendix 1.2 Guide to PEIR** and **Chapter 6 Environmental Impact Assessment Methodology**.

36. Impacts scoped into the assessment relating to water resources and flood risk are outlined in **Table 21-3** and discussed further in **Section 21.7**.

Table 21-3 Water Resources and Flood Risk – Impacts Scoped into the Assessment

Impact ID	Impact and Project Activity	Rationale
Construction		
WRF-C-01	Direct disturbance of surface water bodies – trenched watercourse (cable) crossings, temporary (haul road watercourse crossings) and construction activities at the Onshore Converter Station (OCS) and Energy Storage and Balancing Infrastructure (ESBI)	The Onshore Development Area crosses surface water bodies, which will be directly disturbed by construction activities.
WRF-C-02	Increased sediment supply – construction activitiess at the landfall, onshore ECC and OCS zone	Construction activities in the Onshore Development Area will disturb and expose the ground surface within surface water catchments. This has the potential to increase sediment supply to nearby watercourses.
WRF-C-03	Supply of contaminants to surface and groundwater – construction activities at the landfall, onshore export cable corridor (ECC) and OCS zone	Construction activities in the Onshore Development Area will use fuels, oils and lubricants for machinery / plant. These substances could be accidentally spilt and travel to surface waters and connected groundwaters.
WRF-C-04	Changes to surface and groundwater flows and flood risk– construction activitiess at the landfall, onshore ECC and OCS zone	Construction activities will alter surface drainage patterns and surface flows by changing the distribution and patterns of surface drainage in areas crossed by the Onshore Development Area.
Operation and Maintenance		
WRF-O-03	Supply of contaminants to surface and groundwater – operation of the ESBI with respect to firewater and planned and unplanned O&M activities	O&M activities in the Onshore Development Area will use fuels, oils and lubricants for machinery / plant. In the event of fire emergencies at the ESBI, firewater could be generated, which could contain contaminants. These substances could be accidentally spilt and travel to surface waters and connected groundwaters. During operation, fine sediment is included as a potential contaminant associated with planned and unplanned O&M activities.
WRF-O-04	Changes to surface and groundwater flows and flood risk – presence of permanent above-ground infrastructure	During operation, permanent above ground infrastructure may alter the movement of surface and groundwater, which could locally affect flood risk.
Decommissioning		
WRF-D-01	Direct disturbance of surface water bodies – decommissioning activities not yet defined	Decommissioning impacts are scoped in; however, details of onshore decommissioning activities are not known at this stage. As discussed in **Section 21.7.3**, decommissioning impacts will be assessed in detail through the Onshore Decommissioning Plan (see **Table 21-4**, Commitment ID CO56) where relevant, which will be developed prior to the commencement of onshore decommissioning works. In this assessment, it is assumed that most decommissioning activities would be the reverse of their construction counterparts, and that their impacts would be of similar nature to, and no worse than, those identified during the construction phase.
WRF-D-02	Increased sediment supply – decommissioning activities not yet defined	
WRF-D-03	Supply of contaminants to surface and groundwater – decommissioning activities not yet defined	
WRF-D-04	Changes to surface and groundwater flows and flood risk – decommissioning activities not yet defined	

21.4.3 Embedded Mitigation Measures

37. The Project has made several commitments to avoid, prevent, reduce or, if possible, offset potential adverse environmental effects through mitigation measures embedded into the evolution of the Project Design Envelope. These embedded mitigation measures include actions that will be undertaken to meet other existing legislative requirements and those considered to be standard or best practice to manage commonly occurring environmental effects.

38. The assessment of likely significant effects has therefore been undertaken on the assumption that these measures are adopted during the construction, O&M and decommissioning phases. **Table 21-4** identifies proposed embedded mitigation measures that are relevant to the water resources and flood risk assessment.

39. Full details of all commitments made by the Project are provided in **Volume 2, Appendix 6.3 Commitments Register.** A description of how the Commitments Register should be used alongside the PEIR chapter is provided in **Volume 2, Appendix 1.2 Guide to PEIR** and **Chapter 6 Environmental Impact Assessment Methodology**. In addition, a list of draft outline management plans which are submitted with the PEIR for consultation is provided in **Section 1.10** of **Chapter 1 Introduction**. These documents will be further refined and submitted along with the DCO application. See **Volume 2, Appendix 1.2 Guide to PEIR** for a list of all PEIR documents.

40. The Commitments Register is provided at PEIR stage to provide stakeholders with an early opportunity to review and comment on the proposed commitments. Proposed commitments may evolve during the pre-application phase as the EIA progresses and in response to refinements to the Project Design Envelope and stakeholder feedback. The final commitments will be confirmed in the Commitments Register submitted along with the DCO application.

Table 21-4 Embedded Mitigation Measures Relevant to Water Resources and Flood Risk

Commitment ID	Proposed Embedded Mitigation	How the Embedded Mitigation Will be Secured	Relevance to Water Resources and Flood Risk Assessment	Relevance to Impact ID
CO32	Installation of cable ducts at crossings of Environment Agency Main Rivers will be undertaken using trenchless installation techniques. Installation of cable ducts at crossings of Beverley and North Holderness Internal Drainage Board (IDB) maintained drains will be undertaken using trenchless installation techniques unless agreed otherwise.	DCO Requirement - Code of Construction Practice	Mitigation to avoid the direct disturbance of surface water bodies. Also relevant to **Volume 2, Appendix 21.3 Flood Risk Assessment** as this will mitigate the potential impacts on fluvial flood risk at these locations.	WRF-C-01 WRF-C-02 WRF-C-03 WRF-C-04
CO33	At trenchless crossings of Environment Agency Main Rivers, crossing entry and exit points will be located at least 20m from the bank of the Main River or the nearest landward toe of any associated flood defence structure. At trenchless crossings of Internal Drainage Board maintained drains and where trenchless techniques are proposed for other ordinary watercourses, crossing entry and exit points will be located at least 9m from the bank of the drain or watercourse.	DCO Requirement - Code of Construction Practice	Mitigation to avoid the direct disturbance of surface water bodies. Also relevant to **Volume 2, Appendix 21.3 Flood Risk Assessment.**	WRF-C-01 WRF-C-02 WRF-C-03
CO34	A pre- and post-construction survey will be undertaken at each crossing of an Environment Agency Main River and any associated flood defence structure to ensure there is no adverse effect due to trenchless crossing activities. The scope and methodology of the survey will be agreed with the relevant authorities through the Watercourse Crossing Method Statement (WCMS) prior to the commencement of the relevant stage of construction works.	DCO Requirement - Code of Construction Practice	Mitigation to avoid increasing flood risk. Also relevant to **Volume 2, Appendix 21.3 Flood Risk Assessment.**	WRF-C-04
CO35	A Watercourse Crossing Method Statement (WCMS) will be provided as part of the Code of Construction Practice (CoCP).The WCMS will be developed in accordance with the Outline CoCP and will include details of the crossing technique and construction methodology to be undertaken at each crossing and associated environmental mitigation measures. Where open cut trenching is proposed for ordinary watercourses, temporary measures to maintain the flow of water and mitigate adverse effects on the watercourse and flood risk will be implemented during construction. Where the Environment Agency's Main Rivers are to be crossed by temporary haul roads, bailey or similar clear span bridges will be used. For other watercourses, temporary culverts with an overlying haul road will be used where existing access is not available and where temporary bridges are not practicable. Temporary culverts will be adequately sized to avoid impounding flows (including appropriate climate change allowances), and the invert set below the bed level to allow bedload transport.	DCO Requirement - Code of Construction Practice)	Mitigation to avoid the direct disturbance of surface water bodies and causing changes to surface and groundwater flows and flood risk. Also relevant to **Volume 2, Appendix 21.3 Flood Risk Assessment.**	WRF-C-01 WRF-C-04

Commitment ID	Proposed Embedded Mitigation	How the Embedded Mitigation Will be Secured	Relevance to Water Resources and Flood Risk Assessment	Relevance to Impact ID
CO36	Onshore export cables will be installed at a minimum depth of 2m (to the top of the duct / cable or otherwise) below the channel bed of watercourses, including the landward toe of any associated flood defences. The final depth at each watercourse crossing will be dependent on local geology and geomorphology risks and will take into consideration anticipated climate change-related changes in fluvial flows and erosion that may occur over time. Crossing-specific vertical clearance depth will be agreed with the relevant authorities through the Watercourse Crossing Method Statement (WCMS).	DCO Requirement - Code of Construction Practice	Mitigation to avoid the direct disturbance of surface water bodies. Also relevant to **Volume 2, Appendix 21.3 Flood Risk Assessment.**	WRF-C-01
CO37	With the exception of watercourse crossings, onshore export cable installation works will be located at a minimum of 6m from the outside edge of any pipe which is forming a culverted Internal Drainage Board (IDB) maintained drain where practicable. Where works are required within 6m, this will be agreed with the Beverley and North Holderness IDB prior to the commencement of the relevant works to ensure access to the IDB's assets is maintained during construction.	DCO Requirement - Code of Construction Practice	Mitigation to avoid the direct disturbance of surface water bodies.	WRF-C-01
CO38	A Drilling Fluid Breakout Management Plan will be provided as part of the Code of Construction Practice (CoCP). The Drilling Fluid Breakout Management Plan will be developed in accordance with the Outline CoCP and will detail mitigation measures to reduce the risk of fluid breakouts during trenchless installation works and a response plan should a fluid breakout occur.	DCO Requirement - Code of Construction Practice	The Drilling Fluid Breakout Management Plan will manage the risks of drilling fluid breakout associated with the use of trenchless installation techniques, which could pollute groundwaters or smother habitats at the surface.	WRF-C-03
CO39	A Code of Construction Practice (CoCP) will be provided in accordance with the Outline CoCP. The CoCP will enable effective planning, monitoring and management of onshore construction works to mitigate potential impacts on the environment and communities and ensure compliance with the latest relevant regulatory requirements and best practice.	DCO Requirement - Code of Construction Practice	The Outline CoCP secures best practice mitigation measures to that will limit impacts on surface and groundwaters. Also relevant to **Volume 2, Appendix 21.3 Flood Risk Assessment** as secures measures to ensure there is not an increased risk of flooding during construction.	WRF-C-01 WRF-C-02 WRF-C-03 WRF-C-04
CO40	A Pollution Prevention Plan (PPP) will be provided as part of the Code of Construction Practice (CoCP). The PPP will incorporate the latest relevant Environment Agency best practice guidelines for pollution prevention and detail how ground and surface waters will be protected from construction-related pollution. The PPP will include appropriate control measures for the use and storage of any fuels, oils and other chemicals during construction works.	DCO Requirement - Code of Construction Practice	The PPP includes best practice mitigation measures that would minimise the likelihood of an accidental release and put in place procedures for an effective response to any pollution event in the water environment.	WRF-C-03

Commitment ID	Proposed Embedded Mitigation	How the Embedded Mitigation Will be Secured	Relevance to Water Resources and Flood Risk Assessment	Relevance to Impact ID
CO43	A Construction Surface Water Drainage Plan will be provided as part of the Code of Construction Practice (CoCP) and will be developed in accordance with the Outline CoCP. The Construction Surface Water Drainage Plan will detail measures to minimise water within the temporary works area, to ensure the required ongoing drainage of surrounding land (including appropriate climate change allowances) and that the existing land drainage system is not adversely compromised by construction works. Site-specific construction drainage measures and post-construction drainage reinstatement and maintenance requirements will be detailed in the Construction Surface Water Drainage Plan based on land drainage survey undertaken by a suitably qualified expert prior to construction and in consultation with landowners.	DCO Requirement - Code of Construction Practice	The Construction Surface Water Drainage Plan includes measures to manage surface water during construction, which will limit and reduce any potential flood risk impacts. Also relevant to **Volume 2, Appendix 21.3 Flood Risk Assessment.**	WRF-C-02 WRF-C-04
CO44	An Operational Drainage Strategy will be provided for permanent infrastructure in the Onshore Converter Station (OCS) zone in accordance with the Outline Operational Drainage Strategy. The Operational Drainage Strategy will include measures to ensure that existing land drainage is reinstated and / or maintained, discharge rates are limited and flows are attenuated to maintain greenfield run-off rates.	DCO Requirement - Operational Drainage Strategy	The Operational Drainage Strategy includes design measures to limit runoff from the OCS and ESBI and discharge runoff at a controlled rate that will not increase flood risk. Also relevant to **Volume 2, Appendix 21.3 Flood Risk Assessment.**	WRF-O-03 WRF-O-04
CO46	A Soil Management Plan (SMP) will be provided as part of the Code of Construction Practice (CoCP). The SMP will be developed in accordance with the Outline CoCP and will detail the soil stripping, excavation, storage, reinstatement, cropping and aftercare measures to safeguard soil resources and drainage during the construction works. The SMP will be informed by Agricultural Land Classification (ALC) and soil condition surveys which will be undertaken post-consent and prior to construction.	DCO Requirement - Code of Construction Practice	The Soil Management Plan includes measures to limit impacts associated with exposed ground and soil erosion, which could transfer to nearby watercourses.	WRF-C-02 WRF-C-03
CO49	Details of residual contamination risks identified during construction will be included in the Onshore Operation and Maintenance (O&M) Plan or similar. O&M workers required to undertake ground excavations during the O&M phase will be provided with the Onshore O&M Plan to allow them to determine the nature of ground conditions in each area and develop appropriate risk assessments and method statements. Appropriate pollution prevention measures and emergency response measures in the event of an uncontrolled release of hazardous materials and other pollutants will be included in the Onshore O&M Plan.	DCO Requirement - Onshore Operations and Maintenance Plan	Standard best practice measures on pollution prevention will be applied during any localised and infrequent intrusive works during the O&M phase to minimise impacts to surface and groundwater.	WRF-O-03
CO56	An Onshore Decommissioning Plan will be developed prior to commencement of onshore decommissioning works based on the relevant available guidance and legislative requirements. The scope and methodology of onshore decommissioning works and appropriate mitigation measures will be detailed in the plan.	DCO Requirement - Onshore Decommissioning Plan	Ensures that effects to water resources and flood risk during decommissioning of the Project's onshore infrastructure will be minimised in accordance with relevant available guidance and legislative requirements at the time.	WRF-D-01 WRF-D-02 WRF-D-03 WRF-D-04

Commitment ID	Proposed Embedded Mitigation	How the Embedded Mitigation Will be Secured	Relevance to Water Resources and Flood Risk Assessment	Relevance to Impact ID
CO79	A Battery Safety Management Plan (BSMP) will be developed in accordance with the Outline BSMP. The BSMP will provide a health and safety risk assessment of the Energy Storage and Balancing Infrastructure (ESBI) and detail appropriate prevention, monitoring and contingency measures for any identified hazards, including fire and chemical leak containment, to ensure compliance with latest relevant regulations and standards. The BSMP will also include measures for provision of information to the local community on ESBI risks and how these risks are appropriately mitigated and managed.	DCO Requirement - Battery Safety Management Plan	The BSMP will include measures to prevent contaminated fire water associated with the operation of the ESBI from contaminating surface and groundwaters.	WRF-O-03 WRF-O-04
CO104	Crossing ID WX-29 as listed within the Onshore Crossing Schedule located in the vicinity of the Hempholme Pumping Station will be installed using trenchless techniques. The crossing will be a minimum 30m from the sheet piles, located to the south of the Hempholme Pumping Station. The cables will be installed at a minimum depth of 5m below the bed level of Mickley Dike and the flood defence structures.	DCO Works DCO Requirement - Code of Construction Practice	Relevant to **Volume 2, Appendix 21.3 Flood Risk Assessment.** Minimises effects to flood defence structures and asset at the Hempholme Pumping Station.	N/A
CO108	A site-specific Flood Warning and Evacuation Plan will be included in the Project Emergency Response Plan provided as part of the Code of Construction Practice (CoCP). The Flood Warning and Evacuation Plan will be developed in accordance with the Outline CoCP and will include a series of actions to be adopted should adverse weather or flooding be forecast.	DCO Requirement - Code of Construction Practice	Relevant to **Volume 2, Appendix 21.3 Flood Risk Assessment**. The Flood Warning and Evacuation Plan will include measures to limit the flood risk to construction personnel, plant and equipment, materials and other temporary assets.	N/A

41. A draft version of the **Outline Code of Construction Practice** (document reference 8.9) is provided with the PEIR for consultation, which will be updated post-PEIR and submitted with the DCO application. The Outline CoCP will detail measures relevant to water resources and flood risk that will be secured in the plan. Indicative embedded mitigation measures which are included in the Outline CoCP are set out in **Table 21-5.**

Table 21-5 Indicative Embedded Mitigation Measures Included in the Outline Code of Construction Practice

Outline CoCP: Embedded Mitigation Measures for Water Resources and Flood Risk
Pollution Prevention Plan (PPP) (part of CoCP developed post-consent) A PPP for the specific stage of construction works will be included in the CoCP. The PPP will be developed in accordance with the Environment Agency's Pollution Prevention Guidance (PPG) notes (including PPG01, PPG05, PPG06, PPG08, PPG21, PPG22) (although these have been revoked in England, they still provide a useful guide for best practice measures), CIRIA's C532 Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors (2001), Defra's Pollution Prevention for Businesses (2016), CIRIA's C648 Control of Water Pollution from Linear Construction Projects (2006) and other latest available guidance. The PPP will include the following measures to minimise the risk of on-site pollution incidents on ground and surface waters during construction. The PPP should be implemented in conjunction with the pollution incident reporting and containment measures in the Project Emergency Response Plan: • Concrete and cement mixing and washing areas will be located at least 10m away from the nearest watercourse. These areas will incorporate settlement and recirculation systems to allow water to be re-used. All washing out of equipment will take place in a contained area, and the water collected for disposal off-site; • Storing all fuels, oils, lubricants and other chemicals in impermeable bunds with capacity of 110% of the capacity if the largest storage vessel located within the bund or 25% of the total capacity of the tanks in the bund (whichever is greatest), with any damaged containers being removed from site; • Siting of storage bunds within the working area will take into consideration site security, location of sensitive receptors such as boreholes, wells, drains and watercourses and potential pollution pathways and flood risk; • The walls for the storage bunds will be of sufficient height and structural soundness to withstand flood water ingress; • Storage bunds will be locked and made secure when not in use; • Refuelling will take place in a dedicated impermeable area, using a bunded bowser, located at least 10m away from the nearest water body; • Biodegradable oils are to be used where practicable; • Ensuring that spill kits are available on site at all times as well as sandbags and stop logs for deployment on the outlets from the site drainage system in case of emergency spillages; • Potential contaminants will be stored under cover to prevent rainwater carrying pollutants away;

Outline CoCP: Embedded Mitigation Measures for Water Resources and Flood Risk
• Temporary construction compounds will comprise hardstanding areas of permeable material, such as gravel aggregates, matting / timber, or similar, underlain by geotextile or another suitable material to a minimum of 50% of the exposed area; • Potential contaminants will be stored in a safe place away from vehicles to prevent collisions; • Fuels, oils, lubricants and other chemicals will be clearly labelled, and the site should retain an up-to-date Control of Substances Hazardous to Health (COSHH) inventory; • All reasonable steps will be undertaken to ensure that mud, silty water and other loose sediments do not enter the local road network and surface water drains. Should these materials encroach onto the local road network, steps will be undertaken to ensure its clean-up; • Wheel washing facilities will be cleaned frequently; • Plant and equipment not in use will be placed away from watercourses and surface water drains with suitable interceptor drip tray protection or plant nappies utilised; • Activities involving the handling of large quantities of hazardous materials (e.g. deliveries and refuelling activities) will be undertaken by designated and trained construction staff; • Measures to intercept sediment run-off at source in the drainage system using suitable filters will be implemented to remove sediment from water discharged to the surface drainage network; • Dewatering from cable trenches and excavations and surface water run-offs will be collected in lagoons / settlement tanks to allow suspended solids to settle before discharge; • Storage bunds and drainage systems will be inspected regularly (e.g. weekly) for signs of spillage, leaks and damage and silt depositions; • Inspection of all construction plant and equipment for fuel leaks to be undertaken before being mobilised to the working area; • Buffer strips of vegetation adjacent to water bodies will be retained where practicable to intercept any contaminated run-off; • The soil stockpiles will be set back at least 10m from watercourses; and • Geotextile silt fencing will be used. where required, at the toe of stockpile slopes, to reduce the movement of silt – this should be installed before soil stripping has begun and vehicles start tracking over the site.
Drilling Fluid Breakout Management Plan (part of CoCP developed post-consent) Where the construction works involve trenchless installation techniques with the use of drilling fluid (i.e. bentonite or other inert clay-based material), a Drilling Fluid Breakout Management Plan will be included in the CoCP for the relevant stage of construction works. The Drilling Fluid Breakout Management Plan will be informed by site-specific ground investigations and the specific installation technique and design of each trenchless crossing. The plan will include the following information: • Site-specific risk assessment and design measures (e.g. hydro-fracturing modelling, depth of installation) to minimise the risk of breakouts; • Provision of drilling fluid management system appropriate to the trenchless installation works being undertaken;

Outline CoCP: Embedded Mitigation Measures for Water Resources and Flood Risk

- Monitoring of drilling fluid properties, volume / flow and pressure during the works to quickly identify any losses should a breakout occur;
- A protocol for the reporting of potential breakout and stopping works; and
- Measures to contain and clean up the breakout (e.g. sandbags, pumps, lost circulation additive materials).

Watercourse Crossing Method Statement (part of CoCP developed post-consent)

Where the construction works involve watercourse crossing(s), a Watercourse Crossing Method Statement(s) will be included in the CoCP for the relevant stage of construction works. The method statement will be provided for each crossing and include the following information:

- Site-specific results of pre-construction watercourse survey(s) undertaken for the works;
- The type of duct installation technique and any requirement for haul road crossing;
- The location and design of the cable crossing and haul road crossing (if required); and
- Proposed construction methodology and environmental mitigation measures to minimise impacts on surface and ground waters with respect to their quality, flow and associated flood risk.

Where a watercourse is crossed using trenched installation techniques or during the installation of temporary culverts for haul road crossings, temporary measures will be implemented to maintain the flow of water along the watercourse and included in the Watercourse Crossing Method Statement. These measures would include the following:

- The duration that temporary dams are in place will be kept to a minimum;
- Flumes, pumps or diversion channels will be adequately sized to ensure that flows downstream are maintained whilst minimising upstream impoundment, accounting for climate change allowances;
- A sediment / siltation trap will be installed upstream of any temporary dams. Excess sediment will be moved before or as the temporary dams are removed to stop mobilisation downstream once works are complete;
- A sediment / siltation trap will also be installed downstream of the temporary dam to capture any sediment that is overpumped. For lower flows, hay bales or similar may be used;
- Weather forecast and any flood alert / warning will be reviewed to ensure works are not undertaken during flood events, and works during very wet weather conditions will be avoided;
- Scour protection measures will be implemented to protect the riverbed downstream of the dam from high energy flow at the outlets of flumes and pumps;
- If a diversion channel is required, geotextiles or similar techniques will be used to line the channel and prevent sediment from entering the watercourse;
- Vegetation will not be removed from the banks, unless necessary to undertake the works, in which case removal will be restricted to the smallest practicable footprint;
- Channel bed and banks will be appropriately reinstated (e.g. by replacing resectioned banks with more natural profiles that are typical of the natural geomorphology of the watercourse);
- A fish rescue will be required to be undertaken prior to dewatering the area between the temporary dams; and
- Pumps will be fitted with a mesh of suitable size to prevent fish access.

Outline CoCP: Embedded Mitigation Measures for Water Resources and Flood Risk

In addition, where a haul road crossing of a watercourse is required, the following measures will be implemented and included in the Watercourse Crossing Method Statement:

- Where temporary culverts are used, they will be adequately sized to maintain flow patterns and sediment conveyance, accounting for climate change allowances, and avoid unnecessary changes to the hydromorphology of the watercourse;
- Temporary culverted sections of watercourses will be designed to be long enough to protection the section of watercourse being crossed to ensure no release of mud / silt run-off into watercourses from vehicular use of the overlying haul road;
- In sensitive locations where a temporary culvert or bridge is considered to be unsuitable to maintain access over the watercourse (e.g. due to the presence of sensitive ecological receptors or where the watercourse is too wide), a stop end to the haul road will be implemented whereby the haul road will stop and continue on the other side of the watercourse. Access to the opposite side of the watercourse will be taken from the existing road network or an alternative route;
- Regular clearing of debris from culverts will be undertaken as required to ensure no blockages to flow are present during construction. Notification to the relevant authorities will be made in advance of debris clearing to ensure no consents / permits are required; and
- Following the completion of the relevant construction works, temporary culverts or bridges (and their abutments) will be removed, and the bed and banks of the watercourse will be reinstated to their pre-construction conditions as far as practicable.

Where watercourse crossings are required, the appropriate permits and consents will be sought from the relevant authorities as required prior to the commencement of the relevant construction works.

Details of the locations and work undertaken on any Main River or associated flood defences, including any reports or records, will be submitted to the Environment Agency upon completion of construction works. Details of the location and work undertaken on any IDB-maintained drain or ordinary watercourse will be submitted to the Beverley and North Holderness IDB or ERYC as appropriate upon completion of construction works.

Construction Surface Water Drainage Plan (part of CoCP developed post-consent)

A Construction Surface Water Drainage Plan for the specific stage of construction works will be included in the CoCP. The plan will provide the following information:

- Site-specific results of land drainage survey(s) undertaken for the works;
- Locations and design of the pre-construction and post-construction land drainage and other temporary surface water drainage requirements;
- Control measures to minimise accumulation of surface water within the working area, ensure ongoing drainage of surrounding land and manage surface water run-offs during construction;
- Maintenance requirements for the installed drainage during construction; and
- Reinstatement requirements for existing land drainage impacted by the works following the completion of construction.

Outline CoCP: Embedded Mitigation Measures for Water Resources and Flood Risk

Land drainage survey(s) will be undertaken by a suitably qualified drainage expert prior to the commencement of the relevant construction works to establish the existing drainage system and record the locations and conditions of field drains and ditches in the working area. Site-specific survey findings will be used to inform the design of pre-construction and post-construction land drainage and any other temporary surface water drainage requirements included in the Construction Surface Water Drainage Plan.

In addition, the drainage design will include appropriate climate change allowances and appropriate pollution prevention measures (e.g. hydrocarbon / silt interceptors) and control measures to ensure surface water discharge to the surrounding drainage network occurs at a controlled rate (e.g. attenuation ponds, soakaways).

Land drainage channels will be installed within the working area by the Principal Contractor(s) to intercept existing field drains and ditches and maintain the integrity of the existing drainage system during construction. New land drainage channels will not be installed into areas where they are not currently present, unless otherwise agreed with the relevant landowner, occupier and / or their land agents. Land drainage systems will be maintained during construction and reinstated on completion of construction works.

Foul drainage from construction welfare facilities will be collected through mains connection to an existing mains sewer (if such a connection is available) or in a septic tank located within the working area to be taken for off-site disposal at a licenced facility.

Flood Warning and Evacuation Plan (part of CoCP developed post-consent)

A Flood Warning and Evacuation Plan will be developed by the Principal Contractor(s) and included in the Project Emergency Response Plan to ensure the monitoring of flood hazards during construction and establish a site-specific protocol to be undertaken in the event of flooding to protect construction staff, plant and equipment, materials and other assets.

The Flood Warning and Evacuation Plan will include the following measures:

- Construction staff will be required to monitor local weather forecasts and flood alert / warning services such as the Environment Agency's Flood Line or other approved providers in rural areas not covered by the Environment Agency's services. Independent checks will be undertaken to account for risk of flooding beyond those identified by flood alert / warning services such as heavy rainfall or accumulation of surface water on site;
- All construction staff should be made aware of any areas, including access routes, located within Flood Zones 2 or 3 and any flood alert / warning issued for those areas. Where a flood alert / warning is issued, construction works in the affected area will cease where deemed necessary, and the affected area should be cleared of all personnel, and where practicable, plant and equipment and materials;
- Include key contacts, including Flood Line, emergency services, utilities companies and insurance providers;
- Clearly identify areas at risk of flooding on construction site layout plans;
- Ensure that there is safe access and egress from the site to allow timely evacuation in the event of a tidal, fluvial or surface water flood event;
- Identify plant and equipment, materials and other assets that could be left in-situ without risk of damage or causing pollution and critical assets that require removal or additional protection;

Outline CoCP: Embedded Mitigation Measures for Water Resources and Flood Risk

- Undertake visual checks on flood defences, watercourses and drainage culverts prior to and during the commencement of the relevant construction works following a flood event or significant adverse weather event. Any signs of degradation or damage will be reported to the relevant authorities (i.e. Environment Agency) immediately;
- Debris from construction activities will be safely contained to reduce the risk of large items entering the flood flow;
- Where practicable, soil stockpiles within a floodplain will be avoided. Where soil storage in Flood Zones 2 and 3 is unavoidable, storage areas will be located such that they do not block or divert existing surface water flow paths;
- Plant and equipment and materials will be stored in areas of hardstanding, preferably away from flood waters, and where not practicable, these will be sufficiently secured to prevent them being from washed away;
- Soil stockpiles will be stored with gaps in between them to enable flow conveyance; and
- The construction works in the affected area would commence once the working conditions are deemed safe.

42. In addition to the Outline CoCP**,** embedded mitigation measures for water resources and flood risk will also be included in the Outline Operational Drainage Strategy and the Outline BSMP, which will be developed at ES stage and submitted with the DCO application. Indicative embedded mitigation measures which are proposed to be included in these plans are set out in **Table 21-6**.

Table 21-6 Indicative Embedded Mitigation Measures To Be Included in the Outline Operational Drainage Strategy and Outline Battery Safety Management Plan

Outline Operational Drainage Strategy: Embedded Mitigation Measures for Water Resources and Flood Risk (to be developed at ES stage)

The operational drainage design will include Sustainable Drainage Systems (SuDS) measures and appropriate climate change allowances. Surface water will be discharged from the site at a controlled rate, which will be determined during the detailed design stage. Appropriate consideration will be given to maintaining any existing floodplain capacity and / or flow conveyance during extreme rainfall events.

Outline BSMP: Embedded Mitigation Measures for Water Resources and Flood Risk (to be developed at ES stage)

Specific pollution prevention measures for the ESBI will be identified through the design process. Best practice measures (CIRIA, 2014) may include:

- All potential sources of chemical pollution stored within an internal secondary containment bund;
- The bund would be epoxy coated to withstand chemical degradation and would not be connected to foul or surface drainage and would be permanently sealed;

- Quarterly preventative maintenance checks would be instigated on site and repairs carried out on the bund if issues are found;
- This bund would be designed to contain at least 110% of the entire pollutant source; and
- In addition, external tertiary containment bunds would be constructed around the perimeter boundary to contain firefighting water and surface water runoff.

An emergency contract would be taken out with an appropriate water management service to provide a tankering facility on site to pump out accumulated firefighting water and/or rainwater from within the secondary or tertiary containment bunds.

21.4.4 Realistic Worst-Case Scenarios

43. To provide a precautionary, but robust, assessment at this stage of the Project's development process, a realistic worst-case scenario has been defined in **Table 21-7** for each impact scoped into the assessment (as outlined in **Section 21.4.2**). The realistic worst-case scenarios are derived from the range of parameters included in the Project Design Envelope. They ensure that the assessment of likely significant effects is based on the maximum potential impact on the environment. Should an alternative development scenario be taken forward in the final design of the Project, the resulting effects would not be greater in effect significance. Further details on the Project Design Envelope are provided in **Chapter 6 Environmental Impact Assessment Methodology**.

44. Following the PEIR publication, further design refinements will be made based on ongoing engineering studies and considerations of the EIA and stakeholder feedback. Therefore, realistic worst-case scenarios presented in the PEIR may be updated in the ES. The Project Design Envelope will be refined where possible to retain design flexibility only where it is needed.

21.4.5 Development Scenarios

45. Consideration is also given to the different development scenarios with respect to the Onshore Converter Station (OCS) zones. At this stage, two OCS zone options remain in the Project Design Envelope (see **Chapter 4 Project Description** for further details) noting that only one option will be developed. The two development scenarios are:

- Infrastructure located in OCS Zone 4; or
- Infrastructure located in OCS Zone 8.

46. With respect to the water resources and flood risk assessment, it is noted that the assessment of likely significant effects is not materially affected by the two development scenarios, as the same broad receptors, realistic worst-case scenarios and potential effects are applicable to both OCS zone options. Therefore, the assessment outcomes presented in **Section 21.7** remain the same for both development scenarios.

Table 21-7 Realistic Worst-Case Scenarios for Impacts on Water Resources and Flood Risk

Impact ID	Impact and Project Activity	Realistic Worst-Case Scenario	Rationale
Construction			
WRF-C-01	Direct disturbance of surface water bodies – trenched watercourse (cable) crossings, temporary (haul road watercourse crossings) and construction activities at the OCS and ESBI	Number of trenched crossings: Worst-case is the number of trenched crossings per surface water catchment and the installation of associated temporary haul road crossings. Details of watercourse crossing are provided in **Volume 2, Appendix 4.3 Crossing Schedule – Onshore**. Detailed methods for trenched ordinary watercourse crossings will be determined during detailed design stage post-consent. They may include: • Temporary dam and divert or fluming, and ducts installed below the channel bed and channel reinstated sympathetically. • Where the onshore ECC crosses an open ditch or drain, and access for the haul road is required, an appropriately sized culvert may be installed inside the channel bed to avoid upstream impoundment. As a worst-case, it is assumed that temporary haul road crossings would remain in place for the duration of the Project's construction. **Landfall** • Indicative temporary landfall construction compound area: 12,500m^2 (including construction footprint of TJB and underground link box). • Indicative haul road width at landfall: 7m. **Onshore ECC** • Maximum length of HVDC export cable corridor: 50km • Maximum length of HVAC export cable corridor: 5km • Indicative width of cable trench at surface: 3m • Target minimum cable burial depth using open cut trenching: 1.2m • Maximum number of trenches of HVDC onshore export cables: 2 • Maximum number of trenches of HVAC onshore export cables: 4 • Indicative haul road width: 6m (8.5m where passing places are required) **OCS Zone (OCS and ESBI)** • Maximum developable area for OCS and ESBI: 25ha (including but not limited to platform footprint, landscaping, access, drainage and attenuation but exclude areas for ecological mitigation / enhancement) • Total temporary area: 4.5ha (including 2 temporary construction compounds for the OCS and ESBI) • Total permanent area: 20.5ha (including but not limited to platform footprint, landscaping, access, drainage and attenuation but exclude areas for ecological mitigation / enhancement)	Direct disturbance of surface water bodies will occur during temporary damming and diversion/ fluming of ordinary watercourses, or where ordinary watercourses are crossed by temporary access routes (i.e. the haul road). These parameters represent the worst-case scenario of the onshore ECC. An indicative layout of infrastructure within the OCS zone has not been determined at the time of writing the PEIR to allow an assessment of potential worst-case impacts from direct disturbance to surface water bodies within either OCS zone. Following further development of the project design, impacts to watercourse(s) within the OCS zone will be assessed at ES stage based on the realistic worst-case scenario derived from the Project Design Envelope in the ES.

Impact ID	Impact and Project Activity	Realistic Worst-Case Scenario	Rationale
WRF-C-02	Increased sediment supply – construction activitiess at the landfall, onshore ECC and OCS zone	**Landfall** • Indicative temporary landfall construction compound area: 12,500m^2 (including construction footprint of TJB and underground link box) • Indicative haul road width at landfall: 7m • Maximum number of landfall cable ducts: 3 (including 1 spare) • Maximum number of Transition Joint Bay (TJB) at landfall: 1 • Maximum number of underground link box at landfall: 1 • Maximum horizonal length of trenchless installation: 2,000m • Indicative minimum depth of trenchless installation at cliff: 5m • Anticipated duration of landfall construction works: approximately three years (including one year of trenchless installation works) **Onshore ECC** As for direct disturbance of surface water bodies and in addition: • Maximum length of HVDC export cable corridor: 50km • Maximum length of HVAC export cable corridor: 5km • Indicative temporary construction corridor width for HVDC onshore export cables: 32m (50m at trenchless crossing locations) • Indicative temporary construction corridor width for HVAC onshore export cables: 55m (60m at trenchless crossing locations) • Indicative number of jointing bay locations along onshore ECC: 62 • Indicative number of link box locations along onshore ECC: 56 (for the purposes of the PEIR assessment, it is assumed that at approximately 20 link box locations for the HVDC export cables and all link box locations for the HVAC export cables will involve the use of above-ground link boxes) • Maximum jointing bay and link box temporary construction area for HVDC export cables: 660m^2 (per location) • Maximum jointing bay and link box temporary construction area for HVAC export cables: 1,040m^2 (per location) • Maximum jointing bay burial depth: 2.5m • Maximum underground link box burial depth / above-ground link box height: 2m • Indicative number of main construction compounds for onshore export cable works: 4 • Indicative main construction compound area: 20,000m^2 (per compound) • Indicative number of intermediate construction compounds for onshore export cable works: 8 • Indicative intermediate construction compound area: 5,625m^2 (per compound) • Maximum land area temporarily disturbed during construction: 1,700,000m^2 • Indicative trenchless installation compound area for HVDC export cables: 300m^2 (5,625m^2 for non-HDD techniques) (per compound)	These parameters represent the maximum footprint of disturbance and activities within the Onshore Development Area that could lead to the potential disturbance of sediment, contamination through spills and leaks, and alteration of surface and groundwater flows and flood risk.
WRF-C-03	Supply of contaminants to surface and groundwater – construction activities at the landfall, onshore ECC and OCS zone		

Impact ID	Impact and Project Activity	Realistic Worst-Case Scenario	Rationale
WRF-C-04	Changes to surface and groundwater flows and flood risk– construction activitiess at the landfall, onshore ECC and OCS zone	• Indicative trenchless installation compound dimensions for HVAC export cables: 800m^2 (5,625m^2 for non-HDD techniques) (per compound) • Target minimum cable burial depth using trenchless installation techniques: 3.5m • Target maximum cable burial depth using trenchless installation techniques: 20m • Anticipated duration of onshore export cable construction works: approximately four years **OCS Zone (OCS and ESBI)** • Maximum developable area for OCS and ESBI: 25ha (including but not limited to platform footprint, landscaping, access, drainage and attenuation but exclude areas for ecological mitigation / enhancement) • Total temporary area: 4.5ha (including 2 temporary construction compounds for the OCS and ESBI) • Total permanent area: 20.5ha (including but not limited to platform footprint, landscaping, access, drainage and attenuation but exclude areas for ecological mitigation / enhancement) • Indicative quantity of topsoil excavated within OCS zone: 100,000m^3 (assumed 50% of topsoil to be removed off-site – 50,000m^3) • Dewatering details: Pumped and discharged to temporary attenuation/settlement ponds or mechanical plant (e.g. siltbuster) • Indicative access road width (including site access road from the public highway and internal tracks within the site): 7.3m • Anticipated duration of OCS and ESBI construction works: approximately five years	
Operation and Maintenance			
WRF-O-03	Supply of contaminants to surface and groundwater – operation of the ESBI with respect to firewater and planned and unplanned O&M activities	Anticipated duration of O&M phase: approximately 35 years **Landfall and Onshore ECC** • Link boxes would require periodic access by personnel for inspection and testing during operation and maintenance. • Maximum number of underground link box at landfall: 1 • Indicative number of link box locations along onshore ECC: 56 (for the purposes of the PEIR assessment, it is assumed that at approximately 20 link box locations for the HVDC export cables and all link box locations for the HVAC export cables will involve the use of above-ground link boxes) **OCS Zone (OCS and ESBI)** • Staffing: Unmanned asset except for routine inspections, planned maintenance works and unplanned emergency maintenance works.	These parameters represent the worst-case scenario for O&M requirements and fuel storage.

Impact ID	Impact and Project Activity	Realistic Worst-Case Scenario	Rationale
WRF-O-04	Changes to surface and groundwater flows and flood risk – presence of permanent above-ground infrastructure	**Landfall** • Maximum permanent underground link box area: 10m^2 • Underground link box will be installed with a manhole cover for O&M access at ground level and typically marked / protected by bollards, fences or similar of approximately 1.2 to 2m in height (where required and agreed with the relevant landowners). • Maximum permanent TJB area: 30m^2 **Onshore ECC** • Maximum length of HVDC export cable corridor: 50km • Maximum length of HVAC export cable corridor: 5km • Indicative width of operational easement for HVDC export cables: 20m • Indicative width of operational easement for HVAC export cables: 25m • Indicative width of cable trench at surface: 3m • Maximum permanent jointing bay area: 30m^2 (per jointing bay) • Maximum permanent underground link box area: 4m^2 (per link box) • Maximum permanent above-ground link box area: 3m^2 (per link box) • Target minimum cable burial depth using open cut trenching: 1.2m **OCS Zone (OCS and ESBI)** • Maximum developable area for OCS and ESBI: 25ha (including but not limited to platform footprint, landscaping, access, drainage and attenuation but exclude areas for ecological mitigation / enhancement) • Total permanent area: 20.5ha (including but not limited to platform footprint, landscaping, access, drainage and attenuation but exclude areas for ecological mitigation / enhancement) • Indicative impermeable area (OCS): 2.2ha. • Indicative impermeable area (ESBI): 3.7ha.	These parameters represent the worst-case scenario for impermeable ground and potential sources of disruption to surface and groundwater flows.

Impact ID	Impact and Project Activity	Realistic Worst-Case Scenario	Rationale
Decommissioning			
WRF-D-01	Direct disturbance of surface water bodies – decommissioning activities not yet defined	The final decommissioning strategy of the Project's onshore infrastructure has not yet been decided. For a description of potential onshore decommissioning works, refer to **Chapter 4 Project Description**. It is recognised that regulatory requirements and industry best practice change over time. Therefore, the details and scope of onshore decommissioning works will be determined by the relevant regulations and guidance at the time of decommissioning. Specific arrangements will be detailed in an Onshore Decommissioning Plan (see **Table 21-4**, Commitment ID CO56), which will be submitted and agreed with the relevant authorities prior to the commencement of onshore decommissioning works. For this assessment, it is assumed that decommissioning is likely to operate within the parameters identified for construction (i.e. any activities are likely to occur within the temporary construction working areas and require no greater amount or duration of activity than assessed for construction). The decommissioning sequence will generally be the reverse of the construction sequence. It is therefore assumed that decommissioning impacts would likely be of similar nature to, and no worse than, those identified during the construction phase.	
WRF-D-02	Increased sediment supply – decommissioning activities not yet defined		
WRF-D-03	Supply of contaminants to surface and groundwater – decommissioning activities not yet defined		
WRF-D-04	Changes to surface and groundwater flows and flood risk – decommissioning activities not yet defined		

21.5 Assessment Methodology

21.5.1 Guidance Documents

47. The following guidance documents have been used to inform the baseline characterisation, assessment methodology and mitigation design for water resources and flood risk:

- Construction Industry Research and Information Association (CIRIA) (2001) C532 Control of water pollution from construction sites;
- CIRIA (2014) C736 Containment systems for the prevention of pollution Secondary, tertiary and other measures for industrial and commercial premises. CIRIA, London;
- Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites;
- Defra (2016) Guidance: Pollution prevention for businesses;
- Department for Transport (2024) Transport Analysis Guidance (TAG) Unit A3 Environmental Impact Appraisal (Department for Transport, 2024);
- Standards for Highways (2020) Design Manual for Roads and Bridges LA113 Road drainage and the water environment;
- Department for Levelling Up, Housing and Communities, 2022; and
- National Planning Policy Framework (Annex 3 Flood Risk Vulnerability Classification).

21.5.2 Data and Information Sources

21.5.2.1 Desk Study

48. A desk study has been undertaken to compile baseline information in the previously defined Study Area (see **Section 21.4.1**) using the sources of information set out in **Table 21-8**.

Table 21-8 Desk-Based Sources for Water Resources and Flood Risk Data

Data Source	Spatial Coverage	Year(s)	Summary of Data Contents
Environment Agency Catchment Data Explorer	100% of Study Area	Cycle 1 (2009) to Cycle 3 (2022) data (last updated in August 2023)	WFD water body status objectives and classification data.
Environment Agency Water Quality Data Archive	Watercourses with monitoring stations	Updated approximately every six months	Archive water quality data for a wide range of parameters.
Defra MAGiC	100% of Study Area	Undated	• Source Protection Zones (SPZ) • Aquifer designation mapping (bedrock and superficial) • Groundwater vulnerability mapping • Statutory and non-statutory designated sites
British Geological Survey	100% of Study Area	Undated	• Geological mapping (bedrock and superficial geology) • Archive borehole data
Environment Agency flood map	100% of Study Area	Updated every three months	• Flood risk mapping • Rivers • Sea • Surface water • Reservoirs
Environment Agency and East Riding of Yorkshire Council abstraction (available on request)	Individual locations within the Study Area (where applicable)	East Riding of Yorkshire Council data received on 03/10/24. Environment Agency data received on 20/11/24	Details of surface and groundwater abstraction points (location and type).
Environment Agency Discharges to Controlled Waters database	Individual locations within the Study Area (where applicable)	Discharge data downloaded on 20/10/24	Details of active effluent discharge (location and type).

21.5.2.2 Site-Specific Surveys

49. In addition to desk-based sources, a site-specific survey was undertaken to provide detailed geomorphological baseline information. The walkover survey methodology was discussed and agreed with stakeholders through the second ETG10 meeting held on 24th September 2024 (**Volume 2, Appendix 21.1 Consultation Responses for Water Resources and Flood Risk**). **Table 21-9** summarises the survey that was undertaken between 21st and 23rd October 2024 (**Volume 2, Appendix 21.2 Fluvial Geomorphology Survey Report**).

Table 21-9 Site-Specific Survey Data for Water Resources and Flood Risk

Survey	Spatial Coverage	Year(s)	Summary of Survey Data
Geomorphology baseline survey	Main Rivers, IDB drains, and larger ordinary watercourses crossed by the Onshore Development Area	2024	The survey included an assessment of channel form, flow conditions, floodplain characteristics, in-channel and riparian vegetation, and any evidence of channel modification. The survey methodology was consulted on and agreed at the second ETG10 meeting (**Volume 2, Appendix 21.1 Consultation Responses for Water Resources and Flood Risk**).

21.5.3 Impact Assessment Methodology

50. **Chapter 6 Environmental Impact Assessment Methodology** sets out the overarching approach to the impact assessment methodology. The topic-specific methodology for the water resources and flood risk assessment is described further in this section.

51. The assessment methodology was consulted on and agreed with stakeholders at the second ETG10 meeting held on 24th September 2024 (**Volume 2, Appendix 21.1 Consultation Responses for Water Resources and Flood Risk**).

21.5.3.1 Impact Assessment Criteria

21.5.3.1.1 Receptor Sensitivity and Impact Magnitude

52. For each potential impact, the assessment identifies receptors sensitive to that impact and implements a systematic approach to understanding the impact pathways and the level of impacts (i.e. magnitude) on given receptors. The definitions of sensitivity and magnitude for the purpose of the water resources and flood risk assessment are provided in **Table 21-10** and **Table 21-11**. These specific definitions have been based on the following guidance documents:

- Transport Analysis Guidance (TAG) Unit A3 Environmental Impact Appraisal (Department for Transport, 2024);
- Design Manual for Roads and Bridges LA113 Road drainage and the water environment (Standards for Highways, 2020); and
- National Planning Policy Framework (Annex 3 Flood Risk Vulnerability Classification) (Department for Levelling Up, Housing and Communities, 2022).

53. The guidance documents provide a limited amount of detail with regard to the different types of receptors that fall within each category. The definitions set out in **Table 21-10** and **Table 21-11** have been expanded based on professional judgement to include more explicit reference to each type of water receptor. These definitions are industry good practice consistent with assessments undertaken for other NSIP such as the Sheringham Shoal Extension and Dudgeon Extension Projects (Equinor, 2022).

Table 21-10 Definition of Sensitivity for a Water Recourses and Flood Risk Receptor

Sensitivity	Definition
High	The receptor has no or very limited capacity to tolerate changes to hydrology, geomorphology, water quality or flood risk and has little potential for substitution. This includes water resources which support human health and / or the economic activity at a regional scale, or receptors with a high vulnerability to flooding. **Water resources** • Controlled waters with an unmodified, naturally diverse hydrological regime, a naturally diverse geomorphology with no barriers to the operation of natural processes, and good water quality; • Supports habitats or species that are highly sensitive to changes in surface hydrology, geomorphology or water quality; • Supports Principal Aquifer with public water supply abstractions by provision of recharge; and • Site is within Inner or Outer Source Protection Zone (SPZ1, SPZ2).

Sensitivity	Definition
	Flood risk • Highly Vulnerable Land Use, as defined by Annex 3 of NPPF (Department for Levelling Up, Housing and Communities, 2022); and • Land with more than 100 residential properties (after Department for Transport, 2024).
Medium	The receptor has limited capacity to tolerate changes to hydrology, geomorphology, water quality or flood risk. This includes water resources which support human health and/or economic activity at a local scale or receptors with a high vulnerability to flooding. **Water resources** • Controlled waters with hydrology that sustains natural variations, geomorphology that sustains natural processes, and water quality that is not contaminated to the extent that habitat quality is constrained; • Supports or contributes to habitats or species that are sensitive to changes in surface hydrology, geomorphology and/or water quality; • Supports Secondary A or Secondary B Aquifer with water supply abstractions; and • Site is within SPZ3 (total catchment). **Flood risk** • More Vulnerable Land Use, as defined by Annex 3 of NPPF (Department for Levelling Up, Housing and Communities, 2022); and • Land with between 1 and 100 residential properties or more than 10 industrial premises (Department for Transport, 2024).
Low	The receptor has moderate capacity to tolerate changes to hydrology, geomorphology and water quality or flood risk. This includes water resources that support human health and/or economic activity at a neighbourhood (multiple property) scale and receptors with a moderate vulnerability to flooding. **Water resources** • Controlled waters with hydrology that supports limited natural variations, geomorphology that supports limited natural processes, and water quality that may constrain some ecological communities; • Supports or contributes to habitats that are not sensitive to changes in surface hydrology, geomorphology or water quality; and • Supports Secondary A or Secondary B Aquifer without abstractions. **Flood risk** • Less Vulnerable Land Use, as defined by Annex 3 of NPPF (Department for Levelling Up, Housing and Communities, 2022); and • Land with 10 or fewer industrial properties (after Department for Transport, 2024).
Negligible	The receptor is generally tolerant of changes to hydrology, geomorphology, water quality or flood risk. This includes water resource that supports human health and/or economic activity at a single property scale and receptors with a low vulnerability to flooding. **Water resources** • Controlled waters with hydrology that does not support natural variations, geomorphology that does not support natural processes, and water quality that constrains ecological communities; • Aquatic or water-dependent habitats and/or species are tolerant to changes in hydrology, geomorphology or water quality; and • Non-productive strata that does not support groundwater resources. **Flood risk** • Water Compatible Land Use as defined by Annex 3 of NPPF (Department for Levelling Up, Housing and Communities, 2022); and • Land with limited constraints and a low probability of flooding of residential and industrial properties (after Department for Transport, 2024).

Table 21-11 Definition of Magnitude of Impact for a Water Recourses and Flood Risk Receptor

Magnitude	Definition
High	Permanent/irreversible, or large-scale changes, over the whole receptor affecting usability, risk, or value. This causes fundamental changes to key features of the receptor's character or distinctiveness. **Water resources** • Permanent changes to geomorphology and/or hydrology that prevent natural processes operating; • Permanent and/or wide scale effects on water quality or availability; • Permanent loss or long-term degradation of a water supply source resulting in prosecution; • Permanent or wide scale degradation of habitat quality; • Deterioration in WFD surface water body status or prevention of achieving future status objectives; and • Deterioration in groundwater levels, flows or quality leading to a deterioration in WFD groundwater body status.

Magnitude	Definition
	Flood risk • Permanent or major change to existing flood risk; • Reduction in on-site flood risk by raising ground level in conjunction with provision of compensation storage; • Increase in off-site flood risk due to raising ground levels without provision of compensation storage; and • Failure to meet either sequential or exception test (if applicable).
Medium	Partial loss or noticeable change over the majority of the receptor, and/or discernible alteration to key features of the receptor's character or distinctiveness. Moderate permanent or long-term reversible change may result affecting usability, value, or risk, over the medium-term or local area. **Water resources** • Medium-term effects on water quality or availability; • Medium-term degradation of a water supply source, possibly resulting in prosecution; • Habitat change over the medium-term; • Potential temporary downgrading in the status of individual WFD elements, without affecting the ability of the surface water to achieve future objectives; and • Medium-term deterioration in groundwater levels, flow or quality leading to potential temporary downgrading of WFD status. **Flood risk** • Medium-term or moderate change to existing flood risk; • Possible failure of sequential or exception test (if applicable); and • Reduction in off-site flood risk within the local area due to the provision of a managed drainage system.
Low	Discernible temporary change over a minority of the receptor, and/or with minimal effect on usability, risk or value. There may also be a potential discernible alteration to key features of the receptor's character or distinctiveness. **Water resources** • Short-term or local effects on water quality or availability; • Short-term degradation of a water supply source; • Habitat change over the short-term; and • No change to WFD status. **Flood risk** • Short-term temporary or minor change to existing flood risk;
	• Localised increase in on-site or off-site flood risk due to increase in impermeable area; and • Passing of sequential and exception test.
Negligible	Temporary change, undiscernible over longer timescales, with no effect on usability, risk or value. This may result in light, or no, alteration to the characteristics or features of the receptor's character or distinctiveness. **Water resources** • Temporary impact on local water quality or availability; • Temporary or no degradation of a water supply source; and • Very slight local changes to habitat that have no observable impact on dependent receptors. **Flood risk** • Temporary or very minor change to existing flood risk; and • Highly localised increase in on-site or off-site flood risk due to increase in impermeable area.

21.5.3.1.2 Effect Significance

54. The assessment of significance of an effect is informed by the sensitivity of the receptor and the magnitude of the impact (see **Chapter 6 Environmental Impact Assessment Methodology**). The determination of significance is guided by the use of an impact significance matrix presented in **Table 21-12**.

Table 21-12 Water Resources and Flood Risk Significance of Effect Matrix

		Adverse Magnitude				Beneficial Magnitude			
		High	**Medium**	**Low**	**Negligible**	**Negligible**	**Low**	**Medium**	**High**
Sensitivity	**High**	Major	Major	Moderate	Minor	Minor	Moderate	Major	Major
	Medium	Major	Moderate	Minor	Minor	Minor	Minor	Moderate	Major
	Low	Moderate	Minor	Minor	Negligible	Negligible	Minor	Minor	Moderate
	Negligible	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Minor

55. Definitions of each level of significance are provided in **Table 21-13**. For the purposes of this assessment, any effect that is of major or moderate significance is considered to be significant in EIA terms, whether this be adverse or beneficial. Any effect that has a significance of minor or negligible is not significant. These specific definitions have been defined by professional judgement and represent industry good practice consistent with assessments undertaken for other NSIP such as the Sheringham Shoal Extension and Dudgeon Extension Projects (Equinor, 2022).

Table 21-13 Definition of Effect Significance

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

21.5.4 Cumulative Effects Assessment Methodology

56. The cumulative effect assessment (CEA) (**Section 21.8**) considers other plans and projects that may act collectively with the Project to give rise to cumulative effects on water resources and flood risk receptors. The general approach to the CEA for water resources and flood risk involves screening for potential cumulative effects, identifying a short list of plans and projects for consideration and evaluating the significance of cumulative effects. **Chapter 6 Environmental Impact Assessment Methodology** and **Volume 2, Appendix 6.5 Cumulative Effects Screening Report – Onshore** provide further details on the general framework and approach to the CEA.

21.5.5 Assumptions and Limitations

57. This chapter provides a preliminary assessment of the likely significant effects of the Project in relation to water resources and flood risk using information available at the time of drafting as described in **Chapter 6 Environmental Impact Assessment Methodology**. This assessment will be refined and presented in the ES to be submitted with the DCO application.

58. This assessment is based on a range of publicly available information and data sources (as listed in **Table 21-8**) and is largely desk-based. Although these data sets are considered robust, there is a level of uncertainty and assumptions associated with their use in this impact assessment. For example, the known characteristics of the drainage network and attributes and conditions specific to water bodies have been used as a proxy to assign value and sensitivity to the wider catchments and the ordinary watercourses within them. This is a precautionary approach that ensures value and sensitivity have not been under-assessed within this preliminary assessment.

59. Due to the timing of drafting this chapter, the assessment is based on the 2024 versions of Risk of Flooding from Surface Water and Risk of Flooding from Rivers and Sea data from the Environment Agency. It is noted that in 2025 updated versions of this data have been published which will be incorporated at the ES stage.

21.6 Baseline Environment

21.6.1 Existing Baseline

21.6.1.1 Surface Water

21.6.1.1.1 Surface Water Drainage

60. The majority of the Onshore Development Area falls within the catchment of the River Hull. This river system drains the eastern side of the Yorkshire Wolds and flows in a generally north-south direction to join the Humber Estuary at Hull.

61. As discussed in **Section 21.4.1**, the Onshore Development Area comprises a number of surface water catchments, which are analogous to the river water body catchments identified in the Humber RBMP (Environment Agency, 2022) (as described in **Section 21.4.1**). These surface water catchments are shown on **Figure 21-1** and listed below, grouped according to the Environment Agency operational catchment in which they are located:

- Barmston Sea Drain:
  - Barmston Sea Drain from Skipsea Drain to N Sea (GB104026077780).

  - Barmston Sea Drain / Skipsea Drain to Conf (GB104026077770).
  - Onshore coastal catchment (not part of a defined water body catchment).
- Hull Upper:
  - Old Howe / Frodingham Beck to R Hull (GB104026067021).
  - Mickley Dike Catchment (GB104026066990).
  - Hull from West Beck to Arram Beck (GB104026067000).
- Hull Lower:
  - Beverley and Barmston Drain (GB104026067211).
  - Bryan Mills Beck Source to Bryan Mills Farm (GB104026066960).
  - Ella Dyke (GB104026066941).
  - Foredyke Stream Lower to Holderness Dr (GB104026066910).
  - High Hunsley to Arram Area (GB104026066841).
  - High Hunsley to Woodmansey Area (GB104026066820).
  - Holderness Drain Source to Foredyke Stream (GB104026066950).
  - Scorborough Beck (GB104026066901).
- Hull and East Riding Canals:
  - Leven Canal (GB70410003)

62. In addition, adjacent to the North Sea near Skipsea there is an area of onshore coastal catchment drained by several small artificial drains (**Figure 21-1**). Onshore coastal catchments are areas which drain directly to coastal or estuarine waters, rather than through a defined river water body catchment.

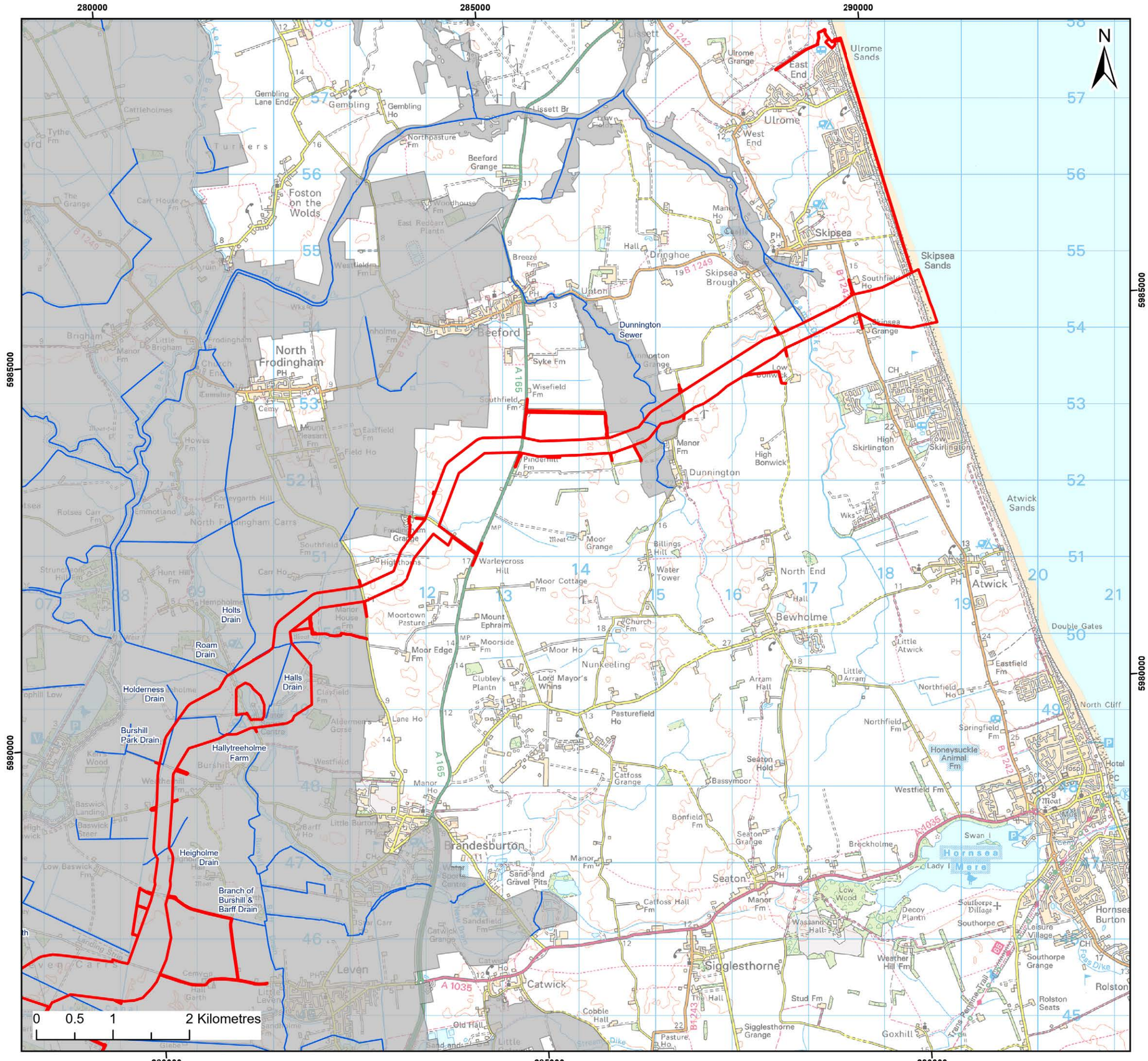
63. A large part of the Study Area is drained by channels managed by the Beverley and North Holderness Internal Drainage Board (IDB). The Onshore Development Area crosses several IDB drains (**Figure 21-3**).

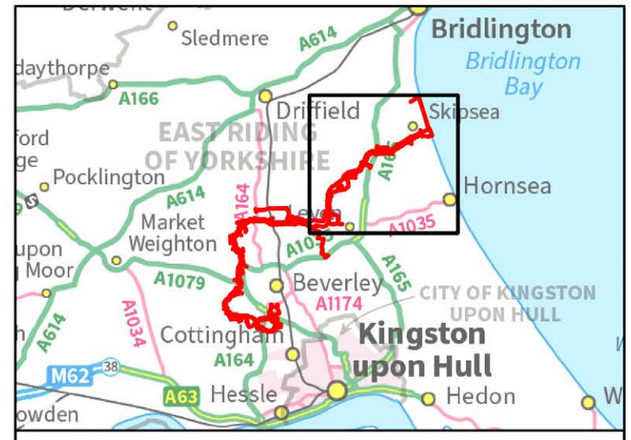
21.6.1.1.2 Geomorphology

64. The methodology and results of the geomorphological baseline survey undertaken in October 2024 are discussed in detail in **Volume 2, Appendix 21.2 Fluvial Geomorphology Survey Report**.

65. Based on the geomorphology walkover survey (**Volume 2, Appendix 21.2 Fluvial Geomorphology Survey Report**) watercourses in the Onshore Development Area are typically of uniform depth and have trapezoidal cross sections with steep banks, indicative of artificial straightening. Typically, the watercourses are relatively narrow agricultural drains, except for the River Hull, which is 20 to 25m wide. Channels are typically incised below adjacent arable farmland. Most channels appear to be dominated by depositional processes, with slow (glide) flows, low gradients and low velocities contributing to the settling out of fines. Fine sediment loads are likely sourced from adjacent agricultural fields and upstream in the wider catchment. Banks and channel margin areas are generally well-vegetated with rushes, sedges and reeds.

66. The only watercourse that shows extended areas of relatively natural geomorphology is Bealey's Beck (Scorborough Beck catchment). Bealey's Beck is a locally gravel-bed watercourse with well-defined riffle-pool sequences. The channel is well-wooded in places with limited evidence of channel incision and better connectivity with the surrounding floodplain. The surveyed reaches of Bealey's Beck do not appear to have been dredged, and the channel planform is gently meandering with evidence of bank erosion in places and some local bank protection structures.





Legend:

- Onshore Development Area
- Beverley and North Holderness Internal Drainage Board Catchment Area
- Beverley and North Holderness Internal Drainage Board Maintained Drains

Project: Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title: Internal Drainage Board Watercourses - Sheet 1 of 2

Figure:	Drawing No:				
21-3	PC6250-RHD-XX-ON-DR-GS-0120				
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Co-ordinate system: British National Grid

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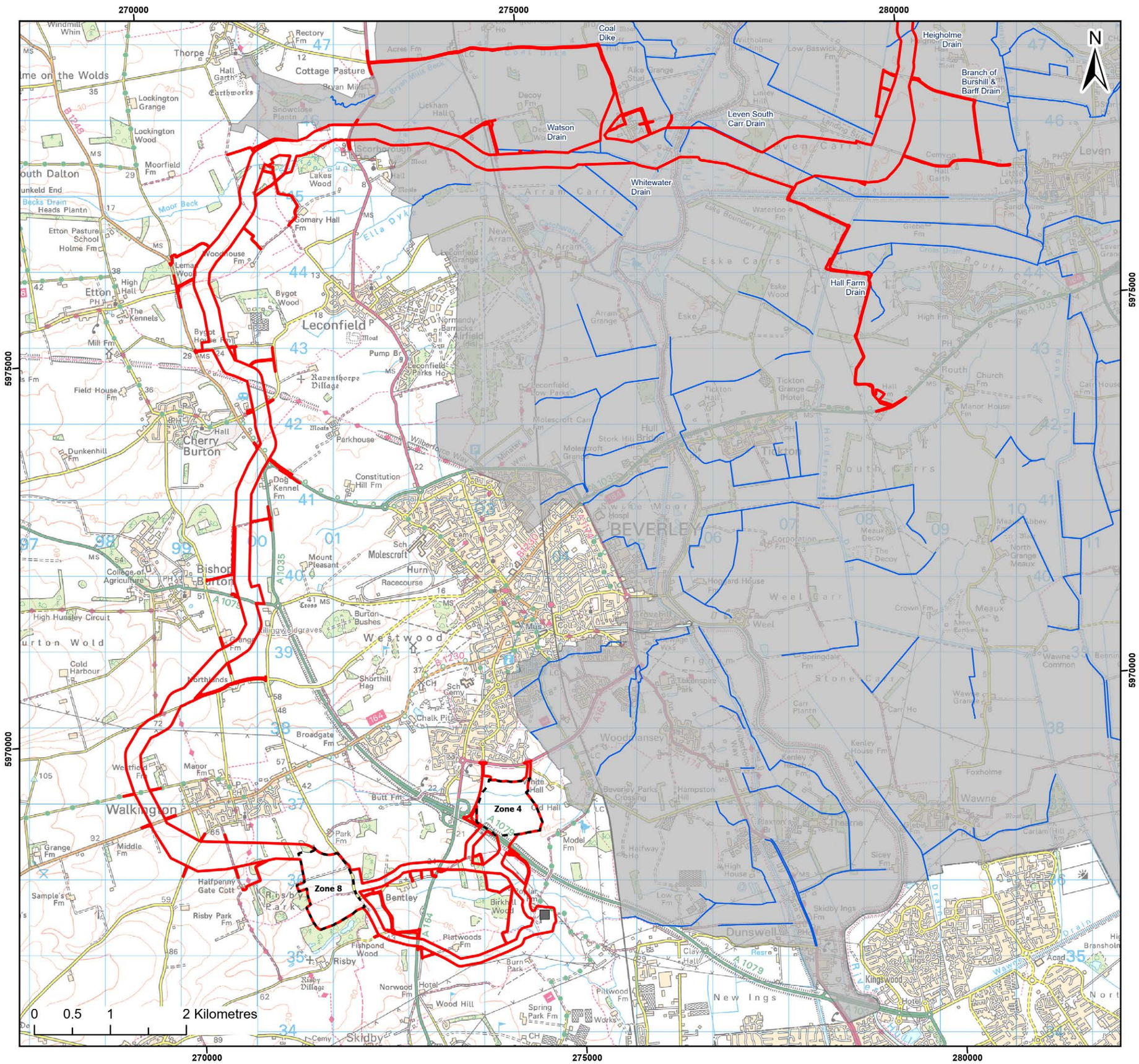

Legend:

- Onshore Development Area
- Onshore Converter Station Options
- Indicative Birkhill Wood Substation Location
- Beverley and North Holderness Internal Drainage Board Catchment Area
- Beverley and North Holderness Internal Drainage Board Maintained Drains

Project: Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title: Internal Drainage Board Watercourses - Sheet 2 of 2

Figure: 21-3

Drawing No: PC6250-RHD-XX-ON-DR-GS-0120

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Co-ordinate system: British National Grid

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21.6.1.1.3 Water Quality

67. A review of the Environment Agency's Catchment Data Explorer (Environment Agency, 2023) for surface water bodies gives an indication of water quality across the catchments of interest (**Table 21-14)**. These water body catchments are shown on **Figure 21-1**. The most recent Environment Agency water body classification data is for River Basin Planning Cycle 3 (last updated August 2023), which provides an update in the classification for all water bodies from the Cycle 2 (2019) classification round.

68. The ecological status (or ecological potential for artificial / heavily modified water bodies) is Moderate across the Onshore Development Area. Most water bodies are either artificial or heavily modified. The main activities that are adversely affecting water bodies are sewage treatment and discharge and land management practices (e.g. nutrient management and soil management).

69. Note that the chemical status of water bodies is not reported in **Table 21-14**. This is because all water bodies in England were assessed by the Environment Agency as Fail for chemical status in Cycle 2 (2019) due to a group of global pollutants. These are polybrominated diphenyl ethers (PBDE – a group of brominated flame retardants), mercury, certain polycyclic aromatic hydrocarbons (PAH), and perfluorooctane sulfonate (PFOS – a group of per-and polyfluoroalkyl substances (PFAS)). No feasible technical solution exists to remove these chemicals entirely and they will take time to naturally drop to required levels. 2040 to 2063 is listed by the Environment Agency as the objective date for recovery for water bodies assessed in **Table 21-14**. The most recent update for chemical status (Cycle 3 (2022)) for all water bodies in England has therefore been classified as 'does not require assessment' by the Environment Agency[1].

Table 21-14 Water Body Water Quality Details (after Environment Agency, 2023)

Water Body	Type and Designation	Ecological Status / Potential	Reason for Not Achieving Good Status (RNAG)[2] Activity	Classification Elements Affected
Barmston Sea Drain from Skipsea Drain to N Sea GB104026077780	River Artificial	Moderate	Poor nutrient management	Phosphate
			Private Sewage Treatment	
			Not applicable	Mercury and its compounds PBDE
Barmston Sea Drain / Skipsea Drain to Conf GB104026077770	River Not designated artificial or heavily modified	Moderate	Sewage discharge (continuous) Private sewage treatment	Macrophytes and Phytobenthos combined
				Phosphate
				Invertebrates
			Sewage discharge (continuous)	Ammonia
			Private sewage treatment	Dissolved oxygen
			Not applicable	Mercury and its compounds PBDE
Old Howe / Frodingham Beck to R Hull GB104026067021	River Heavily modified	Moderate	Other (not listed but linked to physical modification)	Mitigation measures assessment
			Not applicable	Mercury and its compounds PBDE
Foredyke Stream Lower to Holderness Dr GB104026066910	River Artificial	Moderate	Land drainage Land leaching	Fish
			Poor nutrient management	Phosphate

[1] Further explanation of the chemical status for water bodies in England is provided on the Environment Agency Catchment Data Explorer: https://environment.data.gov.uk/catchment-planning/help/usage#chemical-status.

[2] Reason for Not Achieving Good (water body status/potential)

Water Body	Type and Designation	Ecological Status / Potential	Reason for Not Achieving Good Status (RNAG)[2] Activity	Classification Elements Affected
			Sewage discharge (continuous)	
			Sewage discharge (continuous) Land leaching	Ammonia
			Sewage discharge (continuous) Land drainage - operational management Landfill leaching	Dissolved oxygen
			Other (not listed but linked to physical modification)	Mitigation measures assessment
			Unknown (pending investigation)	PFOS
			Not applicable	Mercury and its compounds PBDE
Mickley Dike Catchment GB104026066990	River Artificial	Moderate	Poor nutrient management Private sewage treatment Drought	Dissolved oxygen
			Other (not listed but linked to physical modification)	Mitigation measures assessment
			Not applicable	Mercury and its compounds PBDE
Hull from West Beck to Arram Beck GB104026067000	River Heavily modified	Moderate	Land drainage - operational management	Fish
			Other (not listed but linked to physical modification)	Mitigation measures assessment
			Not applicable	Mercury and its compounds PBDE
			Other (not listed but linked to physical modification)	Mitigation measures assessment
			Not applicable	Mercury and its compounds PBDE
			Unknown (pending investigation)	Benzo(g-h-i)perylene Benzo(k)fluoranthene Benzo(b)fluoranthene
			Contaminated water body bed sediments	Tributyltin compounds
Holderness Drain Source to Foredyke Stream GB104026066950	River Artificial	Moderate	Not applicable (no sector responsible)	Phosphate
			Not applicable (no sector responsible)	Ammonia
			Land drainage - operational management	Dissolved oxygen

Water Body	Type and Designation	Ecological Status / Potential	Reason for Not Achieving Good Status (RNAG)[2] Activity	Classification Elements Affected
			Other (not listed but linked to physical modification)	Mitigation measures assessment
			Not applicable	Mercury and its compounds PBDE
Beverley and Barmston Drain GB104026067211	River Artificial	Moderate	Land drainage - operational management Riparian / in-river activities (inc. bankside erosion) Poor nutrient management	Phosphate
			Riparian / in-river activities (inc. bankside erosion) Poor nutrient management	Dissolved oxygen
			Other (not listed but linked to physical modification)	Mitigation measures assessment
			Not applicable	Mercury and its compounds PBDE
Bryan Mills Beck Source to Bryan Mills Farm GB104026066960	River Not designated artificial or heavily modified	Moderate	Poor soil management Sewage discharge (continuous)	Phosphate
			Other (not listed but linked to physical modification)	Mitigation measures assessment
			Not applicable	Mercury and its compounds PBDE
Scorborough Beck GB104026066901	River Not designated artificial or heavily modified	Moderate	Poor soil management Sewage discharge (continuous)	Macrophytes and Phytobenthos Combined
			Not applicable	Mercury and its compounds PBDE
Ella Dyke GB104026066941	River Heavily modified	Moderate	Sewage discharge (continuous) Unknown (pending investigation)	Phosphate
			Not applicable (no sector responsible)	Dissolved oxygen
			Other (not listed but linked to physical modification)	Mitigation measures assessment
			Not applicable	Mercury and its compounds PBDE
High Hunsley to Arram Area GB104026066841	River Artificial	Moderate	Not applicable (no sector responsible)	Ammonia
			Poor nutrient management	Phosphate
			Other (not listed but linked to physical modification)	Mitigation measures assessment

Water Body	Type and Designation	Ecological Status / Potential	Reason for Not Achieving Good Status (RNAG)[2] Activity	Classification Elements Affected
			Not applicable	Mercury and its compounds PBDE
			Unknown (pending investigation)	Benzo(g-h-i)perylene Benzo(k)fluoranthene Benzo(b)fluoranthene
High Hunsley to Woodmansey Area GB104026066820	River Artificial	Moderate	Not applicable (No sector responsible)	Fish
			Not applicable	Mercury and its compounds PBDE
Leven Canal GB70410003	Canal Artificial	Moderate	Not applicable	Mercury and its compounds PBDE

21.6.1.1.4 Abstractions

70. Data received from the Environment Agency shows there is one surface water abstraction point and one groundwater abstraction point within the Onshore Development Area. Details of these abstractions and any other abstractions within 100m of the Onshore Development Area are shown in **Table 21-15.**

Table 21-15 Surface and Groundwater Abstractions within the Onshore Development Area and within 100m of the Onshore Development Area (Environment Agency Data)

Location	Licence Number	Source	Primary Use	Secondary Use
Within Onshore Development Area				
Hotham Family Trust	2/26/32/154	Groundwater Borehole No2 - chalk - Scorborough	Water Supply	Private water undertaking
Albanwise Ltd	NE/026/0032/047	Surface water Leven South Carr Drain - Hall Farm	Environmental	Non-remedial river / wetland support
Within 100m of Onshore Development Area				
J S R Farms Ltd	2/26/32/303	Groundwater Borehole - Chalk - Leconfield	Agriculture	General agriculture
J S R Farms Ltd	2/26/32/303	Groundwater Borehole - Chalk - Leconfield	Agriculture	General agriculture
Albanwise Ltd	NE/026/0032/047	Surface Water Leven South Carr Drain - Hall Farm	Environmental	Non-remedial river/wetland support
Albanwise Farming Ltd	2/26/32/189	Surface water	Agriculture	General agriculture (spray irrigation)
Albanwise Farming Ltd	2/26/32/189	Surface water	Agriculture	General agriculture (spray irrigation)

Location	Licence Number	Source	Primary Use	Secondary Use
Albanwise Farming Ltd	2/26/32/189	Surface water	Agriculture	General agriculture (spray irrigation)
Albanwise Farming Ltd	2/26/32/189	Surface water	Agriculture	General agriculture (spray irrigation)
Albanwise Farming Ltd	2/26/32/189	Surface water	Agriculture	General agriculture (spray irrigation)
W Lee & Co	NE/026/0032/020	Surface water	Agriculture	General agriculture (spray irrigation)
W Lee & Co	NE/026/0032/020	Surface water	Agriculture	General agriculture (spray irrigation)
Albanwise Farming Ltd	NE/026/0032/074	Surface water	Agriculture	General agriculture (spray irrigation)

71. Data received for East Riding of Yorkshire Council show there are no groundwater abstractions located within the Onshore Development Area (**Table 21-16**). There are three groundwater abstractions located within 100m of the Onshore Development Area. Two of these are small-scale abstractions for domestic use. Details of the third are unknown but aerial imagery suggests it is located on a site now associated with a veterinary surgery.

Table 21-16 Groundwater Abstractions within 100m of the Onshore Development Area (East Riding of Yorkshire Council Data)

Location	Source	Use
Cherry Burton, HU17 7LU	Unknown	Unknown
Cottingham, HU16 5SA	Borehole	Domestic
Scorborough, YO25 9BB	Borehole	Domestic

21.6.1.1.5 Discharges

72. Details of active discharge permits (required under the Environmental Permit Regulations) within the Onshore Development Area, or within 100m of it are shown in **Table 21-17** (Environment Agency, 2024a). There is only one discharge within the Onshore Development Area and a further six within 100m. All discharge to land rather than a watercourse.

Table 21-17 Active Discharge Consents within 100m of the Onshore Development Area

Location	Permit Number	Surface Water Catchment	Details
Within Onshore Development Area			
Main Street, Aike	WA6054	Beverley and Barmston Drain	Sewage discharges – final / treated effluent - not water company. Discharged into land / infiltration system.
Within 100m of the Onshore Development Area			
Bishop Burton, Ashfield Farm, Dog Kennel Lane.	C4396	High Hunsley to Arram Area	Sewage discharges – final / treated effluent - not water company. Discharged into land / infiltration system.
Aike, west of main street: domestic property (multiple) – including farmhouses.	C5515	Beverley and Barmston Drain	Sewage discharges – final / treated effluent - not water company. Discharged into land / infiltration system.
Aike, Aike Lane, High Grange Farm: domestic property (single) - including farmhouse.	C4439	Beverley and Barmston Drain	Sewage discharges – final / treated effluent - not water company. Discharged into land / infiltration system.
Aike, adjacent to High Grange Farm. Crop and animal rearing; plant nursery.	C3905	Beverley and Barmston Drain	Sewage discharges – final / treated effluent - not water company. Discharged into land / infiltration system.
Aike, High Grange Farm. Crop and animal rearing; plant nursery.	WA5882	Beverley and Barmston Drain	Sewage discharges – final / treated effluent - not water company. Discharged into land / infiltration system.

Location	Permit Number	Surface Water Catchment	Details
Aike, Granary Cottage: Farm and plant nursery. Crop and animal rearing; plant nursery.	C4972	Beverley and Barmston Drain	Sewage discharges – final / treated effluent - not water company. Discharged into land / infiltration system.

21.6.1.1.6 Flood Risk

73. A summary of flood risk is provided in this section and in **Volume 2, Appendix 21.3 Flood Risk Assessment**.

74. Large areas of the East Riding of Yorkshire are defended against fluvial and coastal flooding. As such, much of the flood risk posed to the area is residual, as a result of flood events exceeding the standard of protection afforded by the defences, defence or pumping failure, or flooding behind defences due to local runoff or groundwater (East Riding of Yorkshire Council, 2019).

75. Flood zone definitions are provided in **Table 21-18**.

Table 21-18 Flood Risk Definitions (Department for Levelling Up, Housing and Communities, 2022)

Flood Zone	Probability of Flooding	Return Periods
1	Low	Land having a less than 0.1% annual probability of river or sea flooding. (shown as 'clear' on the Flood Map for Planning – all land outside Zones 2 and 3).
2	Medium	Land having between a 1% and 0.1% annual probability of river flooding: or Land having a 0.5% and 0.1% annual probability of sea flooding (land shown in light blue on the Flood Map for Planning).
3	High	Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea flooding (Land shown in dark blue on the Flood Map for Planning).

21.6.1.1.7 Flooding from Rivers and the Sea

76. Environment Agency mapping shows that most of the Onshore Development Area lies outside Flood Zones 2 and 3 (i.e., Flood Zone 1 (<0.1% Annual Exceedance Probability (AEP)) (**Figure 21-4**). Any land that is not mapped as Flood Zones 2 or 3 is part of Flood Zone 1, although this is not specifically mapped.

77. The main areas at flood risk within the Onshore Development Area are as follows:

- At the landfall and along the emergency beach access, the coastline (seaward of MHWS) is in Flood Zone 3. In this area, the dominant source of flooding is from tidal sources, as opposed to being at risk from fluvial sources.
- Between Skipsea and the A165 road, there are two narrow (approximately 75-100m wide) areas in Flood Zones 2 and 3 associated with Stream Dike and Dunnington Sewer.
- West of the A165 road to Scorborough Lane, the onshore ECC crosses a large area that is mainly in Flood Zone 3, with peripheral areas in Flood Zone 2. This is an extensive low lying area beside the River Hull.
- Between Bishop's Burton and Lockington, there are relatively narrow valley floor areas in Flood Zone 3 associated with relatively small scale permanent and ephemeral channels that drain the eastern slopes of the Yorkshire Wolds.
- At OCS Zone 4, there is a narrow area of valley floor in Flood Zones 2 and 3 associated with Autherd Drain. South of Autherd Drain, there is also a narrow area in Flood Zones 2 and 3 associated with a minor field drain near Beverley Parks.
- A minor ordinary watercourse crosses the onshore ECC in two locations in the Platwoods Fields / Jillywood Farm area. This area is in Flood Zones 2 and 3.

21.6.1.1.8 Surface Water Flood Risk

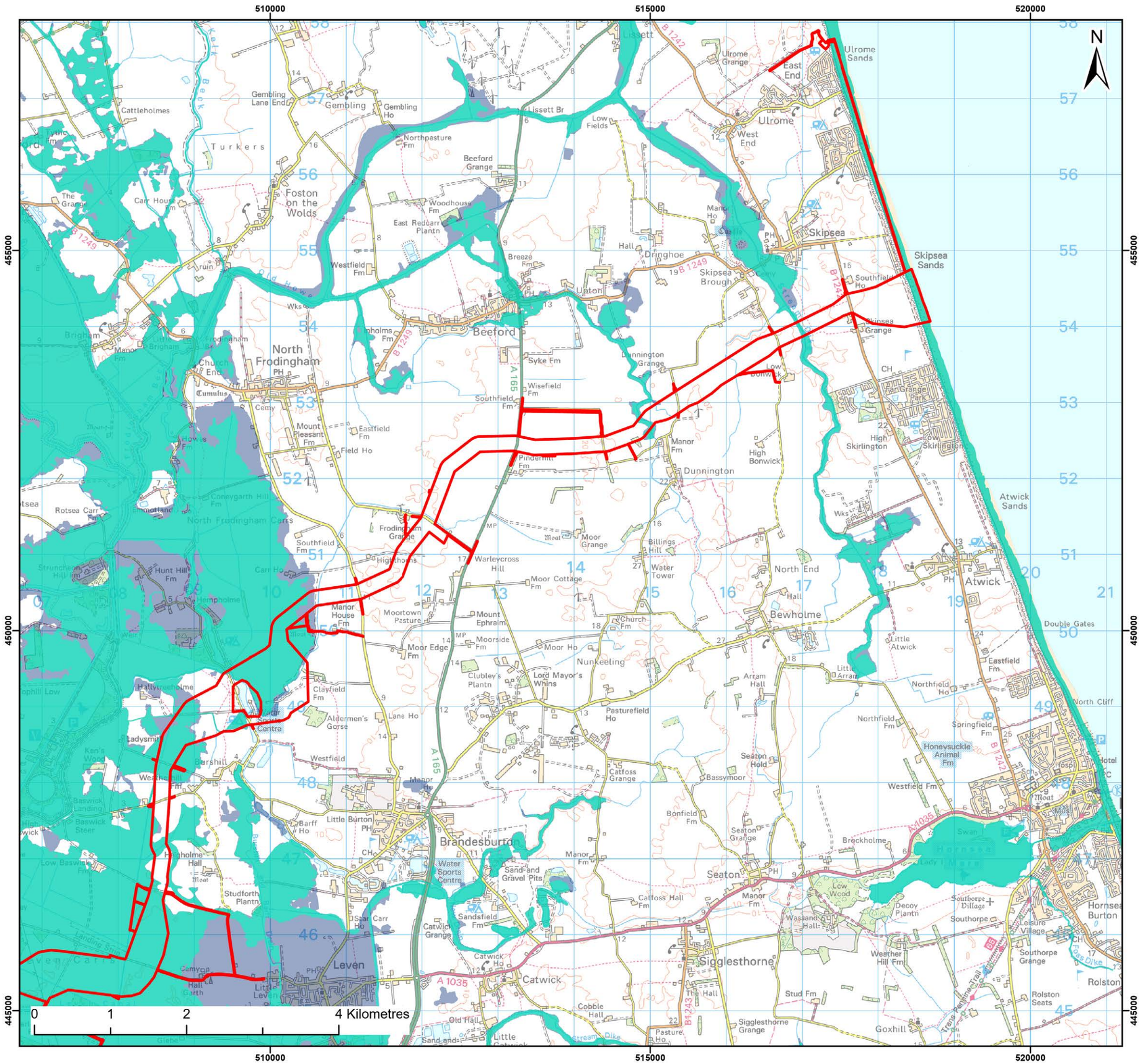
78. Given the low-lying topography of the Onshore Development Area, the risk of surface water flooding is high in many places (**Figure 21-5**).

79. Surface water flood risk occurs as isolated areas of ponding and discrete flow pathways across most of the Onshore Development Area. Flow paths are related to permanent watercourses (including drains and ditches) and ephemeral channels draining the Yorkshire Wolds.

80. Several surface water flow path crosses OCS Zone 4 associated with Autherd Drain and smaller tributary features. At Zone 8, there is a surface water flow path and more extensive area of ponding west of Coppleflat Lane road.

21.6.1.1.9 Reservoir Flood Risk

81. The Onshore Development Area crosses two areas at risk of reservoir flooding associated with two artificial storage reservoirs situated at Tophill Low (see **Figure 21-3-7** of **Volume 2, Appendix 21.3 Flood Risk Assessment**). The water stored in these reservoirs is abstracted from the adjacent River Hull and is ultimately used for public supply.



Project:

Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Flood Risk (Fluvial, Tidal)
- Sheet 1 of 2

Figure:	Drawing No:				
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Co-ordinate system: British National Grid

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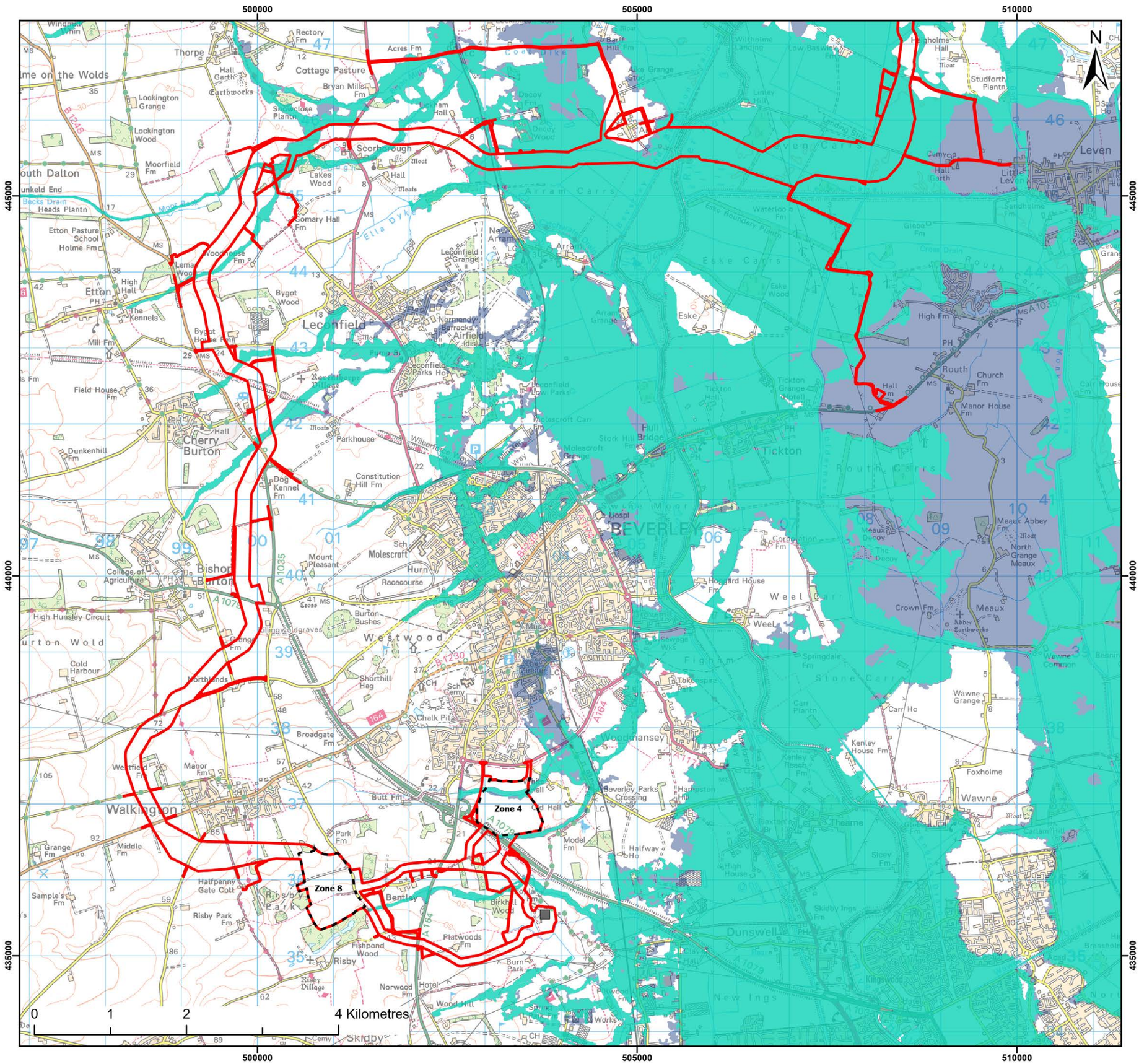

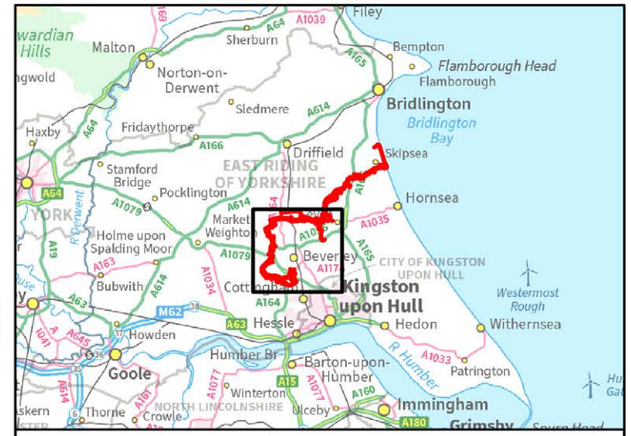

Legend:

- Onshore Development Area
- Onshore Converter Station Options
- Indicative Birkhill Wood Substation Location
- Flood Zone 2
- Flood Zone 3

Project:
Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Flood Risk (Fluvial, Tidal)
- Sheet 2 of 2

Figure: 21-4

Drawing No: PC6250-RHD-XX-ON-DR-GS-0121

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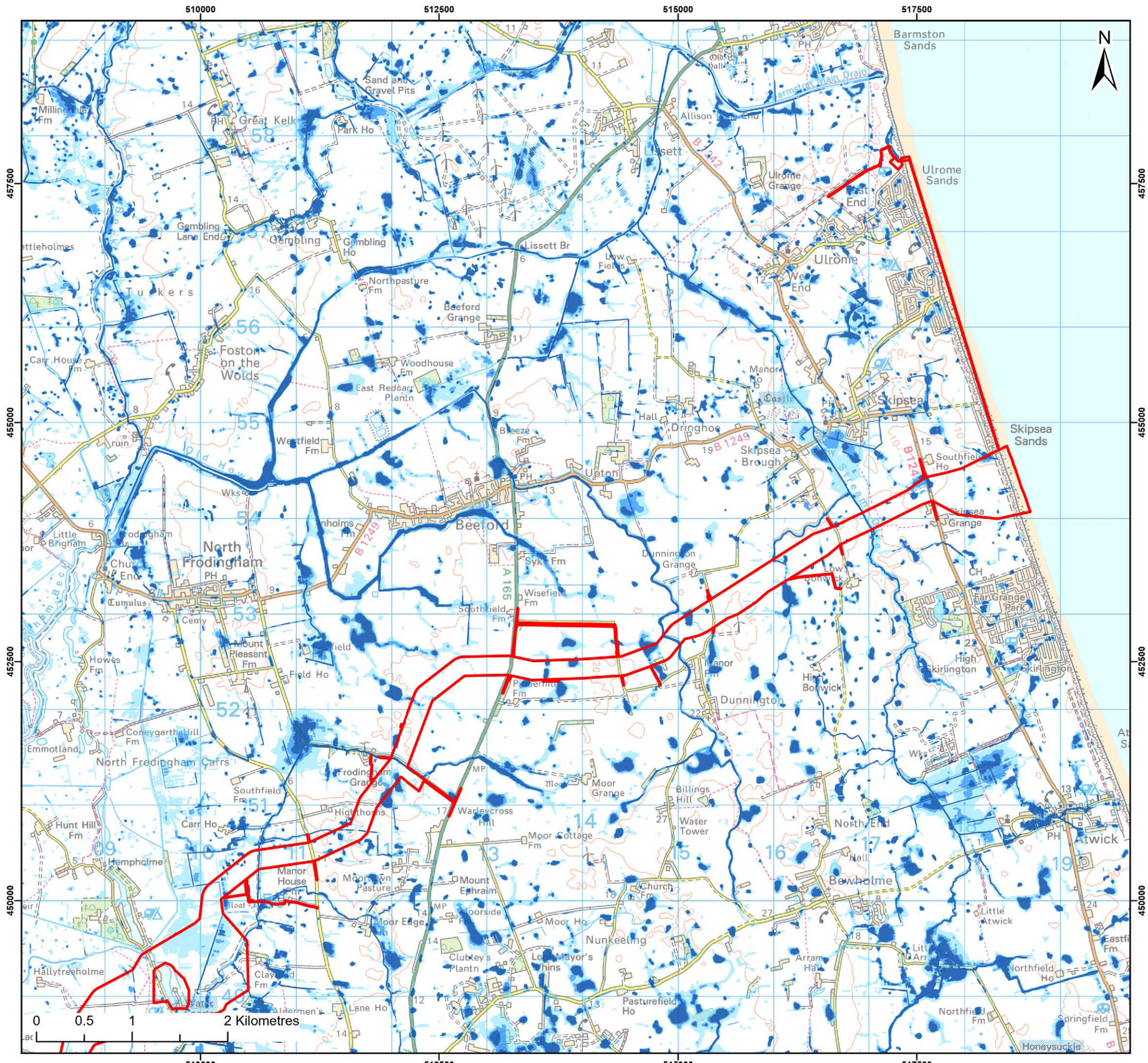

Legend:

Onshore Development Area

Environment Agency Risk of Flooding from Surface Water (RoFSW)

- High Risk - In any given year there is a chance of flooding of greater than 1 in 30 (3.3%)
- Medium Risk - In any given year there is a chance of flooding of greater than 1 in 100 (1%) and 1 in 30 (3.3%)
- Low Risk - In any given year there is a chance of flooding of greater than 1 in 1,000 (0.1%) and 1 in 100 (1%)

Project:

Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Surface Water Flood Risk
- Sheet 1 of 3

Figure:	Drawing No:				
21-5	PC6250-RHD-XX-ON-DR-GS-0122				
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Co-ordinate system: British National Grid

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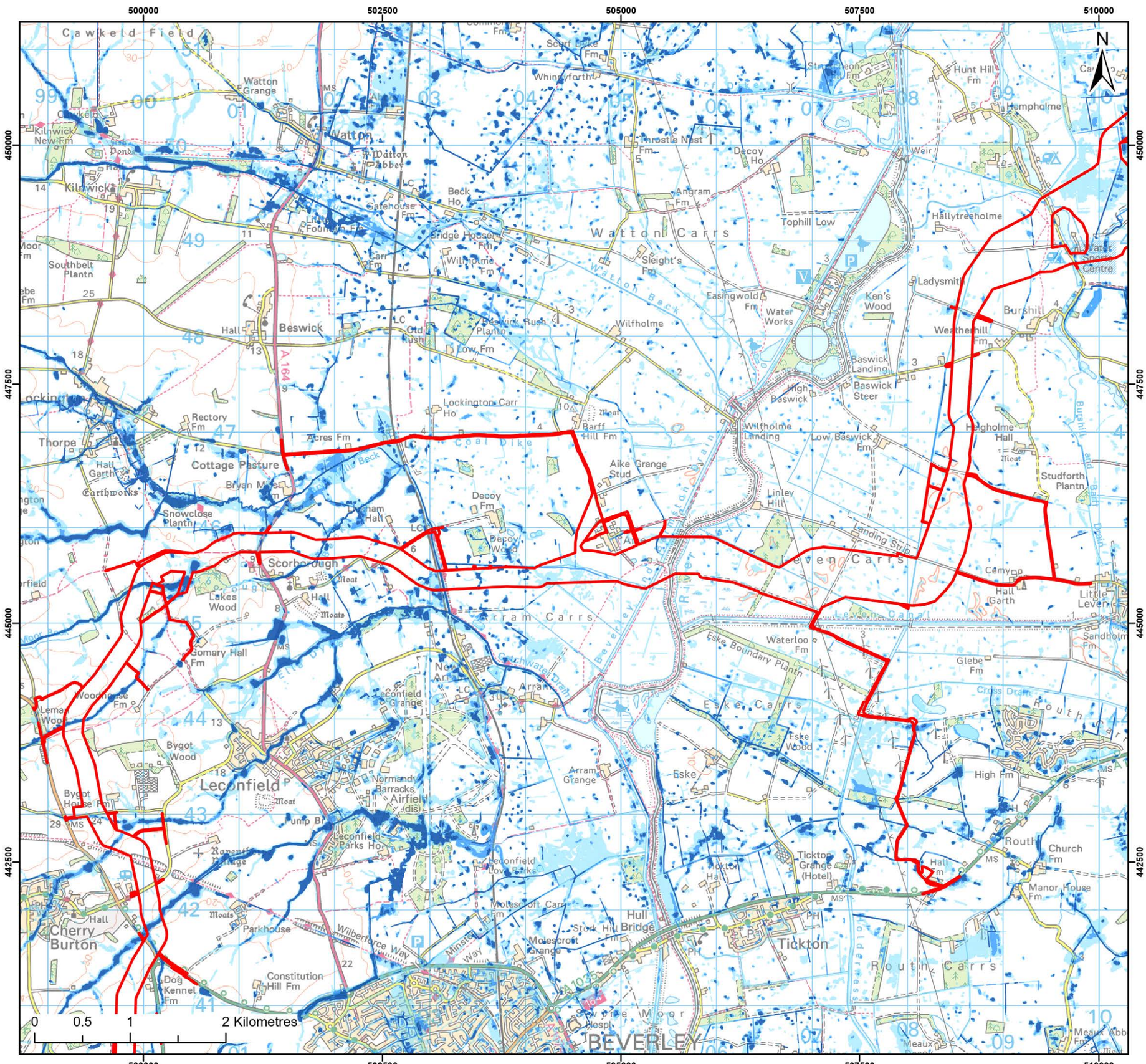

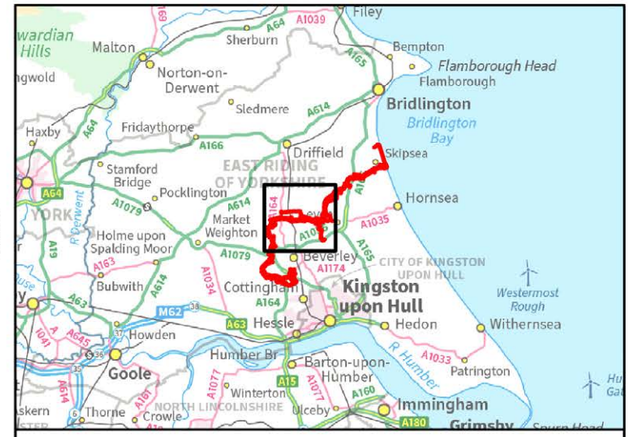

Legend:

Onshore Development Area

Environment Agency Risk of Flooding from Surface Water (RoFSW)

- High Risk - In any given year there is a chance of flooding of greater than 1 in 30 (3.3%)
- Medium Risk - In any given year there is a chance of flooding of greater than 1 in 100 (1%) and 1 in 30 (3.3%)
- Low Risk - In any given year there is a chance of flooding of greater than 1 in 1,000 (0.1%) and 1 in 100 (1%)

Project:
Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Surface Water Flood Risk
- Sheet 2 of 3

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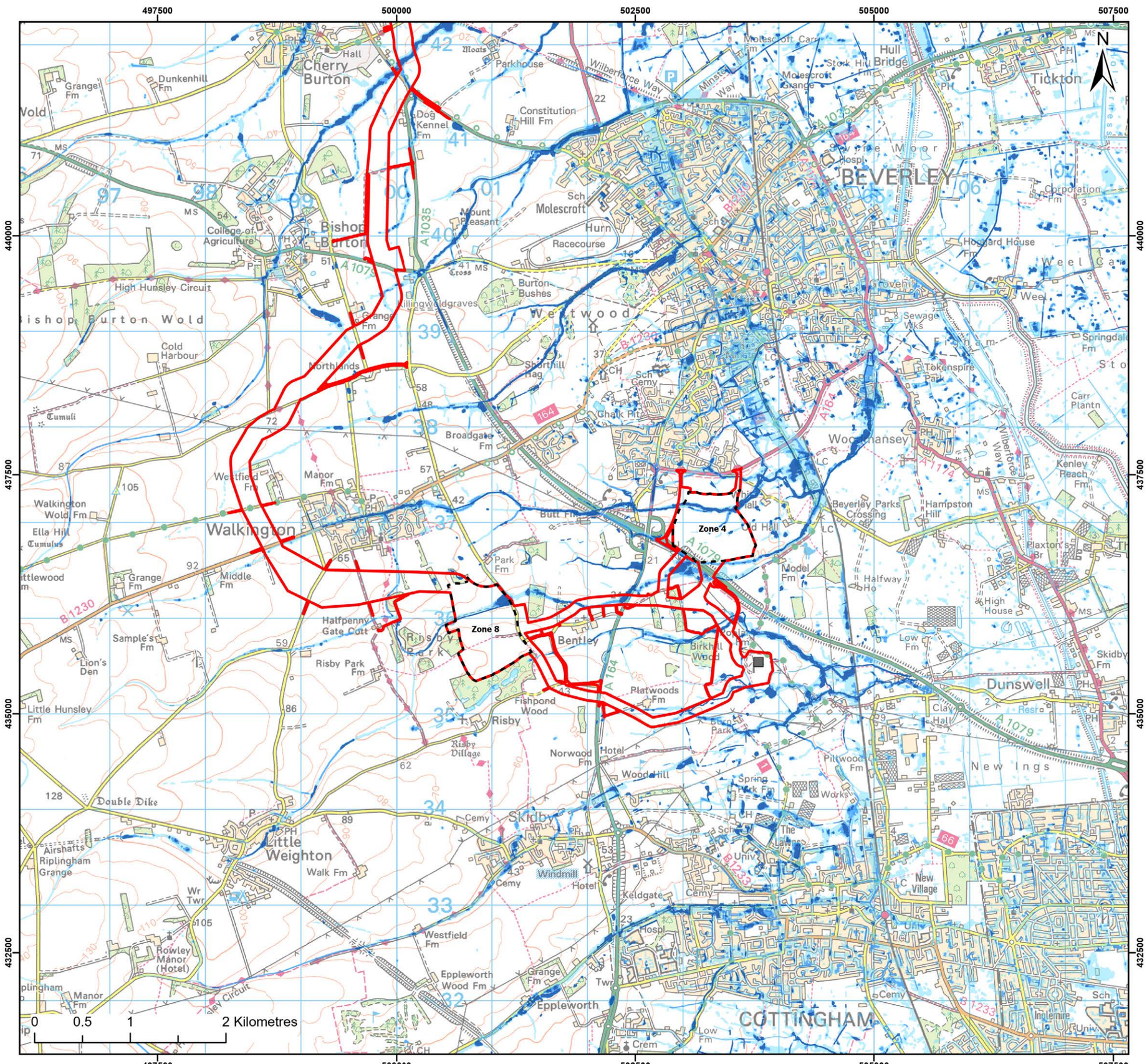

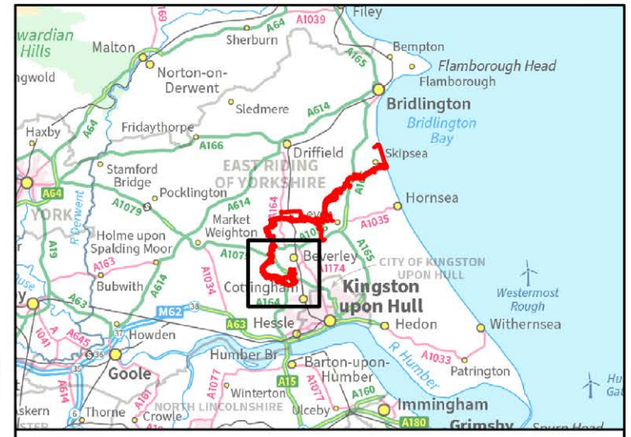

Legend:

- Onshore Development Area
- Onshore Converter Station Options
- Indicative Birkhill Wood Substation Location

Environment Agency Risk of Flooding from Surface Water (RoFSW)

- High Risk - In any given year there is a chance of flooding of greater than 1 in 30 (3.3%)
- Medium Risk - In any given year there is a chance of flooding of greater than 1 in 100 (1%) and 1 in 30 (3.3%)
- Low Risk - In any given year there is a chance of flooding of greater than 1 in 1,000 (0.1%) and 1 in 100 (1%)

Project:
Dogger Bank D
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DOGGER BANK WIND FARM

Title:
Surface Water Flood Risk
- Sheet 3 of 3

Figure:	Drawing No:
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82. In a ‘wet day scenario’, when rivers levels are already high, a small area (approximately 0.043ha) of the onshore ECC is at risk of reservoir flooding between Brandesburton and Hempholme.

83. Approximately 500m east of Aike, small areas of the onshore ECC are at risk of reservoir flooding under wet day and dry day scenarios. River levels would be normal in a dry day scenario.

21.6.1.1.10 Groundwater Flood Risk

84. The Strategic Flood Risk Assessment (SFRA) shows the Areas Susceptible to Groundwater Flooding, displayed on a strategic scale map showing groundwater flood areas based on a 1km square grid (East Riding of Yorkshire Council, 2019). The data shows the proportion of each 1km grid square where geological and hydrogeological conditions indicate groundwater might emerge. Groundwater flood in the Onshore Development Area is as follows:

- Landfall:
  - Mapping demonstrates that the landfall is situated in an area where <25% of the area of classified as being at risk of groundwater emergence.
- Onshore ECC:
  - From Skipsea to Frodingham Road, the onshore ECC passes through a mixture of classifications. Some areas are indicated to have less than <25% chance of groundwater flooding, with some areas having no data provided. From Frodingham Road to the A164, the onshore ECC passes an area with >=75% chance of groundwater flooding.
  - From the Main Street to Risby Lane, the west and east route the majority of the route is in an area with no data provided. The start and end of the route have some areas of < 25% chance of groundwater emergence.
- OCS zones:
  - At both OCS zones, there is no groundwater flood risk mapping. Therefore, the risk from groundwater is unknown in this area. The potential presence of groundwater will be identified as part of pre-construction ground investigations undertaken post-consent.

21.6.1.2 Groundwater

21.6.1.2.1 Bedrock Geology and Bedrock Aquifers

85. Groundwater features are shown on **Figure 21-2**. Bedrock geology across the Onshore Development Area is characterised by the White Chalk Subgroup (see **Chapter 19 Geology and Ground Conditions, Figure 19-2**). The subgroup is divided into two formations:

- The area from the coast to Dunnington Sewer is characterised by rocks of the Rowe Chalk Formation (white, flint-bearing chalk with sporadic marl bands).
- The majority of the Onshore Development Area is characterised by rocks of the Flamborough Chalk Formation (white, well-bedded, flint-free chalk with common marl seams).
- West of the A164 road near Scorborough, the Onshore Development Area is underlain by rocks of the Burnham Chalk Formation (white, thinly-bedded chalk with common tabular and discontinuous flint bands; sporadic marl seams).

86. These rocks support a Principal aquifer (Defra MAGIC (undated)) across the entire Onshore Development Area. Principal aquifers provide significant quantities of drinking water and water for business needs. They may also support rivers, lakes and wetlands.

21.6.1.2.2 Superficial Geology and Superficial Aquifers

87. The majority of the Onshore Development Area is underlain Secondary (undifferentiated) aquifers. For these features, it is not possible to apply either a Secondary A or B definition, because of the variable characteristics of the rock type, they have only a minor value.

88. The Onshore Development Area also crosses a relatively large Secondary A aquifer in the River Hull valley. There are less extensive Secondary A aquifers in alluvial settings near Skipsea in the east and Scorborough in the west. Secondary A aquifers comprise permeable layers that can support local water supplies and may form an important source of base flow to rivers.

89. Small Secondary B aquifers are also present in Skipsea – Dunnington area. Secondary B aquifers are lower permeability layers which may yield limited amounts of groundwater due to localised features such as fissures, permeable horizons and weathering.

21.6.1.2.3 Groundwater Vulnerability

90. The following categories apply to groundwater vulnerability (BGS, 2024):

- High vulnerability means a pollutant can be easily transmitted to groundwater (characterised by high-leaching soils and the absence of low-permeability superficial deposits).
- Medium vulnerability areas offer some groundwater protection.
- Low vulnerability means areas that provide the greatest protection to groundwater from pollution.

91. The majority of the Onshore Development Area is characterised by medium to medium-high vulnerability (Defra MAGIC (undated); **Figure 21-6**). West of Aike, vulnerability is medium to medium-high and there is also a soluble rock risk. West of Bishop's Burton, the onshore ECC crosses an area of high groundwater vulnerability that has a soluble rock risk. Soluble rock risk areas are where solution features enable the rapid movement of a pollutant to groundwater.

92. The Onshore Development Area also crosses a small area with soluble rock risk north of Skipsea.

21.6.1.2.4 Drinking Water Safeguard Zones, Drinking Water Protected Areas and Source Protection Zones

93. The onshore ECC crosses Tophill Low Drinking Water Safeguard Zones (DWSZ) (surface water) (**Figure 21-1**) in the Dunnington - Hempholme area. South of Scorborough, the onshore ECC crosses Cottingham DWSZ (groundwater). A short section of access road north of the A1035 also crosses Cottingham DWSZ (groundwater).

94. Approximately 800m east of Aike, the onshore ECC crosses a small area of (approximately 1.3ha) of the Hull from West Beck to Arram Beck Drinking Water Protected Areas (DWPA) (surface water).

95. The area covered by Cottingham DWSZ is also a Source Protection Zone (SPZ). Between Scorborough and Walkington, the onshore ECC crosses SPZ 3 (total catchment). SPZ 3 is defined as the area around a supply source within which all the groundwater ends up at the abstraction point.

96. South of Walkington to the Jillywoods area, the onshore ECC is in SPZ 2 (outer protection). Zone 2 is defined as having a 400-day travel time of pollutant to source and has a 250 or 500m minimum radius around the source, depending on the amount of water taken. OCS Zones 4 and 8 are both located in this area (Zone 2).

97. South of Jillywoods, the onshore ECC crosses SPZ 1. SPZ 1 is the most sensitive, having a 50-day travel time of pollutant to source with a 50m default minimum radius. Birkhill Wood Substation, and part of the onshore ECC into Birkhill Wood Substation, are located in this area (Zone 1).

98. A short section of access road also crosses SPZ 1 north of the A1035 road.

21.6.1.2.5 Groundwater Quality

99. The Onshore Development Area is underlain by a single groundwater body: Hull and East Riding Chalk (GB40401G700700) (**Figure 20-2**). Both quantitative and chemical classification elements are Poor. Groundwater quality pressures are being caused by:

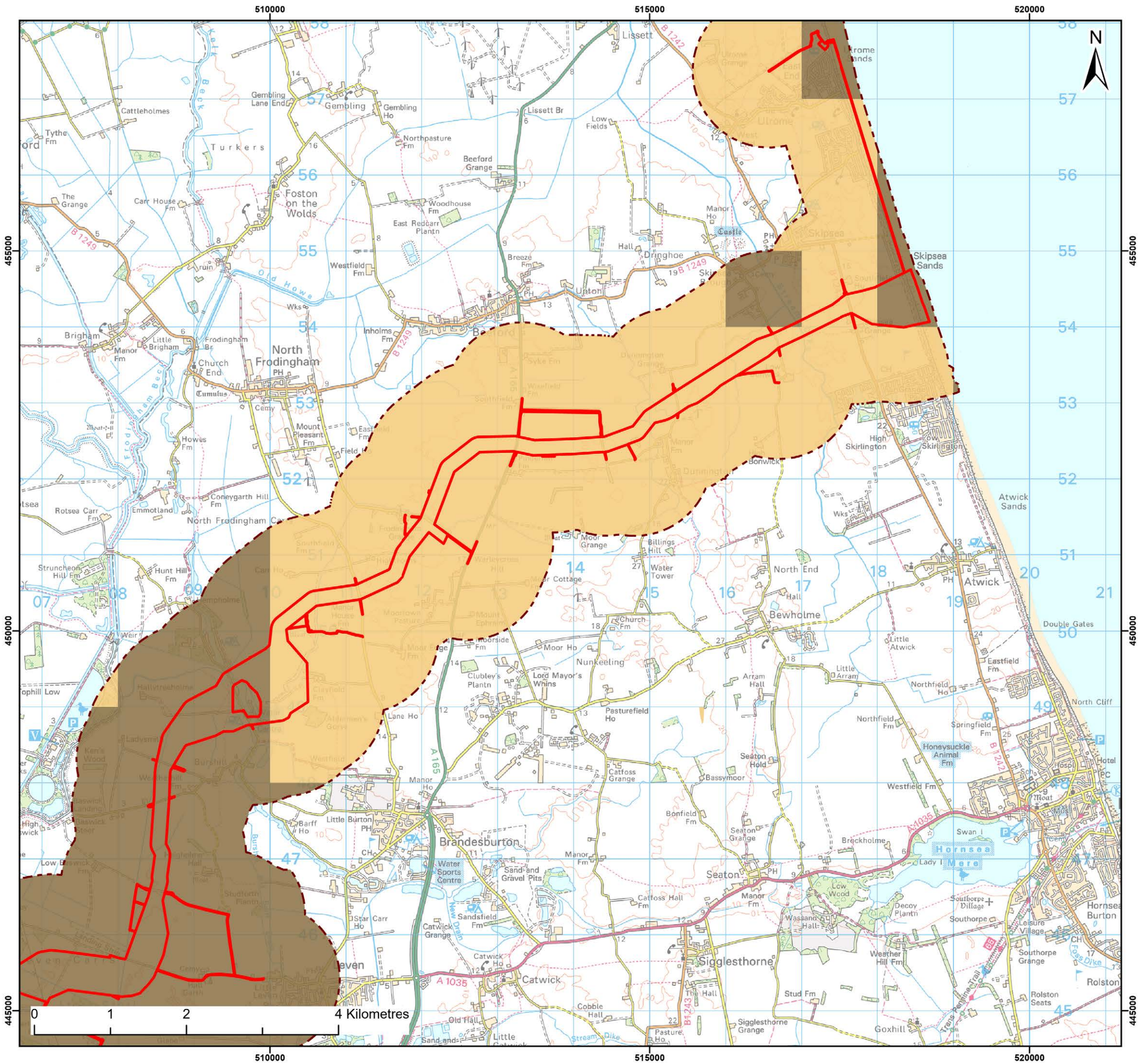
- Poor nutrient management;
- Atmospheric deposition;
- Private sewage treatment;
- Sewage discharge (continuous);
- Farm/site infrastructure; and
- Groundwater abstraction.

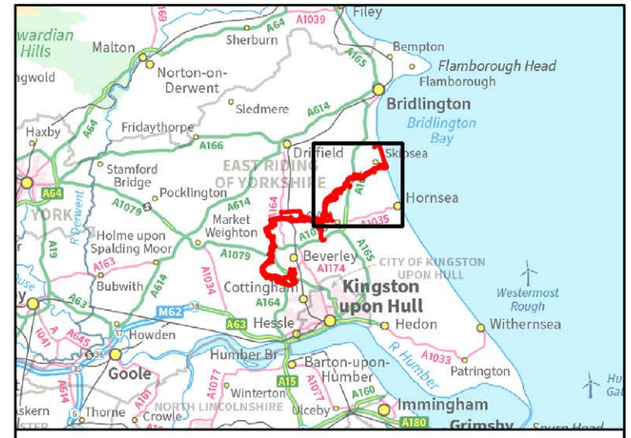
100. These pressures affect the following classification elements that result in the water body not achieving good status:

- General chemical test;
- Trend assessment;
- Chemical Drinking Water Protected Area;
- Chemical GWDTE test;
- Quantitative saline intrusion; and
- Chemical saline intrusion.

21.6.1.3 Designated Sites

101. The only nationally / internationally designated sites (i.e. Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar) crossed by the Onshore Development Area are Withow Gap, Skipsea SSSI and Leven Canal SSSI.





Legend:

- Onshore Development Area
- Onshore Development Area 1km Buffer

Groundwater Vulnerability Map

- Secondary Superficial Aquifer - Medium Vulnerability
- Secondary Superficial Aquifer - High Vulnerability

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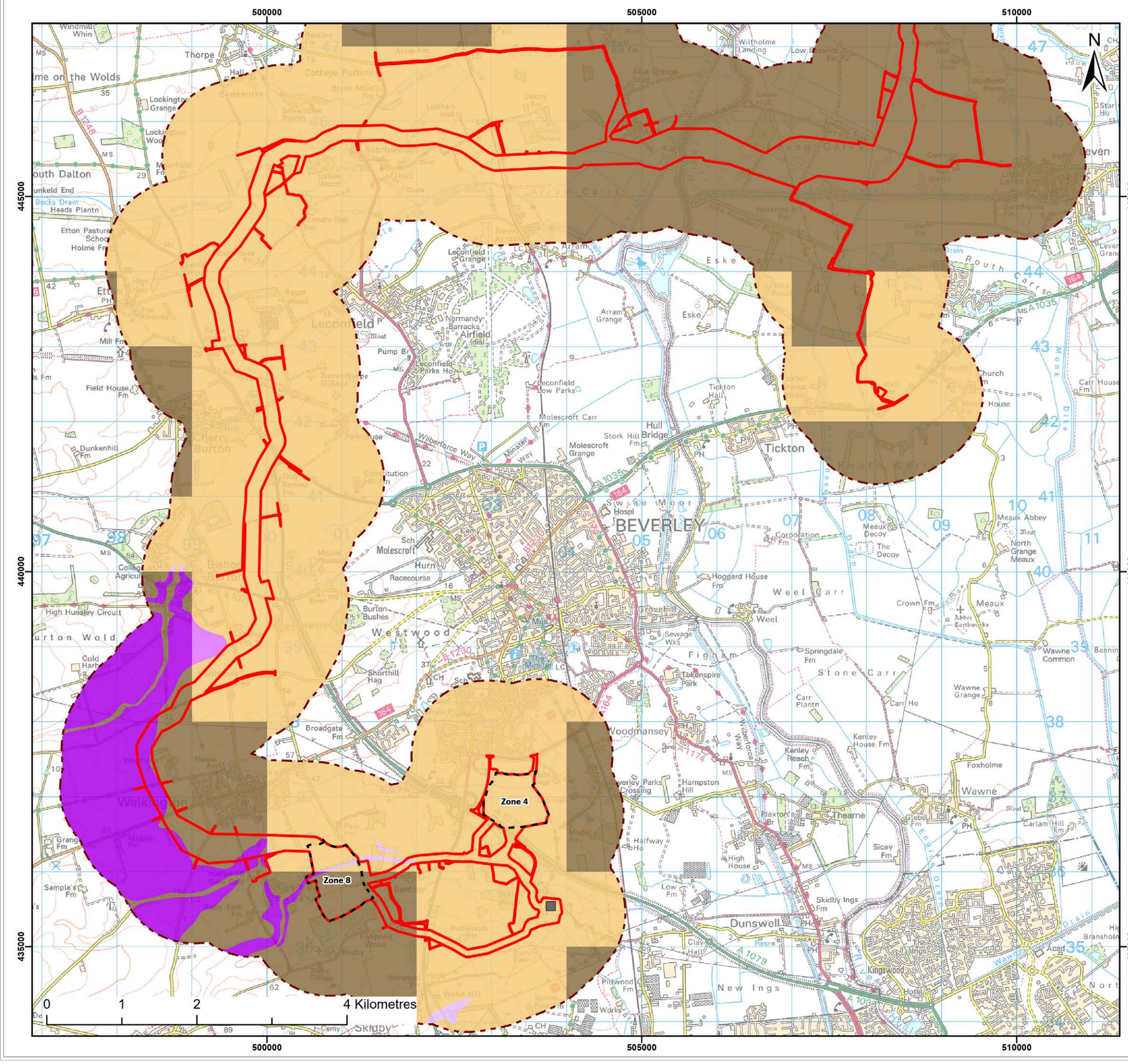

Legend:

- Onshore Development Area
- Onshore Converter Station Options
- Indicative Birkhill Wood Substation Location
- Onshore Development Area 1km Buffer

Groundwater Vulnerability Map

- Principle Bedrock Aquifer - Low Vulnerability
- Principle Bedrock Aquifer - Medium Vulnerability
- Principle Bedrock Aquifer - High Vulnerability
- Secondary Superficial Aquifer - Medium Vulnerability
- Secondary Superficial Aquifer - High Vulnerability

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Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Groundwater Vulnerability
- Sheet 2 of 2

Figure: 21-6

Drawing No: PC6250-RHD-XX-ON-DR-GS-0244

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102. Withow Gap, Skipsea SSSI is an important site for the interpretation of Late Devensian (glacial) and Flandrian (post-glacial) environmental history in Holderness. The unique feature of the site is the exposure in a coastal section of a sequence of mere deposits which occupies a hollow in the Late Devensian (Skipsea) till. The site was last assessed by Natural England in March 2024 and was in favourable condition (Natural England, 2024).

103. Leven Canal SSSI provides a refuge for wetland plants and now supports an important remnant of this once much more widespread vegetation. The canal is fed by calcareous springs supplying water of a very high quality. The site was last assessed by Natural England in 2017 and was in unfavourable (no change) status (Natural England, 2017). The key issues at the site are inappropriate water levels, siltation and pollution (agriculture / run off).

104. In addition, several nationally designated sites are located close to and potentially hydrologically connected to the Onshore Development Area.

105. Bryan Mills Field SSSI is located 50m north of the Onshore Development Area. The SSSI is spring-fed and comprises a tall fen community which occupies the centre of a small ungrazed field; the surrounding drier areas of which have been planted with trees. The site was last assessed in 2022 and was in favourable status (Natural England, 2022a). There is no surface water connectivity with the Onshore Development Area but there may be a groundwater connection due to the spring fed nature of the site.

106. Skipsea Bail Mere SSSI is located approximately 1km downstream of the Onshore Development Area. The SSSI is important for the interpretation of the vegetational history of the northern part of the Holderness coastal plain. The SSSI was last assessed in 2022 and was in favourable condition (Natural England, 2022b).

107. West of Beverley, the Onshore Development Area is 700m west of Burton Bushes SSSI, although there appears to be no surface water connectivity to the site. The SSSI is characterised by oak woodland that is known to exceed 200 years in age, and evidence suggests that it is of natural origins. It is considered a good example of the woodland characteristic of Holderness till soils. The SSSI was last assessed in 2023 as in favourable (100%) condition (Natural England, 2023).

108. Pulfin Bog SSSI is located 1.2km south (downstream) of the Onshore Development Area. Pulfin Bog is one of the last remnants of a fenland reed swamp community in the Hull valley. It is valued both for its botanical interest, and for the reedbed habitat it provides for breeding birds. There is surface water connectivity with the Onshore Development Area. The site was last assessed in 2018 and was at unfavourable (declining) status due to invasive non-native species and flood defence works (Natural England, 2018).

109. Tophill Low SSSI is located 1km west of the Onshore Development Area. The SSSI consists of two artificial storage reservoirs situated in the River Hull valley (the water stored in the reservoirs is abstracted from the adjacent River Hull). The site is important as one of few inland standing open water bodies suitable for wintering wildfowl in North Humberside. The SSSI also attracts a wide range of other wildfowl species during spring and autumn migrations. The site was last assessed in 2022 and was at favourable status (Natural England, 2022c). The onshore ECC is crossed by Mickley Dike catchment, which is hydrologically connected to the River Hull downstream.

110. Designated sites are discussed in **Chapter 23 Onshore Ecology and Ornithology** and presented on **Figure 23-3**.

21.6.1.3.1 Local Wildlife Sites

111. A total of eight Local Wildlife Sites (LWS) are present within the Onshore Development Area, all of which are non-statutory designated sites (**Table 21-19**). These sites are shown on **Figure 22-3** of **Chapter 22 Soils and Land Use**. The majority of these sites are not wetlands, but Bealey's Beck Lockington, Fishpond Wood Risby Estate and Risby Park are characterised by wetland habitats.

Table 21-19 Local Wildlife Sites Crossed by the Onshore Development Area (after East Riding of Yorkshire Council, 2023)

Local Wildlife Site	Habitat
Bealey's Beck, Lockington	Wetland
Bealey's Lane	Verge, hedge
Beeford - Dunnington	Verge
Fishpond Wood, Risby Estate	Wetland, woodland
Risby Park	Wood, wetland, grassland, parkland
Leman Road Corner - Moorbeck Road (a)	Verge
Leman Road Corner - Moorbeck Road (b)	Verge
Raventhorpe Embankment	Grassland

21.6.1.4 Baseline Receptor Catchment Sensitivity

112. Catchment receptor sensitivity is described in **Table 21-20**.

Table 21-20 Baseline Catchment Receptor Sensitivity

Water Body	Sensitivity	Justification
Barmston Sea Drain from Skipsea Drain to N Sea GB104026077780	High	Artificial water body characterised by numerous straight planform reaches indicative of resectioning for land drainage and flood defence purposes. The water body is at Moderate ecological potential due to diffuse pollution from poor nutrient management and private sewage treatment, which is adversely affecting phosphate levels. The macrophytes sub element and mitigation measures assessment are classified as Moderate and Moderate or less. The catchment supports Tophill Low DWSZ. Sensitivity is high because the catchment drains directly to the Greater Wash SPA.
Barmston Sea Drain / Skipsea Drain to Conf GB104026077770	High	Water body not designated artificial or heavily modified. The catchment is characterised by numerous straight planform reaches indicative of resectioning for land drainage and flood defence purposes. Ecological status is Moderate – ammonia and phosphate are both Poor. The catchment supports Tophill Low Drinking Water Safe-guard Zone. Sensitivity is high because Skipsea Bail Mere SSSI is located approximately 900m downstream of the Onshore Development Area.
Old Howe / Frodingham Beck to R Hull GB104026067021	Medium	Heavily modified river water body with several long, straight planform sections reaches indicative of resectioning for land drainage and flood defence purposes. Ecological potential is Moderate due to physical modifications. The catchment supports Tophill Low DWSZ.
Foredyke Stream Lower to Holderness Dr GB104026066910	Low	Artificial river water body with a straight planform over most of its length indicative of resectioning for land drainage and flood defence purposes. Ecological potential is Moderate (with a Bad classification for fish and dissolved oxygen and Poor status for phosphate). The main activities adversely affecting water quality are poor nutrient management, sewage discharge, land drainage and landfill leaching.
Mickley Dike Catchment GB104026066990	Medium	Artificial river water body with a straight planform over most of its length indicative of resectioning for land drainage and flood defence purposes. Ecological potential is Moderate (with a Poor classification for dissolved oxygen). The main activities adversely affecting water quality are poor nutrient management, sewage treatment, land drainage and drought (natural). The catchment supports Tophill Low DWSZ.
Hull from West Beck to Arram Beck GB104026067000	High	Heavily modified water body characterised by several straight planform sections indicative of resectioning for land drainage and flood defence purposes. The water body is at Moderate ecological potential and the status of the macrophytes sub element is Poor. The main activities adversely affecting water quality are land drainage and mitigation measures not being in place to address physical modifications. The catchment supports the River Hull from West Beck to Arram Beck Drinking Water Protected Area. Pulfin Bog SSSI is located 1.5km downstream of the onshore ECC.
Holderness Drain Source to Foredyke Stream GB104026066950	Low	Artificial river water body with a straight planform over most of its length indicative of resectioning for land drainage and flood defence purposes. Ecological potential is Moderate (with a Poor classification for dissolved oxygen and Moderate for ammonia and Moderate or less for mitigation measures assessment). The main activities adversely affecting water quality are land drainage and mitigation measures not being in place to address physical modifications.
Beverley and Barmston Drain GB104026067211	Low	Artificial river water body with a straight planform over most of its length indicative of resectioning for land drainage and flood defence purposes. Ecological potential is Moderate (with a Bad classification for dissolved oxygen). Burton Bushes SSSI is located 1km east of the onshore ECC, and it is designated for its broadleaved woodland on till soils. The SSSI is not crossed by any watercourses or surface water flow paths that connect to the Onshore Development Area. Tophill Low SSSI is in the catchment, 2.3km upstream of the onshore ECC. The main activities adversely affecting water quality are riparian / in-river activities (e.g. bankside erosion), poor nutrient management, land drainage and mitigation measures not being in place to address physical modifications.

Water Body	Sensitivity	Justification
Bryan Mills Beck Source to Bryan Mills Farm GB104026066960	High	Water body not designated artificial or heavily modified. The upper part of Bryan Mills Beck is characterised by a meandering channel and evidence of natural geomorphological processes. Downstream of the confluence with Scorborough Beck, the channel has an artificial appearance and appears to have been straightened for land drainage and flood protection purposes. Ecological status is Moderate due to Moderate classifications for phosphate and dissolved oxygen. The catchment supports Bryan Mills Field SSSI and Bryan Mills Beck LWS.
Scorborough Beck GB104026066901	Low	Water body not designated artificial or heavily modified. The channel planform is mainly straight, which is indicative of resectioning for land drainage and flood defence purposes At Moderate ecological status due to a Moderate classification for the macrophytes sub element. The hydrological regime does not support good. The main activities adversely affecting water quality are sewage discharge and poor soil management.
Ella Dyke GB104026066941	Low	Heavily modified water body at Moderate ecological potential. Channel planform is generally straight, which is indicative of resectioning for land drainage and flood defence purposes. Status is Poor for invertebrates and phosphate. The main activities adversely affecting water quality are sewage discharge and physical modifications.
High Hunsley to Arram Area GB104026066841	Low	Artificial river water body with a straight planform over most of its length, which is indicative of resectioning for land drainage and flood defence purposes. Ecological potential is Moderate (with Poor classifications for phosphate and dissolved oxygen). The catchment contains a very small area of Burton Bushes SSSI. The SSSI is not crossed by any watercourses or surface water flow paths that connect to the Onshore Development Area.
High Hunsley to Woodmansey Area GB104026066820	Low	Artificial river water body with several long, straight planform sections, which is indicative of resectioning for land drainage and flood defence purposes. Ecological potential is Moderate (with a Moderate classification for fish) and mitigation measures assessment. The Moderate fish status is due to 'suspect data'.
Leven Canal GB70410003	High	Artificial water body at Moderate ecological potential. The mitigation measures assessment is classified as Moderate or less. The water body supports Leven Canal SSSI, which is crossed by the Onshore Development Area.
Onshore coastal catchment	High	A narrow strip of land near the coast characterized by several short artificial drains. Sensitivity is high because the catchment supports Withow Gap, Skipsea SSSI and drains to the Greater Wash SPA.
Hull and East Riding Chalk GB40401G700700	High	Groundwater body at Poor overall status that supports a Principal aquifer across the entire Onshore Development Area. Superficial deposits support a Secondary A aquifer. Groundwater vulnerability is mainly medium with some areas classed medium-high. The groundwater body also supports an SPZ and drinking water (groundwater) safeguard zone.

21.6.2 Predicted Future Baseline

113. The review of the baseline environment in this chapter demonstrates that surface water bodies in the Study Area support limited areas of high-quality natural habitats. Many of these water bodies have experienced physical modification for land drainage and flood risk management, affecting their geomorphology. Water quality is classified as Moderate in the RBMP across the Study Area and affected by sewage and land management practices. Watercourses are adversely affected by diffuse pollution from agriculture and point source pollution (sewage).

114. Ongoing measures to reduce existing pressures on geomorphology and water quality as part of the implementation of the WER is likely to improve conditions over time.

115. The hydrology of the surface drainage network is expected to change with higher winter flows and lower summer flows with a greater number of storm-related flood flows (climate change is causing more extreme weather). This is likely to lead to changes in the hydrology of the river systems with increased geomorphological activity occurring as a result of storm events. Therefore, the drainage network is unlikely to remain stable over time and may revert to more natural river types in future, although there would be ongoing channel management (e.g. by the IDB).

116. Groundwater resources face pressure from diffuse pollution from agriculture (e.g. poor soil and nutrient management). Ongoing initiatives (Defra, 2023a (Plan for Water: our integrated plan for delivering clean and plentiful water); 2023b (Environmental Improvement Plan 2023)) are in place to reduce pressures on groundwater, including increased regulation of agricultural chemicals, in order to achieve compliance with the WER. This would suggest that groundwater quality and quantity is likely to improve in the future, although this would occur over long timescales.

117. In terms of groundwater quantity, an increasingly extreme climate and demand for drinking water is likely to lead to greater stress of groundwater aquifers.

21.7 Assessment of Effects

118. The likely significant effects to water resources and flood risk receptors that may occur during construction, operation and decommissioning of the Project are assessed in the following sections. The assessment follows the methodology set out in **Section 21.5** and is based on the realistic worst-case scenarios defined in **Section 21.4.4**, with consideration of embedded mitigation measures identified in **Section 21.4.3**.

119. As noted in **Section 21.4.5**, the assessment of likely significant effects for the OCS zone infrastructure will remain the same for both development scenarios.

21.7.1 Potential Effects during Construction

21.7.1.1 Direct Disturbance on Surface Water Bodies (WRF-C-01)

120. Details of watercourse crossing are provided in **Volume 2, Appendix 4.3 Crossing Schedule – Onshore**. The location of Main River, ordinary watercourse and IDB drain crossings are shown on **Figure 21-7** and **Figure 21-8**. **Volume 2, Appendix 4.3 Crossing Schedule – Onshore** considers optionality retained at this stage in the Onshore Development Area for onshore export cable routeing and haul road access. It is anticipated that following design and site selection refinements, the number of watercourse crossings will reduce in the Onshore Crossing Schedule developed at ES stage for the DCO application, and the assessment of this impact will be updated at ES stage.

121. Trenchless installation techniques, such as HDD, have been embedded in the design of cable duct installation works for Main Rivers and IDB drains crossings (see Commitment ID CO32, **Table 21-4**).

122. The cable ducts will be installed below the channel bed at trenchless crossings. Although ground disturbance will occur at the crossing entry and exit points, these will be located at least 20m from the bank of Environment Agency Main Rivers and flood defence assets and at least 9m from the bank of IDB drains and other ordinary watercourses where trenchless crossings are proposed (Commitment ID CO33, **Table 21-4**). This means there would be no direct disturbance to the watercourses crossed using a trenchless installation technique. Therefore, there is no direct mechanism for impacts to occur to the geomorphology, hydrology and physical habitats of these watercourses.

123. Based on the results of the fluvial survey, **Volume 2, Appendix 21.2 Fluvial Geomorphology Survey Report**, all watercourses, except for Bealey's Beck, crossed by the Project are characterised by resectioning for flood defence and drainage purposes (i.e. fresh dredgings were visible adjacent to the channel). Most channels appear to be artificial. Apart from Bealey's Beck, reaches are set within sediment deposition zones, with slow flows, low gradients and low velocities contributing to the settling out of fine sediments / silts by low energy glide flows.

124. Most channels are characterised by riparian vegetation, which will help to increase channel roughness and reduce flow velocities. There was little or no evidence of active bank erosion or bank protection structures, which suggests that high energy erosive flows are uncommon in the Study Area. Most of the fine sediment in the surveyed areas is likely to have been sourced from the surrounding arable fields.

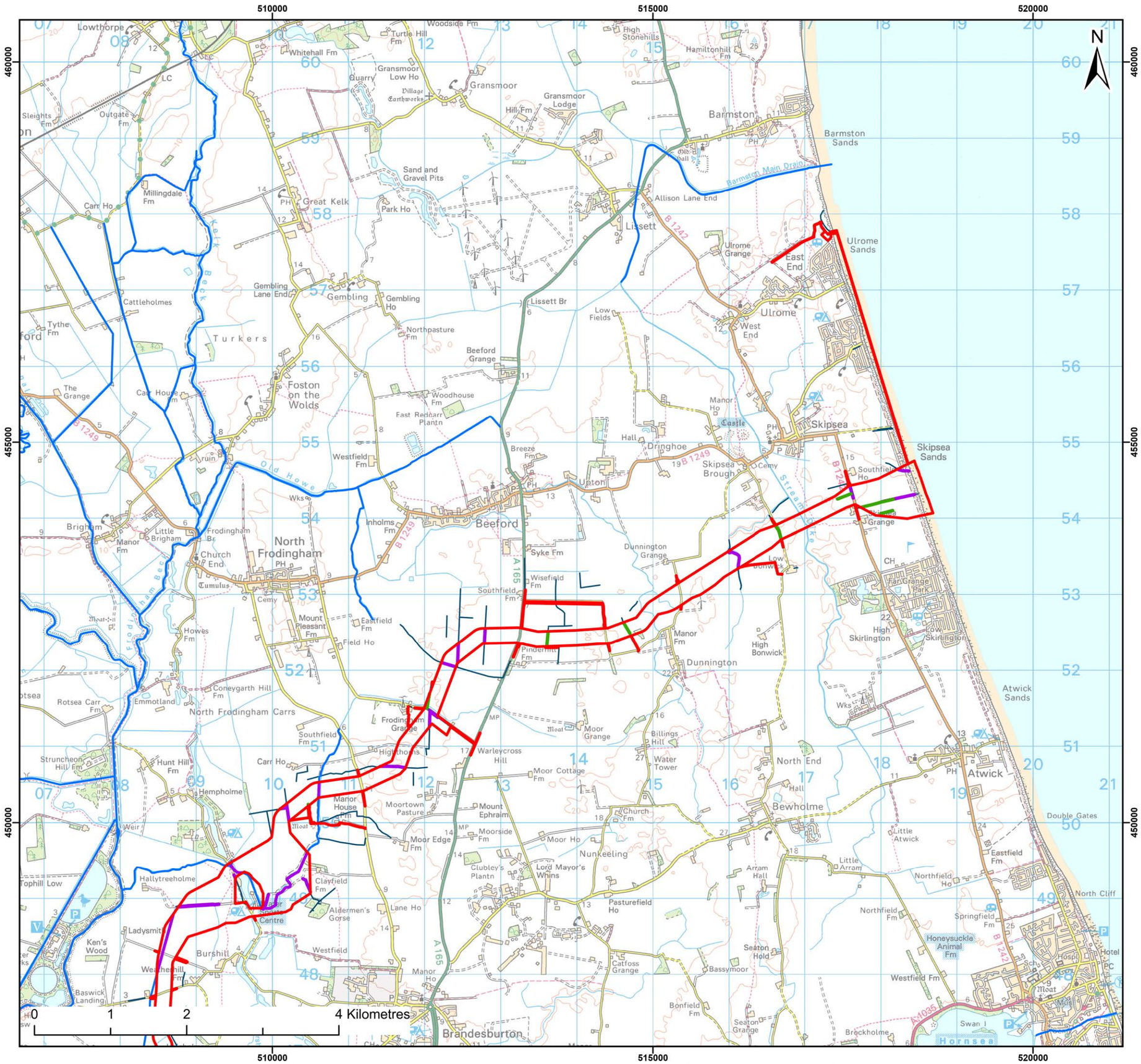
125. Overall, the geomorphological characteristics of the Study Area suggest there is limited potential for significant vertical channel incision of sufficient magnitude to expose the buried onshore export cables.

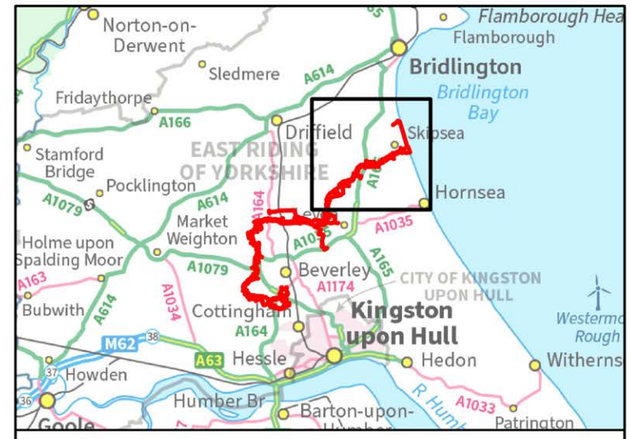
126. Bealey's Beck, which will be a trenchless crossing, is a more dynamic / natural watercourse with evidence of erosion and bank protection in places (**Volume 2, Appendix 21.2 Fluvial Geomorphology Walkover Survey**). Further details on the depth of the trenchless crossing below channel bed at this location will be considered where appropriate in the ES to reflect potential geomorphological risks of incision and scour exposing the cables and refine the assessment of potential worst-case impacts.

127. Direct disturbance of ordinary watercourses will occur at trenched crossings at the locations shown on **Figure 21-7** and **Figure 21-8**. Trenched crossings will involve installing temporary dams (composed of sandbags, 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 riverbed between the two dams with the river flow maintained using a temporary pump or flume.

128. Open cut trenching of watercourses would directly disturb the bed and banks of the watercourse and would result in the direct loss of natural geomorphological features and changes to their associated physical habitat niches. It may also result in increased geomorphological instability due to enhanced scour and increased sediment supply and changes to hydrology. These are temporary impacts that would only occur temporarily whilst construction work is in progress, and the bed and banks would be reinstated to their original level, position, planform and profile.

129. In addition to the installation of cable ducts for the onshore export cables, it may be necessary to install temporary crossing structures (e.g. culverts or clear span bridges) to allow haul road access across watercourses where direct access is not readily available from both sides. This may potentially be required on watercourses which will be crossed using trenchless installation techniques.





Legend:

- Onshore Development Area
- Main River
- Ordinary Watercourse

Indicative Watercourse Crossing

- Trenchless Techniques
- Trench

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DOGGER BANK WIND FARM

Title: Indicative Watercourse Crossings (main river, ordinary watercourses) - Sheet 1 of 3

Figure: 21-7

Drawing No: PC6250-RHD-XX-ON-DR-GS-0123

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Co-ordinate system: British National Grid

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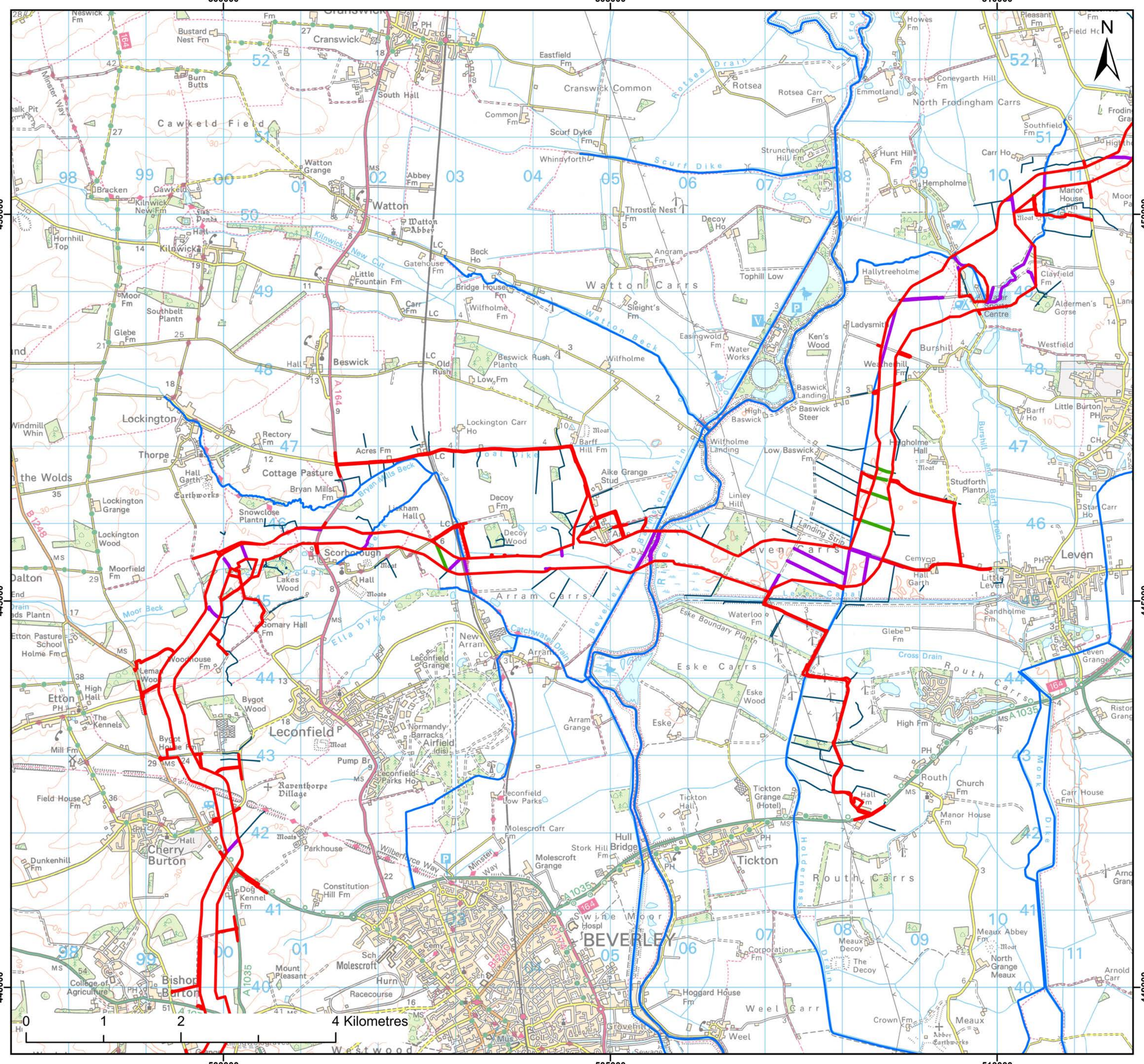

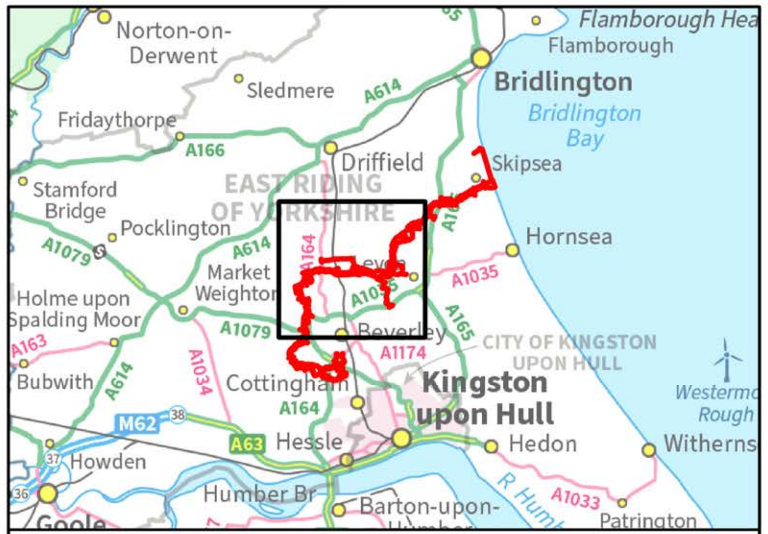

Legend:

- Onshore Development Area
- Main River
- Ordinary Watercourse

Indicative Watercourse Crossing

- Trenchless Techniques
- Trench

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Project:

Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Indicative Watercourse Crossings (main river, ordinary watercourses) - Sheet 2 of 3

Figure: 21-7 | Drawing No: PC6250-RHD-XX-ON-DR-GS-0123

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
02	12/03/2025	JH	AB	A3	1:40,000
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Co-ordinate system: British National Grid

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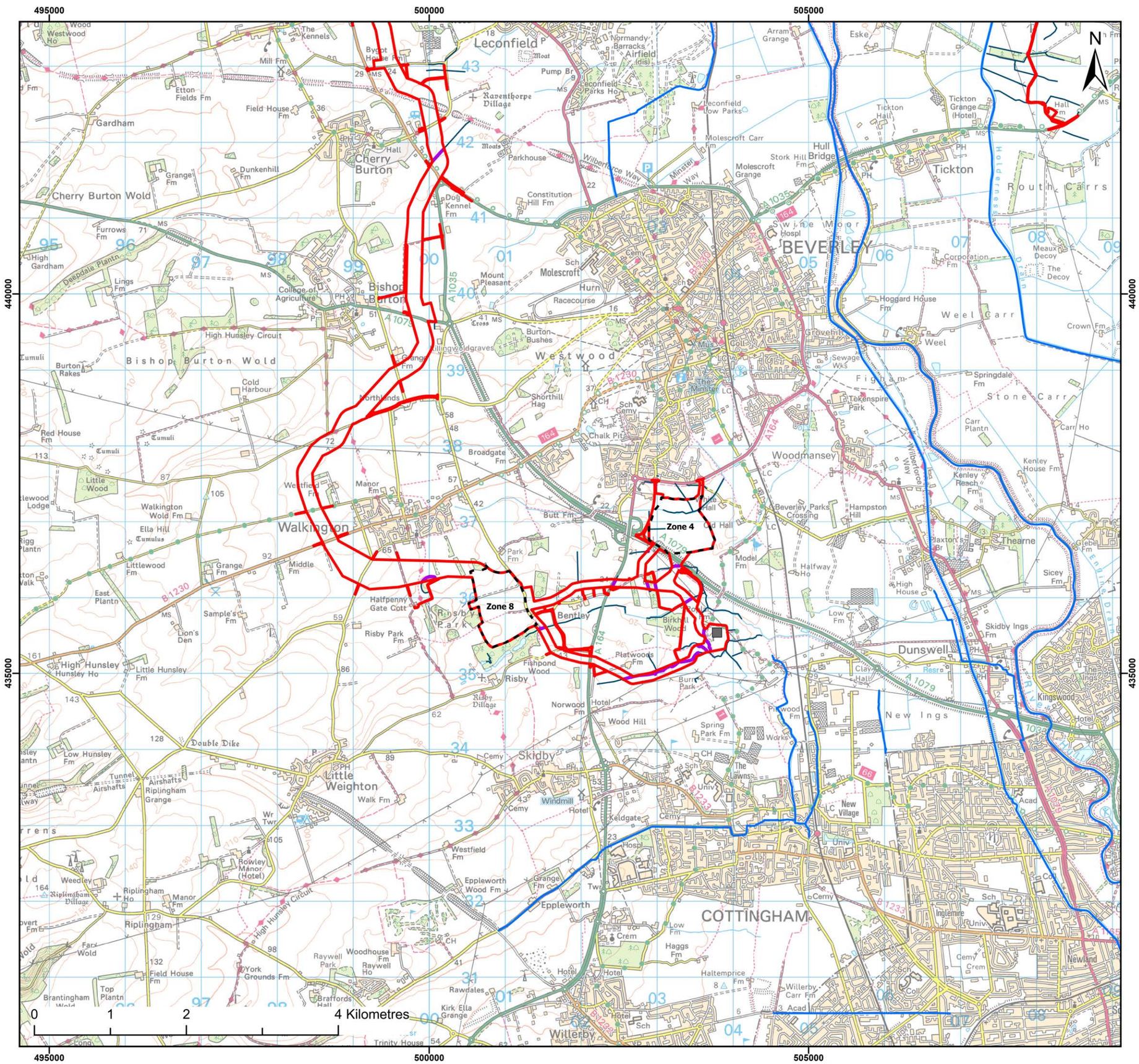

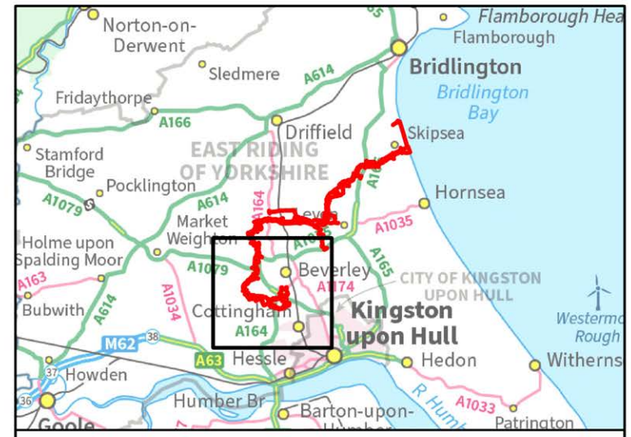

Legend:

- Onshore Development Area
- Onshore Converter Station Options
- Indicative Birkhill Wood Substation Location
- Main River
- Ordinary Watercourse

Indicative Watercourse Crossing

- Trenchless Techniques
- Trench

Project: Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title: Indicative Watercourse Crossings (main river, ordinary watercourses) - Sheet 3 of 3

Figure: 21-7

Drawing No: PC6250-RHD-XX-ON-DR-GS-0123

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid

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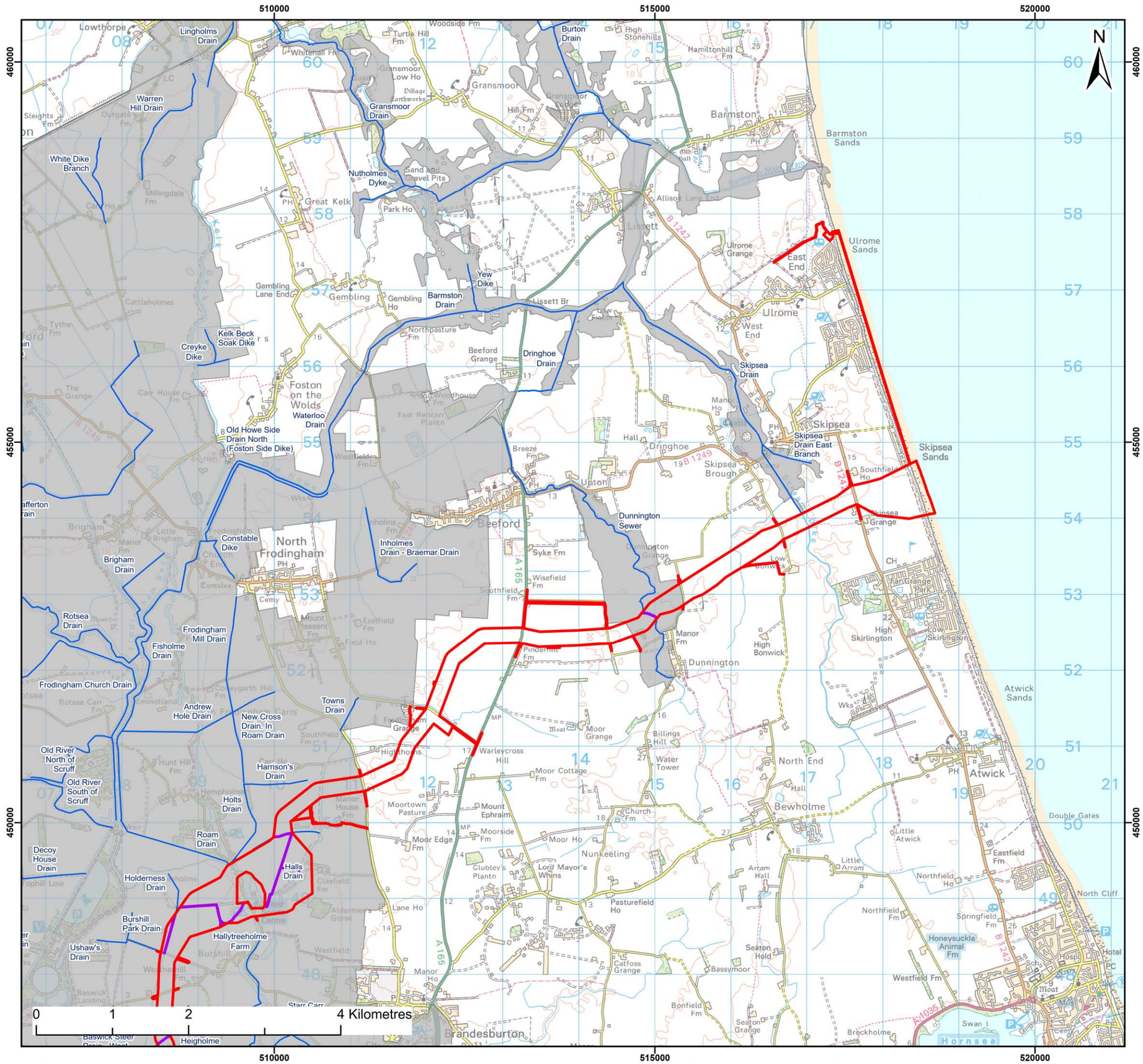

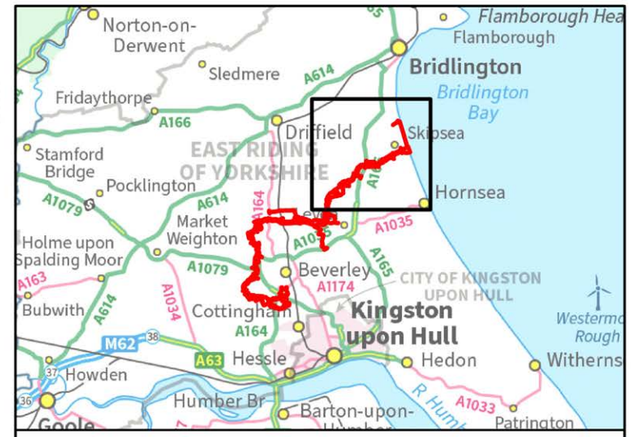

Legend:

- Onshore Development Area
- Beverley and North Holderness Internal Drainage Board Maintained Drains
- Beverley and North Holderness Internal Drainage Board Catchment Area

Indicative Watercourse Crossing

- Trenchless Techniques

Project:
Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Indicative Watercourse Crossings (Internal Drainage Board Maintained Drains)
- Sheet 1 of 3

Figure: 21-8

Drawing No: PC6250-RHD-XX-ON-DR-GS-0124

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid

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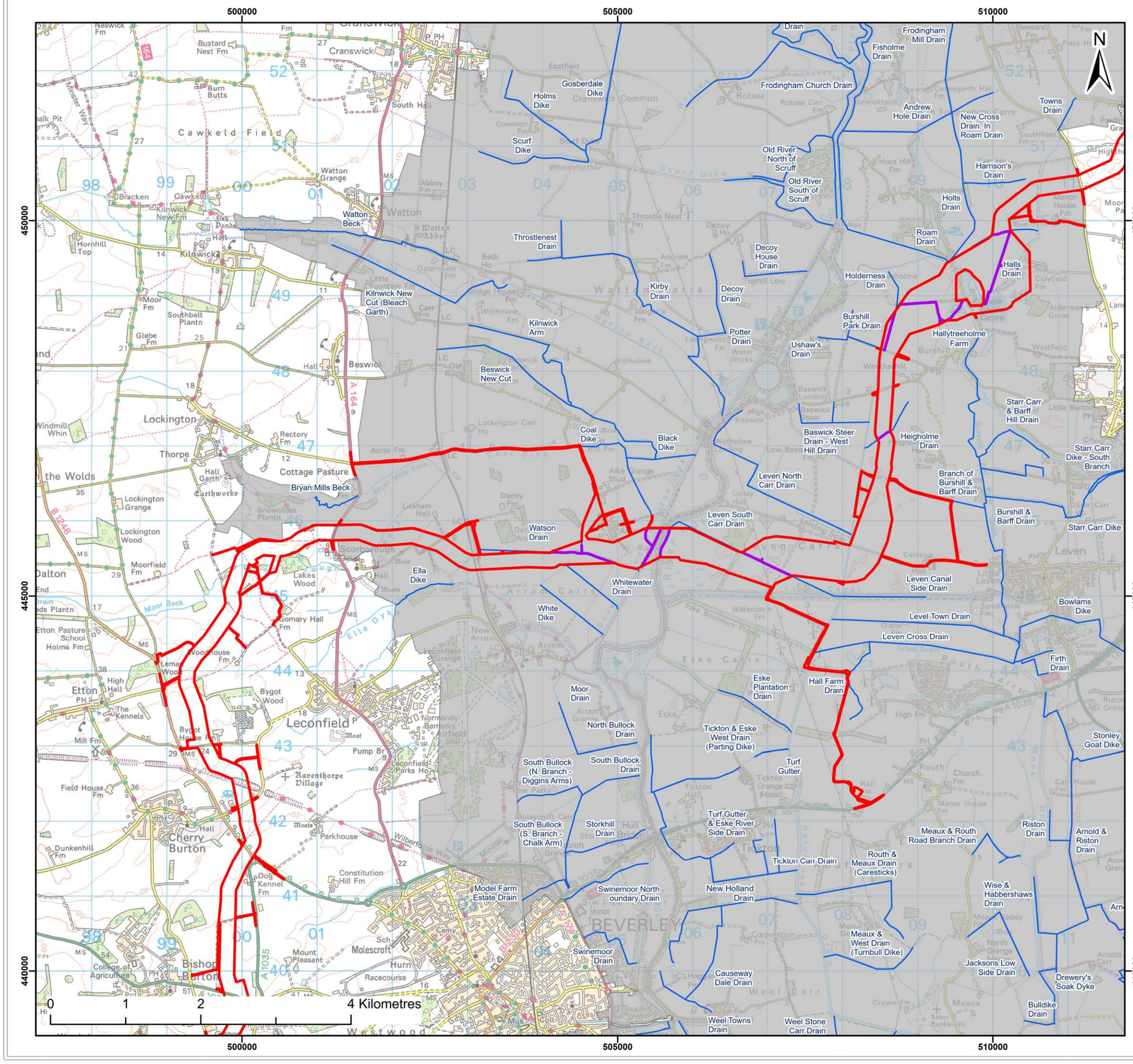

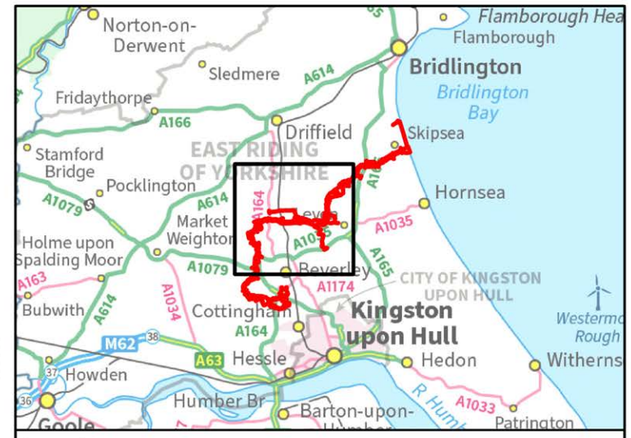

Legend:

- Onshore Development Area
- Beverley and North Holderness Internal Drainage Board Maintained Drains
- Beverley and North Holderness Internal Drainage Board Catchment Area

Indicative Watercourse Crossing

- Trenchless Techniques

Project:
Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Indicative Watercourse Crossings (Internal Drainage Board Maintained Drains)
- Sheet 2 of 3

Figure: 21-8
Drawing No: PC6250-RHD-XX-ON-DR-GS-0124

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid

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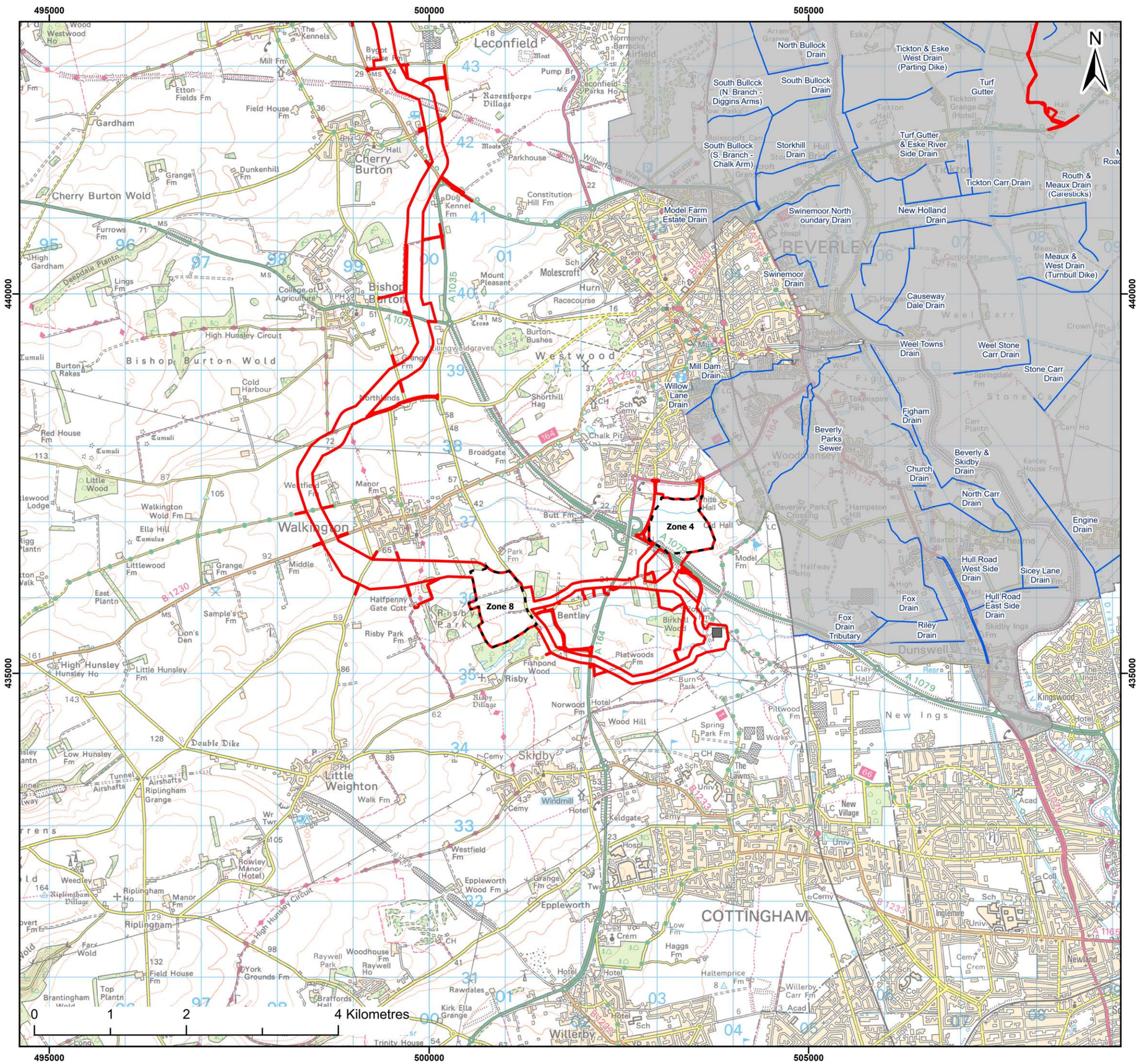

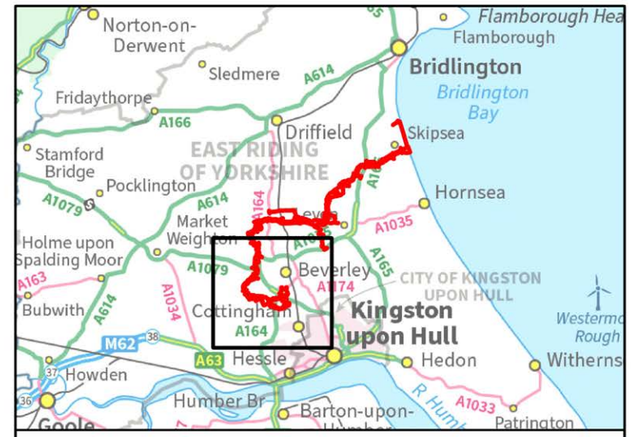

Legend:

- Onshore Development Area
- Onshore Converter Station Options
- Indicative Birkhill Wood Substation Location
- Beverley and North Holderness Internal Drainage Board Maintained Drains
- Beverley and North Holderness Internal Drainage Board Catchment Area

Project:
Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Indicative Watercourse Crossings (Internal Drainage Board Maintained Drains)
- Sheet 3 of 3

Figure:	Drawing No:
21-8	PC6250-RHD-XX-ON-DR-GS-0124

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid

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130. Installation of temporary culverts across ordinary watercourses could potentially directly disturb the bed and banks of the watercourse and result in the direct loss of natural geomorphological features. They could also result in reduced flow and sediment conveyance, create upstream impoundment and affect the patterns of erosion and sedimentation. These impacts would be reversible once the temporary culverts have been removed, and the bed and banks reinstated.

131. Temporary clear span bridges are unlikely to result in significant disturbance to the bed and banks of the channel, with any impacts limited to the footprint of the bridge abutments themselves.

132. An indicative layout of infrastructure within the OCS zone has not been determined at the time of writing the PEIR to allow an assessment of potential worst-case impacts from direct disturbance to surface water bodies within either OCS zone. Following further development of the project design, impacts to watercourse(s) within the OCS zone will be assessed at ES stage based on the realistic worst-case scenario derived from the Project Design Envelope in the ES.

21.7.1.1.1 Receptor Sensitivity

133. Receptor sensitivity is described in **Table 21-20.** Of the 15 surface water catchments crossed by the Onshore Development Area, sensitivity is **high** in six, **medium** in two and **low** in the remainder (seven).

21.7.1.1.2 Impact Magnitude

134. For the purposes of this assessment, magnitude of impact is assumed to be directly proportional to the total number of trenched watercourse crossings within each river water body catchment. Temporary haul road crossings would also be required at each trenched crossing to allow construction access to continue across the watercourse. The criteria for assigning impact magnitude are shown in **Table 21-21**.

135. Temporary haul road crossings may also be required at other locations (i.e. at trenchless crossings where stop ends are not implemented). The impact of temporary haul road crossings at these locations would be lower than at trenched crossings because the installation of temporary haul road crossing structures is a lot less intrusive than open cut trenching works.

136. Where the Environment Agency's Main Rivers are to be crossed by temporary haul roads, temporary bailey or similar clear span bridges will be used. For other watercourses where temporary culverts are proposed, the base of the culvert will be installed beneath the channel bed so as to avoid the impoundment of water and sediment. Culverts will be sized to accommodate reasonable 'worst-case' weather volumes and flows (including appropriate climate change allowances). (Commitment ID CO35, **Table 21-4**).

Table 21-21 Magnitude of Impact for Trenched Watercourse Crossings

Magnitude of Impact	Number of Trenched Crossings per Water Body Catchment
No impact	0
Negligible	1 to 4
Low	5 to 9
Medium	10 to 14
High	15 or greater

137. In catchments where the only crossings are for haul road access, magnitude of impact has been set to low as a precautionary assumption, and this will be updated through further assessment in the ES.

138. In addition, embedded mitigation measures relevant to trenched watercourses crossings (Commitment IDs CO32, CO33, CO35, , CO36, CO37 and CO39, see **Table 21-4** and **Table 21-5**) are also considered in setting the magnitude of impact. This means that the magnitude of impact indicated by the number of trenched crossings will be lowered due to embedded mitigation.

139. The mitigation measures will ensure impacts on flows and fluvial geomorphology at trenched and temporary haul road crossings sites are minimised, and channels would be reinstated to their former profile. Negligible impacts will not be reduced because embedded mitigation will not result in a 'no change' scenario.

140. The number and type of watercourse crossings are shown in **Table 21-22**. In five catchments, there are no crossings of any type (i.e. both for the cable duct and haul road installation). In these catchments, no impacts from direct disturbance are expected.

141. In one catchment (Hull from West Beck to Arram Beck), there is a trenchless crossing, but as this is a Main River (River Hull), a stop end will be implemented, and a temporary haul road crossing will not be used. Construction access will continue onwards from both sides of the stop end. No impacts are anticipated in this catchment.

142. In two catchments (Beverley and Barmston Drain and Scorborough Beck), there are no trenched crossings for the cable duct installation, but temporary structures will be required at trenchless crossing points for the haul road crossing. As a precautionary assumption and considering the embedded mitigation measures relevant to the installation and use of temporary culverts (**Table 21-4** and **Table 21-5**), the impact magnitude would be **low** in these catchments.

Table 21-22 Water Body Crossings in Surface Water Catchments

Catchment	Sensitivity	Trenchless Crossings (Cable Duct Installation)			Trenched Crossings (Cable Duct Installation Including Temporary Haul Road Crossing)	Magnitude of Impact With Embedded Mitigation
		Main River	Ordinary Watercourse	With Temporary Haul Road Crossing		
Barmston Sea Drain from Skipsea Drain to N Sea	High	0	0	0	0	No impact
Barmston Sea Drain / Skipsea Drain to Conf	High	0	3	3	3	Low
Old Howe / Frodingham Beck to R Hull	Medium	0	4	4	2	Low
Foredyke Stream Lower to Holderness Dr	Low	0	0	0	0	No impact
Mickley Dike Catchment	Medium	1	18	18	2	Low
Hull from West Beck to Arram Beck	High	1	1	0	0	No impact
Holderness Drain Source to Foredyke Stream	Low	2	22	21	5	Low
Beverley and Barmston Drain	Low	1	18	13	0	Low
Bryan Mills Beck Source to Bryan Mills Farm	High	1	2	3	1	Low
Scorborough Beck	Low	1	6	6	0	Low
Ella Dyke	Low	0	0	0	0	No impact
High Hunsley to Arram Area	Low	0	3	3	1	Low
High Hunsley to Woodmansey Area	Low	0	0	0	0	No impact
Leven Canal	High	0	0	0	0	No impact
Onshore coastal catchment	High	0	2	2	2	Low

143. Trenched crossings will be required in seven catchments for the cable duct installation, and additional temporary haul road crossings may also be required at trenchless crossing locations. In these catchments, the number of trenched crossings would range from 1 to 5, but the impact magnitude would be **low** as a precautionary assumption due to the use of temporary haul road crossings at trenchless crossing locations.

21.7.1.1.3 Effect Significance

144. The effect significance for each water body resulting from the direct disturbance of surface water bodies is assessed in **Table 21-23.**

145. Overall, it is predicted that sensitivity is between **low** and **high** (depending on the catchment), and the magnitude of impact is **low** in all catchments with the exception of Barmston Sea Drain from Skipsea Drain to N Sea, Foredyke Stream Lower to Holderness Dr, Hull from West Beck to Arram Beck, Ella Dyke, High Hunsley to Woodmansey Area and Leven Canal catchments where **no impact** is predicted. The effect is therefore of **minor adverse** significance in all catchments with low magnitude impacts, which is **not significant** in EIA terms. and **no change** in catchments with no impacts.

Table 21-23 Effect Significance Associated with the Direct Disturbance of Surface Water Bodies

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
Holderness Drain Source to Foredyke Stream	Low	Five trenched crossings would be required in this catchment. In addition, there could be up to 21 temporary haul road crossings at trenchless crossing locations. These would have a much lower impact than trenched crossings and would be mitigated by Commitment ID CO35 (**Table 21-4** and **Table 21-5**). Impact magnitude has been set as low on a precautionary basis due to temporary haul road crossing installation. This will be updated through further assessment in the ES. Catchment sensitivity is low, and this would lead to a minor adverse effect significance in the catchment. The majority of surface water abstractions listed in **Table 21-15** are located in this catchment, one abstraction approximately 90m away from a trenched crossing location. Where trenched crossings are used, temporary measures would be employed to maintain the flow of water along the watercourse, minimising impacts on flows (Commitment ID CO35, see **Table 21-4** and **Table 21-5**) and the ability of the operator to abstract surface water. In addition, with embedded mitigation measures in place, impacts on surface water abstractions within 100m of the Onshore Development are not anticipated.	Low	Minor adverse
Beverley and Barmston Drain	Low	There are no trenched crossings in this catchment. There could be up to 13 temporary haul road crossings at trenchless crossing locations. These would have a much lower impact than trenched crossings and would be mitigated by Commitment ID CO35 (**Table 21-4** and **Table 21-5**). Impact magnitude has been set as low on a precautionary basis due to temporary haul road crossing installation. This will be updated through further assessment in the ES. Catchment sensitivity is low, and this would lead to a minor adverse effect significance in the catchment. The watercourse that flows through the LWS at Fishpond Wood, Risby Estate, will be crossed downstream of the LWS using a trenchless installation technique. Beverley and Barmston Drain is crossed using a trenchless installation technique downstream of Tophill Low SSSI. Impacts from direct disturbance on designated sites and LWS are not anticipated.	Low	Minor adverse

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
Bryan Mills Beck Source to Bryan Mills Farm	High	One trenched crossing would be required in this catchment. In addition, there could be up to three temporary haul road crossings at trenchless crossing locations. These would have a much lower impact than trenched crossings and would be mitigated by Commitment ID CO35 (**Table 21-4** and **Table 21-5**). Impact magnitude has been set as low on a precautionary basis due to temporary haul road crossing installation. This will be updated through further assessment in the ES. Catchment sensitivity is high because Bryan Mills Field SSSI is located in the catchment, and this would lead to a minor adverse effect significance in the catchment. The SSSI is located 2.4km away from the closest crossing, which means that impacts on the SSSI are not anticipated.	Low	Minor adverse
High Hunsley to Arram Area	Low	One trenched crossing would be required in this catchment. In addition, there could be up to three temporary haul road crossings at trenchless crossing locations. These would have a much lower impact than trenched crossings and would be mitigated by Commitment ID CO35 (**Table 21-4** and **Table 21-5**). Impact magnitude has been set as low on a precautionary basis due to temporary haul road crossing installation. This will be updated through further assessment in the ES. There is no surface water connectivity between the onshore ECC and the very small area of Burton Bushes SSSI located in this catchment.. Impacts from direct disturbance on designated sites and LWS are not anticipated. Catchment sensitivity is low, and this would lead to a minor adverse effect significance in the catchment.	Low	Minor adverse
Barmston Sea Drain / Skipsea Drain to Conf	High	Three trenched crossings would be required in this catchment. In addition, there could be up to three temporary haul road crossings at trenchless crossing locations. These would have a much lower impact than trenched crossings and would be mitigated by Commitment ID CO35 (**Table 21-4** and **Table 21-5**). Impact magnitude has been set as low on a precautionary basis due to temporary haul road crossing installation. This will be updated through further assessment in the ES. Sensitivity is high, and this would lead to a minor adverse effect significance in the catchment. Minor adverse effect significance is due to the presence of Skipsea Bail Mere SSSI, which is located 1km downstream of the closest crossing. The site's interest lies in its buried lake deposits and palaeoenvironmental archive (e.g. pollen). Due to the distance from the SSSI, small-scale temporary nature of works, and embedded mitigation to limit sediment supply and control flows at trenched crossing sites, impacts on the SSSI are not anticipated.	Low	Minor adverse

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
Old Howe / Frodingham Beck to R Hull	Medium	Two trenched crossings would be required in this catchment. In addition, there could be up to four temporary haul road crossings at trenchless crossing locations. These would have a much lower impact than trenched crossings and would be mitigated by Commitment ID CO35 (**Table 21-4** and **Table 21-5**). Impact magnitude has been set as low on a precautionary basis due to temporary haul road crossing installation. This will be updated through further assessment in the ES. Sensitivity is medium, and this would lead to a minor adverse effect significance. Tophill Low DWSZ is in this catchment (designated for risks related to pesticide use (metaldehyde) and nitrates – impacts from watercourse crossings on these parameters are not anticipated.	Low	Minor adverse
Mickley Dike Catchment	Medium	Two trenched crossings would be required in this catchment. In addition, there could be up to 18 temporary haul road crossings at trenchless crossing locations. These would have a much lower impact than trenched crossings and would be mitigated by Commitment ID CO35 (**Table 21-4** and **Table 21-5**). Impact magnitude has been set as low on a precautionary basis due to temporary haul road crossing installation. This will be updated through further assessment in the ES. Sensitivity is medium, and this would lead to a minor adverse effect significance in the catchment. Tophill Low DWSZ is in this catchment (designated for risks related to pesticide use (metaldehyde) and nitrates) – impacts from watercourse crossings on these parameters are not anticipated.	Low	Minor adverse
Scorborough Beck	Low	There would be no trenched crossings in this catchment. In addition, there could be up to six temporary haul road crossings at trenchless crossing locations. These would have a much lower impact than trenched crossings and would be mitigated by Commitment ID CO35 (**Table 21-4** and **Table 21-5**). Impact magnitude has been set as low on a precautionary basis due to temporary haul road crossing installation. This will be updated through further assessment in the ES. Sensitivity is low, so the effect significance would be minor adverse.	Low	Minor adverse
Hull from West Beck to Arram Beck	High	Although two trenchless crossings would be required in this catchment, a stop end will be implemented at this location, and temporary haul crossings would not be required. As there are no trenched crossings or temporary haul road crossings, impacts on designated sites (West Beck to Arram Beck Drinking Water Protected Area, and Pulfin Bog SSSI) are not anticipated.	No impact	No change

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
Onshore coastal catchment	High	Two trenched crossings would be required in this catchment. In addition, there could be up to two temporary haul road crossings at trenchless crossing locations. These would have a much lower impact than trenched crossings and would be mitigated by Commitment ID CO35 (**Table 21-4** and **Table 21-5**). Impact magnitude has been set as low on a precautionary basis due to temporary haul road crossing installation. This will be updated through further assessment in the ES. Sensitivity is high, and this would lead to a minor adverse effect significance in the catchment. Withow Gap SSSI is located approximately 280m northeast of the closest trenched crossing, although there is no surface water flow path connectivity to the designated site. This means impacts are not expected. The Greater Wash SPA is located approximately 320m east of the nearest trenched crossing on a minor ditch, which drains to the coast. Although there could be an increase in suspended sediment during the crossing work, this would be localised and temporary. Increases in suspended sediment from trenched crossings are anticipated to be the same magnitude as a typical high flow event in the channel, and therefore unlikely to affect the wider SPA, which measures over 3,500km^2.	Low	Minor adverse
Ella Dyke	Low	No crossings of any type (trenched, trenchless or temporary haul road crossing) are required in these catchments. This means there is no mechanism for impact.	No impact	No change
Barmston Sea Drain from Skipsea Drain to N Sea	High		No impact	No change
Foredyke Stream Lower to Holderness Dr	Low		No impact	No change
High Hunsley to Woodmansey Area	Low		No impact	No change
Leven Canal	High		No impact	No change

21.7.1.2 Increased Sediment Supply (WRF-C-02)

146. Construction of the landfall, onshore ECC, OCS and ESBI and associated temporary construction compounds will involve ground disturbance (e.g. piling, earthworks and the tracking of large construction machinery). This will create areas of bare ground by removing vegetation cover and topsoil and will increase the potential for soil erosion. This could result in an increase in the supply of fine sediment (e.g. clays, silts and fine sands) to the surface water drainage network.

147. Increased sediment supply can affect the geomorphology of water bodies by increasing the turbidity of the water column and, where energy is sufficiently low, encouraging increased deposition of fine sediment on the bed of the channel. Increased sediment loads could therefore smother existing bed habitats, reduce light penetration and reduce dissolved oxygen concentrations, adversely affecting the biota of the water body including macrophytes, aquatic invertebrates and fish. This has the overall effect of reducing the quality of in-channel habitats.

148. In addition to the potential sources of sediment considered, temporary watercourse crossings may be used to maintain haul road access across water bodies. These crossings would provide a mechanism by which sediment could be produced close to the water bodies which they cross. Disturbed ground associated with trenched crossings also has the potential to increase sediment supply.

21.7.1.2.1 Receptor Sensitivity

149. Receptor sensitivity is described in **Table 21-20** of the 15 surface water catchments crossed by the Onshore Development Area, sensitivity is **high** in six, **medium** in two and **low** in the remainder (seven).

21.7.1.2.2 Impact Magnitude

150. **Table 21-24** shows the criteria used to assess the magnitude of impact associated with increased sediment supply resulting from the maximum potential area of exposed ground in a water body catchment.

Table 21-24 Magnitude of Impact Resulting from Exposed Land in a Water Body Catchment

Magnitude of Impact	Area of Exposed Ground per Catchment during Construction (%)
Negligible	Less than or equal to 1
Low	1 to 6
Medium	6 to 10
High	10 or greater

151. In addition, embedded mitigation measures (Commitment IDs CO32, CO33, CO39, CO43 and CO46, see **Table 21-4** and **Table 21-5**) are also considered in setting the magnitude of impact. This means that the magnitude of impact indicated by the area of disturbed ground will be lowered due to embedded mitigation. Mitigation measures will limit the area of disturbed ground in each catchment and limit the potential for sediment to reach the surrounding surface water drainage network. Negligible impacts will not be reduced because embedded mitigation will not result in a 'no change' scenario.

152. The area of each water body catchment occupied by the Onshore Development Area is shown in **Table 21-25**.

153. Impact magnitude is **negligible** in all catchments except Mickley Dike Catchment where it is **low**. Mickley Dike Catchment has a relatively small area, and the onshore ECC widens to retain some optionality for onshore export cable routeing and haul road access.

Table 21-25 Worst-Case Estimated Maximum Area of Disturbed Ground in Each Catchment Receptor

Catchment	Estimated Total Area of Disturbed Ground during Construction		Magnitude of Impact With Embedded Mitigation
	km^2	% Catchment Area	
Barmston Sea Drain from Skipsea Drain to N Sea	0.001	0.01	Negligible
Barmston Sea Drain / Skipsea Drain to Conf	0.66	1.7	Negligible
Old Howe / Frodingham Beck to R Hull	0.85	3.3	Negligible
Foredyke Stream Lower to Holderness Dr	0.012	0.01	Negligible
Mickley Dike Catchment	1.42	8.5	Low
Hull from West Beck to Arram Beck	0.01	0.3	Negligible
Holderness Drain Source to Foredyke Stream	2.54	5.8	Negligible
Beverley and Barmston Drain	2.88	2.7	Negligible
Bryan Mills Beck Source to Bryan Mills Farm	0.31	1.0	Negligible
Scorborough Beck	0.89	2.5	Negligible
Ella Dyke	0.01	0.03	Negligible
High Hunsley to Arram Area	1.35	3.3	Negligible
High Hunsley to Woodmansey Area	0.86	5.7	Negligible
Leven Canal	0.00006 (60 m^2)	0.1	Negligible
Onshore coastal catchment	0.03	1.2	Negligible

154. Estimated areas of disturbed ground are also relatively high in the High Hunsley to Woodmansey Area catchment and Holderness Drain Source to Foredyke Stream catchment. This is due to optionality for the final OCS zone location and optionality for onshore export cable routeing and haul road access (as described for the Mickley Dike catchment). The data shown in **Table 21-25** will be updated in the ES. It is anticipated that areas of disturbed ground will be further refined in most catchments through site selection and design refinements.

21.7.1.2.3 Effect Significance

155. The effect significance for each surface water catchment is assessed in **Table 21-26**.

156. Overall, it is predicted that catchment sensitivity is between **low** and **high** (depending on the catchment)**,** and the magnitude of impact is **negligible** to **low**. Effect significance is therefore of **negligible** to **minor adverse** significance, which is **not significant** in EIA terms.

Table 21-26 Effect Significance Associated with Increased Sediment Supply

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
Barmston Sea Drain from Skipsea Drain to N Sea	High	This catchment contains a very small area (0.001km^2) of access road that would only be used for landfall emergency works. Although effect significance is minor adverse, this is due to high sensitivity associated with the Greater Wash SPA. Embedded mitigation for soil management and surface water flows (including Commitment IDs CO39 and CO46, **Table 21-4** and **Table 21-5**) will limit the potential for increased sediment supply. Given the small area of catchment that would only be used in an emergency, impacts on sediment supply that could affect watercourses and the SPA are considered unlikely.	Negligible	Minor adverse
Mickley Dike Catchment	Medium	The proportion of each catchment that would be affected by construction and potentially increase sediment supply is relatively high (5.8% to 8.5%) compared to the other catchments crossed by Onshore Development Area. This is due to optionality that has been retained for the onshore export cable routeing and haul road access. These figures will be further refined through site selection and design refinements, and they will be updated in the ES. Embedded mitigation for soil management and surface water flows (including Commitment IDs CO39 and CO46, **Table 21-4** and **Table 21-5**) will limit the potential for increased sediment supply.	Low	Minor adverse
Holderness Drain Source to Foredyke Stream	Low		Negligible	Negligible
High Hunsley to Arram Area	Low	An estimated maximum of 1.35km^2 (3.3% of the catchment) would be affected by construction activities. Embedded mitigation for soil management and surface water flows (including Commitment IDs CO39 and CO46, **Table 21-4** and **Table 21-5**)) will limit the potential for increased sediment supply.	Negligible	Negligible

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
High Hunsley to Woodmansey Area	Low	The area of disturbed ground in each of these catchments is dependent on which OCS zone is selected for development: OCS Zone 4 (High Hunsley to Woodmansey Area catchment) and Zone 8 (Beverley and Barmston Drain catchment). As a worst-case, it is assumed either catchment could be affected, giving maximum areas of disturbed ground in each catchment of 2.7% and 5.7% respectively. These figures will be further refined through site selection and design refinements, and they will be updated in the ES. Embedded mitigation for soil management and surface water flows (including Commitment IDs CO39 and CO46, **Table 21-4** and **Table 21-5**) will limit the potential for increased sediment supply. The majority of the watercourse that flows through Fishpond Wood, Risby Estate LWS is upstream of Onshore Development Area (Beverley and Barmston Drain catchment) (only 0.22ha overlaps). The onshore ECC in Beverley and Barmston Drain's catchment is located downstream of Tophill Low SSSI. There is no surface water connectivity between the onshore ECC and Burton Bushes SSSI. Impacts from direct disturbance on designated sites and LWS are not anticipated.	Negligible	Negligible
Beverley and Barmston Drain	Low		Negligible	Negligible
Hull from West Beck to Arram Beck	High	An estimated maximum of 0.01km^2 (0.3% of the catchment) would be affected by construction activities. Effect significance is minor adverse due to high sensitivity because the catchment is a designated DWPA (surface water). Embedded mitigation for soil management and surface water flows (including Commitment IDs CO39 and CO46, **Table 21-4** and **Table 21-5**) will limit the potential for increased sediment supply. The only construction activity in the catchment would be the trenchless crossing of the River Hull. Due to this crossing technique, impacts on the DWPA are not anticipated.	Negligible	Minor adverse
Leven Canal	High	The Leven Canal water body is a SSSI and will be crossed for access purposes using an existing track and bridge crossing point. Minor adverse effects are due to high sensitivity. Embedded mitigation for soil management and surface water flows (including Commitment IDs CO39 and CO46, **Table 21-4** and **Table 21-5**) will limit the potential for increased sediment supply. Given the small area of catchment that would be crossed temporarily during construction (60m^2), using existing infrastructure, effects on sediment supply and SSSI are considered unlikely.	Negligible	Minor adverse

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
Barmston Sea Drain / Skipsea Drain to Conf	High	An estimated maximum of 0.66km^2 (1.7% of the catchment) would be affected by construction activities. Effect significance is minor adverse due to high sensitivity because Skipsea Bail Mere SSSI is located approximately 1km downstream of the onshore ECC. Embedded mitigation for soil management and surface water flows (including Commitment IDs CO39 and CO46, **Table 21-4** and **Table 21-5**)) will limit the potential for increased sediment supply. Impacts on the SSSI are not anticipated.	Negligible	Minor adverse
Old Howe / Frodingham Beck to R Hull	Medium	An estimated maximum of 0.85km^2 (3.3% of the catchment) would be affected by construction activities. Embedded mitigation for soil management and surface water flows (including Commitment IDs CO39 and CO46, **Table 21-4** and **Table 21-5**) will limit the potential for increased sediment supply.	Negligible	Minor adverse
Foredyke Stream Lower to Holderness Dr	Low	A very small area of this catchment (0.012km^2 (0.01%)) would be affected by construction activities. Embedded mitigation for soil management and surface water flows (including Commitment IDs CO39 and CO46, **Table 21-4** and **Table 21-5**) will limit the potential for increased sediment supply.	Negligible	Negligible
Bryan Mills Beck Source to Bryan Mills Farm	High	An estimated maximum of 0.31km^2 (1.0% of the catchment) would be affected by construction activities. Embedded mitigation for soil management and surface water flows (including Commitment IDs CO39 and CO46, **Table 21-4** and **Table 21-5**) will limit the potential for increased sediment supply. Effect significance is minor adverse due to high sensitivity because Bryan Mills Field SSSI is located approximately 50m away from the Onshore Development Area. Excavations for the onshore ECC will be shallow (target minimum burial depth of 1.2m where open cut trenching is used) through superficial deposits, and the SSSI appears to be spring fed. The small scale and shallow nature of onshore ECC excavations, at 50m distance from the SSSI, mean that impacts on the designated are not anticipated.	Negligible	Minor adverse
Scorborough Beck	Low	An estimated maximum of 0.89km^2 (2.5% of the catchment) would be affected by construction activities. Embedded mitigation for soil management and surface water flows (including Commitment IDs CO39 and CO46, **Table 21-4** and **Table 21-5**) will limit the potential for increased sediment supply. With mitigation in place impacts on Bealey's Beck Lockington LWS are not anticipated. Bealey's Beck will also be crossed using a trenchless installation technique, further limiting the potential for sediment to enter the channel.	Negligible	Negligible

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
Ella Dyke	Low	An estimated maximum of 0.01km^2 (0.03% of the catchment) would be affected by construction activities. Embedded mitigation for soil management and surface water flows (including Commitment IDs CO39 and CO46, **Table 21-4** and **Table 21-5**) will limit the potential for increased sediment supply.	Negligible	Negligible
Onshore coastal catchment	High	An estimated maximum of 0.03km^2 (1.2% of the catchment) would be affected by construction activities. Embedded mitigation for soil management and surface water flows (including Commitment IDs CO39 and CO46, **Table 21-4** and **Table 21-5**) will limit the potential for increased sediment supply. Effect significance is minor adverse due to high sensitivity because Withow Gap, Skipsea SSSI is located in the catchment. The catchment also drains directly to the Greater Wash SPA. With mitigation measures in place, impacts on the SSSI and SPA are not anticipated.	Negligible	Minor adverse

21.7.1.3 Supply of Contaminants to Surface and Groundwater (WRF-C-03)

157. During construction, there is potential for the accidental release of lubricants, fuels and oils from construction machinery. This could occur because of spillages, leakage from vehicle storage areas and direct release from construction machinery working directly in or adjacent to water bodies, including land drainage channels. Bentonite, which is an inert clay-based material used during trenchless installation works, can breakout during construction and smother habitats, although it is inert and not a pollutant.

158. There is also potential for accidental leakages of foul water from welfare facilities, and construction materials including concrete. These can enter surface waters and connected groundwaters through run-off, especially following rainfall.

159. A significant accidental leakage or spillage has the potential to cause adverse effects to water quality if contaminants enter the surface drainage network and can adversely affect the ecology of the water bodies.

160. Construction activities, such as excavations for cable trenching, could result in the remobilisation of contaminants that are already present in the soil. This could include in-situ contaminated land and nutrients such as nitrogen and phosphorus from nitrogen-rich arable soils.

161. Excavations along the onshore ECC for the cable trenches and any deeper excavations in the Onshore Development Area may encounter groundwater, which would need to be discharged. Discharge water may contain contaminants already present in soil, or from construction machinery, which could contaminate nearby watercourses.

162. The supply of nutrients to surface waters, either from soil disturbance, septic tanks or via a mains sewer connection could result in adverse effects on water quality (including, in extreme cases, eutrophication) and aquatic plant, invertebrate and fish communities supported by surface waters.

163. Construction activities such as excavation, piling and trenchless installation techniques (e.g. HDD) which disturb the ground can also introduce contaminants into underlying groundwater bodies, particularly shallow aquifers. The length of trenchless installation at each crossing is likely to vary depending on the obstacle being crossed. Longer lengths of installation, such as the landfall, have a greater potential to interact with the underlying chalk aquifer. There is also the risk of a breakout of drilling muds (e.g. bentonite). These activities could adversely affect the quality of the underlying groundwater and connected surface waters, and any associated licensed or unlicensed abstractions.

21.7.1.3.1 Receptor Sensitivity

164. Receptor sensitivity is described in **Table 21-20** of the 15 surface water catchments crossed by the Onshore Development Area, sensitivity is **high** in six, **medium** in two and **low** in the remainder (seven).

165. Groundwater sensitivity is **high**.

21.7.1.3.2 Impact Magnitude

166. The area of each catchment disturbed by construction (**Table 21-25)** is used as a proxy for the area of land that could be affected by the accidental release of contaminants.

167. In addition, embedded mitigation measures (Commitment IDs CO32, CO33, CO38, CO39, CO40 and CO46, see **Table 21-4** and **Table 21-5**) are also considered in setting the magnitude of impact. This means that the magnitude of impact indicated by the area of disturbed ground and potential for spills or leaks during construction will be lowered due to embedded mitigation. Mitigation measures will limit the potential for accidental spills and leaks and put in place procedures for an effective response to any pollution event. Negligible impacts will not be reduced because embedded mitigation will not result in a 'no change' scenario.

168. Impact magnitude is **negligible** in all catchments except the Mickley Dike catchment where it is **low**. Mickey Dike has a relatively small area and the onshore ECC widens to retain some optionality for onshore export cable routeing and haul road access.

169. Estimated areas of disturbed ground are also relatively high in the High Hunsley to Woodmansey Area catchment and the Holderness Drain Source to Foredyke Stream catchment. This is due to optionality for the final OCS zone location and optionality for onshore export cable routeing and haul road access (as described for the Mickley Dike catchment). The data shown in **Table 21-25** will be updated in the ES. It is anticipated that areas of disturbed ground will be further refined in most catchments through site selection and design refinements.

21.7.1.3.3 Effect Significance

170. The effect significance for each water body resulting from the supply of contaminants to surface and groundwater is assessed in **Table 21-27**.

171. Overall, it is predicted that catchment sensitivity is between **low** and **high** (depending on the catchment)**,** and the magnitude of impact is **negligible** to **low**. Effect significance is therefore of **negligible** to **minor adverse** significance, which is **not significant** in EIA terms.

Table 21-27 Effect Significance Associated with the Supply of Contaminants to Surface and Groundwater

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
Barmston Sea Drain from Skipsea Drain to N Sea	High	This catchment contains a very small area (0.001km^2) of access road that would only be used for landfall emergency works. Although effect significance is minor adverse, this is due to high sensitivity associated with the Greater Wash SPA. Embedded mitigation secured in the CoCP which will be informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will limit the potential for accidental spills and leaks and put in place procedures for an effective response to any pollution event. Given the small area of catchment that would only be used in an emergency, accidental spills or leaks that could contaminate surface and groundwaters and affect the SPA are considered unlikely.	Negligible	Minor adverse

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
Mickley Dike Catchment	Medium	The proportion of each catchment that would be affected by construction, which could result in the accidental release of contaminants to the surface and groundwater, is relatively high (5.8% to 8.5%) compared to the other catchments crossed by Onshore Development Area. This is due to optionality that has been retained for onshore export cable routeing and haul road access. These figures will be further refined through site selection and design refinements, and they will be updated in the ES. Embedded mitigation secured in the CoCP which will be informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will limit the potential for accidental spills and leaks and put in place procedures for an effective response to any pollution event. In addition, with mitigation measures in place, impacts on surface water quality and the ability of the operator to abstract surface water from the abstractions listed in **Table 21-15** are not anticipated.	Low	Minor adverse
Holderness Drain Source to Foredyke Stream	Low		Negligible	Negligible
High Hunsley to Arram Area	Low	An estimated maximum of 1.35km^2 (3.3% of the catchment) would be affected by construction activities, which could result in the accidental release of contaminants to the surface and groundwater. There is one active discharge consent within 100m of the Onshore Development Area, which discharges to land. Impacts on water quality in the vicinity of the discharge are not anticipated.	Negligible	Negligible
		There is no surface water connectivity between the onshore ECC and the very small area of Burton Bushes SSSI located in this catchment. Impacts from the supply of contaminants to the designated site are not anticipated. Embedded mitigation secured in the CoCP which will be informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will limit the potential for accidental spills and leaks and put in place procedures for an effective response to any pollution event.		
High Hunsley to Woodmansey Area	Low	The area of disturbed ground in each of these catchments is dependent on which OCS zone is selected for the final design: OCS Zone 4 (High Hunsley to Woodmansey Area catchment) and Zone 8 (Beverley and Barmston Drain catchment). As a worst-case, it is assumed either catchment could be affected, giving maximum areas of disturbed ground of 2.7% and 5.7%, respectively. These figures will be further refined through site selection and design refinements, and they will be updated in the ES. There is one active discharge consent within the Onshore Development Area, and five within 100m, which discharge to land. Impacts on water quality in the vicinity of the discharge are not anticipated.	Negligible	Negligible

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
Beverley and Barmston Drain	Low	The wet day reservoir flood risk extent for Tophill Low reservoir overlaps with part of the onshore ECC. The risk of a reservoir failure is very low and the risk of pollutant in-wash back to Tophill Low SSSI is considered low because the main reservoir flood extent that overlaps the onshore ECC is in a different catchment (Mickley Dike). The SSSI is also located upstream of the onshore ECC. Impacts on the SSSI are not anticipated. Embedded mitigation secured in the CoCP which will be informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will limit the potential for accidental spills and leaks and put in place procedures for an effective response to any pollution event. The majority of the watercourse that flows through Fishpond Wood, Risby Estate LWS is upstream of Onshore Development Area (Beverley and Barmston Drain catchment) (only 0.22ha overlaps). With mitigation in place, impacts on the LWS are not anticipated.	Negligible	Negligible
Hull from West Beck to Arram Beck	High	An estimated maximum of 0.01km^2 (0.3% of the catchment) would be affected by construction activities, which could result in the accidental release of contaminants to the surface and groundwater.	Negligible	Minor adverse
		Effect significance is minor adverse due to high sensitivity because the catchment is a designated DWPA (surface water). Embedded mitigation secured in the CoCP which will be informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will limit the potential for accidental spills and leaks and put in place procedures for an effective response to any pollution event. The only construction activity in the catchment would be the trenchless crossing of the River Hull. Due to this crossing technique, impacts on the DWPA are not anticipated.		
Leven Canal	High	The Leven Canal water body is a SSSI and will be crossed for access purposes using an existing track and bridge crossing point. Minor adverse effects are due to high sensitivity. Embedded mitigation secured in the CoCP which will be informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will limit the potential for accidental spills and leaks and put in place procedures for an effective response to any pollution event. Given the small area of catchment that would be crossed temporarily during construction (60m^2) using existing infrastructure, effects on the SSSI associated with accidental spills and leaks are considered unlikely.	Negligible	Minor adverse

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
Barmston Sea Drain / Skipsea Drain to Conf	High	An estimated maximum of 0.66km^2 (1.7% of the catchment) would be affected by construction activities, which could result in the accidental release of contaminants to the surface and groundwater. Effect significance is minor adverse due to high sensitivity because Skipsea Bail Mere SSSI is located approximately 1km downstream of the onshore ECC. Embedded mitigation secured in the CoCP which will be informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will limit the potential for accidental spills and leaks and put in place procedures for an effective response to any pollution event. Impacts on the SSSI are not anticipated.	Negligible	Minor adverse
Old Howe / Frodingham Beck to R Hull	Medium	An estimated maximum of 0.85km^2 (3.3% of the catchment) would be affected by construction activities, which could result in the accidental release of contaminants to the surface and groundwater. Embedded mitigation secured in the CoCP which will be informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will limit the potential for accidental spills and leaks and put in place procedures for an effective response to any pollution event.	Negligible	Minor adverse
Foredyke Stream Lower to Holderness Dr	Low	A very small area of this catchment (0.012km^2 (0.01%)) would be affected by construction activities, which could result in the accidental release of contaminants to the surface and groundwater. Embedded mitigation secured in the CoCP which will be informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will limit the potential for accidental spills and leaks and put in place procedures for an effective response to any pollution event.	Negligible	Negligible
Bryan Mills Beck Source to Bryan Mills Farm	High	An estimated maximum of 0.31km^2 (1.0% of the catchment) would be affected by construction activities which could result in the accidental release of contaminants to the surface and groundwater. Embedded mitigation secured in the CoCP, informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will limit the potential for accidental spills and leaks and put in place procedures for an effective response to any pollution event	Negligible	Minor adverse

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
		Effect significance is minor adverse due to high sensitivity because Bryan Mills Field SSSI is located approximately 50m away from the Onshore Development Area. Excavations for the onshore ECC will be shallow (target minimum burial depth of 1.2m where open cut trenching is used) through superficial deposits, and the SSSI appears to be spring fed. The closest trenchless crossing that could interact with deeper groundwater is approximately 600m away. The small scale and shallow nature of onshore ECC excavations, at 50m distance from the SSSI, mean that impacts on the designated are not anticipated.		
Scorborough Beck	Low	An estimated maximum of 0.89km^2 (2.5% of the catchment) would be affected by construction activities, which could result in the accidental release of contaminants to the surface and groundwater. Embedded mitigation secured in the CoCP, informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will limit the potential for accidental spills and leaks and put in place procedures for an effective response to any pollution event. With mitigation in place, impacts on Bealey's Beck Lockington LWS are not anticipated. Bealey's Beck will also be crossed using a trenchless installation technique, further limiting the potential for contaminants to enter the channel.	Negligible	Negligible
Ella Dyke	Low	An estimated maximum of 0.01km^2 (0.03% of the catchment) would be affected by construction activities, which could result in the accidental release of contaminants to the surface and groundwater. Embedded mitigation secured in the CoCP, informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will limit the potential for accidental spills and leaks and put in place procedures for an effective response to any pollution event. In addition, with mitigation measures in place, impacts on surface water quality and the ability of the operator to abstract surface water from the abstraction within 100m of the Onshore Development Area (with respect to the access road only) (**Table 21-15**) are not anticipated.	Negligible	Negligible
Onshore coastal catchment	High	An estimated maximum of 0.03km^2 (1.2% of the catchment) would be affected by construction activities, which could result in the accidental release of contaminants to the surface and groundwater. Embedded mitigation secured in the CoCP, informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will limit the potential for accidental spills and leaks and put in place procedures for an effective response to any pollution event.	Negligible	Minor adverse

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
		Effect significance is minor adverse due to high sensitivity because Withow Gap Skipsea SSSI is located in the catchment. The catchment also drains directly to the Greater Wash SPA. With mitigation measures in place, impacts on the SSSI and SPA are not anticipated.		
Hull and East Riding Chalk	High	An estimated maximum of 12.37km^2 (0.63% of the catchment) would be affected by construction activities (this figure will be updated in the ES following further site selection and design refinements). Trenching will be shallow and ground investigations will be undertaken at deeper trenchless crossings and excavations. Inert drilling fluids and inert cable ducting will be used. Embedded mitigation measures secured in the CoCP, informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will limit the potential for accidental spills and leaks and put in place procedures for an effective response to any pollution event. Impacts on the groundwater abstractions located within and outside the Onshore Development Area are not anticipated. With embedded mitigation in place, impacts on the groundwater body and associated designations (Principal aquifer, DWSZ and SPZ) are considered unlikely.	Negligible	Minor adverse

21.7.1.4 Changes to Surface and Groundwater Flows and Flood Risk (WRF-C-04)

172. Initial site preparation activities and construction works could alter surface drainage patterns and surface flows by changing the distribution of surface drainage across the Onshore Development Area. Infiltration would be reduced, and surface runoff increased, by a reduction in the proportion of impermeable surfaces in a drainage catchment caused by the compaction of soil by construction vehicles and the development of surface infrastructure (e.g. OCS and ESBI). This is directly related to the area of construction that can alter site runoff characteristics as the greater the area of construction, the greater the potential impact on surface and groundwater flows.

173. Temporary changes to surface flows because of trenched crossings of ordinary watercourses may also occur, particularly if the capacity of any pumps or flumes are exceeded. Any changes in surface flows can alter and / or increase flood risk in the Onshore Development Area.

174. Surface and subsurface flow patterns can be altered because of changes to infiltration rates, surface flows, the installation of impermeable subsurface infrastructure and local groundwater abstraction (e.g. for dewatering of cable trenches and other excavations, where required, and construction use). Therefore, the construction of the onshore infrastructure associated with the Project has the potential to generate increased surface water flows. This could result in increased discharge within watercourses and associated bed and bank scour, as well as in-wash of increased volumes of fine sediment related to the additional surface runoff. This could adversely affect hydrology and geomorphology of the surface drainage network.

175. It is anticipated that temporary abstraction of groundwater of up to 20m^3 per day at the landfall and up to 70m^3 per day at the OCS zone would be required during construction. Abstraction conditions associated with abstraction licenses that may be required would be agreed with the Environment Agency as part of the consenting process.

176. The potential flood risk implications of the Project are assessed in detail in **Volume 2, Appendix 21.3 Flood Risk Assessment**.

21.7.1.4.1 Receptor Sensitivity

177. Receptor sensitivity is described in **Table 21-20** of the 15 surface water catchments crossed by the Onshore Development Area, sensitivity is **high** in six, **medium** in two and **low** in the remainder (seven).

178. Groundwater sensitivity is **high**.

21.7.1.4.2 Impact Magnitude

179. The proportion of each catchment disturbed by construction (**Table 21-25**) is used as a proxy for the area of land that could experience changes in land use, and therefore changes to infiltration rates, runoff rates and flood risk.

180. In addition, embedded mitigation measures (Commitment IDs CO32, CO34, CO35, CO39 and CO43, see **Table 21-4** and **Table 21-5**) are also considered in setting the magnitude of impact. This means that the magnitude of impact indicated by the area of disturbed ground and potential for changes in land use and runoff during construction will be lowered due to embedded mitigation. Mitigation measures will limit the area over which land use is changed and therefore reduce the potential for changes in surface water runoff. Mitigation measures will also manage any runoff that is generated during construction. Negligible impacts will not be reduced because embedded mitigation will not result in a 'no change' scenario.

181. Impact magnitude is **negligible** in all catchments except the Mickley Dike catchment where it is **low**. Mickey Dike has a relatively small area and the onshore ECC widens to retain some optionality for onshore export cable routeing and haul road access.

182. Estimated areas of disturbed ground are also relatively high in the High Hunsley to Woodmansey Area catchment and the Holderness Drain Source to Foredyke Stream catchment. This is due to optionality for the final OCS zone location and optionality for onshore export cable routeing and haul road access (as described for the Mickley Dike catchment). The data shown in **Table 21-25** will be updated in the ES. It is anticipated that areas of disturbed ground will be further refined in most catchments through site selection and design refinements.

21.7.1.4.3 Effect Significance

183. The effect significance for each water body resulting changes to surface and groundwater flows and flood risk is assessed in **Table 21-28**.

184. Overall, it is predicted that catchment sensitivity is between **low** and **high** (depending on the catchment)**,** and the magnitude of impact is **negligible** to **low**. Effect significance is therefore of **negligible** to **minor adverse** significance, which is **not significant** in EIA terms.

Table 21-28 Effect Significance Associated with Changes to Surface and Groundwater Flows

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
Barmston Sea Drain from Skipsea Drain to N Sea	High	This catchment contains a very small area (0.001km^2) of access road that would only be used for landfall emergency works. Across the entire catchment, these activities are unlikely to lead to significant changes in surface water drainage or flood risk. Embedded mitigation secured in the CoCP which will be informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will minimise the impact of any changes to surface water flows. Although effect significance is minor adverse, this is due to high sensitivity associated with the Greater Wash SPA. Given the small area of catchment that would only be used in an emergency, impacts on the SPA are considered unlikely.	Negligible	Minor adverse
Mickley Dike Catchment	Medium	The proportion of each catchment that would be affected by construction is relatively high (5.8 to 8.5%) compared to the other catchments crossed by Onshore Development Area. This is due to optionality that has been retained for the onshore export cable routeing and haul road access. These figures will be further refined through site selection and design refinements, and they will be updated in the ES. Two to five trenched crossings would be required in these catchments, which means there is limited potential for flows to be affected by the capacity of pumps or flumes at trenched crossings.	Low	Minor adverse

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
Holderness Drain Source to Foredyke Stream	Low	Embedded mitigation secured in the CoCP which will be informed by the Outline CoCP (Commitment IDs CO35 and CO39, **Table 21-4** and **Table 21-5**) will minimise the impact of any changes to surface water flows. As described in **Section 21.7.1.1**, where trenched crossings are used, temporary measures would be employed to maintain the flow of water along the watercourse, minimising impacts on flows (Commitment ID CO35, see **Table 21-4** and **Table 21-5**) and the ability of the operator to abstract surface water. In addition, with embedded mitigation measures in place, impacts on surface water abstractions within 100m of the Onshore Development are not anticipated.	Negligible	Negligible
High Hunsley to Arram Area	Low	An estimated maximum of 1.35km^2 (3.3% of the catchment) would be affected by construction activities. Across the entire catchment, these activities are unlikely to lead to significant changes in surface water drainage or flood risk. The low number of trenched crossings in this catchment (one) means there is limited potential for flood water flow to be affected by the capacity of pumps or flumes at trenched crossings. There is no surface water connectivity between the onshore ECC and the very small area of Burton Bushes SSSI located in this catchment. Impacts on designated sites and LWS are not anticipated.	Negligible	Negligible
		Embedded mitigation secured in the CoCP which will be informed by the Outline CoCP (Commitment IDs CO35 and CO39, **Table 21-4** and **Table 21-5**) will minimise the impact of any changes to surface water flows.		
High Hunsley to Woodmansey Area	Low	The area of disturbed ground in each of these catchments is dependent on which OCS zone is selected for the final design: OCS Zone 4 (High Hunsley to Woodmansey Area catchment) and Zone 8 (Beverley and Barmston Drain catchment). As a worst-case, it is assumed either catchment could be affected, giving maximum areas of disturbed ground of 2.7% and 5.7%, respectively. These figures will be further refined through site selection and design refinements, and they will be updated in the ES. There would be no trenched crossings in Beverley and Barmston Drain's catchment that could affect flows and impacts at temporary crossings for the haul road would be mitigated by Commitment ID CO35 (**Table 21-4**). The majority of the watercourse that flows through Fishpond Wood, Risby Estate LWS is upstream of Onshore Development Area (Beverley and Barmston Drain catchment) (only 0.22ha overlaps). The onshore ECC is located downstream of Tophill Low SSSI. Impacts on designated sites and LWS are not anticipated.	Negligible	Negligible
Beverley and Barmston Drain	Low		Negligible	Negligible

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
Hull from West Beck to Arram Beck	High	An estimated maximum of 0.01km^2 (0.3% of the catchment) would be affected by construction activities. Across the entire catchment, these activities are unlikely to lead to significant changes in surface water drainage or flood risk. Effect significance is minor adverse due to high sensitivity because the catchment is a designated DWPA (surface water). Embedded mitigation secured in the CoCP which will be informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will minimise the impact of any changes to surface water flows. The only construction activities in the catchment would be the trenchless crossing of the River Hull and, potentially, short sections of haul road on either side of the crossing. However, the catchment is only 50m wide at the crossing point, so the haul road and crossing entry and exit points may be located outside the catchment. Due to the crossing technique, impacts on the DWPA are not anticipated.	Negligible	Minor adverse
Leven Canal	High	The Leven Canal water body is a SSSI and will be crossed for access purposes using an existing track and bridge crossing point. Minor adverse effects are due to high sensitivity. Embedded mitigation secured in the CoCP which will be informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will minimise the impact of any changes to surface water flows.	Negligible	Minor adverse
		Given the small area of catchment that would be crossed temporarily during construction (60m^2) using existing infrastructure, effects on the SSSI are considered unlikely.		
Barmston Sea Drain / Skipsea Drain to Conf	High	An estimated maximum of 0.66km^2 (1.7% of the catchment) would be affected by construction activities. Across the entire catchment, these activities are unlikely to lead to significant changes in surface water drainage or flood risk. Three trenched crossings would be required in this catchment, which means there is limited potential for flows to be affected by the capacity of pumps or flumes at trenched crossings. Embedded mitigation secured in the CoCP which will be informed by the Outline CoCP (Commitment IDs CO35 and CO39, **Table 21-4** and **Table 21-5**) will minimise the impact of any changes to surface water flows. Effect significance is minor adverse due to high sensitivity because Skipsea Bail Mere SSSI is located approximately 1km downstream of the onshore ECC. The watercourse that connects to the SSSI will be crossed using a trenchless technique. Impacts on the SSSI are not anticipated.	Negligible	Minor adverse

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
Old Howe / Frodingham Beck to R Hull	Medium	An estimated maximum of 0.85km^2 (3.3% of the catchment) would be affected by construction activities. Across the entire catchment, these activities are unlikely to lead to significant changes in surface water drainage or flood risk. Two trenched crossings would be required in this catchment, which means there is limited potential for flows to be affected by the capacity of pumps or flumes at trenched crossings. Embedded mitigation secured in the CoCP (Commitment IDs CO35 and CO39, **Table 21-4** and **Table 21-5**) will minimise the impact of any changes to surface water flows.	Negligible	Minor adverse
Foredyke Stream Lower to Holderness Dr	Low	A very small area of this catchment (0.012km^2 (0.01%)) would be affected by construction activities. Across entire catchments, these activities are unlikely to lead to significant changes in surface water drainage or flood risk. Embedded mitigation secured in the CoCP which will be informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will minimise the impact of any changes to surface water flows.	Negligible	Negligible
Bryan Mills Beck Source to Bryan Mills Farm	High	An estimated maximum of 0.31km^2 (1.0% of the catchment) would be affected by construction activities. Across the entire catchment, these activities are unlikely to lead to significant changes in surface water drainage or flood risk. The low number of trenched crossings in this catchment (one) means there is limited potential for flows to be affected by the capacity of pumps or flumes at trenched crossings. Embedded mitigation secured in the CoCP, informed by the Outline CoCP (Commitment IDs CO35 and CO39, **Table 21-4** and **Table 21-5** will minimise the impact of any changes to surface water flows. Effect significance is minor adverse due to high sensitivity because Bryan Mills Field SSSI is located approximately 50m away from the Onshore Development Area. Excavations for the onshore ECC will be shallow (target minimum burial depth of 1.2m where open cut trenching is used) through superficial deposits. The SSSI is recorded as being spring fed. The closest trenchless crossing that could interact with deeper groundwater is approximately 600m away. The small scale and shallow nature of the onshore ECC excavations and distance to the trenchless crossing mean that impacts on the designated site are not anticipated.	Negligible	Minor adverse
Scorborough Beck	Low	An estimated maximum of 0.89km^2 (2.5% of the catchment) would be affected by construction activities. Across the entire catchment, these activities are unlikely to lead to significant changes in surface water drainage or flood risk. There are no trenched crossings in this catchment that could affect flows, and impacts at temporary crossings for the haul would be mitigated by Commitment ID CO35 (**Table 21-4**), which will minimise the impact of any changes to surface water flows. With mitigation in place, impacts on Bealey's Beck Lockington LWS are not anticipated. Bealey's Beck will also be crossed using a trenchless installation	Negligible	Negligible

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
		technique, further limiting the potential for changes to flows in the channel.		
Ella Dyke	Low	An estimated maximum of 0.01km^2 (0.03% of the catchment) would be affected by construction activities. Across the entire catchment, these activities are unlikely to lead to significant changes in surface water drainage or flood risk. Embedded mitigation secured in the CoCP, informed by the Outline CoCP (Commitment ID CO39, **Table 21-4** and **Table 21-5**) will minimise the impact of any changes to surface water flows. In addition, with mitigation measures in place, impacts on surface water quality and the ability of the operator to abstract surface water from the abstraction within 100m of the Onshore Development Area (with respect to the access road only) (**Table 21-15**) are not anticipated.	Negligible	Negligible
Onshore coastal catchment	High	An estimated maximum of 0.03km^2 (1.2% of the catchment) would be affected by construction activities. Across the entire catchment, these activities are unlikely to lead to significant changes in surface water drainage or flood risk. Two trenched crossings would be required in this catchment, which means there is limited potential for flows to be affected by the capacity of pumps or flumes at trenched crossings. Embedded mitigation secured in the CoCP, informed by the Outline CoCP (Commitment IDs CO35 and CO39, **Table 21-4** and **Table 21-5**) will minimise the impact of any changes to surface water flows.	Negligible	Minor adverse
		Effect significance is minor adverse due to high sensitivity because Withow Gap, Skipsea SSSI is located in the catchment. The onshore coastal catchment also drains directly to the Greater Wash SPA. With mitigation measures in place, impacts on the SSSI and SPA are not anticipated.		
Hull and East Riding Chalk	High	An estimated maximum of 12.37km^2 (0.63 % of the catchment) would be affected by construction activities (this figure will be updated in the ES following further site selection and design refinements). It is anticipated that temporary abstraction of groundwater of up to 20m^3 per day at the landfall and up to 70m^3 per day at the OCS zone would be required during construction. Abstraction conditions associated with abstraction licenses that may be required would be agreed with the Environment Agency as part of the consenting process. The volumes of water that would be temporarily required would be unlikely to significantly alter the movement or level of groundwater in the wider Hull and East Riding Chalk groundwater body (which measures 1,967km^2) or affect gross patterns of groundwater flow or affect gross patterns of groundwater flow which supply small-scale private abstractions close to the Onshore Development Area. Given the small scale and temporary nature of any abstractions, and likely slow response time of the groundwater body, impacts on the groundwater body and associated designations (Principal aquifer, DWSZ and SPZ) are considered	Negligible	Minor adverse

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect Significance
		unlikely.		

21.7.2 Potential Effects during Operation

21.7.2.1 Supply of Contaminants to Surface and Groundwater (WRF-O-03)

185. O&M activities in the Onshore Development Area will typically include routine non-intrusive inspection works and planned maintenance works at the TJB and underground link box at the landfall, jointing bays and link boxes along the onshore ECC and above-ground infrastructure at the OCS and ESBI, as well as unplanned emergency maintenance works as required.

186. O&M activities could lead to a supply of fine sediment, fuels, oils and lubricants from any local workings and impermeable surfaces. Contaminants, including fine sediment, could affect water quality and geomorphology of water bodies in the surface water drainage network. This in turn could impact upon aquatic ecology.

187. Landfall and onshore export cable infrastructure will be designed to minimise maintenance works throughout their operational life. Unplanned maintenance works to address cable faults will be undertaken as and when necessary, and depending on the nature of the repair, may involve intrusive works such as the excavation of the TJB / jointing bay and the removal and replacement of the faulty equipment. Standard best practice measures with respect to pollution prevention and response will be applied during any localised and infrequent intrusive works during the O&M phase, which will be incorporated into the relevant Onshore O&M Plan (Commitment ID CO49, see **Table 21-4**).

188. Contaminants may leak into surface waters during operation through surface runoff or accidental spillage or leakage of fuel oils or lubricants from vehicles during O&M activities, which could impact upon surface water quality and that of connected groundwaters (including aquifers which support potable water supplies, particularly in SPZ 1 in the area crossed by the onshore ECC). This could have subsequent impacts upon aquatic ecology and the use of water resources for licensed and unlicensed abstractions.

189. Contamination could also occur through the runoff of firewater. Water or foam used to fight fires at locations where chemicals are used or stored can become contaminated with the chemicals and become hazardous (HSE, 1995). Firewater runoff from an emergency event at the ESBI could contaminate surface and groundwaters. This will be managed by incorporating measures within the BSMP (Commitment ID CO79), indicative measures are included in **Table 21-6**.

190. It is anticipated that the OCS and ESBI will be unmanned with no permanent on-site personnel presence, and personnel visits would be temporary and limited to infrequent O&M activities. Drainage arrangements for foul water from any operational welfare facilities have not been finalised at this stage, but any discharge of nutrients from these facilities would be minimal.

21.7.2.1.1 Receptor Sensitivity

191. Receptor sensitivity is described in **Table 21-20** of the 15 surface water catchments crossed by the Onshore Development Area, sensitivity is **high** in six, **medium** in two and **low** in the remainder (seven).

192. Groundwater sensitivity is **high**.

21.7.2.1.2 Impact Magnitude

193. The area of installed infrastructure (above ground or buried) can be used as a proxy to indicate the extent of required O&M activities in each catchment. Worst-case figures shown in **Table 21-29** are based on the width of the cable trenches, permanent area for the TJB, jointing bays, link boxes, OCS and ESBI. Magnitude of impact is based on the same thresholds as shown in **Table 21-24**. In addition, embedded mitigation measures secured in the Operational Drainage Strategy (Commitment ID CO44) and BSMP (Commitment ID CO79) (**Table 21-4** and **Table 21-6**) is considered in setting the magnitude of impact.

194. Operational drainage measures will manage runoff from the OCS and ESBI and ensure the appropriate management of firewater during an emergency situation. Impact magnitude in all catchment receptors except Barmston Sea Drain from Skipsea Drain to N Sea and High Hunsley to Woodmansey Area is anticipated to be **negligible** due to the very small proportion of permanent infrastructure in each catchment (0.00003 to 0.45% (the average for all catchments is 0.08%).

Table 21-29 Areas and Percentages of Permanent Infrastructure in Each Surface and Groundwater Catchment

Catchment	Area of Permanent Infrastructure		Impact Magnitude
	km²	% of Catchment Area	
Barmston Sea Drain from Skipsea Drain to N Sea	N/A	N/A	No impact
Barmston Sea Drain / Skipsea Drain to Conf	0.008	0.02	Negligible
Old Howe / Frodingham Beck to R Hull	0.012	0.05	Negligible
Foredyke Stream Lower to Holderness Dr	0.001	0.003	Negligible
Mickley Dike Catchment	0.014	0.08	Negligible
Hull from West Beck to Arram Beck	0.0002	0.01	Negligible
Holderness Drain Source to Foredyke Stream	0.021	0.05	Negligible
Beverley and Barmston Drain	0.24	0.23	Negligible
Bryan Mills Beck Source to Bryan Mills Farm	0.006	0.02	Negligible
Scorborough Beck	0.015	0.04	Negligible
Ella Dyke	0.001	0.01	Negligible
High Hunsley to Arram Area	0.025	0.06	Negligible
High Hunsley to Woodmansey Area	0.21	1.37	Low
Leven Canal	0.00003	0.12	Negligible
Onshore coastal catchment	0.002	0.22	Negligible
Hull and East Riding Chalk	0.466	0.02	Negligible

196. No permanent infrastructure would be located in the Barmston Sea Drain from Skipsea Drain to N Sea catchment, which means there is no mechanism for impact.

197. Due to the possibility of the OCS and ESBI being located in Zone 4, impact magnitude would be **low** in the High Hunsley to Woodmansey Area catchment.

21.7.2.1.3 Effect Significance

198. Effect significance for the supply of contaminants to surface and groundwater is assessed in **Table 21-30**. Overall, it is predicted that sensitivity is **low** to **high** (depending on the catchment) and the magnitude of impact is **negligible** to **low**. The effect is therefore of **negligible** to **minor adverse** significance, which is **not significant** in EIA terms. No impact is predicted for the Barmston Sea Drain from Skipsea Drain to N Sea catchment, therefore the effect significance is **no change**.

Table 21-30 Assessment of Effects Associated with the Supply of Contaminants to Surface and Groundwaters During Operation

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect significance
Barmston Sea Drain from Skipsea Drain to N Sea	High	No permanent infrastructure will be located in this catchment.	No impact	No change
Foredyke Stream Lower to Holderness Dr	Low		Negligible	Negligible
Holderness Drain Source to Foredyke Stream	Low		Negligible	Negligible
Scorborough Beck	Low		Negligible	Negligible

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect significance
Ella Dyke	Low	Permanent infrastructure would have a limited spatial extent within each catchment. In these catchments localised and infrequent O&M activities may be necessary during the operational life of the Project. However, the mechanism for contaminants to enter the surface water drainage system, as a result of these activities, is limited. O&M associated with the Project's onshore infrastructure is considered unlikely to affect the consented discharge in the High Hunsley to Arram Area catchment or Burton Bushes SSSI, which is located 800m away. If any emergency repairs are required during the operational life of the Project, best practice mitigation measures would be sufficient to minimise the likelihood of an accidental release of contaminants and put in place procedures for an effective response to any pollution event. Best practice measures would also limit the potential for fine sediment supply to watercourses during any intrusive O&M works (Commitment ID CO49, see **Table 21-4**).	Negligible	Negligible
High Hunsley to Arram Area	Low		Negligible	Negligible
		During operation, impacts of the buried onshore export cable infrastructure on surface water abstractions in the catchments of Holderness Drain Source to Foredyke Stream and Ella Dyke are not anticipated.		
Beverley and Barmston Drain	Low	One of these catchments will contain the OCS and ESBI, depending on whether OCS Zone 4 (High Hunsley to Woodmansey Area catchment) or OCS Zone 8 is selected (Beverley and Barmston Drain catchment). The total permanent area for the OCS and ESBI (0.205km^2) would form a very small proportion of either catchment, equivalent to 0.23% (Beverley and Barmston Drain) and 1.37% (High Hunsley to Arram Area) of the total catchment areas. Although some routine inspection and maintenance works would be required throughout the operational life of the Project, an Operational Drainage Strategy will be developed for permanent infrastructure within the OCS zone (Commitment ID CO44, see **Table 21-4** and **Table 21-6)**.	Negligible	Negligible
High Hunsley to Woodmansey Area	Low		Low	Minor adverse

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect significance
		This will be in place to control any potential accidental release of oils from the transformers and other electrical equipment, foul drainage, surface water drainage and other pollutants from on-site O&M activities. The exact details of welfare areas associated with the OCS zone are still to be determined. Given the nature of the development as an unmanned asset, foul flows are likely to be minimal. It is anticipated that any foul water flows from the site will drain to a septic tank and be tankered away or to a package treatment plant prior to discharge to a nearby watercourse. Design sizing and requirements will be determined at the detailed design stage post-consent. O&M activities in the OCS zone are considered unlikely to affect the consented discharges in the Beverley and Barmston Drain catchment. Permanent infrastructure in the Beverley and Barmston Drain's catchment would be located 2.5km downstream of Tophill Low SSSI. Given the very small areas of permanent infrastructure and the small-scale and infrequent nature of any maintenance work, impacts on the designated sites are not anticipated.		
		Embedded mitigation secured in the BSMP will limit the potential for surface or groundwater contamination from firewater associated with operation of the ESBI (Commitment ID CO79, see **Table 21-4** and **Table 21-6**).		
Old Howe / Frodingham Beck to R Hull	Medium	Impact magnitude is negligible in these catchments because the total area of permanent infrastructure that could require maintenance work is very small (0.0003% to 0.22% of the catchment areas). Effect significance is minor adverse in these catchments due to medium to high sensitivity associated with designated sites. Given the very small areas of permanent infrastructure and the small-scale and infrequent nature of any maintenance work, impacts on the designated sites are not anticipated.	Negligible	Minor adverse
Mickley Dike Catchment	Medium		Negligible	Minor adverse
Barmston Sea Drain / Skipsea Drain to Conf	High		Negligible	Minor adverse
Hull from West Beck to Arram Beck	High		Negligible	Minor adverse
Bryan Mills Beck Source to Bryan Mills Farm	High		Negligible	Minor adverse
Leven Canal	High		Negligible	Minor adverse
Onshore coastal catchment	High		Negligible	Minor adverse

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect significance
		If any emergency repairs are required during the operational life of the Project, best practice mitigation measures would be sufficient to minimise the likelihood of an accidental release of contaminants and put in place procedures for an effective response to any pollution event. Best practice measures would also limit the potential for fine sediment supply to watercourses during any intrusive O&M works (Commitment ID CO49, see **Table 21-4**).		
Hull and East Riding Chalk	High	The groundwater body is extensive, covering 1967.3km^2, and permanent infrastructure would only occupy 0.47km^2 (0.02% of the catchment). As described for surface water catchments that may contain the OCS and ESBI, an Operational Drainage Strategy will be developed for permanent infrastructure within the OCS zone (Commitment ID CO44, see **Table 21-4** and **Table 21-6)**.	Negligible	Minor adverse
		This will be in place to control any potential accidental release of oils from the transformers and other electrical equipment, foul drainage, surface water drainage and other pollutants from on-site O&M activities. Embedded mitigation secured in the BSMP will limit the potential for surface or groundwater contamination from firewater associated with operation of the ESBI (Commitment ID CO79, see **Table 21-4** and **Table 21-6**). Impacts on the groundwater abstractions located within and outside the Onshore Development Area (see **Table 21-15** and **Table 21-16**) are not anticipated.		

21.7.2.2 Changes to Surface and Groundwater Flows and Flood Risk (WRF-O-04)

199. Permanent above ground infrastructure would result in permanent changes to land use. Although permeable surface treatments will be used where possible, permanent features will include manhole cover at ground level associated with underground link boxes at the landfall and along the onshore ECC, above-ground link boxes along the onshore ECC and the OCS and ESBI. This change in land use from greenfield agricultural land would result in an increase in impermeable land area.

200. The presence of buried cable ducts for the onshore exports, TJB / jointing bays and underground link boxes along the onshore ECC and at the landfall may impact upon subsurface flow corridors as it will introduce an impermeable barrier, which may change subsurface flow patterns, forcing water to move upwards towards the surface, or downwards away from the surface. Buried infrastructure may also impact upon the level of recharge and distribution of groundwater within the aquifers underlying the Onshore Development Area (Principal and superficial aquifers). However, the relatively shallow depth of the majority of buried infrastructure means that any impacts are likely to be highly localised and confined to shallow near-surface groundwater bodies. Installation of cable ducts will be deeper at trenchless crossing locations.

201. An increase in the impermeable area in a catchment, especially associated with the OCS and ESBI, would result in a reduced rate of infiltration and therefore a potential increase in surface runoff in watercourses, including land drainage channels. Changes in surface water runoff and subsurface flows could be sufficient to impact the hydrology of the surface water system. Surface water runoff may increase, which may result in permanent changes to geomorphology by increasing rates of bed and bank erosion, encouraging geomorphological adjustment. Geomorphological changes may also impact upon in-channel habitat conditions for aquatic organisms. Impacts on geomorphology and in-channel habitats are likely to be particularly marked if drainage from a large area is discharged at a discrete location within the existing surface drainage network.

202. Furthermore, disturbed ground within the temporary construction corridor is likely to change the transmissivity of the ground which overlays the buried infrastructure after reinstatement and may therefore become a preferential corridor for subsurface water flow.

203. Changes to the proportion of groundwater contained in surface waters could potentially alter water chemistry and impact upon the quality of water-dependent habitats.

204. Abstraction at the OCS zone may be required during operation of the Project. Although an abstraction volume of up to 70m^3 per day is included as a worst-case scenario, the OCS and ESBI will not be permanently staffed, and operational water use would be minimal (e.g. general water supply – toilet, taps, hoses). Operational water use would also include emergency storage of firewater for fighting non-electrical fires, although it is anticipated that emergency stores would only be replenished very infrequently. Abstraction conditions associated with abstraction licenses that may be required would be agreed with the Environment Agency as part of the consenting process.

21.7.2.2.1 Receptor Sensitivity

205. Receptor sensitivity is described in **Table 21-20** of the 15 surface water catchments crossed by the Onshore Development Area, sensitivity is **high** in six, **medium** in two and **low** in the remainder (seven).

206. Groundwater sensitivity is **high**.

21.7.2.2.2 Impact Magnitude

207. The area of installed infrastructure (above ground or buried) can be used as a proxy to indicate the extent of required O&M activities in each catchment. Worst-case figures shown in **Table 21-29** are based on the width of the cable trenches, permanent area for the TJB, jointing bays, link boxes, OCS and ESBI. Magnitude of impact is based on the same thresholds as shown in **Table 21-24**. In addition, embedded mitigation measures secured in the Operational Drainage Strategy (Commitment ID CO44) and BSMP (Commitment ID CO79) (**Table 21-4** and **Table 21-6**) is considered in setting the magnitude of impact. No operational mitigation is planned along the onshore ECC and at the landfall.

208. Impact magnitude in all catchment receptors except Barmston Sea Drain from Skipsea Drain to N Sea and High Hunsley to Woodmansey Area is anticipated to be **negligible** due to the very small proportion of permanent infrastructure in each catchment (0.00003 to 0.45% (the average for all catchments is 0.08%).

209. No permanent infrastructure would be located in the Barmston Sea Drain from Skipsea Drain to N Sea catchment, which means there is no mechanism for impact.

210. Due to the possibility of the OCS and ESBI being located in Zone 4, impact magnitude would be **low** in the High Hunsley to Woodmansey Area catchment.

21.7.2.2.3 Effect Significance

211. Effect significance for changes to surface and groundwater flows and flood risk is assessed in **Table 21-30** and **Table 21-31**. Overall, it is predicted that sensitivity is **low** to **high** (depending on the catchment) and the magnitude of impact is **negligible** to **low**. The effect is therefore of **negligible** to **minor adverse** significance, which **is not significant** in EIA terms. No impact is predicted for the Barmston Sea Drain from Skipsea Drain to N Sea catchment, therefore the effect significance is **no change**.

Table 21-31 Assessment of Effects Associated with Changes to Surface and Groundwater Flows and Flood Risk During Operation

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect significance
Barmston Sea Drain from Skipsea Drain to N Sea	High	No permanent infrastructure will be located in this catchment.	No impact	No change
Foredyke Stream Lower to Holderness Dr	Low	As a result of the limited spatial extent of permanent infrastructure associated with the landfall and onshore ECC in these catchments (**Table 21-29**), effects on surface water flows are considered to be negligible. No operational mitigation measures are proposed for the landfall and onshore export cable infrastructure, therefore the magnitude of effect will remain negligible. During operation, impacts of the buried onshore export cable infrastructure on surface water abstractions in the catchments of Holderness Drain Source to Foredyke Stream and Ella Dyke are not anticipated. There is no surface water connectivity between the onshore ECC and the very small area of Burton Bushes SSSI located in the High Hunsley to Arram area catchment. Given the very small area of permanent infrastructure in the catchment compared to the extensive ground water body, impacts from changes to groundwater flows on the SSSI, which is located 800m away, are not anticipated.	Negligible	Negligible
Mickley Dike Catchment	Medium		Negligible	Negligible
Holderness Drain Source to Foredyke Stream	Low		Negligible	Negligible
Scorborough Beck	Low		Negligible	Negligible
Ella Dyke	Low		Negligible	Negligible
High Hunsley to Arram Area	Low		Negligible	Negligible
Beverley and Barmston Drain	Low	One of these catchments will contain the OCS and ESBI, depending on whether OCS Zone 4 (High Hunsley to Woodmansey Area catchment) or OCS Zone 8 is selected (Beverley and Barmston Drain catchment). Potential changes in runoff at the OCS and ESBI would be managed through the Operational Drainage Strategy (Commitment ID CO44, see **Table 21-4** and **Table 21-6**). Operational drainage design will include Sustainable Drainage Systems (SuDS) measures and appropriate climate change allowances. Surface water will be discharged from the site at a controlled rate, which will be determined during the detailed design stage post-consent. Appropriate consideration will be given to maintaining any existing floodplain capacity and / or flow conveyance during extreme rainfall events. Permanent infrastructure in Beverley and Barmston Drain's catchment would be located 2.5km downstream of Tophill Low SSSI. Given the very small areas of permanent infrastructure in the catchment and distance to the site, impacts on the SSSI are not anticipated. Embedded mitigation secured in the BSMP will limit the potential for surface or groundwater contamination from firewater associated with operation of the ESBI (Commitment ID CO79, see **Table 21-4** and **Table 21-6**).	Negligible	Negligible
High Hunsley to Woodmansey Area	Low		Low	Minor adverse
Barmston Sea Drain / Skipsea Drain to Conf	Medium		Negligible	Minor adverse

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect significance
Old Howe / Frodingham Beck to R Hull	Medium	Impact magnitude is negligible in these catchments because the total area of permanent infrastructure that could affect surface and groundwater flows and flood risk is very small (0.0003% to 0.22% of the catchment areas). Impacts on the groundwater abstractions located within and outside the Onshore Development Area (see **Table 21-15** and **Table 21-16**) are not anticipated. Groundwater abstraction during operation would only be for general use in the OCS zone (e.g. taps, hoses) and stored water for emergency firefighting. It is unlikely that minor groundwater abstraction during operation would affect gross patterns of groundwater flow or recharge at the water body scale. None of the private groundwater boreholes are located close to the OCS zone. Effect significance is minor adverse due to medium to high sensitivity. The very small area of permanent infrastructure in each catchment means the impacts on designated sites in the catchments are considered very unlikely.	Negligible	Minor adverse
Hull from West Beck to Arram Beck	High		Negligible	Minor adverse
Bryan Mills Beck Source to Bryan Mills Farm	High		Negligible	Minor adverse
Leven Canal	High		Negligible	Minor adverse
Onshore coastal catchment	High		Negligible	Minor adverse
Hull and East Riding Chalk	High	The groundwater body is extensive, covering 1967.3km^2, and permanent infrastructure would only occupy 0.47km^2 (0.02% of the catchment). As described for surface water catchments that may contain the OCS and ESBI, an Operational Drainage Strategy will be developed for permanent infrastructure within the OCS zone (Commitment ID CO44, see **Table 21-4** and **Table 21-6**). This will be in place to control surface water runoff from the OCS and ESBI.	Negligible	Minor adverse

Catchment	Sensitivity	Assessment	Impact Magnitude	Effect significance
		During operation, there may be the requirement for abstraction at the OCS zone for general use (e.g. toilet, taps, hoses) and an emergency store would be required for fighting non-electrical fires. Although up to 70m^3 per day has been allowed for as a worst-case scenario, the OCS zone will not be permanently manned, and general use is expected to be minimal. Abstraction conditions associated with abstraction licenses that may be required would be agreed with the Environment Agency as part of the consenting process. The volumes of water that would be temporarily required would be unlikely to significantly alter the movement or level of groundwater in the wider Hull and East Riding Chalk groundwater body (which measures 1,967km^2) or affect gross patterns of groundwater flow. Best practice measures secured in the BSMP at the OCS zone would ensure the risk of a fire is low and therefore the store of water for firefighting would be unlikely to require regular refilling (Commitment ID CO79, see **Table 21-4** and **Table 21-6**). It is considered unlikely that minor operational abstraction at the OCS zone would affect the wider groundwater body. Impacts on the groundwater abstractions located outside the Onshore Development Area (see **Table 21-15** and **Table 21-16**) are not anticipated.		

21.7.3 Potential Effects during Decommissioning

21.7.3.1 Decommissioning Impacts (WRF-D-01, WRF-D-02, WRF-D-03, WRF-D-04)

212. No decision has been made regarding the final decommissioning strategy for the onshore infrastructure, as it is recognised that regulatory requirements and industry best practice change over time.

213. Commitment ID CO56 (see **Table 21-4**) requires an Onshore Decommissioning Plan to be prepared and agreed with the relevant authorities prior to the commencement of onshore decommissioning works. This will ensure that decommissioning water resources and flood risk impacts will be assessed in accordance with the applicable regulations and guidance at that time of decommissioning where relevant, with appropriate mitigation implemented as necessary to avoid significant effects.

214. The detailed activities and methodology for decommissioning will be determined later within the Project's lifetime, but would be expected to include:

- Deinstallation and removal of electrical equipment, buildings and other infrastructure for the OCS and ESBI;
- Removal of above-ground link boxes along the onshore ECC;
- Inspection of underground infrastructure to be left in-situ along the onshore ECC and at the landfall (i.e. TJB, jointing bays, underground link boxes, onshore export cables and ducting) to ensure they are safe to remain in place. If considered unsuitable to be left in-situ at the time of decommissioning, these components will be removed; and
- Site reinstatement and landscaping.

215. Whilst a detailed assessment of decommissioning impacts cannot be undertaken at this stage, for this assessment, it is assumed that decommissioning is likely to operate within the parameters identified for construction (i.e. any activities are likely to occur within the temporary construction working areas and require no greater amount or duration of activity than assessed for construction). The decommissioning sequence will generally be the reverse of the construction sequence. It is therefore assumed that decommissioning impacts would likely be of similar nature to, and no worse than, those identified during the construction phase.

21.7.4 Additional Mitigation Measures

216. No additional mitigation measures have been proposed with respect to water resources and flood risk.

21.8 Cumulative Effects

217. Cumulative effects are the result of the impacts of the Project acting in combination with the impacts of other proposed and reasonably foreseeable developments on receptors. This includes plans and projects that are not inherently considered as part of the current baseline.

218. The overarching framework used to identify and assess cumulative effects is set out in **Chapter 6 Environmental Impact Assessment Methodology**. The four-stage approach is based upon the Planning Inspectorate Advice Note Seventeen: Cumulative Effects Assessment (PINS, 2024). The fourth stage of the process is the assessment stage, which is detailed within the sections below for potential cumulative effects on water resources and flood risk receptors.

21.8.1 Screening for Potential Cumulative Effects

219. The first step of the CEA identifies which impacts associated with the Project alone, as assessed under **Section 21.7**, have the potential to interact with other plans and projects to give rise to cumulative effects.

220. All potential cumulative effects to be taken forward in the CEA are detailed in **Table 21-32** with a rationale for screening them in or out. Only impacts determined to have a residual effect of negligible or greater are included in the CEA. Those assessed as 'no change' are excluded, as there is no potential for them to contribute to a cumulative effect.

Table 21-32 Water Resources and Flood Risk – Potential Cumulative Effects

Impact ID	Impact and Project Activity	Potential for Cumulative Effects	Rationale
Construction			
WRF-C-01	Direct disturbance of surface water bodies – trenched watercourse (cable) crossings, temporary (haul road watercourse crossings) and construction activities at the OCS and ESBI	Yes	Impacts to surface water bodies could act cumulatively with other projects if these cause direct disturbance to the same water body catchments.

Impact ID	Impact and Project Activity	Potential for Cumulative Effects	Rationale
WRF-C-02	Increased sediment supply – construction activitiess at the landfall, onshore ECC and OCS zone	Yes	Other projects being constructed within the same water body catchments may lead to an increase in sediment supply.
WRF-C-03	Supply of contaminants to surface and groundwater – construction activities at the landfall, onshore export cable corridor (ECC) and OCS zone	Yes	Other projects being constructed within the same water body catchments may act cumulatively to reduce surface and groundwater quality if they cause a supply of contaminants to be released into the surface water drainage system.
WRF-C-04	Changes to surface and groundwater flows and flood risk– construction activitiess at the landfall, onshore ECC and OCS zone	Yes	Other projects being constructed within the same water body catchments may act cumulatively to reduce surface and groundwater quality if they cause contaminants to be released into the surface water drainage system.
Operation and Maintenance			
WRF-O-03	Supply of contaminants to surface and groundwater – operation of the ESBI with respect to firewater and planned and unplanned O&M activities	Yes	New developments may require maintenance, including access by machinery, therefore increasing the risk of contaminants being released and acting cumulatively. Operational activities associated with the Project will be largely confined to the OCS zone and as such could only result in cumulative impacts in catchments which contain the OCS and ESBI.
WRF-O-04	Changes to surface and groundwater flows and flood risk – presence of permanent above-ground infrastructure	Yes	As a result of the limited spatial extent of permanent impermeable in the Onshore Development Area, the effect is considered to be limited and highly localised and therefore unlikely to act cumulatively with other projects. However, the greater area of impermeable ground at the OCS zone could result in cumulative impacts with other projects in the same catchments.

Impact ID	Impact and Project Activity	Potential for Cumulative Effects	Rationale
Decommissioning			
There is insufficient information available on other plans and projects which could have a spatial and temporal overlap with the Project's onshore decommissioning works. The details and scope of onshore decommissioning works will be determined by the relevant regulations and guidance at the time of decommissioning and provided in the Onshore Decommissioning Plan (see **Table 21-4**, Commitment ID CO56). This will include a detailed assessment of decommissioning impacts and appropriate mitigation measures to avoid significant effects, including cumulative effects. For this assessment, it is assumed that cumulative decommissioning effects would be of similar nature to, and no worse than, those identified during the construction phase.			

21.8.2 Screening for Other Plans / Projects

221. The second step of the CEA identifies a short-list of other plans and projects that have the potential to interact with the Project to give rise to significant cumulative effects during the construction and O&M phases. The short-list provided in **Table 21-33** has been produced specifically to assess cumulative effects on water resources and flood risk receptors. The exhaustive list of all onshore plans and projects considered in the development of the Project's CEA framework is provided in **Volume 2, Appendix 6.5 Cumulative Effects Screening Report - Onshore**.

222. The zone of influence (ZoI) used to identify relevant plans and projects for the water resources and flood risk CEA is the hydrological surface water catchments as defined in **Section 21.4.1**. Plans or projects located in surface water catchments crossed by the Onshore Development Area have been screened into the assessment as there is no mechanism for impact. Plans or projects located in catchments not crossed by the Onshore Development Area have been screened out of the assessment because there is no mechanism for impacts. Very small-small scale developments (erection of single buildings, single wind turbines, car parks and small-scale reconfiguration of existing sites) have been screened out of the assessment.

223. Developments that were fully operational during baseline characterisation, including at the time of site-specific surveys, are considered as part of baseline conditions for the surrounding environment. It is assumed that any residual effects associated with these developments are captured within the baseline information. As such, these developments are not subject to further assessment within the CEA and excluded from the screening exercise presented in **Table 21-33**.

Table 21-33 Short List of Plans / Projects for the Water Resources and Flood Risk Cumulative Effect Assessment

Project / Plan	Development Type	Status	Tier	Construction / Operation Period	Closest Distance to Onshore ECC (km)	Closest Distance to OCS Zone 4 (km)	Closest Distance to OCS Zone 8 (km)	Potential for Significant Cumulative Effects	Rationale
A164 And Jock's Lodge Junction Improvement Scheme Adjacent to and South of Beverley Road (20/01073/STPLF)	Road Improvement Scheme	Under Construction	1	Construction: 2024 to 2026 Operation: 2027+	0.77	0.40	1.94	No	The development is located outside the Onshore Development Area. Appropriate mitigation measures will be provided in a CoCP or similar. A drainage impact assessment and FRA have been submitted for the project. Cumulative effects are not anticipated.
Carr Farm Solar Farm (22/03648/STPLF / 25/00021/REFUSE)	Solar Farm	Refused – Pending Appeal	1	Construction: Unknown	1.56	5.31	7.70	No	The solar farm is located outside the Onshore Development Area, 1.6km away from an access road; the cable corridor is 3.3km away at its closest. Due to the nature of the development and distance from the onshore ECC, cumulative effects are not anticipated. A flood risk assessment and sustainable drainage strategy have been developed for the site, and it is assumed a CoCP or similar will be in place to manage soil/sediments and pollution risk. Cumulative effects are not anticipated.
Creyke Beck Battery Storage (23/03926/STPLF)	Battery Storage Facility	Approved	1	Construction: Unknown Operation: Unknown	0.64	1.62	3.00	No	The development is located outside the Onshore Development Area. The development shall be carried out in accordance with the submitted flood risk assessment and associated mitigation measures. It is assumed a CoCP or similar will be in place to manage soil/sediments and pollution risk. Cumulative effects are not anticipated.
Creyke Beck Solar Farm (21/02335/STPLF)	Solar Farm	Approved	1	Construction: Unknown Operation: Unknown	0.33	1.05	1.56	No	The development is located outside the Onshore Development Area. An CoCP or similar has been submitted which covers potential pollution or other construction effects on sensitive habitats and hydrological systems within and close to the site. Cumulative effects are not anticipated.
Dogger Bank A Offshore Wind Farm (EN010021)	Offshore Wind Farm	Operational	1	Operation: 2025+	0	0.50	2.66	No	There is some spatial overlap between the two projects, but Dogger Bank A will be operational before the Project starts construction. Due to the small spatial scale of buried and above ground permanent infrastructure in some of the same surface water catchments and groundwater catchment, cumulative operational effects from are not anticipated.

Project / Plan	Development Type	Status	Tier	Construction / Operation Period	Closest Distance to Onshore ECC (km)	Closest Distance to OCS Zone 4 (km)	Closest Distance to OCS Zone 8 (km)	Potential for Significant Cumulative Effects	Rationale
Dogger Bank B Offshore Wind Farm (EN010021)	Offshore Wind Farm	Under Construction	1	Construction: 2020 to 2025 Operation: 2026+	0	0.50	2.66	No	There is some spatial overlap between the two projects, but Dogger Bank B will be operational before the Project starts construction. Due to the small spatial scale of buried and above ground permanent infrastructure in some of the same surface water catchments and groundwater catchment, cumulative operational effects from are not anticipated.
Dogger Bank South Offshore Wind Farms (EN010125)	Offshore Wind Farm	Examination	1	Construction: 2026 to 2033 Operation: 2034+	0	0.10	0.30	Yes	There is spatial overlap and potentially a temporal overlap in construction activities in some of the same surface water catchments and groundwater catchment.
Eastern Green Link 2 (22/01990/STPLFE)	Electricity Interconnector	Under Construction	1	Construction: 2024 to 2028 Operation: 2029+	4.51	11.74	10.36	No	Eastern Green Link 2 will be operational before the Project starts construction. Due to the small spatial scale of permanent infrastructure located in two surface water catchments (6km from the onshore ECC) and groundwater catchment, cumulative operational effects from are not anticipated.
Erection of 11 Dwellings and 14 Flats at Ellerburn Avenue (19/01422/FULL)	Residential Development	Approved	1	Construction: Unknown	3.71	4.49	5.94	No	The small-scale development is located outside the Onshore Development Area over 3km away. It is assumed a surface water drainage plan and CoCP or similar will be in place to manage runoff, soil/sediments and pollution risk. Cumulative effects are not anticipated.
Erection of 142 Dwellings at Land North of Frontier Agriculture Limited (21/03827/STPLF)	Residential Development	Approved	1	Construction: Unknown	5.04	14.67	15.63	No	The development is located outside the Onshore Development Area, over 5km away. It is assumed a surface water drainage plan and CoCP or similar will be in place to manage runoff, soil/sediments and pollution risk. Cumulative effects are not anticipated.
Erection of 15 Dwellings at Land to the Rear of Village Hall (23/03778/PLF)	Residential Development	Approved	1	Construction: Unknown	0.78	2.92	1.07	No	A small development of 15 units located outside the Onshore Development Area. The development is in Flood Zone 1 and a surface water drainage plan will be in place. It is assumed a CoCP or similar will be in place to manage soil/sediments and pollution risk. Cumulative effects are not anticipated.

Project / Plan	Development Type	Status	Tier	Construction / Operation Period	Closest Distance to Onshore ECC (km)	Closest Distance to OCS Zone 4 (km)	Closest Distance to OCS Zone 8 (km)	Potential for Significant Cumulative Effects	Rationale
Erection of 157 Dwellings at Barnes Way Land to East of and Kingswood House (21/01691/FULL)	Residential Development	Approved	1	Construction: Unknown	4.85	5.27	7.21	No	The housing development of 157 units is located outside the Onshore Development Area almost 5km away. Satellite imagery shows early construction work. The development may be finished by the time the Project is under construction. Cumulative effects are not anticipated.
Erection of 204 Dwellings at Land South of Larkfield (21/01311/STPLF)	Residential Development	Under Construction	1	Construction: Unknown	4.37	6.16	4.76	No	The housing development of 204 units is located outside the Onshore Development Area over 4km away. Satellite imagery shows construction is underway. The development is likely to be finished by the time the Project is under construction Cumulative effects are not anticipated.
Erection of 22 Dwellings and 1 Apartment Block at Site of Needler Hall (22/02672/STVAR/ 16/00075/STPLF)	Residential Development	Approved	1	Construction: Unknown	2.23	3.56	3.97	No	The small-scale housing development is located outside the Onshore Development Area over 2km away. It is assumed a surface water drainage plan and CoCP or similar will be in place to manage runoff, soil/sediments and pollution risk. Cumulative effects are not anticipated.
Erection of 23 Dwellings at Main Street Parkland (19/03238/PLF)	Residential Development	Approved	1	Construction: Unknown	1.31	19.44	21.61	No	The development is located outside the Onshore Development Area and downstream of the onshore ECC. This is a relatively small housing development and drainage arrangements have been made with Yorkshire Water. It is assumed a CoCP or similar will be in place to manage soil/sediments and pollution risk. Cumulative effects are not anticipated.
Erection of 30 Dwellings at Site of Former Beverley St Nicholas Primary School Juniors (21/02391/PLF)	Residential Development	Approved	1	Construction: Unknown	3.0	2.25	4.55	No	The small-scale development of 30 units is located outside the Onshore Development Area 3km away. It assumed a drainage strategy and CoCP or similar will be in place to manage soil/sediments and pollution risk. Cumulative effects are not anticipated.
Erection of 34 Dwellings at Isledane (20/01495/FULL)	Residential Development	Under Construction	1	Construction: Unknown	3.14	3.91	5.40	No	The small-scale housing development of 34 units is located outside the Onshore Development Area over 3km away. It is assumed a surface water drainage plan and CoCP or similar will be in place to manage runoff, soil/sediments and pollution risk. Cumulative effects are not anticipated.

Project / Plan	Development Type	Status	Tier	Construction / Operation Period	Closest Distance to Onshore ECC (km)	Closest Distance to OCS Zone 4 (km)	Closest Distance to OCS Zone 8 (km)	Potential for Significant Cumulative Effects	Rationale
Erection of 35 Dwellings at Beverley Parklands Amenity Land (21/01330/STPLF)	Residential Development	Approved	1	Construction: Unknown	2.68	1.98	4.54	No	The housing development of 23 units is located outside the Onshore Development Area over 2km away. It is assumed a surface water drainage plan and CoCP or similar will be in place to manage runoff, soil/sediments and pollution risk. Cumulative effects are not anticipated.
Erection of 39 Dwellings at Land East of 30 Canada Drive (24/00410/PLF)	Residential Development	Pending Consideration	1	Construction: Unknown	0.56	6.38	6.14	No	The development is located outside the Onshore Development Area. The Environment Agency currently suggest that planning permission should be refused due to an unacceptable FRA. If planning permission is granted, it is assumed an acceptable FRA will be in place, as well as a CoCP or similar will be in place to manage soil/sediments and pollution risk. Cumulative effects are not anticipated.
Erection of 40 Dwellings at Land West of Manor House Main Street (21/03986/PLF)	Residential Development	Approved	1	Construction: Unknown	1.71	18.67	20.77	No	The development is located outside the Onshore Development Area and downstream of the onshore ECC. This is a relatively small housing development to which the Environment Agency have no objection. A flood risk assessment and sustainable drainage strategy have been developed for the site, and it is assumed a CoCP or similar will be in place to manage soil/sediments and pollution risk. Cumulative effects are not anticipated.
Erection of 450 Dwellings at Richmond Way Land West of Kingston Upon Hull (19/01511/FULL)	Residential Development	Pending Consideration	1	Construction: 2025 to 2030	4.29	4.44	6.57	No	The development is located outside the Onshore Development Area, 4.2km away, in a catchment that is not crossed by the Onshore Development Area (Hull from Arram Beck to Humber). Given the scale of the development (450 units), a condition of the proposal is that no development shall take place until a CoCP or similar has been submitted to and approved in writing by the local authority. Given the distance from the Onshore Development Area and with mitigation measures in place, cumulative effectives are not anticipated.
Erection of 48 Dwellings at Land West of Priory Road (19/02848/STPLF)	Residential Development	Approved	1	Construction: Unknown	4.28	5.61	5.86	No	The housing development of 48 units is located outside the Onshore Development Area over 4km away. It is assumed a surface water drainage plan and CoCP or similar will be in place to manage runoff, soil/sediments and pollution risk. Cumulative effects are not anticipated.
Erection of 53 Dwellings at Land at and North of 64 Park Lane (18/02100/STREM/ 14/02316/STOUT)	Residential Development	Under Construction	1	Construction: Unknown	1.93	3.33	3.64	No	The housing development of 53 units is located outside the Onshore Development Area almost 2km away. It is assumed a surface water drainage plan and CoCP or similar will be in place to manage runoff, soil/sediments and pollution risk. Cumulative effects are not anticipated.

Project / Plan	Development Type	Status	Tier	Construction / Operation Period	Closest Distance to Onshore ECC (km)	Closest Distance to OCS Zone 4 (km)	Closest Distance to OCS Zone 8 (km)	Potential for Significant Cumulative Effects	Rationale
Erection of 53 Dwellings at Site of Longcroft Lower School (23/01202/STPLF)	Residential Development	Approved	1	Construction: Unknown	1.36	3.58	4.37	No	The relatively small housing development (53 units) is located outside the Onshore Development Area, over 1km away. A flood risk assessment has been undertaken for the site and it is assumed a CoCP or similar will be in place to manage soil/sediments and pollution risk. Cumulative effects are not anticipated.
Erection of 64 Dwellings at University of Hull Thwaite Hall (19/00480/STPLF)	Residential Development	Pending Consideration	1	Construction: Unknown	3.22	4.40	5.08	No	The housing development of 64 units is located outside the Onshore Development Area over 3km away. It is assumed a surface water drainage plan and CoCP or similar will be in place to manage runoff, soil/sediments and pollution risk. Cumulative effects are not anticipated.
Erection of 67 Dwellings at Land and Buildings South of Castle Farm (19/03531/STPLF)	Residential Development	Under Construction	1	Construction: Unknown	1.13	6.50	7.14	No	Small-scale housing development (67 units) which is already under construction and likely to be finished by the time the Project is being constructed. Cumulative effects are not anticipated.
Erection of 70 Dwellings at Site of William Gee School (18/01434/RES/ 15/00601/OUT)	Residential Development	Approved	1	Construction: Unknown	4.58	5.81	6.31	No	The housing development of 70 units is located outside the Onshore Development Area over 4km away. Satellite imagery shows early construction work. The development may be finished by the time the Project is under construction. Cumulative effects are not anticipated.
Erection of 78 Dwellings at Land North of Minster Way (22/01468/STREM /16/02784/STPLF)	Residential Development	Approved	1	Construction: Unknown	2.23	1.49	3.97	No	The housing development of 78 units is located outside the Onshore Development Area over 2km away. Time series aerial imagery suggests construction has started over most of the site. It is likely the development will be finished before 2029 when onshore construction of the Project begins. It assumed a drainage strategy and CoCP or similar is in place to manage soil/sediments and pollution risk. Cumulative effects are not anticipated.
Erection of 85 Dwellings at Former Sir Leo Schultz Centre (18/02481/STPLF)	Residential Development	Approved	1	Construction: Unknown	3.31	3.97	5.61	No	The housing development of 85 units is located outside the Onshore Development Area. It is assumed a surface water drainage plan and CoCP or similar will be in place to manage runoff, soil/sediments and pollution risk. Cumulative effects are not anticipated.

Project / Plan	Development Type	Status	Tier	Construction / Operation Period	Closest Distance to Onshore ECC (km)	Closest Distance to OCS Zone 4 (km)	Closest Distance to OCS Zone 8 (km)	Potential for Significant Cumulative Effects	Rationale
Erection of 90 Dwellings at Land North of 88 Poplars Way (20/02207/STREM /17/00398/STOUT)	Residential Development	Under Construction	1	Construction: Unknown	1.52	0.96	2.50	No	The housing development of 90 units is located outside the Onshore Development Area. Over half of the relatively small site appears to have been developed and it is likely to be finished by the time the Project is constructed. Cumulative effects are not anticipated.
Erection of 99 Dwellings at Danepark Road (20/01488/FULL)	Residential Development	Under Construction	1	Construction: 2024 to 2027	2.79	3.64	4.99	No	The housing development of 99 units is located outside the Onshore Development Area almost 3km away. It is assumed a surface water drainage plan and CoCP or similar will be in place to manage runoff, soil/sediments and pollution risk. Cumulative effects are not anticipated.
Erection of a Leisure Hub (19/04358/STPLF/ 23/03025/STREM)	Leisure Facility	Approved	1	Construction: Unknown	0.54	21.33	23.77	No	The development is located outside the Onshore Development Area. The LLFA has requested full details of construction drainage before work starts, and an operational drainage system shall be installed prior to the development being brought into use. Cumulative effects are not anticipated.
Extension of Operations at Riplingham Quarry (20/04198/CM)	Quarry	Operational	1	Operation: 1980 to 2030	4.24	8.0	4.48	No	The development is located outside the Onshore Development Area over 4km away. The proposal is for an extension of quarrying that has been active at the site for over 20 years based on satellite imagery. Excavations at the extended site are active. Given the nature of the development and distance from the Project, cumulative effects are not anticipated.
Field House Solar Farm (22/00824/STPLF)	Solar Farm	Approved	1	Construction: Unknown Operation: Unknown	0.39	7.44	9.99	No	The solar farm development is located outside the Onshore Development Area. A condition of the development is that a CoCp or similar is in place to suitably manage the risks posed to the environment, including pollution and groundwater associated with SPZ 3. With mitigation measures in place cumulative effects are not anticipated.
High Farm Holiday Park (22/03269/STPLF)	Leisure Facility	Approved	1	Construction: Unknown	0.39	7.44	9.99	No	Small scale development of a sales office building, reception, cafe, takeaway and shop, and change of use of land to bowling green. The development is 0.39km from an onshore ECC access road, but 2.6km away from the cable corridor. Due to the nature of the development and distance from the onshore ECC, cumulative effects are not anticipated.
High Farm Holiday Park (22/03269/STPLF)	Leisure Facility	Approved	1	Construction: Unknown	0.39	7.44	9.99	No	The small-scale change of land use for static caravans is located outside the Onshore Development Area. The development shall be carried out in accordance with the submitted flood risk assessment. Cumulative effects are not anticipated.

Project / Plan	Development Type	Status	Tier	Construction / Operation Period	Closest Distance to Onshore ECC (km)	Closest Distance to OCS Zone 4 (km)	Closest Distance to OCS Zone 8 (km)	Potential for Significant Cumulative Effects	Rationale
Hornsea Project Four Offshore Wind Farm (EN010098)	Offshore Wind Farm	Under Construction	1	Construction: 2024 to 2028 Operation: 2029+	0	0.11	0.01	No	There is some spatial overlap between the two projects, but Hornsea Project Four will be operational before the Project starts construction. Due to the small spatial scale of buried and above ground permanent infrastructure in some of the same surface water catchments and groundwater catchment, cumulative operational effects from are not anticipated.
Kenley House Farm Solar Farm (22/01208/STPLF)	Solar Farm	Approved	1	Construction: Unknown Operation: Unknown	3.92	4.73	7.32	No	The development is located outside the Onshore Development Area. A flood risk assessment and drainage strategy have been developed for the site, and it is assumed a CoCP or similar will be in place to manage soil/sediments and pollution risk. Cumulative effects are not anticipated.
Lakeview Holiday Park (19/04370/PLF)	Leisure Facility	Under Construction	1	Construction: Unknown	2.91	18.21	20.75	No	The development is located outside the Onshore Development Area. This is a small development of 51 static caravans located almost 3km from the onshore ECC. Cumulative effects are not anticipated.
Manufacturing Facility Extension at Swift Group Limited Dunswell Road (22/02744/STPLF)	Commercial Development	Approved	1	Construction: Unknown	1.51	2.39	3.78	No	The small-scale commercial development is located outside the Onshore Development Area over 1km away. It is assumed a surface water drainage plan and CoCP or similar will be in place to manage runoff, soil/sediments and pollution risk. Cumulative effects are not anticipated.
Riverside Works (20/04113/PLF)	Commercial Development	Approved	1	Construction: Unknown	3.68	2.99	5.50	No	The development is located outside the Onshore Development Area over 3km away. The proposal is for a change of land use to self-storage container facility comprising 65 containers. Given the nature of the development and distance from the Project, cumulative effects are not anticipated.
Wanlass Beck National Grid Substation (24/03819/STPLF)	Electricity Transmission Infrastructure	Pending Consideration	1	Construction: 2026 to 2030 Operation: 2031+	0.91	2.09	3.02	No	The development is located outside the Onshore Development Area. Although there is the potential for an overlap in construction activities in one surface water catchment and the groundwater catchment, the new substation will occupy a very small area (0.02km^2). Due to the nature of the development and the regulatory regime under which it will be constructed, it is assumed that appropriate mitigation measures secured through a CoCP or similar will be incorporated into the design, thus limiting the potential for cumulative effects to occur. Significant cumulative effects are not anticipated.

Project / Plan	Development Type	Status	Tier	Construction / Operation Period	Closest Distance to Onshore ECC (km)	Closest Distance to OCS Zone 4 (km)	Closest Distance to OCS Zone 8 (km)	Potential for Significant Cumulative Effects	Rationale
Peartree Hill Solar Farm (EN010157)	Solar Farm	Planning	2	Construction: 2026 to 2027 Operation: from 2028+	0.42	1.05	2.66	No	There is some spatial overlap between the two projects, but the solar farm will be constructed before the Project. During operation of the solar farm, embedded mitigation will also manage the risk of increased runoff from hard standing or containerised infrastructure. The solar farm will result in improved percolation of rainwater and reduction in runoff and soil erosion and consequently have minor benefit in terms of surface water flood risk. In addition, the solar farm's proposed operational drainage strategy will manage the risk of increased runoff from hard standing or containerised infrastructure. Cumulative operational effects are not anticipated.
Birkhill Wood National Grid Substation	Electricity Transmission Infrastructure	Planning	3	Construction: 2026 to 2030 Operation: 2031+	0	1.11	2.31	No	The development overlaps with the onshore ECC as the cables connect into the Birkhill Wood Substation. Although there is the potential for an overlap in construction activities in one surface water catchment and the groundwater catchment, the new substation will occupy a very small area (0.024km^2). Due to the nature of the development and the regulatory regime under which it will be constructed, it is assumed that appropriate mitigation measures secured through a CoCP or similar will be incorporated into the design, thus limiting the potential for cumulative effects to occur. Significant cumulative effects are not anticipated.
Humber Carbon Capture Pipeline (EN0710003)	Gas Pipeline	Planning	3	Construction: 2028 to 2032 Operation: 2033+	15.35	16.31	15.44	No	At its closest, the Humber Carbon Capture Pipeline is 15.35km away from the onshore ECC for the Project. Due to the significant distance involved, cumulative effects are not anticipated.
North Humber to High Marnham Grid Upgrade (EN020034)	Electricity Transmission Infrastructure	Planning	3	Construction: 2028 to 2030 Operation: 2031+	0	0.89	0.41	Yes	There is spatial overlap and potentially temporal overlap in construction activities in one surface water catchment and the groundwater catchment.

224. For developments that were not fully operational, including those in planning / pre-construction stages or under construction, during baseline characterisation and operational developments with potential for ongoing impacts, these are included in the screening exercise presented in **Table 21-33**.

225. The screening exercise has been undertaken based on available information on each plan or project up to and including 31st December 2024. Information has been obtained from the Planning Inspectorate's Nationally Significant Infrastructure Project (NSIP) portal, East Riding of Yorkshire Council and Hull City Council planning portals. It is noted that further information regarding the identified plans and projects may become available between PEIR publication and DCO application submission or may not be available in detail prior to construction. The assessment presented here is therefore considered to be conservative, with the significance of cumulative effects expected to be reduced compared to those presented here. The short list of plans and projects will be updated at ES stage to incorporate more recent information at the time of writing.

226. Plans and projects identified in **Table 21-33** have been assigned a tier based on their development status, the level of information available to inform the CEA and the degree of confidence. A three-tier system based on the Planning Inspectorate Advice Note Seventeen has been adopted (PINS, 2024).

227. Each plan or project in **Table 21-33** has been considered on a case-by-case basis. Only plans and projects with potential for significant cumulative effects with the Project are taken forward to a detailed assessment, which are screened based on the following criteria:

- There is potential that a pathway exists whereby an impact could have a cumulative effect on a receptor;
- The impact on a receptor from the Project and the plan or project in consideration has a spatial overlap (i.e., occurring over the same area);
- The impact on a receptor from the Project and the plan or project in consideration has a temporal overlap (e.g. occurring at the same time);
- There is sufficient information available on the plan or project in consideration and moderate to high data confidence to undertake a meaningful assessment; and
- There is some likelihood that the residual effect (i.e., after accounting for mitigation measures) of the Project could result in significant cumulative effects with the plan or project in consideration.

228. The CEA for water resources and flood risk has identified a total of two plans and projects where significant cumulative effects could arise in combination with the Project. A detailed assessment of cumulative effects is provided in the section below.

21.8.3 Assessment of Cumulative Effects

229. As described in **Table 21-33** there is the potential for cumulative effects on water resources and flood risk receptors as a result of the following cumulative projects and the Project:

- North Humber to High Marnham Grid Upgrade; and
- Dogger Bank South Offshore Wind Farms.

230. Similar to the approach noted in **Section 21.4.5**, the CEA for the OCS zone infrastructure will remain the same for both development scenarios. Only one OCS zone option will be taken forward to development. Therefore, there is no cumulative development scenario in which both OCS zones would be developed to be considered in the CEA.

21.8.3.1 Cumulative Impact 1: Direct Disturbance of Surface Water Bodies (WRF-C-01)

231. The North Humber to High Marnham Grid Upgrade and Dogger Bank South Offshore Wind Farms projects have the potential for significant cumulative effects caused by the direct disturbance of surface water bodies.

232. Cumulative effects would be caused by the use of trenched watercourse crossings for the cable duct installation and temporary haul road watercourse crossings as described in **Section 21.7.1.1**.

233. Embedded mitigation measures relevant to the direct disturbance of surface water bodies are listed in **Section 21.4.3** (Commitment IDs CO32, CO33, CO35, CO36, CO37 and CO39, see **Table 21-4** and **Table 21-5**).

21.8.3.1.1 Receptor Sensitivity

234. Receptor sensitivity for catchments crossed by the Project is described in **Section 21.6.1.4**. Of the 15 surface water catchments crossed by the Onshore Development Area, sensitivity is **high** in six, **medium** in two and **low** in the remainder (seven).

21.8.3.1.2 Cumulative Impact Magnitude

235. The North Humber to High Marnham Grid Upgrade project would only cross one catchment in common with the Project (Beverley and Barmston Drain). Figure 10-1 of the North Humber to High Marnham Grid Upgrade Scoping Report (National Grid, 2023) shows a single ordinary watercourse that may be crossed within Beverley and Barmston Drain's catchment – it is not yet known if this would be a trenched crossing or whether access (i.e. a haul road crossing) would also be required. As described in **Section 21.7.1.1**, there would not be any trenched crossings in the Beverley and Barmston Drain's catchment for the Project, but there would be 16 crossings for Dogger Bank South.

236. Chapter 10 Water Environment (Section 10.5) of the North Humber to High Marnham Grid Upgrade Scoping Report (National Grid, 2023) lists embedded mitigation measures relevant to the water environment. This includes measures for watercourses crossings similar to those described for the Project in **Section 21.4.3**.

237. Considering the embedded mitigation measures proposed by both projects for trenched and temporary haul road crossings, cumulative impacts are expected to be of **minor adverse** magnitude for the North Humber to High Marnham Grid Upgrade project.

238. Dogger Bank South Offshore Wind Farms crosses nine of the same catchments as the Project, and six catchments would have trenched crossings from both projects if there is an overlap in construction activities. The cumulative number of trenched crossings in the six catchments are shown in **Table 21-34**.

239. The same methodology as used in this assessment has been used to assess the impact of direct disturbance of surface water bodies for Dogger Bank South Offshore Wind Farms. Taking into account embedded mitigation for trenched and temporary haul road crossings described in Section 20.3.4 of the Dogger Bank South ES Chapter 20 – Flood Risk and Hydrology, impact magnitude is low in four catchments, and medium in Beverley and Barmston Drain's catchment and in the Holderness Drain Source to Foredyke Stream catchment (RWE, 2024).

240. Impact magnitude has been increased as a worst-case from low to medium in the Holderness Drain Source to Foredyke Stream catchment, and from negligible to low in the remaining catchments to account for disturbance associated with temporary haul road crossings at trenchless crossing locations, which will be mitigated by Commitment ID CO35 (see **Table 21-4** and **Table 21-5**). As per the assessment in **Section 21.7.1.1**, this cumulative assessment will be further refined in the ES.

Table 21-34 Cumulative Trenched Crossings between the Project and Dogger Bank South Offshore Wind Farms

Catchment	Sensitivity	Cumulative Number of Trenched Crossings for Cable Duct Installation (Including Temporary Haul Road Crossing)	Cumulative Number of Temporary Haul Road Crossing at Trenchless Crossing for Cable Duct Installation	Impact Magnitude With Embedded Mitigation
Beverley and Barmston Drain	Low	16	22	Medium
Holderness Drain Source to Foredyke Stream	Low	10	23	Medium
Barmston Sea Drain / Skipsea Drain to Conf	High	7	4	Low
Old Howe/Frodingham Beck to R Hull	Medium	5	6	Low
Mickley Dike Catchment	Medium	3	19	Low
High Hunsley to Arram Area	Low	2	3	Low

21.8.3.1.3 Cumulative Effect Significance

241. For the North Humber to High Marnham Grid Upgrade project, the sensitivity of Beverley and Barmston Drain is **low** and cumulative impact magnitude associated with a worst-case of one trenched crossing would be **negligible**. Therefore, the cumulative effect significance would be **negligible**, which is **not significant** in EIA terms.

242. In the six catchments that would have cumulative trenched crossings and cumulative temporary haul road crossings with Dogger Bank South Offshore Wind Farms (**Table 21-34**), effect significance would be **minor adverse**, which is **not significant** in EIA terms.

21.8.3.2 Cumulative Impact 2: Increased Sediment Supply (WRF-C-02)

243. The North Humber to High Marnham Grid Upgrade and Dogger Bank South Offshore Wind Farms projects have the potential for significant cumulative effects caused by increased sediment supply.

244. Cumulative effects would be caused by construction activities such as soil stripping, excavations and tracking of machinery/haul road use, and as described in **Section 21.7.1.2**.

245. Embedded mitigation measures relevant to increased sediment supply are listed in **Section 21.4.3** (Commitment IDs CO32, CO33, CO39, CO43 and CO46, see **Table 21-4** and **Table 21-5**).

21.8.3.2.1 Receptor Sensitivity

246. Receptor sensitivity for catchments crossed by the Project is described in **Section 21.6.1.4**. Of the 15 surface water catchments crossed by the Onshore Development Area, sensitivity is **high** in six, **medium** in two and **low** in the remainder (seven).

21.8.3.2.2 Cumulative Impact Magnitude

247. The North Humber to High Marnham Grid Upgrade project would only cross one catchment in common with the Project (Beverley and Barmston Drain). The Onshore Development Area would occupy 2.7% of the Beverley and Barmston Drain's catchment, although this would be significantly reduced if OCS Zone 4 is selected for the OCS and ESBI. Considering embedded mitigation mesures associated with the Project (**Section 21.4.3**), the magnitude of impact is negligible (**Section 21.7.1.2**). The North Humber to High Marnham Grid Upgrade is of a similar nature to the Project, with respect to substation construction, however, overhead lines will be used instead of buried export cables for the transmission infrastructure.

248. Chapter 10 Water Environment (Section 10.5) of the North Humber to High Marnham Grid Upgrade Scoping Report (National Grid, 2023) lists embedded mitigation measures relevant to the water environment. This includes measures for limiting the area of disturbed ground during construction.

249. As a worst-case, if the North Humber to High Marham Grid Upgrade project disturbed the same amount of ground as the Project, 5.4% of the Beverley and Barmston Drain's catchment could be disturbed. This would give a cumulative impact magnitude of **low**.

250. However, the onshore ECC associated with the Project crosses multiple areas of the Beverley and Barmston Drain's catchment which are not crossed by the North Humber to High Marnham Grid Upgrade project. The cumulative area affected is likely to be less than 5.4% of the catchment area.

251. Dogger Bank South Offshore Wind Farms crosses nine of the same catchments as the Project. For Dogger Bank South Offshore Wind Farms, the methodology for assessing impacts associated with increased sediment supply is the same as reported in this assessment (i.e. the area of the Onshore Development Area in each catchment) (RWE, 2024). Apart from in the Foredyke Stream Lower to Holderness Dr catchment, in each catchment, the maximum areas of exposed ground for with Dogger Bank South Offshore Wind Farms are lower than that for the Project, which reflects the finalised nature of the DCO limits for Dogger Bank South Offshore Wind Farms. The Project retains some areas of optionality for onshore export cable routeing, haul road access and the OCS zones, which means maximum areas of exposed ground will likely be refined based on further site selection and design refinements.

252. In only two catchments would construction of the Project and with Dogger Bank South Offshore Wind Farms at the same time lead to a change in impact magnitude. In the Holderness Drain Source to Foredyke Stream catchment and High Hunsley to Woodmansey Area catchment, impact magnitude would increase to **medium**. In all other surface water catchments crossed by the Project and Dogger Bank South Offshore Wind Farms, impact magnitude would remain **negligible** or **low**.

21.8.3.2.3 Cumulative Effect Significance

253. For the North Humber to High Marnham Grid Upgrade project, the sensitivity of Beverley and Barmston Drain is **low** and cumulative impact magnitude associated with a worst-case of 5.4% disturbed ground would be **low**. Cumulative effect significance would be **minor adverse**, which is **not significant** in EIA terms.

254. In the catchments where the Project and Dogger Bank South Offshore Wind Farms could overlap during construction, sensitivity ranges from **low** to **high**. In catchments where there is no change in impact magnitude, cumulative effects would remain either **negligible** or **minor adverse**. In the Holderness Drain Source to Foredyke Stream catchment and the High Hunsley to Woodmansey Area catchment, where there is a **medium** impact magnitude, cumulative effect significance would increase to **minor adverse**, which is **not significant** in EIA terms.

21.8.3.3 Cumulative Impact 3: Supply of Contaminants to Surface and Groundwater (WRF-C-03)

255. The North Humber to High Marnham Grid Upgrade and Dogger Bank South Offshore Wind Farms projects have the potential for significant cumulative effects caused by supply of contaminants to surface and groundwater.

256. Cumulative effects would be caused by construction activities such as the accidental spillage of lubricants, fuels and oils, and leakage from construction machinery and bentonite breakouts in the case of trenchless crossings as described in **Section 21.7.1.3**.

257. Embedded mitigation measures relevant to the supply of contaminants to surface and groundwater are listed in **Section 21.4.3** (Commitment IDs CO32, CO33, CO38, CO39, CO40 and CO46, see **Table 21-4** and **Table 21-5**).

21.8.3.3.1 Receptor Sensitivity

258. Receptor sensitivity for catchments crossed by the Project is described in **Section 21.6.1.4**. Of the 15 surface water catchments crossed by the Onshore Development Area, sensitivity is **high** in six, **medium** in two and **low** in the remainder (seven).

259. The sensitivity of the Hull and East Riding Chalk groundwater catchment is **high**.

21.8.3.3.2 Cumulative Impact Magnitude

260. The North Humber to High Marnham Grid Upgrade project would only cross one catchment in common with the Project (Beverley and Barmston Drain). The Onshore Development Area would occupy 2.7% of the Beverley and Barmston Drain's catchment, within which there is the potential for spills and leaks associated with construction activities. This figure would be significantly reduced if Zone 4 is selected for the OCS and ESBI. Considering embedded mitigation measures associated with the Project (**Section 21.4.3**), the magnitude of impact is negligible. The North Humber to High Marnham Grid Upgrade is of a similar nature to the Project, with respect to substation construction, however, overhead lines will be used instead of buried export cables for the transmission infrastructure.

261. Chapter 10 Water Environment (Section 10.5) of the North Humber to High Marnham Grid Upgrade Scoping Report (National Grid, 2023) lists embedded mitigation measures relevant to the water environment. This includes measures for the appropriate use and storage of potentially polluting substances.

262. If the North Humber to High Marham Grid Upgrade project disturbed the same amount of ground as the Project, 5.4% of the Beverley and Barmston Drain's catchment could be disturbed and subject to accidental spills and leaks associated with construction activities. This would give a cumulative impact of **low**.

263. However, the onshore ECC associated with the Project crosses multiple areas of the Beverley and Barmston Drain's catchment which are not crossed by the North Humber to High Marnham Grid Upgrade project. The cumulative area affected is likely to be less than 5.4% of the catchment area within which accidental spills or leaks could occur.

264. The North Humber to High Marnham Grid Upgrade would cross a much smaller area of the Hull and East Riding Chalk groundwater body compared to the Project. It is considered unlikely the cumulative area of disturbed ground where spills and leaks could occur would rise above 1% and therefore the cumulative impact magnitude on the groundwater body would be **negligible**.

265. Dogger Bank South Offshore Wind Farms crosses nine of the same catchments as the Project. For Dogger Bank South Offshore Wind Farms, the methodology for assessing impacts associated with the supply of contaminants to surface and groundwater is the same as reported in this assessment (i.e. the area of the Onshore Development Area in each catchment) (RWE, 2024). In each of the nine catchments maximum areas of exposed ground for Dogger Bank South Offshore Wind Farms are lower than that for the Project, which reflects the finalised nature of the DCO limits for Dogger Bank South Offshore Wind Farms. The Project retains some areas of optionality for onshore export cable routeing, haul road access and the OCS zones, which means maximum areas of exposed ground will likely be refined based on further site selection and design refinements.

266. In only two catchments would construction of the Project and Dogger Bank South Offshore Wind Farms at the same time lead to a change in impact magnitude. In the Holderness Drain Source to Foredyke Stream catchment and the High Hunsley to Woodmansey Area catchment, impact magnitude would increase to **medium**. In all surface water catchments crossed by the Project and Dogger Bank South Offshore Wind Farms, impact magnitude would remain **negligible** or **low**.

267. The impact magnitude of Dogger Bank South Offshore Wind Farms on the Hull and East Riding Chalk groundwater body has been assessed as negligible as only 0.23% of the catchment would be affected by construction activities (RWE, 2024). For the Project, the figure is 0.63%, but this includes significant areas where optionality has been retained in the Onshore Development Area. This figure will be further refined at ES stage following site selection and design refinements. The cumulative impact magnitude on the groundwater body is anticipated to be **negligible**.

268. Section 20.3.4 of Chapter 20 Flood Risk and Hydrology of the Dogger Bank South Offshore Wind Farms ES lists and describes the mitigation measures that will be secured in the CoCP (RWE, 2024). This includes measures for the appropriate use and storage of potential pollutants.

21.8.3.3.3 Cumulative Effect Significance

269. For the North Humber to High Marnham Grid Upgrade project, the sensitivity of the Beverley and Barmston Drain surface water catchment is **low** and cumulative impact magnitude associated with a worst-case of 5.4% disturbed ground would be **low**. Cumulative effect significance would be **minor adverse**, which **is not significant** in EIA terms.

270. The sensitivity of the Hull and East Riding Chalk groundwater catchment is **high** and cumulative impact magnitude associated with the North Humber to High Marnham Grid Upgrade and Dogger Bank South Offshore Wind Farms projects would be **negligible.** Cumulative effect significance would be **minor adverse** for both projects in the groundwater catchment, which is **not significant** in EIA terms.

271. In the surface water catchments where the Project and Dogger Bank South Offshore Wind Farms could overlap during construction, sensitivity ranges from **low** to **high**. In catchments where there is no change in impact magnitude, cumulative effects would remain either **negligible** or **minor adverse**. In the Holderness Drain Source to Foredyke Stream catchment and the High Hunsley to Woodmansey Area catchment, cumulative effect significance would increase to **minor adverse**, which is **not significant** in EIA terms.

21.8.3.4 Cumulative Impact 4: Changes to Surface and Groundwater Flows and Flood Risk (WRF-C-04)

272. The North Humber to High Marnham Grid Upgrade and Dogger Bank South Offshore Wind Farms projects have the potential for significant cumulative effects caused by changes to surface and groundwater flows and flood risk.

273. Cumulative effects would be caused by construction activities such as site preparation activities, trenched crossings and other excavations, and changes in land use as described in **Section 21.7.1.4**.

274. Embedded mitigation measures relevant to changes in surface and groundwater flows and flood risk are listed in **Section 21.4.3** (Commitment IDs CO32, CO34, CO35, CO39 and CO43, see **Table 21-4** and **Table 21-5**).

21.8.3.4.1 Receptor Sensitivity

275. Receptor sensitivity for catchments crossed by the Project is described in **Section 21.6.1.4**. Of the 15 surface water catchments crossed by the Onshore Development Area, sensitivity is **high** in six, **medium** in two and **low** in the remainder (seven).

276. The sensitivity of the Hull and East Riding Chalk groundwater catchment is **high**.

21.8.3.4.2 Cumulative Impact Magnitude

277. The North Humber to High Marnham Grid Upgrade project would only cross one catchment in common with the Project (Beverley and Barmston Drain). The Onshore Development Area would occupy 2.7% of the Beverley and Barmston Drain's catchment, within which there is the changes in surface and groundwater flows and flood risk associated with construction activities. This figure would be significantly reduced if OCS Zone 4 is selected for the OCS and ESBI. Considering embedded mitigation measures associated with the Project (**Section 21.4.3**), the magnitude of impact is negligible. The North Humber to High Marnham Grid Upgrade is of a similar nature to the Project, with respect to substation construction, however, overhead lines will be used instead of buried export cables for the transmission infrastructure.

278. Chapter 10 Water Environment (Section 10.5) of the North Humber to High Marnham Grid Upgrade Scoping Report (National Grid, 2023) lists embedded mitigation measures relevant to the water environment. This includes measures for the appropriate use and storage of potentially polluting substances.

279. If the North Humber to High Marham project disturbed the same amount of ground as the Project, 5.4% of the Beverley and Barmston Drain's catchment could be disturbed and subject to changes in surface and groundwater flows and flood risk associated with construction activities. This would give a cumulative impact of **low**.

280. However, the onshore ECC associated with the Onshore Development Area crosses multiple areas of the Beverley and Barmston Drain's catchment which are not crossed by the North Humber to High Marnham Grid Upgrade project. The cumulative area affected is likely to be less than 5.4% of the catchment area within which changes in surface and groundwater flows and flood risk could occur.

281. The North Humber to High Marnham Grid Upgrade project would cross a much smaller area of the Hull and East Riding Chalk groundwater body compared to the Project. It is considered unlikely the cumulative area of disturbed ground where changes in groundwater flows could occur would rise above 1% and therefore the cumulative impact magnitude on the groundwater body would be **negligible**.

282. Dogger Bank South Offshore Wind Farms crosses nine of the same catchments as the Project. For Dogger Bank South Offshore Wind Farms, the methodology for assessing impacts associated with changes to surface and groundwater flows and flood risk is the same as reported in this assessment (i.e. the area of the Onshore Development Area in each catchment) (RWE, 2024). In each of the 12 catchments maximum areas of exposed ground for Dogger Bank South Offshore Wind Farms are lower than that for the Project, which reflects the finalised nature of the DCO limits for Dogger Bank South Offshore Wind Farms. The Project retains some areas of optionality for onshore export cable routeing, haul road access and the OCS zones, which means maximum areas of exposed ground will likely be refined based on further site selection and design refinements.

283. In only two catchments would construction of the Project and Dogger Bank South Offshore Wind Farms at the same time lead to a change in impact magnitude. In the Holderness Drain Source to Foredyke Stream catchment and the High Hunsley to Woodmansey Area catchment, impact magnitude would increase to **medium**. In all surface water catchments crossed by the Project and Dogger Bank South Offshore Wind Farms, impact magnitude would remain **negligible** or **low**.

284. The impact magnitude of Dogger Bank South Offshore Wind Farms on the Hull and East Riding Chalk groundwater body has been assessed as negligible as only 0.23% of the catchment would be affected by construction activities (RWE, 2024). For the Project the figure is 0.63%, but this includes significant areas where optionality has been retained in the Onshore Development Area. This figure will be further refined at ES stage following site selection and design refinements. The cumulative impact magnitude on the groundwater body is anticipated to be **negligible**.

285. Section 20.3.4 of Chapter 20 Flood Risk and Hydrology of the Dogger Bank South Offshore Wind Farms ES lists and describes the mitigation measures that will be secured in the CoCP (RWE, 2024). This includes measures for the appropriate to surface and groundwater flows and flood risk.

21.8.3.4.3 Cumulative Effect Significance

286. For the North Humber to High Marnham Grid Upgrade project, the sensitivity of Beverley and Barmston Drain surface water catchment is **low** and cumulative impacts associated with a worst-case of 5.4% disturbed ground would be **low**. Cumulative effect significance would be **minor adverse**, which is **not significant** in EIA terms.

287. The sensitivity of the Hull and East Riding Chalk groundwater catchment is **high** and cumulative impacts associated with the North Humber to High Marnham Grid Upgrade and Dogger Bank South Offshore Wind Farms projects would be **negligible.** Cumulative effect significance would be **minor adverse** for both projects in the groundwater catchment, which is **not significant** in EIA terms.

288. In the surface water catchments where the Project and Dogger Bank South Offshore Wind Farms could overlap during construction, sensitivity ranges from **low** to **high**. In catchments where there is no change in impact magnitude, cumulative effects would remain either **negligible** or **minor adverse**. In the Holderness Drain Source to Foredyke Stream catchment and the High Hunsley to Woodmansey Area catchment, cumulative effect significance would increase to **minor adverse**, which is **not significant** in EIA terms.

21.8.3.5 Cumulative Impact 5: Supply of Contaminants to Surface and Groundwater (WRF-O-03)

289. The North Humber to High Marnham Grid Upgrade and Dogger Bank South Offshore Wind Farms projects have the potential for significant cumulative effects caused by the supply of contaminants to surface and groundwater during operation.

290. Cumulative effects may be caused by the permanent infrastructure being installed in the same catchments, described in **Section 21.7.2.1**. This could increase the need for O&M activities.

291. Embedded mitigation measures relevant to the supply of contaminants to surface and groundwater during operation are listed in **Section 21.4.3** (Commitment IDs CO44, CO49 and CO79, see **Table 21-4** and **Table 21-6**).

21.8.3.5.1 Receptor Sensitivity

292. Receptor sensitivity for catchments crossed by the Project is described in **Section 21.6.1.4**. Of the 15 surface water catchments crossed by the Onshore Development Area, sensitivity is **high** in six, **medium** in two and **low** in the remainder (seven).

293. The sensitivity of the Hull and East Riding Chalk groundwater catchment is **high.**

21.8.3.5.2 Cumulative Impact Magnitude

294. The North Humber to High Marnham Grid Upgrade project would only cross one catchment in common with the Project (Beverley and Barmston Drain). Permanent infrastructure of the Project would occupy 0.23% of the Beverley and Barmston Drain's catchment. This figure would be significantly reduced if Zone 4 is selected for the OCS and ESBI. Permanent infrastructure for the North Humber to High Marnham Grid Upgrade project would consist of overhead lines and a new substation. Due to the use of overhead lines, it is likely the permanent land take for the North Marnham to High Marnham Grid Upgrade project within the Beverley and Barmston Drain catchment will be lower than that for the Project. Cumulative impact magnitude would be **negligible**.

295. Dogger Bank South Offshore Wind Farms crosses nine of the same catchments as the Project. For Dogger Bank South Offshore Wind Farms, the methodology for assessing impacts associated with the supply of contaminants to surface and groundwater during operation is the same as reported in this assessment (i.e. the area of permanent infrastructure in each catchment) (RWE, 2024). In each of the nine catchments, the area of permanent infrastructure would be similar. The maximum cumulative area would be in the High Hunsley to Woodmansey Area (1.79%) – cumulative impact magnitude would be **low** in this catchment and **negligible** in all other catchments.

21.8.3.5.3 Cumulative Effect Significance

296. For the North Humber to High Marnham Grid Upgrade project, the sensitivity of Beverley and Barmston Drain is **low** and cumulative impact magnitude associated with the installation of permanent infrastructure would be **negligible**, and cumulative effect significance would be **negligible**, which is **not significant** in EIA terms.

297. Cumulative effect significance for the catchments crossed by Dogger Bank South Offshore Wind Farms is **negligible** to **minor adverse**, which is **not significant** in EIA terms.

21.8.3.6 Cumulative Impact 6: Changes to Surface and Groundwater Flows and Flood Risk (WRF-O-04)

298. The North Humber to High Marnham Grid Upgrade and Dogger Bank South Offshore Wind Farms projects have the potential for significant cumulative effects caused by the supply of contaminants to surface and groundwater during operation.

299. Cumulative effects may be caused by the permanent infrastructure being installed in the same catchments, described in **Section 21.7.2.1**. This could affect surface and groundwater flow paths.

300. Embedded mitigation measures relevant to changes to surface and groundwater flows and flood risk during operation are listed in **Section 21.4.3** (Commitment IDs CO44 and CO79, see **Table 21-4** and **Table 21-6**).

21.8.3.6.1 Receptor Sensitivity

301. Receptor sensitivity for catchments crossed by the Project is described in **Section 21.6.1.4**. Of the 15 surface water catchments crossed by the Onshore Development Area, sensitivity is **high** in six **medium** in two and **low** in the remainder (seven).

302. The sensitivity of the Hull and East Riding Chalk groundwater catchment is **high**.

21.8.3.6.2 Cumulative Impact Magnitude

303. The North Humber to High Marnham Grid Upgrade project would only cross one catchment in common with the Project (Beverley and Barmston Drain). Permanent infrastructure of the Project would occupy 0.23% of the Beverley and Barmston Drain's catchment. This figure would be significantly reduced if Zone 4 is selected for the OCS and ESBI. Permanent infrastructure for North Humber to High Marnham Grid Upgrade project would consist of overhead lines and a new substation. Due to the use of overhead lines, it is likely the permanent land take for the North Marnham to High Marnham Grid Upgrade project within the Beverley and Barmston Drain catchment will be lower than that for the Project. Cumulative impact magnitude would be **negligible**.

304. Dogger Bank South Offshore Wind Farms crosses nine of the same catchments as the Project. For Dogger Bank South Offshore Wind Farms, the methodology for assessing impacts associated with changes to surface and groundwater flows and flood risk during operation is the same as reported in this assessment (i.e. the area of permanent infrastructure in each catchment) (RWE, 2024). In each of the nine catchments, the area of permanent infrastructure would be similar. The maximum cumulative area would be in the High Hunsley to Woodmansey Area (1.79%) – cumulative impact magnitude would be **low** in this catchment and **negligible** in all other catchments.

21.8.3.6.3 Cumulative Effect Significance

305. For the North Humber to High Marnham Grid Upgrade project, the sensitivity of Beverley and Barmston Drain is **low** and cumulative impact magnitude associated with the installation of permanent infrastructure would be **negligible**, and cumulative effect significance would be **negligible**, which is **not significant** in EIA terms

306. Cumulative effect significance for the catchments crossed by Dogger Bank South Offshore Wind Farms is **negligible** to **minor adverse**, which is **not significant** in EIA terms.

21.9 Inter-Relationships and Effects Interactions

21.9.1 Inter-Relationships

307. Inter-relationships are defined as effects arising from residual effects associated with different environmental topics acting together upon a single receptor or receptor group. Potential inter-relationships between water resources and flood risk and other environmental topics have been considered, where relevant, within the PEIR. **Table 21-35** provides a summary of key inter-relationships and signposts to where they have been addressed in the relevant chapters.

Table 21-35 Water Resources and Flood Risk – Inter-Relationships with Other Topics

Impact ID	Impact and Project Activity	Related EIA Topic	Where Assessed in the PEIR Chapter	Rationale
Construction				
WRF-C-01	Direct disturbance of surface water bodies – trenched watercourse (cable) crossings, temporary (haul road watercourse crossings) and construction activities at the OCS and ESBI	**Chapter 19 Geology and Ground Conditions**	**Section 21.7.1**	Potential changes to ground conditions (including chemical quality and physical properties such as transmissivity) during construction could affect the quality and quantity of groundwater and hydrologically connected surface water receptors.
WRF-C-02	Increased sediment supply – construction activitiess at the landfall, onshore ECC and OCS zone			
WRF-C-03	Supply of contaminants to surface and groundwater – construction activities at the landfall, onshore export cable corridor (ECC) and OCS zone			
WRF-C-04	Changes to surface and groundwater flows and flood risk– construction activitiess at the landfall, onshore ECC and OCS zone			
WRF-C-01	Direct disturbance of surface water bodies – trenched watercourse (cable) crossings, temporary (haul road watercourse crossings) and construction activities at the OCS and ESBI	**Chapter 23 Onshore Ecology and Ornithology**	**Section 21.7.1**	Potential changes to hydrology, geomorphology and water quality could impact upon water-dependent biological communities.
Operation and Maintenance				
WRF-O-03	Supply of contaminants to surface and groundwater – operation of the ESBI with respect to firewater and planned and unplanned O&M activities	**Chapter 19 Geology and Ground Conditions**	**Section 21.7.2**	Potential changes to ground conditions (including chemical quality and transmissivity) during operation could affect the quality and quantity of groundwater and hydrologically connected surface water receptors.

Impact ID	Impact and Project Activity	Related EIA Topic	Where Assessed in the PEIR Chapter	Rationale
WRF-O-04	Changes to surface and groundwater flows and flood risk – presence of permanent above-ground infrastructure	**Chapter 23 Onshore Ecology and Ornithology**	**Section 21.7.2**	Potential changes to the hydrology, geomorphology and water quality could impact upon water-dependent biological communities and designated sites located in each catchment.
Decommissioning				
The details and scope of onshore decommissioning works will be determined by the relevant regulations and guidance at the time of decommissioning and provided in the Onshore Decommissioning Plan (see **Table 21-4**, Commitment ID CO56). For this assessment, it is assumed that inter-relationships during the decommissioning phase would be of similar nature to those identified during the construction phase.				

21.9.2 Interactions

308. The impacts identified and assessed in this chapter have the potential to interact with each other. Potential interactions between impacts are identified in **Table 21-36**. Where there is potential for interaction between impacts, these are assessed in **Table 21-37** for each receptor or receptor group.

309. Interactions are assessed by development phase ("phase assessment") to see if multiple impacts could increase the overall effect significance experienced by a single receptor or receptor group during each phase. Following from this, a lifetime assessment is undertaken which considers the potential for multiple impacts to accumulate across the construction, O&M and decommissioning phases and result in a greater effect on a single receptor or receptor group. When considering synergistic effects from interactions, it is assumed that the receptor sensitivity remains consistent, while the magnitude of different impacts is additive.

Table 21-36 Water Resources and Flood Risk – Potential Interactions between Impacts throughout the Project's Lifetime

Construction, Operation and Maintenance						
	WRF-C-01	**WRF-C-02**	**WRF-C-03**	**WRF-C-04**	**WRF-O-03**	**WRF-O-04**
Direct disturbance of surface water bodies (WRF-C-01)		Yes	Yes	Yes	Yes	Yes
Increased sediment supply (WRF-C-02)	Yes		Yes	Yes	Yes	Yes
Supply of contaminants to surface and groundwaters (WRF-C-03)	Yes	Yes		Yes	Yes	Yes
Changes to surface and groundwater flows and flood risk (WRF-C-04)	Yes	Yes	Yes		Yes	Yes
Supply of contaminants to surface and groundwaters (WRF-O-03)	Yes	Yes	Yes	Yes		Yes
Changes to surface and groundwater flows and flood risk (WRF-O-04)	Yes	Yes	Yes	Yes	Yes	
Decommissioning						
The details and scope of onshore decommissioning works will be determined by the relevant regulations and guidance at the time of decommissioning and provided in the Onshore Decommissioning Plan (see **Table 21-4,** Commitment ID CO56). For this assessment, it is assumed that interactions during the decommissioning phase would be of similar nature to, and no worse than, those identified during the construction phase.						

Table 21-37 Interaction Assessment – Phase and Lifetime Effects

Receptor	Impact ID	Highest Significance Level			Phase Assessment	Lifetime Assessment
		Construction	O&M	Decommissioning		
Surface water catchments	WRF-C-01 WRF-C-02 WRF-C-03 WRF-C-04 WRF-O-03 WRF-O-04	Minor adverse	Minor adverse	TBC – Assumed no greater than construction	**Construction:** No greater than individually assessed impact. The proposed mitigation would minimise the potential for the direct disturbance of watercourses, the direct (from in-channel works) and indirect (from activities in the vicinity of the channel) supply of fine sediment and contaminants, and changes to surface hydrology and flow patterns during the construction phase. It is therefore considered there would be no pathway for interaction to exacerbate the potential impacts associated with these activities during construction. **Operation:** No greater than individually assessed impact. There would be no direct disturbance during operation, and further measures would be in place to prevent the accidental release of contaminants or changes to flow patterns during operation. It is therefore considered there would be no pathway for interaction to exacerbate the potential impacts associated with these activities during operation. **Decommissioning:** No greater than individually assessed impact. For assessment purposes, it is assumed that decommissioning impacts will be of similar nature and no worse than construction impacts.	No greater than individually assessed impact. The greatest effect significance would occur during the construction of trenched watercourse crossings. Once this disturbance impact has ceased all further impact during construction and operation will be small scale, highly localised and episodic. It is therefore considered that over the Project's lifetime these impacts would not combine to change the overall effect significance of any of the impacts identified in this assessment.

Receptor	Impact ID	Highest Significance Level			Phase Assessment	Lifetime Assessment
		Construction	O&M	Decommissioning		
Groundwater catchments	WRF-C-01 WRF-C-02 WRF-C-03 WRF-C-04 WRF-O-03 WRF-O-04	Minor adverse	Minor adverse	TBC – Assumed no greater than construction	**Construction:** No greater than individually assessed impact. The proposed mitigation would minimise the potential for the introduction of contaminants to groundwater during construction. It is therefore considered there would be no pathway for interaction to exacerbate the potential impacts associated with these activities during construction. **Operation:** No greater than individually assessed impact. The BSMP (Commitment ID CO79, **Table 21-4** and **Table 21-6**) at the ESBI will prevent contamination during operation. Furthermore, the small scale and relative shallowness of the permanent infrastructure means that impacts on groundwater flows during operation are minimal. It is therefore considered there would be no pathway for interaction to exacerbate the potential impacts associated with these activities during operation. **Decommissioning:** No greater than individually assessed impact. For assessment purposes, it is assumed that decommissioning impacts will be of similar nature and no worse than construction impacts.	No greater than individually assessed impact. The greatest magnitude of impact will occur as a result of subsurface excavations during the construction phase. Once this disturbance impact has ceased, any further impact would be small scale, highly localised and episodic. The BSMP (Commitment ID CO79, **Table 21-4** and **Table 21-6**) at the ESBI will prevent contamination during operation. It is therefore considered that over the Project's lifetime these impacts would not combine to change the overall effect significance of any of the impacts identified in this assessment.

21.10 Monitoring Measures

310. As noted in Commitment ID CO34, flood defence monitoring may be required where the onshore export cables cross flood defences. This will likely require monitoring to ensure there is no detrimental impact to flood defences (i.e. no settlement occurs as a result of trenchless installation techniques). Further details will be included in the Outline CoCP to inform the CoCP to be developed post-consent (Commitment ID CO39).

21.11 Summary

311. **Table 21-38** presents a summary of the preliminary results of the assessment of likely significant effects on water resources and flood risk during the construction, operation and decommissioning of the Project. For all impacts and phases of the Project that have been assessed, effect significance is either negligible or minor adverse with embedded mitigation measures in place.

21.12 Next Steps

312. The next steps for water resources and flood risk are to:

- Update the baseline environment and impact assessment within the ES to reflect refinements to the Onshore Development Area boundaries.
- Update the baseline environment and impact assessment within the ES to reflect any refinements made to the Project Design Envelope and the onshore crossing schedule (**Volume 2, Appendix 4.3 Crossing Schedule – Onshore**) at ES stage.
- Update the ES to reflect the outcome of further stakeholder engagement such as through the EPP or statutory consultation.
- The Outline CoCP (as noted in Commitment ID CO39, **Table 21-4** and **Table 21-5**) will also be updated at ES stage based on further refinements to the Onshore Development Area boundaries and Project Design Envelope.
- The short list of projects with the potential for cumulative effects will be reviewed and the CEA updated as relevant.

Table 21-38 Summary of Potential Effects Assessed for Water Resources and Flood Risk

Impact ID	Impact and Project Activity	Embedded Mitigation Measures	Receptor	Receptor Sensitivity	Impact Magnitude	Effect Significance	Additional Mitigation Measures	Residual Effect	Monitoring Measures
Construction									
WRF-C-01	Direct disturbance of surface water bodies – trenched watercourse (cable) crossings, temporary (haul road watercourse crossings) and construction activities at the OCS and ESBI	CO32 CO33 CO35 CO36 CO37 CO39	Surface water catchments	**Low** to **High**	**No Impact** to **Low**	**No Change to Minor Adverse (Not Significant)**	N/A	**No Change to Minor Adverse (Not Significant**	N/A
WRF-C-02	Increased sediment supply – construction activitiess at the landfall, onshore ECC and OCS zone	CO32 CO33 CO39 CO43 CO46	Surface water catchments	**Low** to **High**	**Negligible** to **Low**	**Negligible to Minor Adverse (Not Significant)**	N/A	**Negligible to Minor Adverse (Not Significant)**	N/A
WRF-C-03	Supply of contaminants to surface and groundwater – construction activities at the landfall, onshore export cable corridor (ECC) and OCS zone	CO32 CO33 CO38 CO39 CO40 CO46	Surface water and groundwater catchments	**Low** to **High**	**Negligible** to **Low**	**Negligible to Minor Adverse (Not Significant)**	N/A	**Negligible to Minor Adverse (Not Significant)**	N/A
WRF-C-04	Changes to surface and groundwater flows and flood risk– construction activitiess at the landfall, onshore ECC and OCS zone	CO32 CO34 CO35 CO39 CO43	Surface water and groundwater catchments	**Low** to **High**	**Negligible** to **Low**	**Negligible to Minor Adverse (Not Significant)**	N/A	**Negligible to Minor Adverse (Not Significant)**	N/A

Impact ID	Impact and Project Activity	Embedded Mitigation Measures	Receptor	Receptor Sensitivity	Impact Magnitude	Effect Significance	Additional Mitigation Measures	Residual Effect	Monitoring Measures
Operation and Maintenance									
WRF-O-03	Supply of contaminants to surface and groundwater – operation of the ESBI with respect to firewater and planned and unplanned O&M activities	CO44 CO49 CO79	Surface water and groundwater catchments	**Low** to **High**	**No Impact** to **Low**	**No Change to Minor Adverse (Not Significant)**	N/A	**No Change to Minor Adverse (Not Significant)**	N/A
WRF-O-04	Changes to surface and groundwater flows and flood risk – presence of permanent above-ground infrastructure	CO44 CO79	Surface water and groundwater catchments	**Low** to **High**	**No Impact** to **Low**	**No Change Minor Adverse (Not Significant)**	N/A	**No Change to Minor Adverse (Not Significant)**	N/A
Decommissioning									
WRF-D-01	Direct disturbance of surface water bodies – decommissioning activities not yet defined	CO56	The details and scope of onshore decommissioning works will be determined by the relevant regulations and guidance at the time of decommissioning and provided in the Onshore Decommissioning Plan (see **Table 21-4**, Commitment ID CO56). This will include a detailed assessment of decommissioning impacts and appropriate mitigation measures to avoid significant effects. For this assessment, it is assumed that impacts during the decommissioning phase would be of similar nature to, and no worse than, those identified during the construction phase.						
WRF-D-02	Increased sediment supply – decommissioning activities not yet defined								
WRF-D-03	Supply of contaminants to surface and groundwater – decommissioning activities not yet defined								
WRF-D-04	Changes to surface and groundwater flows and flood risk – decommissioning activities not yet defined								

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List of Acronyms

Acronym	Definition
CoCP	Code of Construction Practice
DWPA	Drinking Water Protected Areas
DWSZs	Drinking Water Safeguard Zones
ECC	Export Cable Corridor
ESBI	Energy Storage and Balancing Infrastructure
FWMA	Flood and Water Management Act
IDB	Internal Drainage Board
LLFA	Lead Local Flood Authority
NPPF	National Planning Policy Framework
NRW	Natural Resources Wales
OCS	Onshore Converter Station
PAHs	Polycyclic aromatic hydrocarbons
PBDE	Polybrominated diphenyl ethers
PEIR	Preliminary Environmental Information Report
PFAS	Per - and polyfluoroalkyl substances
PFOS	Perfluorooctane sulfonate
PPG	Planning Policy Guidance
PPP	Pollution Prevention Plan
RBD	River Basin District
RBMP	River Basin Management Plan
SFRA	Strategic Flood Risk Assessment
SPA	Special Protected Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
WER	Water Environment Regulations
WFD	Water Framework Directive