DOGGER BANK D WIND FARM

Preliminary Environmental Information Report

Volume 2
Appendix 21.3 Flood Risk Assessment

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Table of Contents

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 which is being developed by National Grid Electricity Transmission and does not form part of the Project.
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.
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.
Expert Topic Group (ETG)	A forum for targeted technical engagement with relevant stakeholders through the EPP.
Grid Connection	The offshore and onshore electricity transmission network connection to Birkhill Wood Substation.
Haul Roads	Temporary tracks set aside to facilitate transport access during onshore construction works.
Impact	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.
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.

Term	Definition
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).
Project Design Envelope	A range of design parameters defined where appropriate to enable the identification and assessment of likely significant effects arising from a project's worst-case scenario. The Project Design Envelope incorporates flexibility and addresses uncertainty in the DCO application and will be further refined during the EIA process.
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.
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.
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 (DBD) 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.

21.3 Flood Risk Assessment

21.3.1 Introduction

1. This appendix to the Dogger Bank D Offshore Wind Farm (hereafter 'the Project' or 'DBD') Preliminary Environmental Information Report (PEIR) supports **Volume 1**, **Chapter 21 Water Resources and Flood Risk.** This appendix forms part of the PEIR for the onshore elements of the Project.

2. The purpose of this appendix is to provide a Flood Risk Assessment (FRA) for the Onshore Development Area of the Project during the construction, operation and maintenance (O&M) and decommissioning phases. The onshore elements of the Project will include the landfall, Onshore Converter Station (OCS) zone in which the OCS and Energy Storage and Balancing Infrastructure (ESBI) will be co-located and the onshore export cable corridor (ECC) from the landfall to the OCS zone and onwards to the grid connection point at Birkhill Wood Substation. A full description of the Project is provided in **Volume 1, Chapter 4 Project Description.**

21.3.2 Approach to Assessment

3. The flood risk assessment has been prepared in accordance with the methodology and guidance set out in the following:

   - Overarching National Policy Statement (NPS) for Energy (EN-1) (Department for Energy, Security and Net Zero (DESNZ), 2024a);
   - National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government (MHCLG), 2024);
   - Planning Practice Guidance (PPG) for Flood Risk and Coastal Change (MHCLG, 2022); and
   - Environment Agency's climate change allowance guidance (Environment Agency, 2022).

4. The relevance and the applicability of this policy and guidance has been considered and summarised within this FRA where appropriate. In addition, the appropriate climate change allowances have been reviewed and included in **Section 21.3.12.**

5. Due to the scale of the Project, which is spanning an area from the coastline of the East Riding of Yorkshire at Skipsea to the grid connection point at the Birkhill Wood Substation, south of Beverley, the flood risk varies across the Onshore Development Area. Therefore, the Onshore Development Area has been sub-divided into key sections within this document to aid the assessment.

6. The flood risk for the onshore elements of the Project are addressed separately in this FRA report, as outlined below:

   - Landfall (**Section 21.3.7**);
   - Onshore ECC (**Section 21.3.8**);
   - OCS zones (**Section 21.3.9**); and
   - Temporary construction compounds (**Section 21.3.10**).

7. At this stage, two OCS zone options (i.e. Zone 4 and Zone 8) are included in the Onshore Development Area. To maintain flexibility for routeing onshore export cables to / from the two OCS zones under consideration and onwards to the grid connection point at Birkhill Wood Substation, the onshore ECC diverges into two corridor sections (i.e. northern and southern corridor sections) east of Zone 8. The northern corridor section is being considered for both Zone 4 and Zone 8, while the southern corridor section only applies to Zone 8. Only one OCS zone and one corridor section will be taken forward to development. Within this FRA, the two OCS zone options and the two corridor sections are assessed separately where relevant.

8. This FRA is structured to introduce all relevant policies and guidance related to flood risk, prior to identifying the existing flood risk for each onshore element of the Project. This includes both the temporary and permanent works associated with the Project within the Onshore Development Area and consideration of the proposed crossing methodology for various different types of watercourses along the onshore ECC as shown on **Figure 21.3-1**. It also includes Internal Drainage Board (IDB) maintained drains as shown on **Figure 21.3-2**, that would be crossed by the Project.

9. It should be noted that the flood extents related to the Environment Agency Flood Zones apply only to areas landward of Mean High Water Springs (MHWS). Therefore, this FRA only considers flood risk above MHWS.

10. Due to the timing of drafting this FRA, 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 into the ES stage FRA.

11. 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. **Table 21-4** within **Volume 1, Chapter 21 Water Resources and Flood Risk** identifies proposed embedded mitigation measures that are relevant to the water resources and flood risk assessment. Cross references are provided within the FRA to relevant commitments. Full details of all commitments made by the Project are provided in **Appendix 6.3 Commitments Register**.

21.3.3 Policy and Legislation

21.3.3.1 National Policy Statements

12. Planning policy relevant to energy National Significant Infrastructure Projects (NSIP) is set out in the NPS. The NPS relevant to this FRA are:

- Overarching NPS for Energy (EN-1) (DESNZ, 2024a);
- NPS for Renewable Energy Infrastructure (EN-3) (DESNZ, 2024b); and
- NPS for Electricity Networks Infrastructure (EN-5) (DESNZ, 2024c).

13. The FRA has been prepared with reference to specific requirements in these NPS, the relevant parts of which are summarised in **Table 21.3-1** along with a description of how and where they have been considered in this FRA.

Table 21.3-1 Summary of Relevant National Policy Statement Requirements for the Flood Risk Assessment

NPS Reference and Requirement	How and Where Considered in the Appendix
NPS for Energy (EN-1)	
Paragraphs 5.8.13 and 5.8.14: "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, as assessment should accompany all proposals involving: sites of 1ha or more. This assessment 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."	A site-specific FRA has been progressed for the onshore elements of the Project, which is considered throughout this appendix. Throughout the FRA, the risk of flooding has been assessed for all sources including fluvial, tidal, surface water, groundwater, sewer and any other potential sources. These have all been discussed for each onshore element of the Project, and these can be found, respectively, in these sections: • Landfall (**Section 21.3.7**); • Onshore ECC (**Section 21.3.8**); • OCS zones (**Section 21.3.9**); and • Temporary construction compounds **(Section 21.3.10**).
Paragraph 5.8.17: "Development (including construction works) will need to account for any existing watercourses and flood and coastal erosion risk management structures or features. This is to ensure: • Access, clearances and sufficient land are retained to enable their maintenance, repair, operation, and replacement, as necessary. • Their standard of protection is not reduced • Their condition or structural integrity is not reduced."	The FRA has taken into account the existing watercourses during both the construction and operational life of the Project, which is covered by the flood risk and mitigation measures discussed in **Section 21.3.13.**
Paragraph 5.8.21: "The Sequential Test ensures that a sequential, risk-based approach is followed to steer new development to areas with the lowest risk of flooding, taking all sources of flood risk and climate change into account. Where it is not possible to locate development in low-risk areas, the Sequential Test should go on to compare reasonably available sites with medium risk areas and then, only where there are no reasonably available sites in low and medium risk areas, within high-risk areas."	The Sequential Test has been considered in **Section 21.3.12** for all onshore elements of the Project. Where it is concluded that the Sequential Test has not been able to be met, the Exception Test has also been considered.
Paragraph 5.8.26: "Site layout and surface water drainage systems should cope with events that exceed the design capacity of the system, so that excess water can be safely stored on or conveyed from the site without adverse impacts." Paragraph 5.8.27: "The surface water drainage arrangements for any projects should, account for the predicted impact of climate change throughout the developments lifetime, be such that the volumes and peak flow rates of surface water leaving the site are no greater than the rates prior to the proposed project, unless specific off-site arrangements are made and result in the same net effect."	The FRA references the need to address surface water drainage including the predicted impact of climate change. Measures to address surface water drainage during the construction phase will be included in the **Outline Code of Construction Practice** (CoCP) (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**). Measures to address surface water drainage during the O&M phase will be included within the Outline Operational Drainage Strategy to be provided at Environmental Statement (ES) stage (Commitment ID CO44).

NPS Reference and Requirement	How and Where Considered in the Appendix
Paragraph 4.10.3: "To support planning decisions, the government produces a set of UK Climate Projections as well as hazard-specific tools and guidance like the Environment Agency's climate change allowances for flood risk assessments." Paragraph 4.10.17: "Any adaptation measures should be based on the latest set of UK Climate Projections, the government's latest UK Climate Change Risk Assessment, when available, and in consultation with the EA's Climate Change Allowances for Flood Risk Assessments."	Throughout the FRA, the impact of climate change in relation to the onshore elements of the Project has been assessed, which is covered in **Section 21.3.11**.
NPS for Renewable Energy Infrastructure (EN-3)	
Paragraph 2.4.8: "Whilst offshore wind farms will not be affected by flooding, 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." Paragraph 2.8.11: "The construction, operation and decommissioning of offshore energy infrastructure including the preparation and installation of the cable route and any electrical networks infrastructure can affect the following elements of the physical offshore environment, which can have knock on impacts on other biodiversity receptors."	Throughout the FRA, it has been confirmed that, once operational, the risk to the onshore ECC will be low and that it will be resilient to future climate change as most infrastructure components associated with the onshore ECC (with the exception of above-ground link boxes where required) will be located below ground Overall, it is concluded that these will be at low risk of flooding and therefore the flood risk to the Project is low. The main risk to the Project would be posed during construction of onshore export cable infrastructure, but this will only be temporary in nature. The flood mitigation measures are discussed further in **Section 21.3.13.** With regard to the risk to the OCS and ESBI, OCS Zone 8 will be located in Flood Zone 1. However, if the OCS and ESBI is located in Zone 4, micro-siting of critical infrastructure to Flood Zone 1 will be to be considered as a site selection principle (see **Volume 1, Chapter 5 Site Selection and Consideration of Alternatives**) or, alternatively, further mitigation measures will be required if located in Flood Zone 2 or Flood Zone 3. Therefore, these measures should ensure that the development is safe from flooding and that flooding is not increased elsewhere. The flood mitigation measures are discussed in **Section 21.3.13.**

NPS Reference and Requirement	How and Where Considered in the Appendix
NPS for Electricity Networks Infrastructure (EN-5)	
Paragraph 2.3.3: "Section 4.9 EN-1 advises that the resilience of the project to the effects of climate change must be assessed in the Environmental Statement (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)."	Throughout the FRA, the onshore elements of the Project have been assessed to ensure that the flood risk will not be increased elsewhere and that the Project will be safe from flooding during its O&M phase.

21.3.3.2 Other Policy and Legislation

14. In addition to the NPS, other policy and legislation relevant to the FRA is summarised in the following sections.

21.3.3.2.1 National Policy and Guidance

21.3.2.1.1 National Planning Policy Framework

15. The NPPF sets out the UK Government's planning policies for England and seeks to ensure that flood risk is considered at all stages of the planning and development process. Its policies aim to avoid inappropriate development in areas at highest risk of flooding and to direct development away from these areas.

16. The revised NPPF (MHCLG, 2024) provides clarification that all strategic policies and plans should apply a sequential, risk-based approach to the location of development, taking into account all sources of flood risk (e.g. fluvial, coastal, surface water, groundwater, reservoir and sewer flooding). It also provides guidance of how this is to be considered in the context of the location of site-specific development.

21.3.2.1.2 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 PPG for Flood Risk and Coastal Change (MHCLG, 2022), which was updated on 25th August 2022. This covers all sources of flood risk, Flood Zones and the Vulnerability Classification relevant to the development.

18. Within Paragraph 27 of the PPG, guidance on nationally or regionally important infrastructure is as follows:

"For nationally or regionally important infrastructure the area of search to which the Sequential Test could be applied will be wider than the local planning authority boundary".

19. As required for NSIP, the Project has been subject to an extensive site selection process, detailed in **Volume 1, Chapter 5 Site Selection and Consideration of Alternatives**. This process included an assessment of flood risk issues. Further site selection refinements will be undertaken post-PEIR to inform the Development Consent Order (DCO) application submission, the outcomes of which will be reported at ES stage.

20. For the purposes of the FRA, the application of a sequential approach has been considered based on the indicative flood risk issues related to the onshore elements of the Project. This approach focuses specifically on the above-ground infrastructure once the Project is operational, which comprise the OCS and ESBI co-located within an OCS zone and link boxes within the onshore ECC where they are located above-ground.

21. This assessment has sought to consider the potential flood risk from all sources in greater detail with the aim of sequentially locating it, wherever possible, to avoid the risk. Further details with regard to the consideration of the Sequential Test and, where necessary, the Exception Test are provided in **Section 21.3.12** of this FRA.

22. The Environment Agency has modelled data to inform the Flood Zones and this can be found on the Environment Agency Flood Map for Planning website (Environment Agency, 2024), which has also been reproduced for ease of reference on **Figure 21.3-5**.

23. It is important to note that the Flood Zones on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take into account the possible impacts of climate change and consequences in the future. In addition, they do not differentiate between Flood Zone 3a (high probability of flooding) and Flood Zone 3b (Functional Floodplain). Therefore, the Strategic Flood Risk Assessment (SFRA) has also been considered in the context of the potential flood risk, as it provides information on both of these factors.

24. All designated Main Rivers, as well as some of the larger Ordinary Watercourses are included in the modelling and therefore are considered within the Flood Zone dataset.

25. Flood Zones are defined in Table 1 of the PPG (MHLCG, 2022) as provided in **Table 21.3-2**.

Table 21.3-2 Flood Zones

Flood Zone	Definition
Flood Zone 1 (Low probability)	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 Flood Zones 2, 3a and 3b)
Flood Zone 2 (Medium Probability)	• 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 (Shown as 'light blue' on the Flood Map).
Flood Zone 3a (High Probability)	• Land having a 1% or greater annual probability of river flooding; or • Land having a 0.5% or greater annual probability of sea flooding (Shown as 'dark blue' on the Flood Map).

Flood Zone	Definition
Flood Zone 3b (Functional Floodplain)	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: • land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or • land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map).

26. The PPG provides guidance on how the Sequential Test should be applied to other sources of flooding, and specifically surface water flooding. When considering the risk of flooding from surface water, the online national mapping, showing surface water flood extents, has been considered alongside the above Flood Zone information and reproduced for ease of reference on **Figure 21.3-5**.

21.3.2.1.3 Surface Water Flood Risk

27. The Environment Agency has modelled surface water, published online, to show the risk of surface water flooding. The mapping gives an indication of whether an area may be affected by surface water flooding and to what extent.

28. There are four levels of flood risk defined by the Environment Agency (2013), which are provided in **Table 21.3-3**.

Table 21.3-3 Surface Water Flood Risk

Flood Risk	Definition
High	Each year the area has a chance of flooding of greater than one in 30 (3.3%)
Medium	Each year the area has a chance of flooding of between one in 100 (1%) and one in 30 (3.3%)
Low	Each year the area has a chance of flooding of between one in 1,000 (0.1%) and one in 100 (1%)
Very Low	Each year the area has a chance of flooding of less than one in 1,000 (0.1%)

29. Further information on the depth and velocity of the surface water are available on the Environment Agency website. The depths and velocity are available in high, medium and low annual exceedance events.

21.3.2.1.4 Environment Agency's Climate Change Allowances

30. The Environment Agency originally published its guidance on climate change allowances for Flood Risk Assessments in February 2016, which was subsequently updated in July 2021 and May 2022.

31. The latest climate change guidance sets out the Environment Agency's recommended climate change allowances for development when considering flood risk and coastal change for planning purposes as well as for informing FRA and SFRA (Environment Agency, 2022).

32. The Onshore Development Area is located solely within the Hull and East Riding Management Catchment and therefore values for this Management Catchment have been used within this FRA when assessing the potential future impact of climate change on flood risk.

33. The Environment Agency guidance includes criteria on how to apply peak river allowances as well as the approach with regard to peak rainfall allowances. The guidance on peak river flow allowances included the use of UK Climate Projections (UKCP18). It also includes guidance on how to apply peak river flow allowances such that the Central allowance is to be adopted for all assessments except for Essential Infrastructure, where the Higher Central allowance is to be applied (as discussed further in **Section 21.3.11**).

34. The guidance on the values for peak rainfall allowance are provided for 1% annual probability events and for 3.3% AP events, as well as two future epochs. Furthermore, the guidance notes the approach to adopt for the application of peak rainfall allowances, confirming that the Central allowance should be used for development with a lifetime up to 2100 and the Upper End allowance should be used for development with a lifetime from 2100 to 2125.

21.3.3.2.2 Local Policy and Guidance

21.3.2.2.1 East Riding Local Plan Update 2025-2039

35. As the Project comprises the construction of an offshore wind farm and the associated offshore and onshore transmission infrastructure, the relevant policies in the East Riding Local Plan Update 2025 – 2039 (adopted in 2025) have been considered as follows:

Policy S1: Sustainable Development states:

"When considering development proposals the council will take a positive approach that reflects the three overarching objectives of sustainable development as set out in paragraph 8 of the National Planning Policy Framework, economic, social and environmental, whilst taking into account local circumstances. It will work proactively with applicants to find solutions that mean proposals can be approved wherever possible, and to secure development supporting the council's Vision and Objectives for the Local Plan and the other documents which make up the development plan.

Proposals should ensure that, where appropriate, development will support the future sustainable growth of settlements. Future access and connectivity to neighbouring land should be taken into consideration."

Policy S2: Addressing Climate Change states:

"Development proposals will be supported where they reduce the generation of additional greenhouse gas emissions and incorporate adaptation to the expected impacts of climate change. This will be accomplished by:

- *Directing most new development to areas where there are services, facilities, homes and jobs, reducing the need to travel and where it can be served more easily and viably by sustainable modes of transport.*
- *Efficiently using land, mineral, energy and water resources.*
- *The re-use of the area's building stock and previously developed land.*
- *Building at higher densities where appropriate and supporting opportunities for mixed use development.*
- *Promoting sustainable modes of transport and well-connected places.*
- *Promoting the creation of economic clusters for the renewable and low carbon energy sector.*
- *Incorporating high standards of sustainable design and construction which involve design approaches minimising energy demands, the prudent and efficient use of natural resources, and built-in resilience to the impacts of climate change (e.g. overheating, flood risk).*
- *Incorporating renewable, low carbon and decentralised energy generation and heat networks in appropriate locations and schemes where possible.*
- *Supporting proposals that protect, enhance and link habitat networks to allow biodiversity to adapt to climate change.*
- *Conserving, enhancing and linking green infrastructure networks to provide flood management, shading in areas of built development and natural air conditioning.*
- *Steering development away from areas of high flood risk as far as possible, and ensuring development is as resilient as possible to any residual risks.*
- *Supporting effective on-site water management such as Sustainable Drainage Systems and wider flood management proposals.*
- *Implementing the most recent Shoreline Management Plan and Humber 2100+ strategy. N. Managing development in coastal areas and facilitating the re-location /roll back of development from areas between Barmston and Spurn Point.*
- *Exploiting carbon capture approaches through the protection and restoration of existing 'carbon sinks' such as peat bogs and coastal ecosystems, the creation and expansion of woodland, and the deployment of new technologies.*
- *Support the development of infrastructure, such as hydrogen transportation, that facilitates decarbonisation."*

36. **Policy ENV6: Managing Environmental Hazards** states:

"Environmental hazards, such as flood risk, coastal change, nutrient deposition, aerial pollution, groundwater pollution and other forms of pollution, will be managed to ensure that development does not result in unacceptable consequences to its users, the wider community, and the environment.

Flood Risk

The risk of flooding to development, from all sources both now and in the future, will be managed by applying a sequential test to ensure that development is steered towards areas of lowest risk, as far as possible. The sequential test will, in the first instance, be undertaken on the basis of the East Riding Strategic Flood Risk Assessments (SFRA) and the Environment Agency's Flood Maps, within appropriate search areas. The order of preference for the sequential test is set out in the relevant SFRA, with preference given to reasonably available sites that are in the lower risk / hazard zones. Where necessary, development must also satisfy the exception test.

If, following application of the sequential test, it has not been possible to successfully steer development to a site at low risk of flooding from all sources now and in the future, a sequential approach will be taken to site layout and design, aiming to steer the most vulnerable uses towards the lowest risk parts of the site and upper floors

Flood risk from all sources will be proactively managed by:

Ensuring that new developments:

- *limit surface water run-off to existing run-off rates on greenfield sites, on previously developed land reduce existing run-off rates by a minimum of 30 per cent , or to greenfield run-off rate, and in the Living With Water Area (see Figure 15 and the Policies Map), support proposals that make a reduction in runoff beyond greenfield rates;*
- *do not increase flood risk within or beyond the site;*
- *incorporate Sustainable Drainage Systems (SuDS) into major development proposals and proposals at risk of flooding, unless demonstrated to be inappropriate;*
- *ensuring SuDS provide multi-functional benefits, where appropriate;*
- *do not culvert or otherwise build over watercourses, unless supported by the Risk Management Authority and an appropriate the Water Framework Directive Assessment, as required by Policy ENV5. Where practical existing culverts should be removed;*
- *have a safe access/ egress route from/to areas at low risk of flooding now and in the future or establish that it will be safe to seek refuge at a place of safety within a development;*
- *incorporate flood resistant and resilient mitigation that meets the design risk and residual risk now and in the future; viii. are adequately set-back from all watercourses, including culverted stretches, in line with the advice of the relevant Risk Management Authority; and*
- *adhere to other relevant SFRA recommendations*

Supporting proposals for sustainable flood risk management, including the creation of new and / or improved flood defences, water storage areas and other schemes, provided they would not cause unacceptable adverse environmental, social, or economic impacts.

Supporting the removal of existing culverting and returning these sections to open watercourse.

Designating areas of Flood Zone 3b (Functional Floodplain) and safeguarding land for current and future flood risk management, on the Policies Map Update.

Coastal Change

Development likely to be affected by coastal change will be proactively managed by designating a Coastal Change Management Area (CCMA) on the Policies Map Update.

Within the CCMA proposals will be supported where it is ensured that:

- *The development is safe from the risks associated with coastal change for its intended lifespan;*
- *The development does not have an unacceptable impact on nature conservation, heritage and / or landscape designations;*
- *Sites to be vacated as a result of relocation / roll back or expiry of a temporary permission, will be cleared and restored to a natural state, with net sustainability benefits and, where appropriate, public access to the coast; and*
- *The development has an acceptable relationship with coastal settlements in relation to character, setting, residential amenity and local services."*

37. This FRA has considered flood risk to the Project in the context of the above policies set out in the adopted 2025 Local Plan Update.

21.3.2.2.2 Flood Risk Sequential and Exception Test Supplementary Planning Document

38. In addition, to the 2025 Local Plan Update, ERYC prepared a Supplementary Planning Document (SPD), which sets out the process that will be followed when considering flood risk.

39. The SPD was adopted in November 2021 and provides further guidance on the application of **Policy ENV6: Managing Environmental Hazards**.

40. The SPD replaces the 2010 Flood Risk Note which was updated in 2021 to become the SPD. It was updated to reflect the revised 2021 NPPF, which was current at the time of the update, and the new evidence base available including the SFRA.

41. The SPD sets out the data and information that ERYC expects to be reviewed when undertaking the Sequential Test process and the extent of the search area to be considered based on development type.

42. It is confirmed that the guidance and datasets named in the SPD have been subject to consideration when assessing the appropriateness of the Project in the context of flood risk within this FRA.

21.3.2.2.3 Preliminary Flood Risk Assessment

43. A Preliminary Flood Risk Assessment (PFRA) was produced by ERYC in 2011 to meet the requirements of the Flood Risk Regulations 2009 (FRR) and the European Floods Directive.

44. The PFRA provides a high-level overview of the potential risk of flooding from local sources and identifies areas at risk of flooding which may require more detailed studies. The PFRA is used to inform the development of the Local Flood Risk Management Strategy (LFRMS) and has been considered in the SFRA.

21.3.2.2.4 Local Flood Risk Management Strategy

45. The East Riding of Yorkshire LFRMS 2015 – 2027 was produced in 2015. The LFRMS outlines the aims and the strategic objectives of ERYC in their role as Lead Local Flood Authority (LLFA) to reduce the probability of flooding in the East Riding and its impacts. Policies in the Strategy have also been provided based on these aims.

46. There is a requirement to identify flood risk areas including those areas in Flood Zone 1 which have critical drainage problems and which have been notified as a flood risk area to the local authority by the Environment Agency. These are also referenced by the Environment Agency as critical drainage areas.

47. Consideration of CDA is necessary to inform key flood risk priorities. The East Riding LFRMS does not reference areas designated as CDA. Therefore, it is concluded that the Onshore Development Area is not located within areas designated as CDA.

48. It is noted that drainage catchments have been considered within the East Riding LFRMS and these are based on a number of hydraulic catchments. The mapping indicates that the landfall, onshore ECC and OCS zones fall within the Barmston Main Drain and the River Hull catchments.

49. In addition, the East Riding LFRMS notes that the Kingston upon Hull and Haltemprice catchment has been designated by the Government as a relevant flood risk area.

50. A review of the mapping indicates that the Kingston upon Hull and Haltemprice catchment is located to the south of the OCS zones. However, neither appear to be located within this catchment and therefore the conclusions for this flood risk area are not considered further in this FRA.

51. Furthermore, Policy C1: Providing Infrastructure and facilities within the East Riding LFRMS states:

"Proposals for new and / or improved infrastructure and facilities will be supported where they enhance the quality and range of services and facilities or facilitate delivery of new development needs."

52. As the Project comprises the construction of an offshore wind farm and associated offshore and onshore transmission infrastructure, it is concluded that this infrastructure will enhance the use of renewable energy within the local area, as well as at a national scale.

21.3.2.2.5 Strategic Flood Risk Assessment

53. An SFRA is a high-level strategic document carried out by local authorities to provide a comprehensive and robust appraisal of the extent and the nature of flood risk from all sources of flooding, at present and in the future. The SFRA takes into account the impacts of climate change and assesses the impact that land use changes and development are likely to have on flood risk.

54. The East Riding of Yorkshire Level 1 SFRA, was formally adopted in November 2019. The SFRA covers the entire administrative area of the East Riding of Yorkshire. The Level 1 SFRA includes the following information relating to flood risk.

55. A review of the Level 1 SFRA has confirmed that the landfall, onshore ECC and OCS zones lie within areas of Flood Zone 1, 2, 3a and 3b. The Level 1 SFRA also provides an overview from other sources of flooding such as surface water, groundwater as well as historic flooding. It also provides information to differentiate between Flood Zone 3a (high probability of flooding) and Flood Zone 3b (Functional Floodplain).

56. The Level 1 SFRA notes that the primary fluvial / tidal flood risk in East Riding is associated with the Humber Estuary, River Hull, River Aire, River Derwent, Market Weighton canal, River Ouse and Dutch River. However, it also notes that much of the ERYC administrative area is defended against fluvial and coastal flooding.

57. As such, much of the flood risk to the area is residual and likely to be as a result of flood events exceeding the standard of protection afforded by the defence, failure in the defence or a pumping failure, or flooding behind the defences due to local runoff or groundwater.

58. The Level 1 SFRA also notes that coastal flood risk will be influenced by coastal erosion. In the future, this may introduce areas to the risk of flooding where localised high ground or smaller sea cliffs are eroded away. This effect may be accelerated by climate change (e.g. sea level rise) or as a result of changing wave climate. As such, it indicates that Shoreline Management Plans (SMP) should be referenced in areas where coastal erosion may increase the risk of coastal flooding now or in the future.

59. The Onshore Development Area is located wholly within the East Riding of Yorkshire administrative boundary and given that the study area of the Level 1 SFRA covers all the onshore elements of the Project, as demonstrated by Appendix A of the Level 1 SFRA, the information within the Level 1 SFRA has been considered during the production of this FRA.

60. ERYC has also prepared a Level 2 SFRA (2020) for Goole and Hedon. The Onshore Development Area is located outside the study area for the Level 2 SFRA, and therefore, this has not been considered further in this FRA.

21.3.2.2.6 Catchment Flood Management Plans

61. Catchment Flood Management Plans (CFMP) consider all types of inland flooding including from rivers, groundwater, surface water and tidal flooding. Flooding directly from the sea (coastal flooding) is covered in the SMP.

62. CFMP consider the likely impacts climate change, the effects of how we manage the land and how areas can be developed sustainably to establish flood risk management policies which will deliver sustainable flood risk management for the long term.

63. The Onshore Development Area is located within the study area of the Hull and Coastal Streams Catchment Flood Management Plan, and as such, the information provided in the CFMP is considered in the production of this FRA.

21.3.2.2.7 Shoreline Management Plans

64. Shoreline Management Plans (SMP) are non-statutory plans for coastal defence management planning. They aim to identify the best ways to manage flood and erosion risk and develop an 'intent of management' for the shoreline.

65. The Onshore Development Area, and specifically the landfall to the south-east of Skipsea, is located within the study area of the Flamborough Head to Gibraltar Point SMP.

66. The landfall is located in the Wilsthorpe to Atwick Sub-Section 3, where the policy for the short term, medium term and long term is 'No Active Intervention'. The SMP notes for this policy unit that:

"No Active Intervention will occur though all epochs. However, works may be necessary to maintain the functionality of the Barmston Drain. Management approaches depend in funding and relevant approvals and permissions. Adaptation to coastal change may be needed. If defences are present, some risk from flooding, erosion and ground instability may remain".

67. The information included in the SMP has been considered in this FRA, specifically in relation to the landfall.

21.3.4 Consultation

68. Topic-specific consultation in relation to flood risk has been undertaken in line with the process set out in **Volume 1, Chapter 7 Consultation**. A Scoping Opinion from the Planning Inspectorate was received on 2nd August 2024, which has informed the scope of the assessment presented within this FRA.

69. 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 FRA. Details of technical consultation undertaken to date on flood risk are provided in **Table 21.3-4.** Stakeholder feedback and comments received through consultation that are relevant to the FRA have been addressed in **Appendix 21.1 Consultation Responses for Water Resources and Flood Risk**.

Table 21.3-4 Technical Consultation Undertaken to Date on Flood Risk

Meeting	Stakeholder(s)	Date(s) of Meeting / Frequency	Purpose of Meeting
ETG Meetings			
ETG10 (Water Resources and Flood Risk) Meeting 02	Environment Agency ERYC Beverley and North Holderness IDB	24/09/2024	To discuss and respond to comments raised in the Scoping Opinion and agree the assessment scope and methodology and approach to data collection.
Other Technical Consultation			
Email Correspondence	Environment Agency	Request submitted on 19/08/2024 Response received on 18/09/2024	To obtain Product 4, 5 and 8 data (i.e. detailed flood risk data such as mapping, models and data)
Email Correspondence	LLFA (ERYC)	Request submitted on 196/08/2024 Response received on 21/08/2024	To obtain information related to surface water flooding, historic data and other relevant information applicable to the Project.

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

21.3.5 Permitting and Consents

71. Any works, either temporary or permanent, which will alter the flow of water along a watercourse or require the erection of a culvert, bridge or modification of a channel will require consent from the relevant authorities such as the Environment Agency, LLFA or IDB.

72. As set out in the Environmental Permitting (England and Wales) Regulations 2016, a permit or exemption is required for any activities which will take place:

- On or within 8m of a Main River (16m if the Main River is tidal);
- On or within 8m of a flood defence structure or culverted Main River (16m if the Main River is tidal);
- Any activity within 16m of a sea defence structure; and
- Quarrying or excavation within 16m of any Main River, more than 8m from the riverbank, culvert or flood defence structure (or 16m, if the Main River is tidal) and planning permission has not already been obtained.

73. Additionally, in accordance with the Flood and Water Management Act 2010 and Section 23 of the Land Drainage Act 1991, consent is required from the LLFA for the construction of a culvert or other structure that may affect the flow within an Ordinary Watercourse.

74. Furthermore, any crossings of Ordinary Watercourses within the Internal Drainage District (IDD) for the Beverley and North Holderness IDB will require appropriate consents from Beverley and North Holderness IDB and will need to be undertaken in accordance with their byelaws.

75. All Main Rivers and Ordinary Watercourses (including IDB-maintained drains) that will be crossed by the onshore ECC are identified and listed in **Appendix 4.3 Crossing Schedule – Onshore**, along with the proposed crossing methodology.

76. It is noted that throughout the process, engagement will be required with all key stakeholders (i.e. Environment Agency, ERYC and Beverley and North Holderness IDB) to ensure that the flood risk related to their specific watercourses are fully considered and that the appropriate permitting requirements regarding the need to cross watercourses within their administrative are confirmed and addressed. Further details on this will be provided at ES stage.

21.3.6 Baseline Environment

21.3.6.1 Hydrology

77. The Humber River Basin Management Plan (RBMP) has been developed by the Environment Agency (Environment Agency, 2022) to comply with the Water Environment (Water Framework Directive) (England and Wales) Regulation 2017. The Humber RBMP defines river water body catchments based on surface hydrological catchments with an area of greater than 5km^2.

78. In accordance with the approach adopted for **Volume 1, Chapter 21 Water Resources and Flood Risk**, the Onshore Development Area in this FRA considers flood risk in the context of these surface hydrological catchments.

79. The Onshore Development Area lies within Hull and East Riding Management Catchment and passes through the operational catchments of Barmston Sea Drain, Hull Lower and Hull Upper.

80. The Onshore Development Area crosses the following Environment Agency Main Rivers, as shown on **Figure 21.3-1:**

- Mickley Dike;
- Holderness Drain;
- River Hull;
- Beverley and Barmston Drain; and
- Scorborough Beck.

81. The Onshore Development Area also crosses the following drains which are located within the IDD for the Beverley and North Holderness IDB, as shown on **Figure 21.3-2**:

- Skipsea Drain (Located on the boundary);
- Dunnington Sewer;
- Holts Drain;
- Halls Drain;
- Hallytreeholme Farm Drain;
- Burshill Park Drain;
- Holderness Drain;
- Heigholme Drain;
- Leven South Carr Drain;

- Coal Dike;
- Watson Drain; and
- Boundary Drain.

21.3.6.2 Existing Surface Water Drainage

82. It is noted that the Onshore Development Area is located on predominantly rural, agricultural land, where there is likely to be limited existing formal drainage systems.

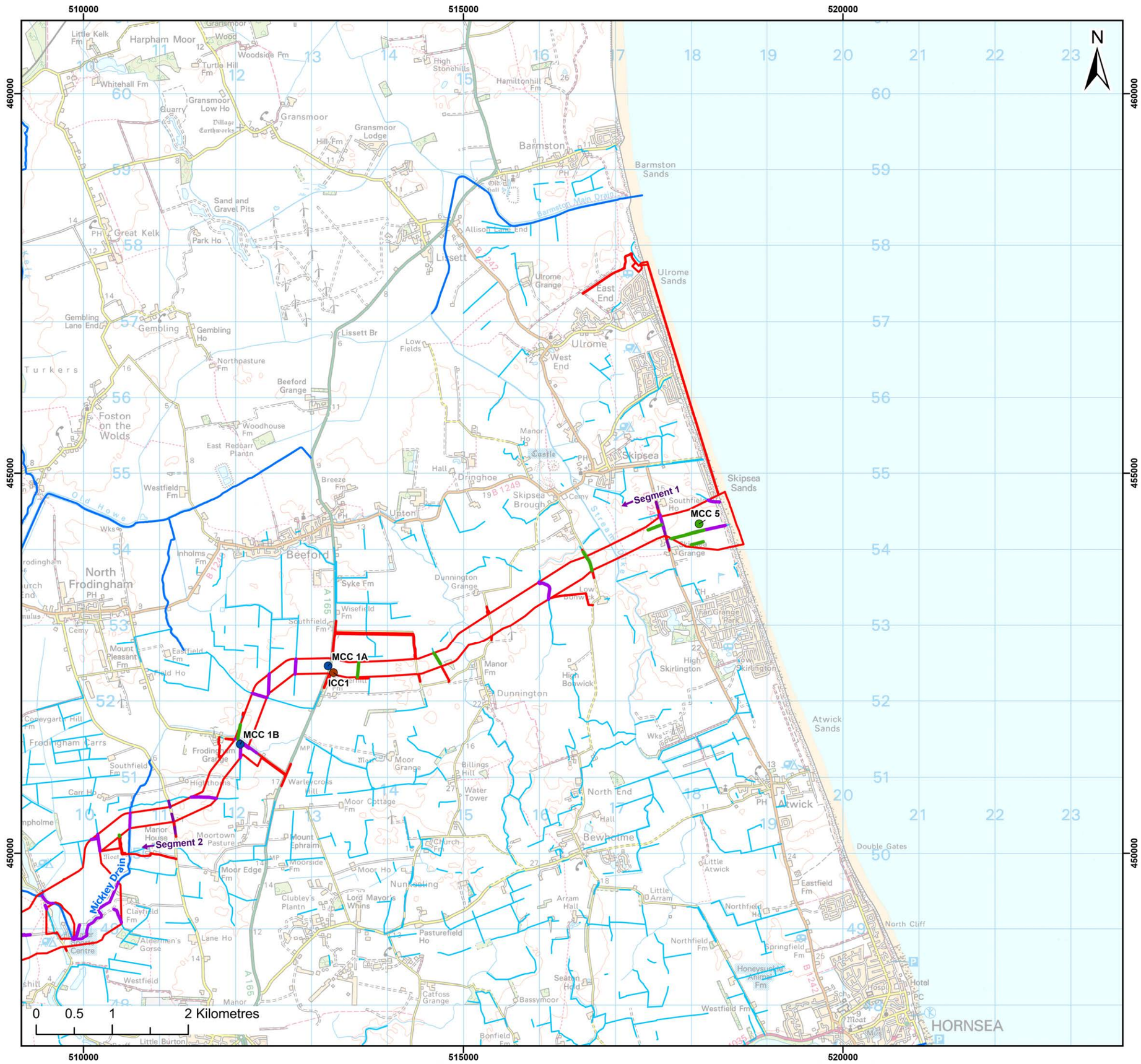
83. However, as noted above, there are a large number of agricultural drainage ditches / land drains (which fall into the classification of Ordinary Watercourses) as well as the Main Rivers that will need to be crossed by the onshore ECC.

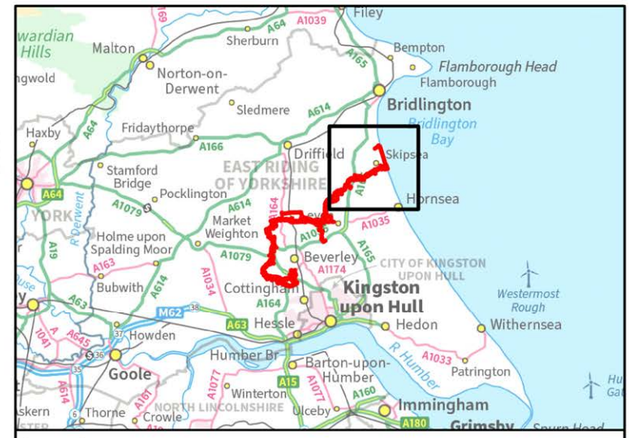
21.3.6.3 Geology and Hydrogeology

84. The British Geological Survey (BGS) 1:50,000 scale solid and superficial geology geological mapping has been reviewed for the Onshore Development Area, as shown on **Figure 21.3-3** for superficial and **Figure 21.3-3** for bedrock deposits.

85. Due to the scale of the Project, the Onshore Development Area covers a significant distance from the landfall, along the onshore ECC, to the OCS zones and onwards to Birkhill Wood Substation. Therefore, there is a range of geology present and can be summarised as the following:

- Superficial Deposits:
  - Till, Devensian formed of Diamicton;
  - Lacustrine Deposits formed of Sand, silt and clay;
  - Alluvium formed of Clay, silt, sand and gravel;
  - Glaciofluvial Deposits, Devensian formed of Sand and Gravel;
  - Tidal Flat Deposits formed of Clay and Silt; and
  - Superficial Deposits formed of Sand and Gravel.
- Bedrock Geology:
  - Rowe Chalk Formation;
  - Flamborough Chalk Formation; and
  - Burnham Chalk Formation.





Legend:

- Onshore Development Area
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting
- Main River
- Ordinary Watercourse

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works
- Landfall Construction Compound

Indicative Watercourse Crossing Locations for Cable Duct Installation Works

- Trenchless Techniques
- Trench

Project:
Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Indicative Watercourse Crossing Locations within the Onshore Development Area -
Sheet 1 of 3

Figure: 21.3-1

Drawing No: PC6250-RHD-XX-ON-DR-GS-0297

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Co-ordinate system: British National Grid

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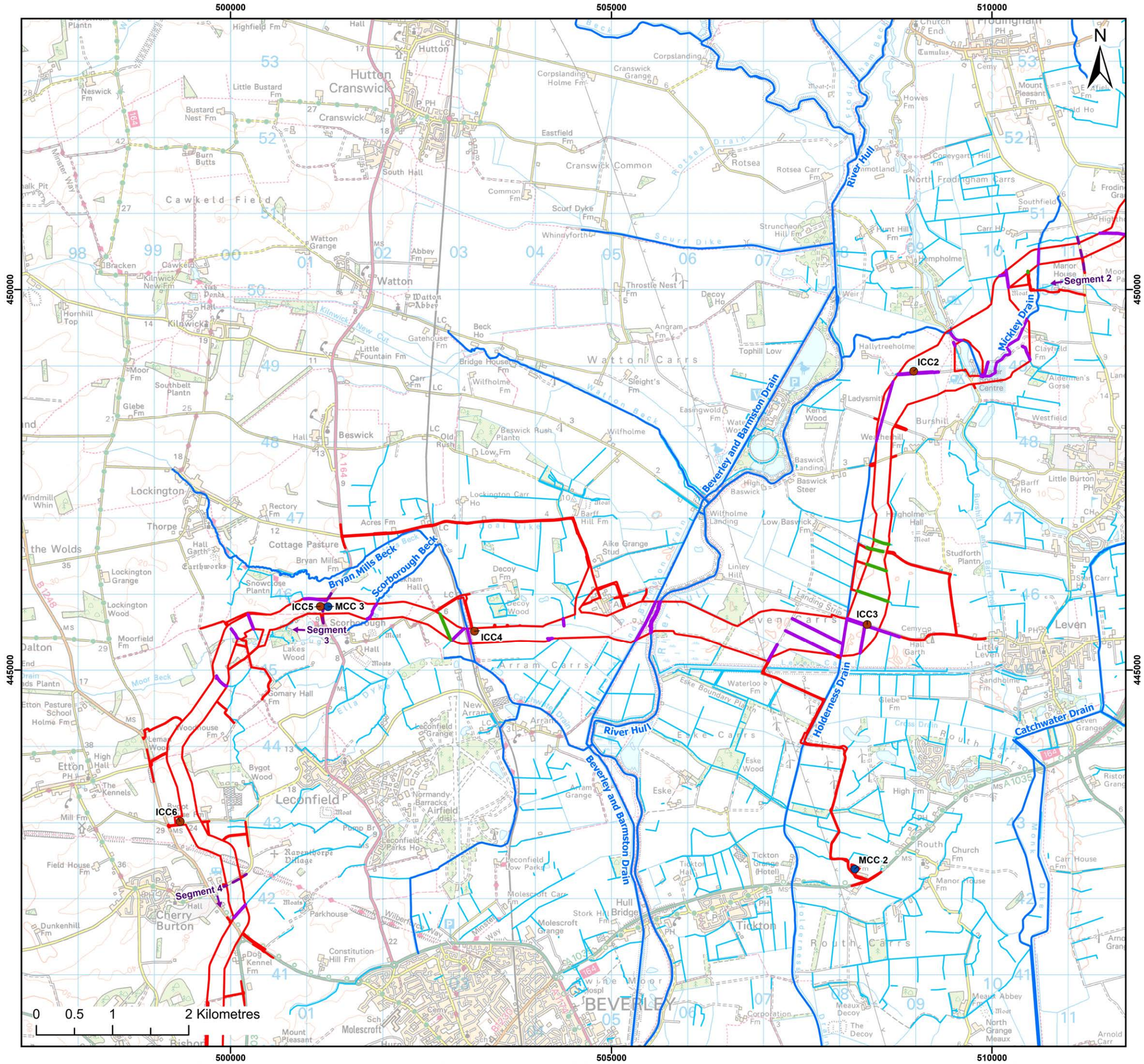

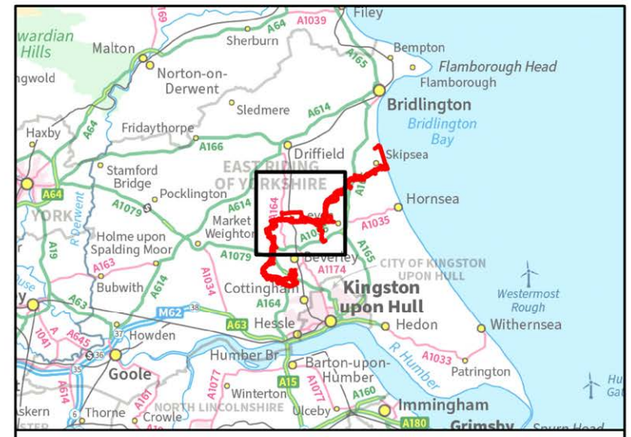

Legend:

- Onshore Development Area
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting
- Main River
- Ordinary Watercourse

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works

Indicative Watercourse Crossing Locations for Cable Duct Installation Works

- Trenchless Techniques
- Trench

Project:
Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Indicative Watercourse Crossing Locations within the Onshore Development Area - Sheet 2 of 3

Figure: 21.3-1

Drawing No: PC6250-RHD-XX-ON-DR-GS-0297

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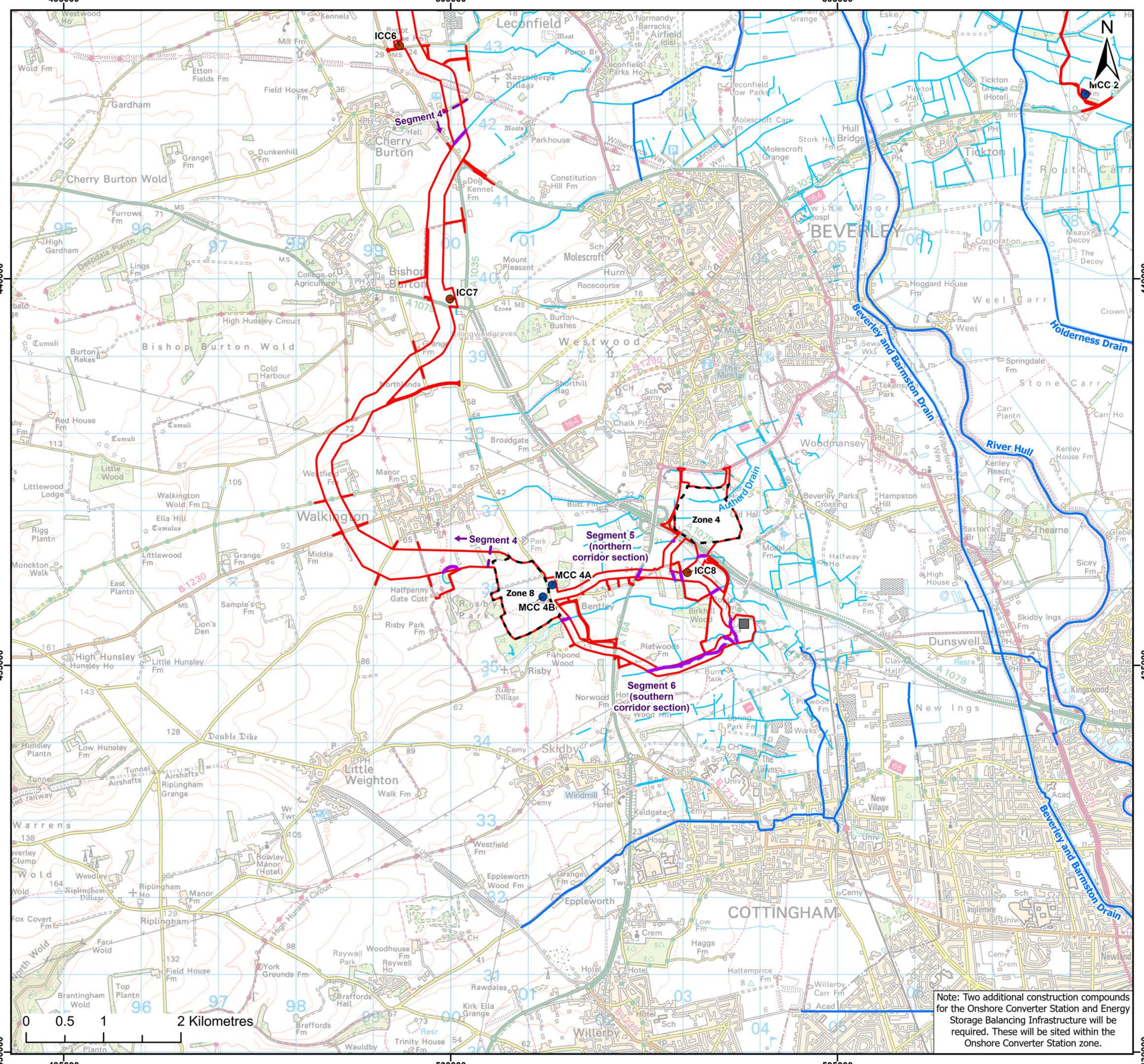

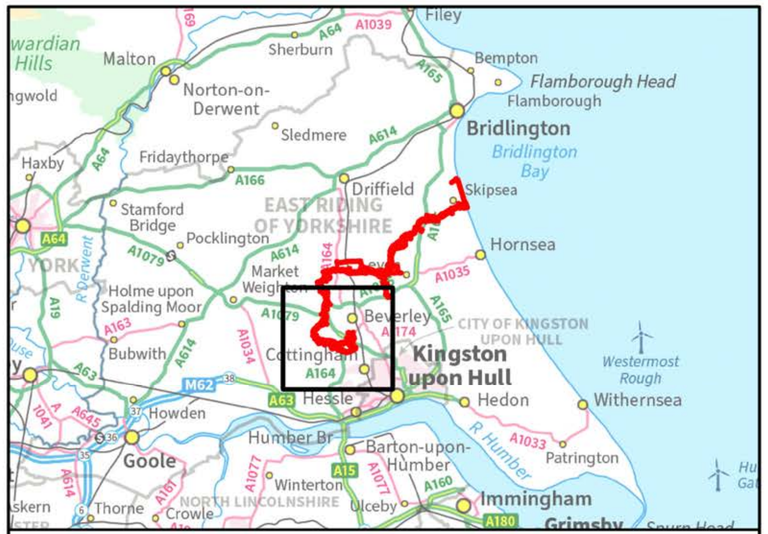

Legend:

- Onshore Development Area
- Onshore Converter Station Zone Options
- Indicative Birkhill Wood Substation Location
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting
- Main River
- Ordinary Watercourse

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works

Indicative Watercourse Crossing Locations for Cable Duct Installation Works

- Trenchless Techniques
- Trench

Source: © Haskoning DHV UK Ltd, 2025; © Environment Agency, 2025.

Project: Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title: Indicative Watercourse Crossing Locations within the Onshore Development Area - Sheet 3 of 3

Figure: 21.3-1 | Drawing No: PC6250-RHD-XX-ON-DR-GS-0297

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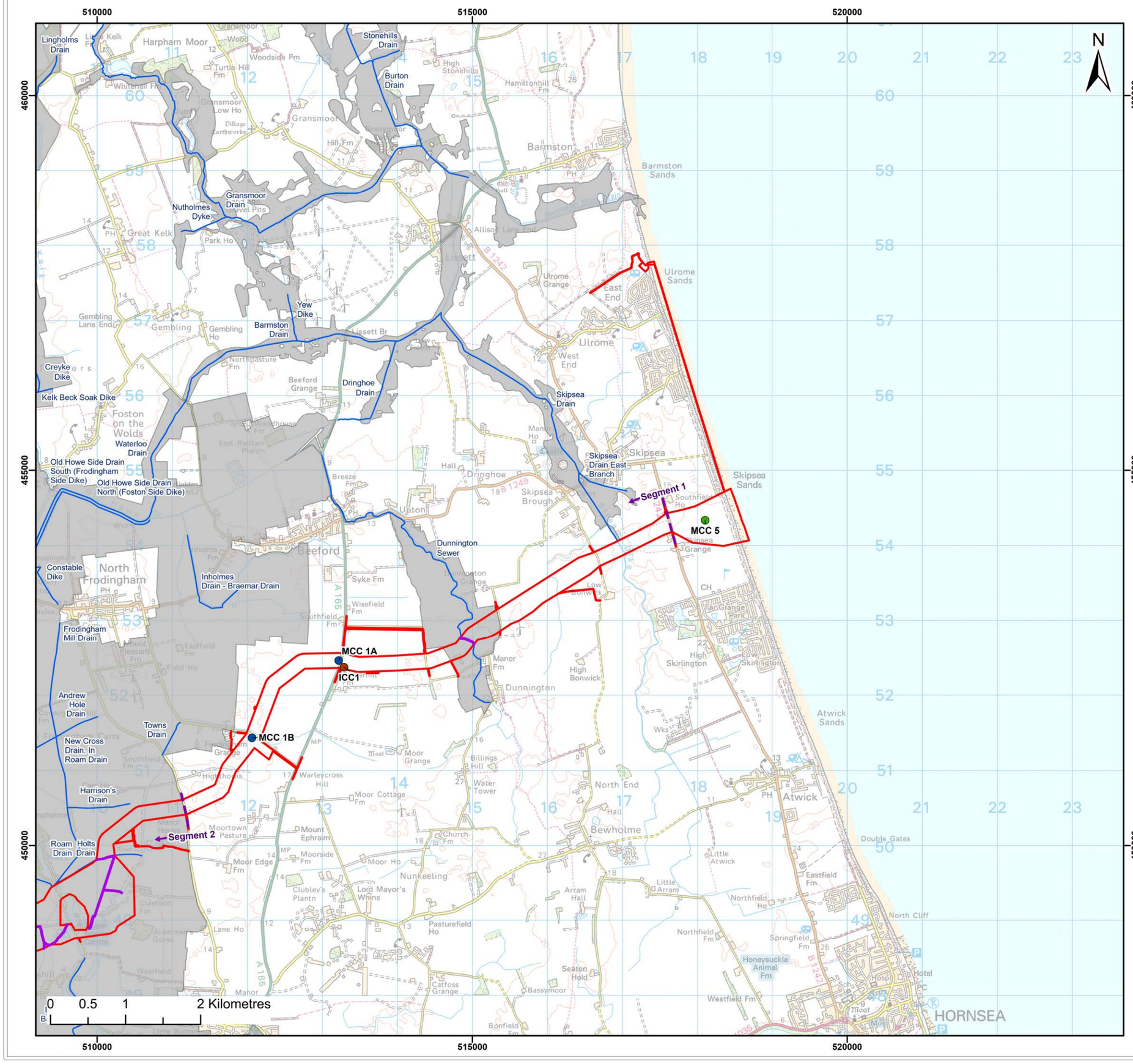

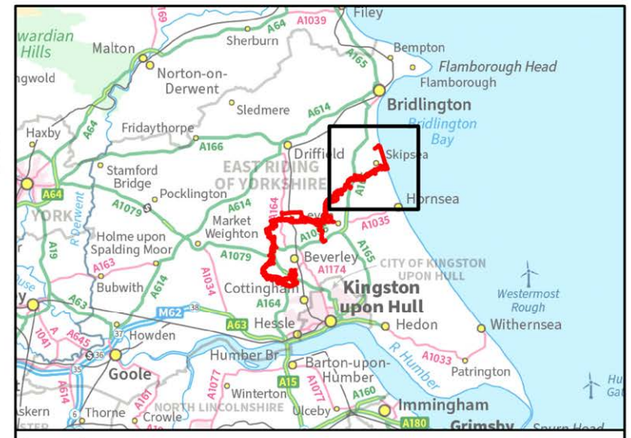

Legend:

- Onshore Development Area
- Beverley and North Holderness Internal Drainage Board (IDB) Maintained Drains
- Beverley and North Holderness Internal Drainage District (IDD)
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works
- Landfall Construction Compound

Indicative Watercourse Crossing

- Trenchless Techniques

Project:
Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Internal Drainage Board Maintained Drains within the Onshore Development Area - Sheet 1 of 3

Figure: 21.3-2

Drawing No: PC6250-RHD-XX-ON-DR-GS-0298

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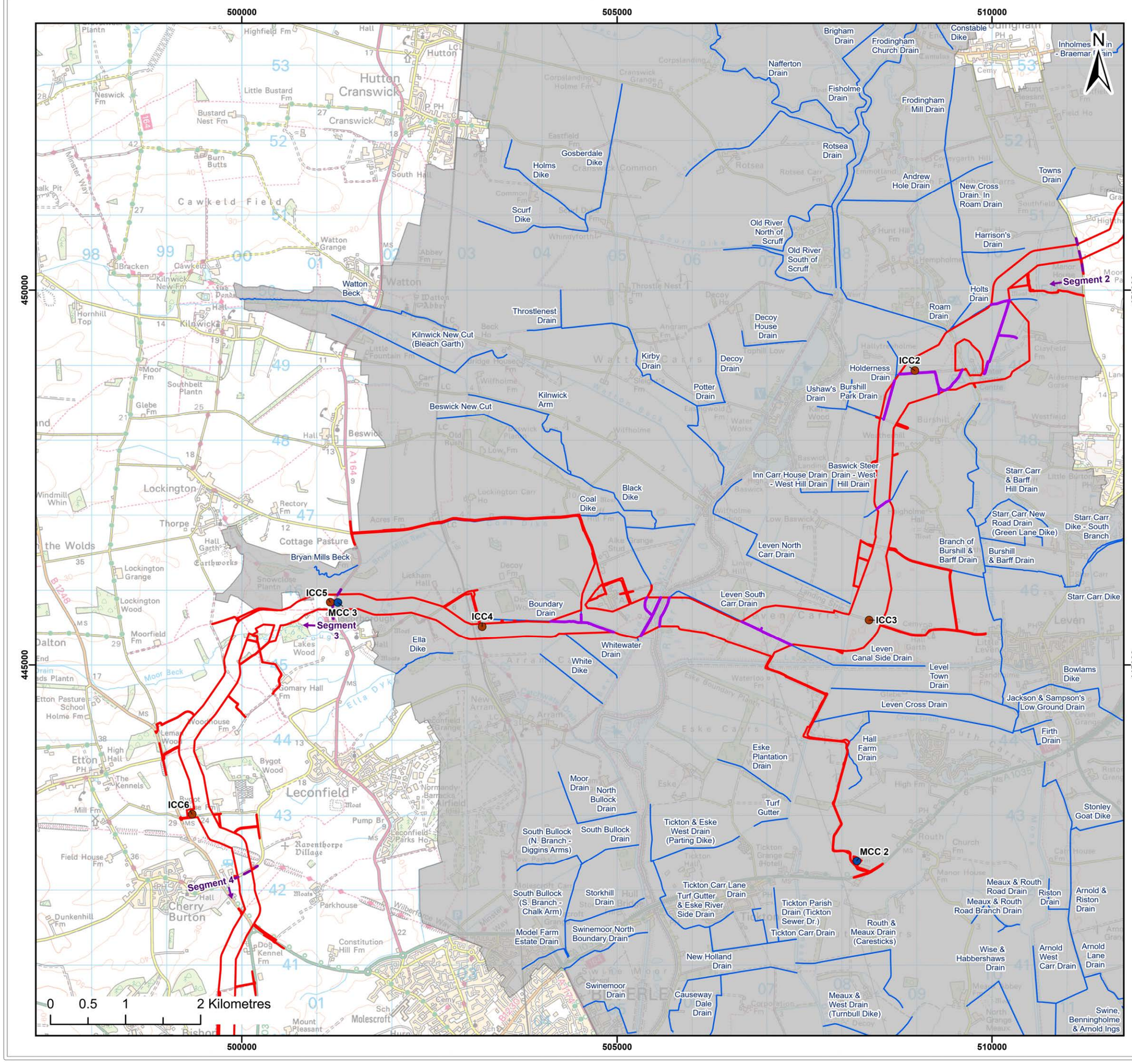

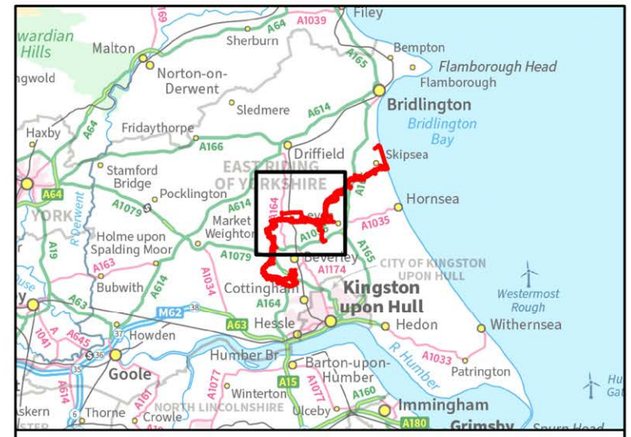

Legend:

- Onshore Development Area
- Beverley and North Holderness Internal Drainage Board (IDB) Maintained Drains
- Beverley and North Holderness Internal Drainage District (IDD)
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works

Indicative Watercourse Crossing

- Trenchless Techniques

Project: Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title: Internal Drainage Board Maintained Drains within the Onshore Development Area - Sheet 2 of 3

Figure: 21.3-2

Drawing No: PC6250-RHD-XX-ON-DR-GS-0298

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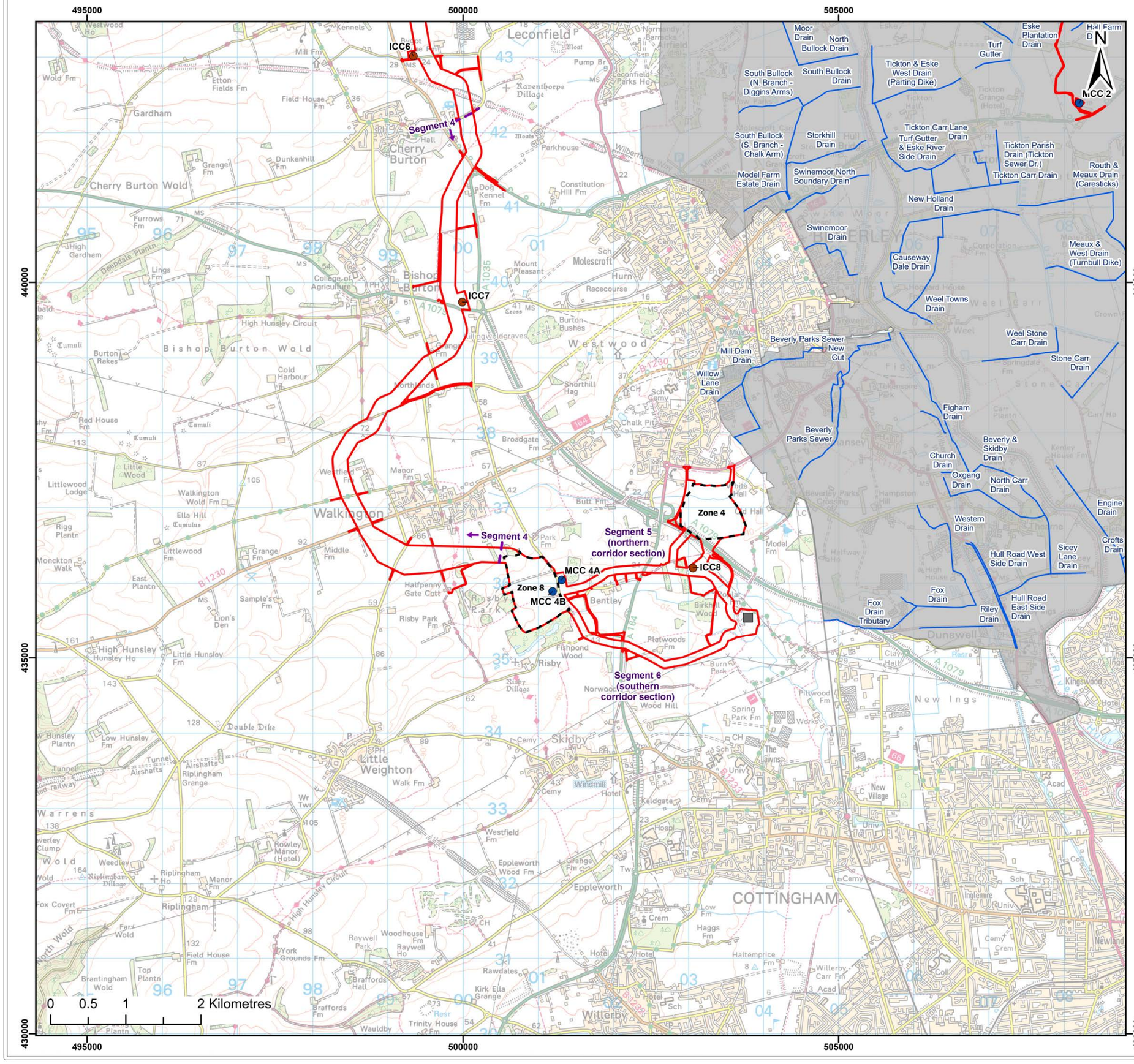

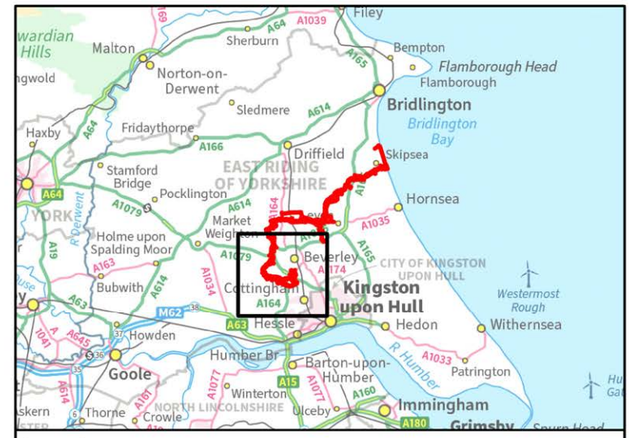

Legend:

- Onshore Development Area
- Onshore Converter Station Zone Options
- Indicative Birkhill Wood Substation Location
- Beverley and North Holderness Internal Drainage Board (IDB) Maintained Drains
- Beverley and North Holderness Internal Drainage District (IDD)
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works

Note: Two additional construction compounds for the Onshore Converter Station and Energy Storage Balancing Infrastructure will be required. These will be sited within the Onshore Converter Station zone.

Project:
Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Internal Drainage Board Maintained Drains within the Onshore Development Area - Sheet 3 of 3

Figure: 21.3-2
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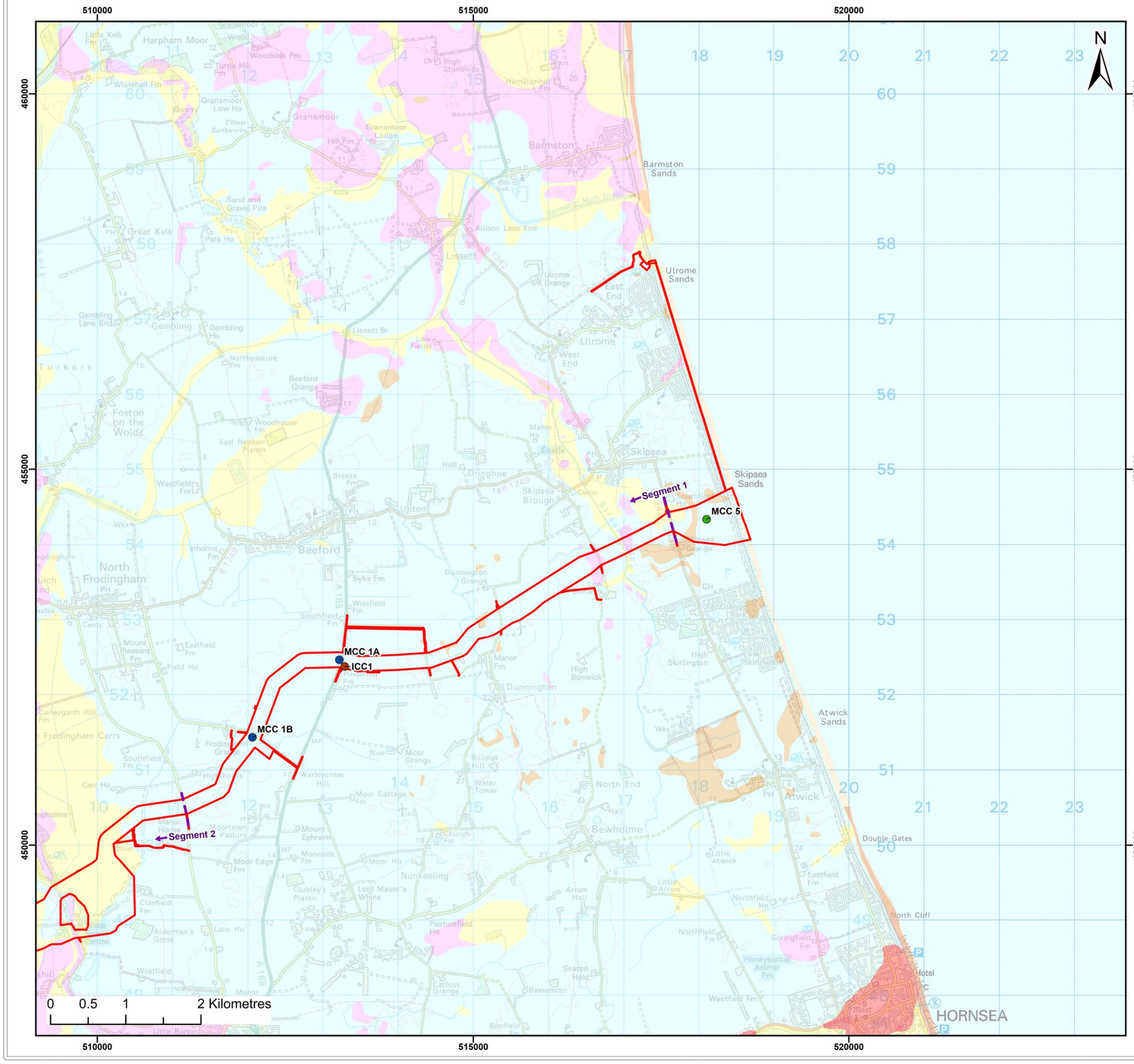

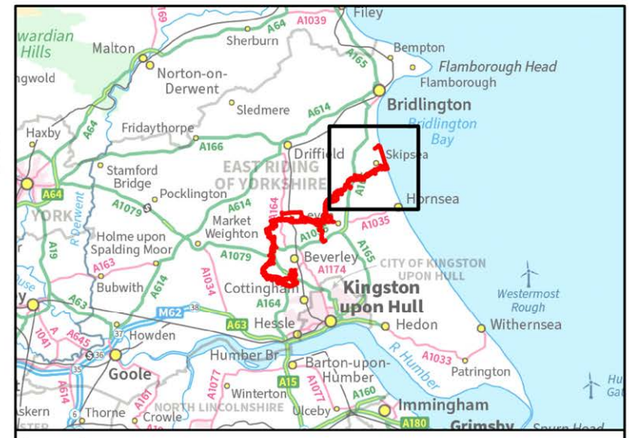

Legend:

- Onshore Development Area

Superficial Geology

- Alluvium
- Glaciofluvial Deposits
- Lacustrine Deposits
- Marine Beach Deposits
- Marine Deposits
- Sand and Gravel
- Till
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works
- Landfall Construction Compound

Project:

Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Superficial Deposits within the Onshore Development Area (British Geological Survey 1:50,000 Scale) - Sheet 1 of 3

Figure: 21.3-3

Drawing No: PC6250-RHD-XX-ON-DR-GS-0299

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Co-ordinate system: British National Grid

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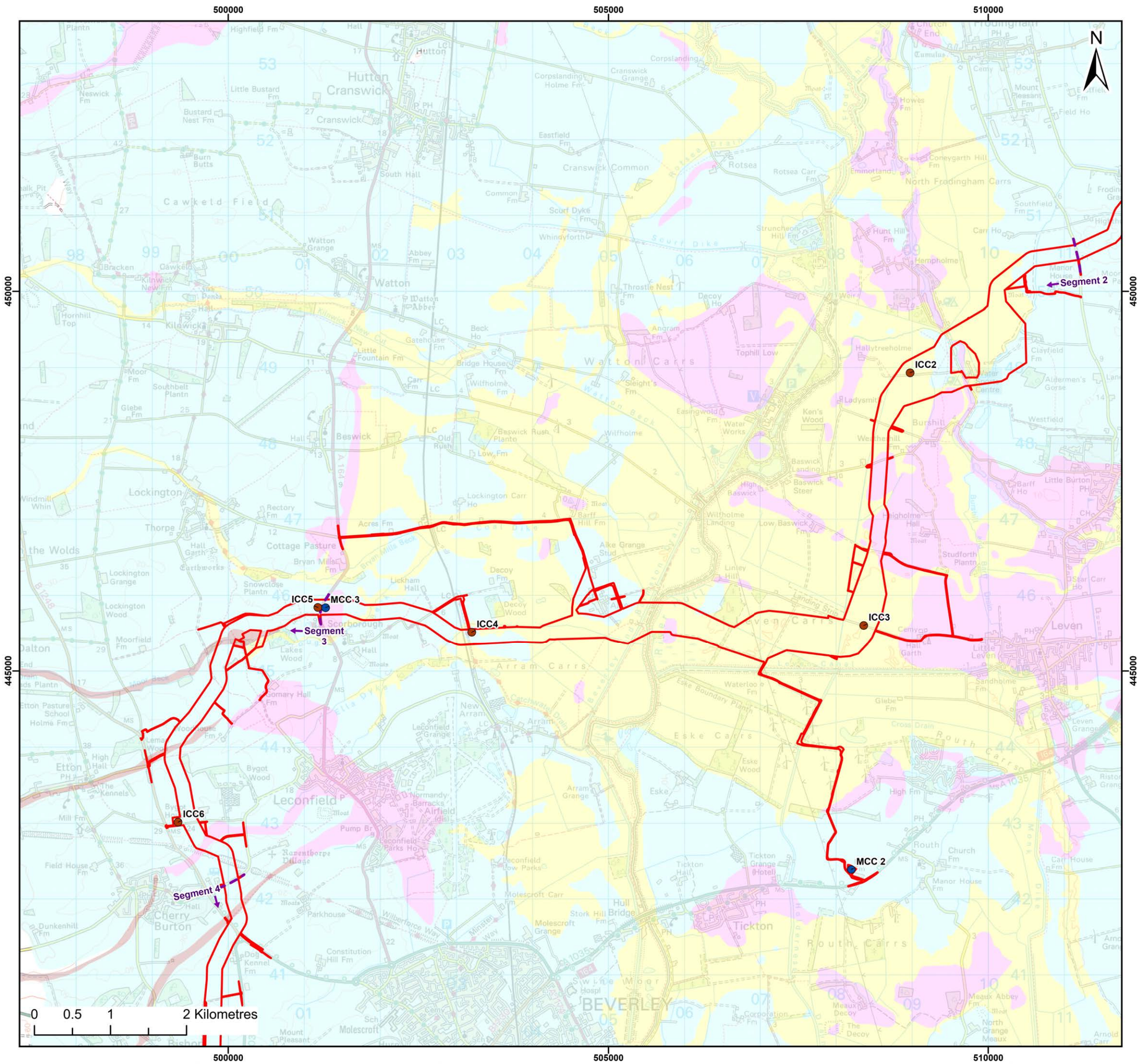

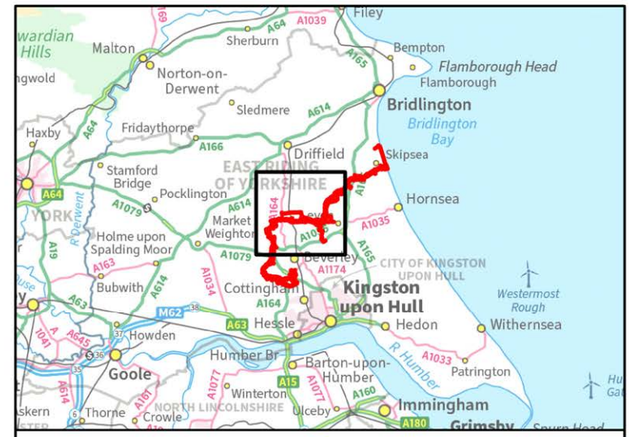

Legend:

- Onshore Development Area
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works

Project:
Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Superficial Deposits within the Onshore Development Area (British Geological Survey 1:50,000 Scale) - Sheet 2 of 3

Figure: 21.3-3
Drawing No: PC6250-RHD-XX-ON-DR-GS-0299

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Co-ordinate system: British National Grid

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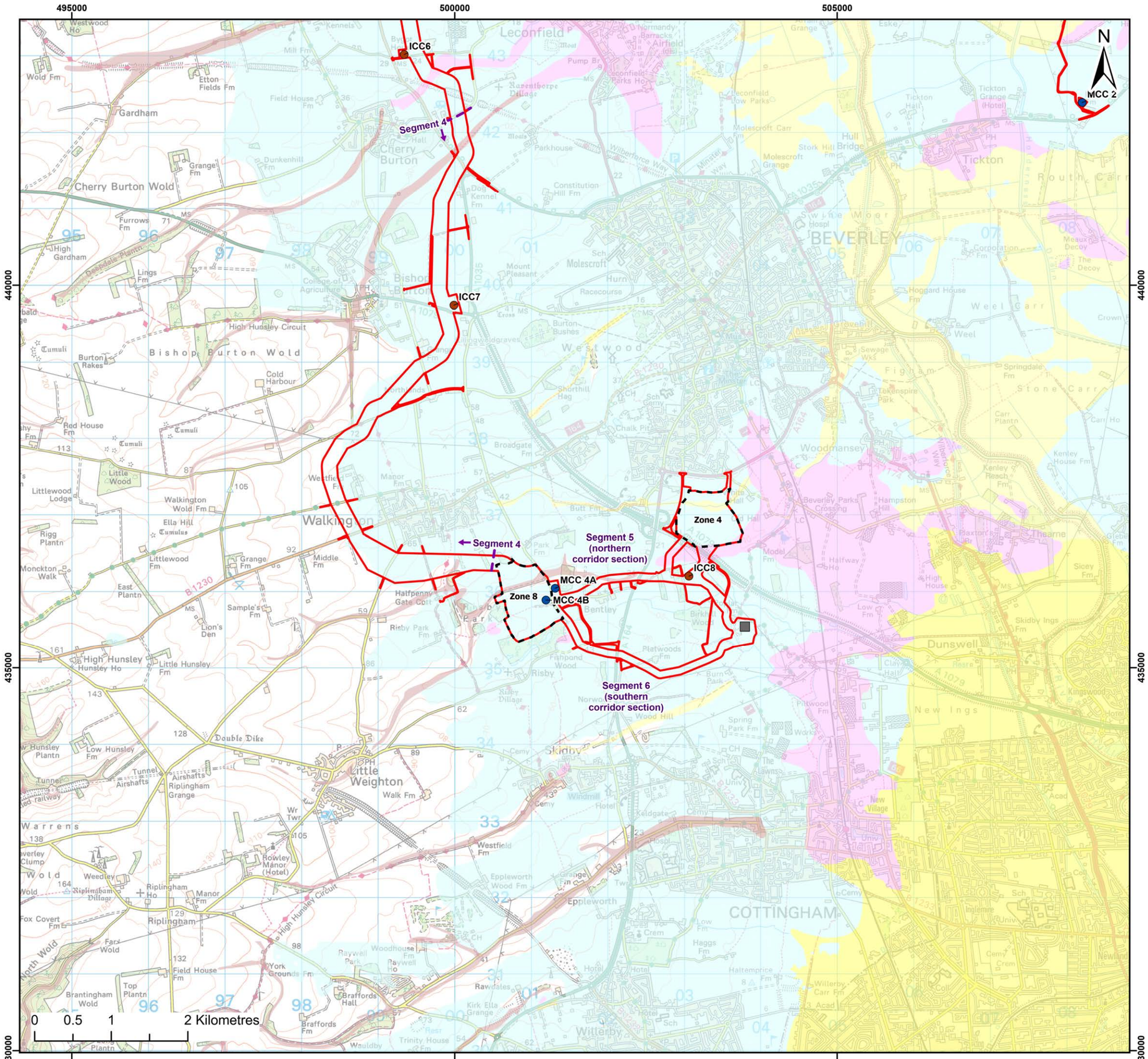

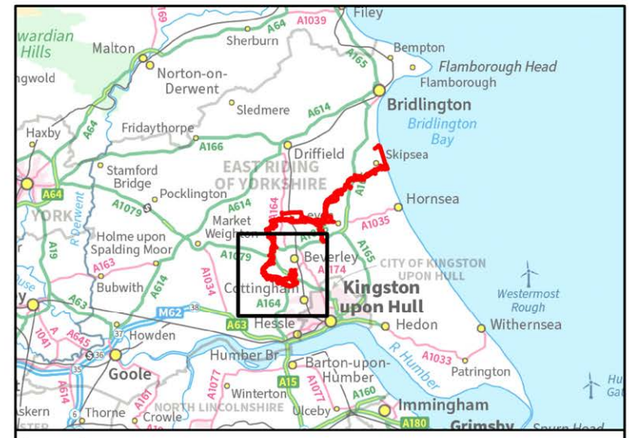

Legend:

- Onshore Development Area
- Onshore Converter Station Zone Options
- Indicative Birkhill Wood Substation Location
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works

Note: Two additional construction compounds for the Onshore Converter Station and Energy Storage Balancing Infrastructure will be required. These will be sited within the Onshore Converter Station zone.

Project:
Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Superficial Deposits within the Onshore Development Area (British Geological Survey 1:50,000 Scale) - Sheet 3 of 3

Figure: 21.3-3
Drawing No: PC6250-RHD-XX-ON-DR-GS-0299

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

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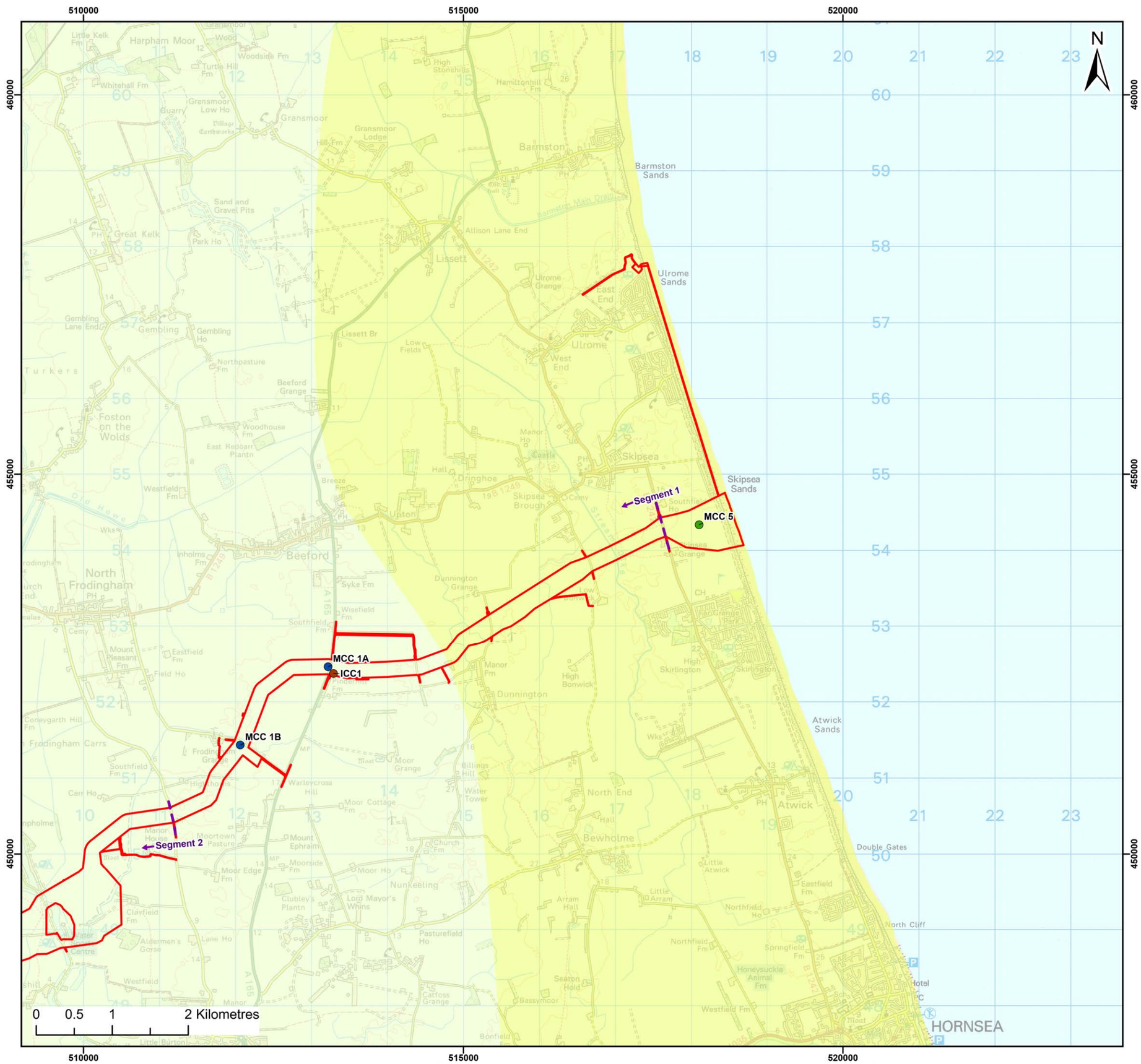

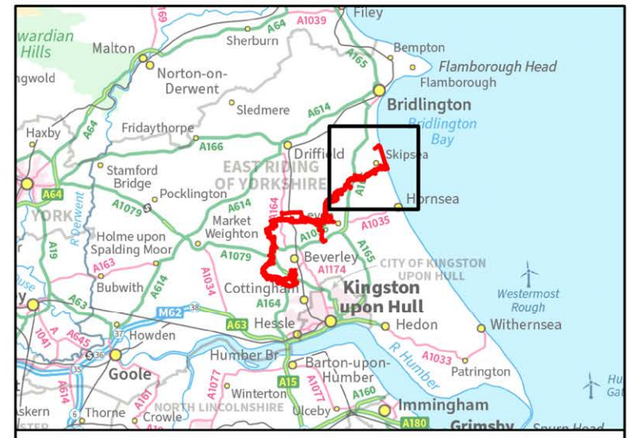

Legend:

- Onshore Development Area

Bedrock Geology

- Flamborough Chalk Formation
- Rowe Chalk Formation
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works
- Landfall Construction Compound

Project:
Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Bedrock Deposits within the Onshore Development Area (British Geological Survey 1:50,000 Scale) - Sheet 1 of 3

Figure: 21.3-4 | Drawing No: PC6250-RHD-XX-ON-DR-GS-0300

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

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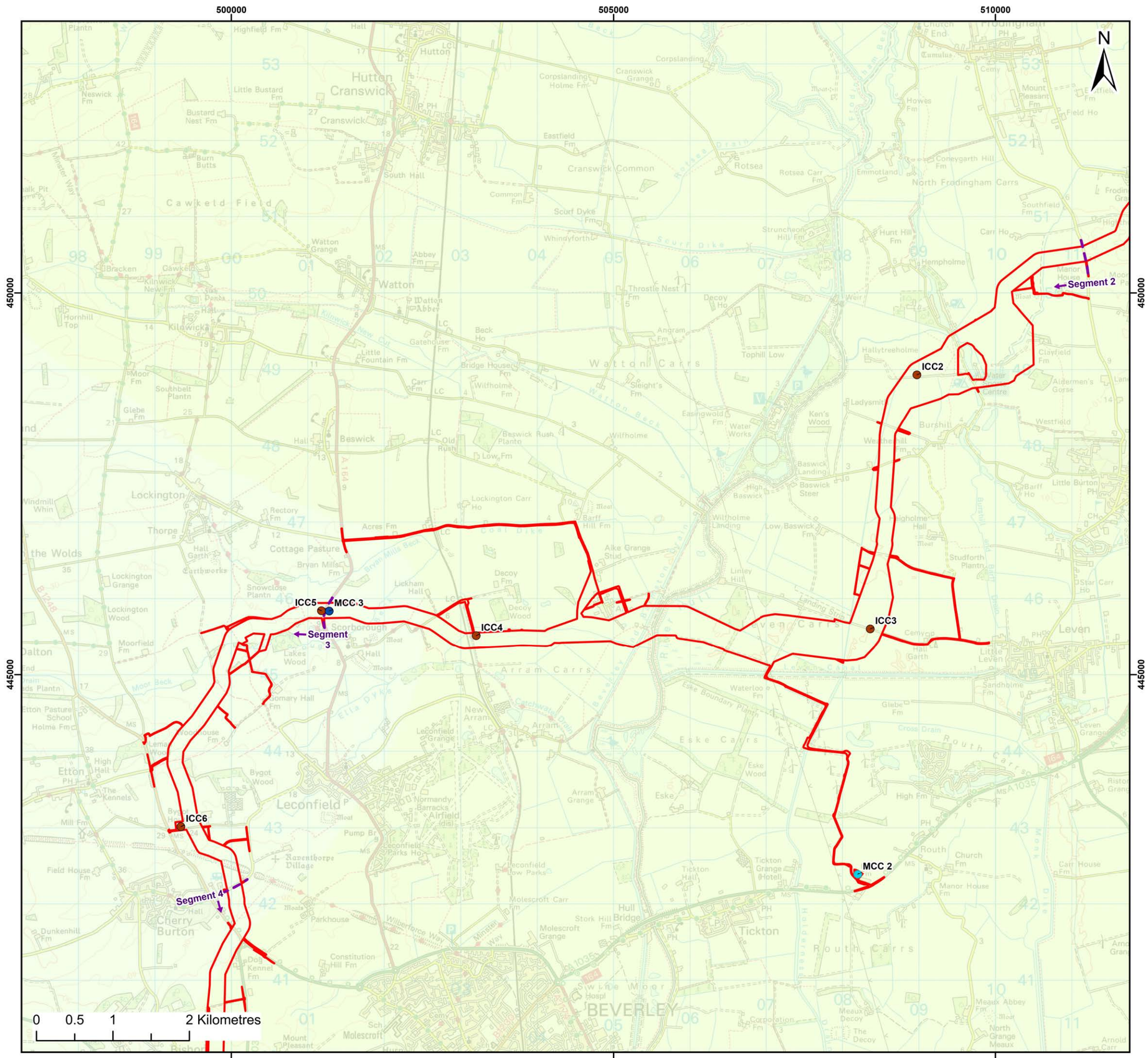

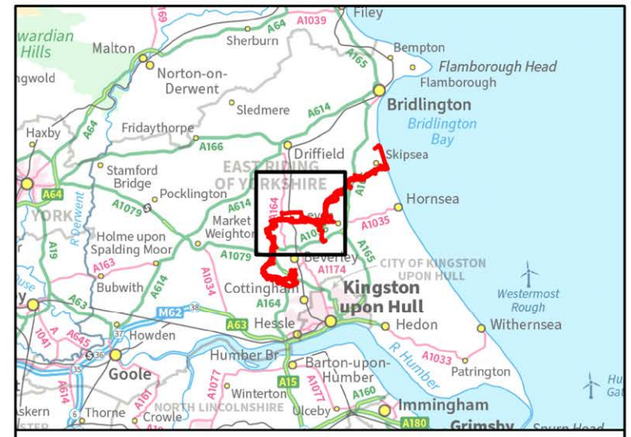

Legend:

- Onshore Development Area

Bedrock Geology

- Burnham Chalk Formation
- Flamborough Chalk Formation
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works

Project:
Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Bedrock Deposits within the Onshore Development Area (British Geological Survey 1:50,000 Scale) - Sheet 2 of 3

Figure: 21.3-4
Drawing No: PC6250-RHD-XX-ON-DR-GS-0300

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Co-ordinate system: British National Grid

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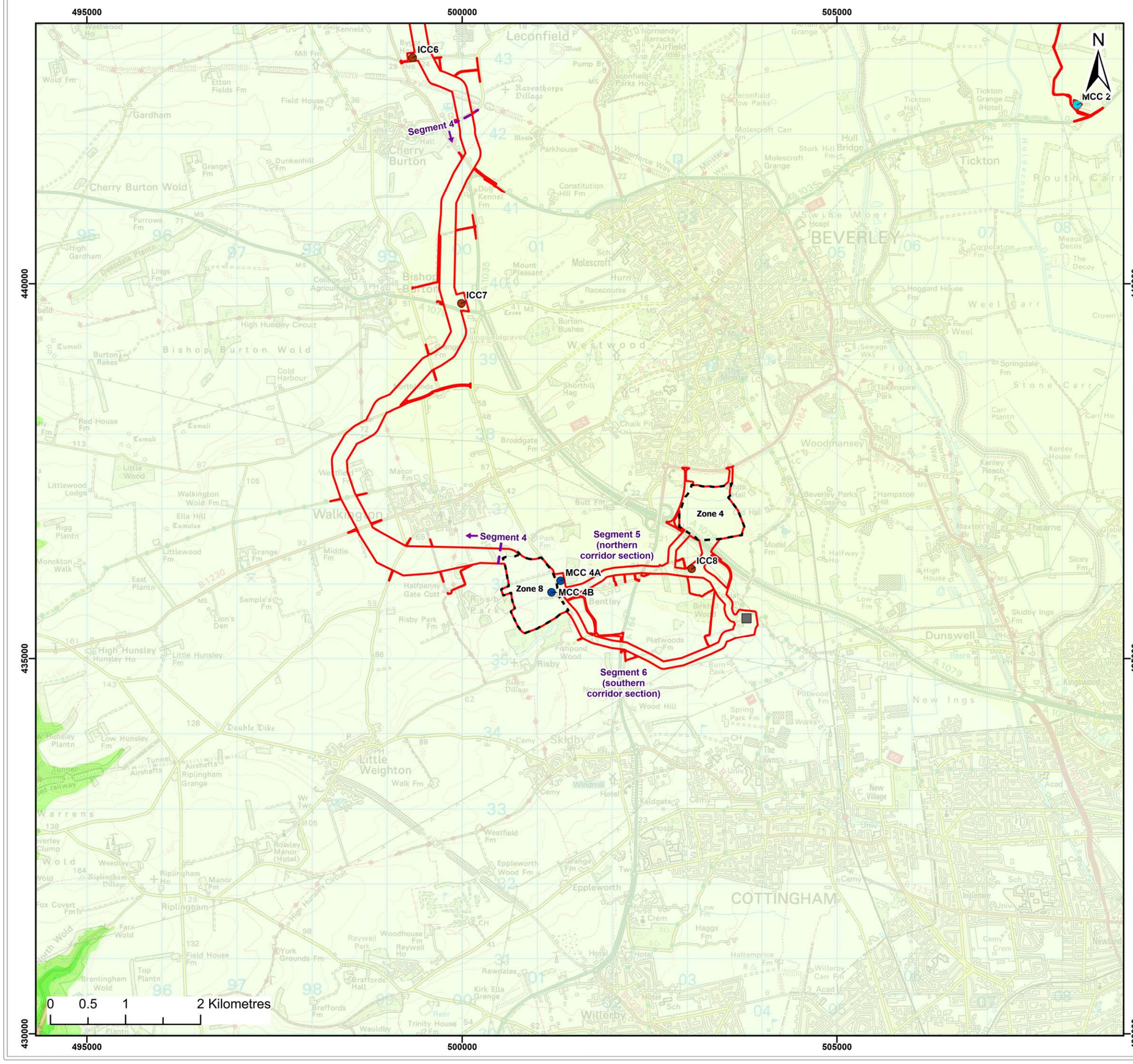

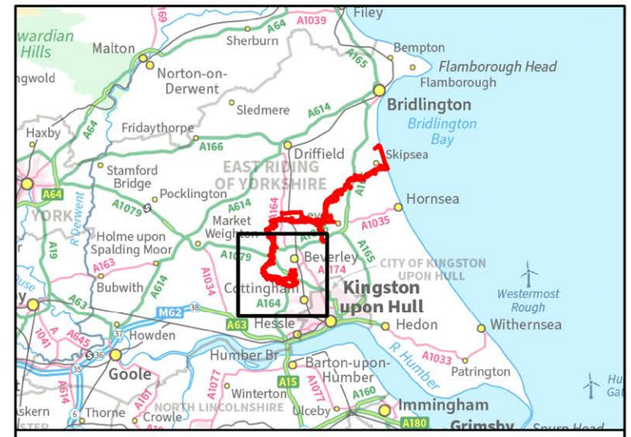

Legend:

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

Bedrock Geology

- Burnham Chalk Formation
- Flamborough Chalk Formation
- Welton Chalk Formation
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works

Note: Two additional construction compounds for the Onshore Converter Station and Energy Storage Balancing Infrastructure will be required. These will be sited within the Onshore Converter Station zone.

Project:
Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Bedrock Deposits within the Onshore Development Area (British Geological Survey 1:50,000 Scale) - Sheet 3 of 3

Figure: 21.3-4
Drawing No: PC6250-RHD-XX-ON-DR-GS-0300

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Co-ordinate system: British National Grid

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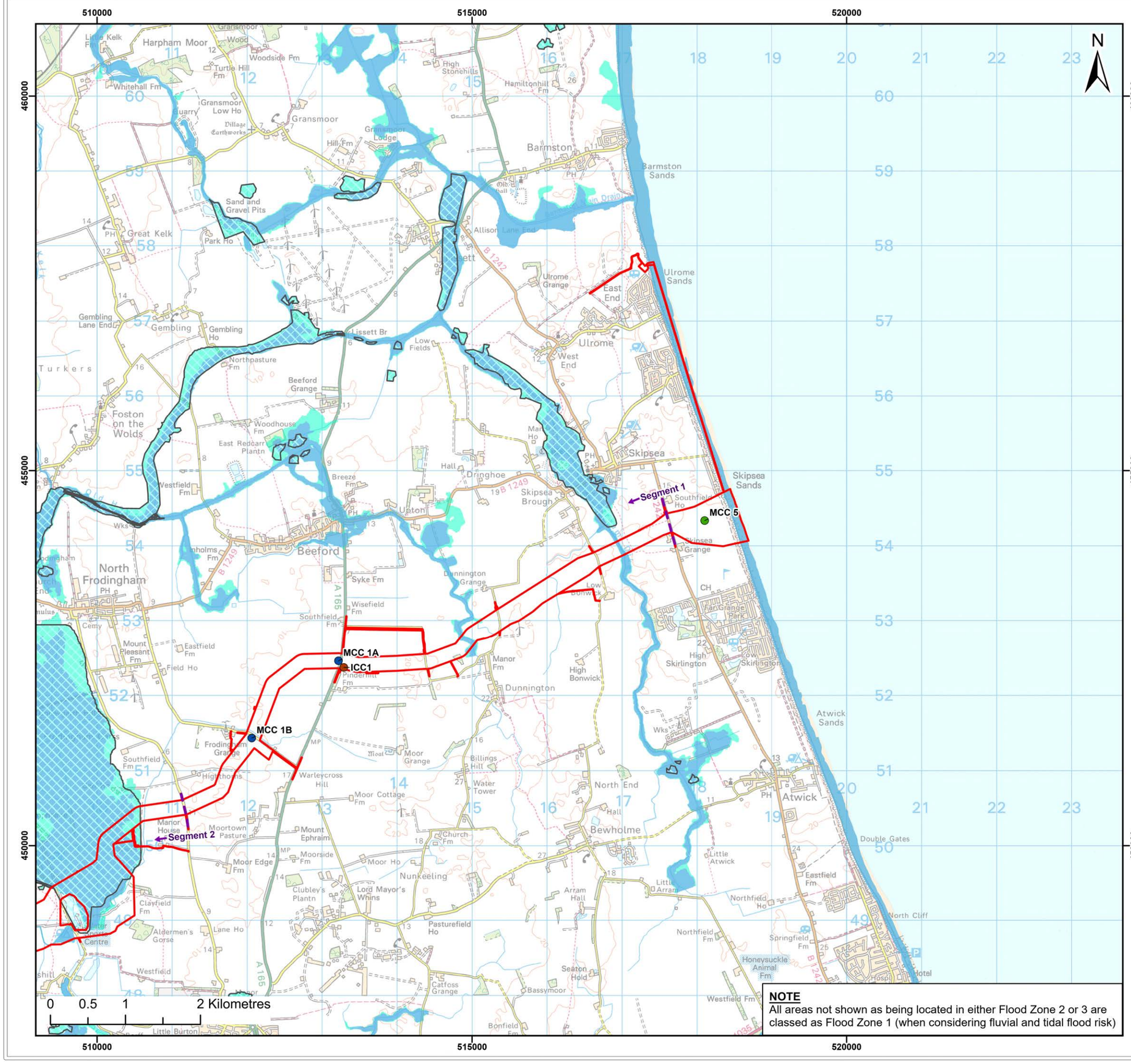

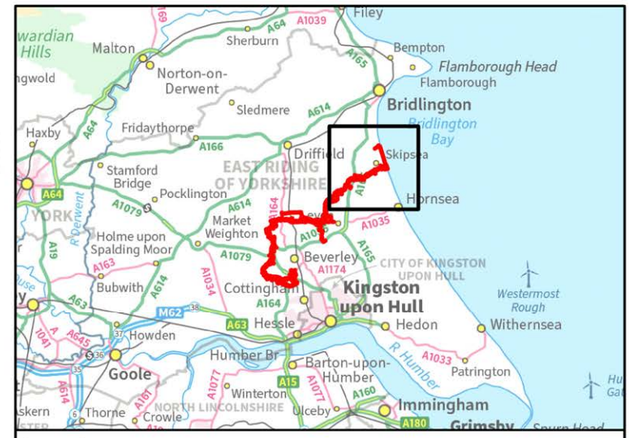

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Project:
Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Environment Agency Flood Zones and Historic Flood Extent within the Onshore Development Area - Sheet 1 of 3

Figure: 21.3-5

Drawing No: PC6250-RHD-XX-ON-DR-GS-0301

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

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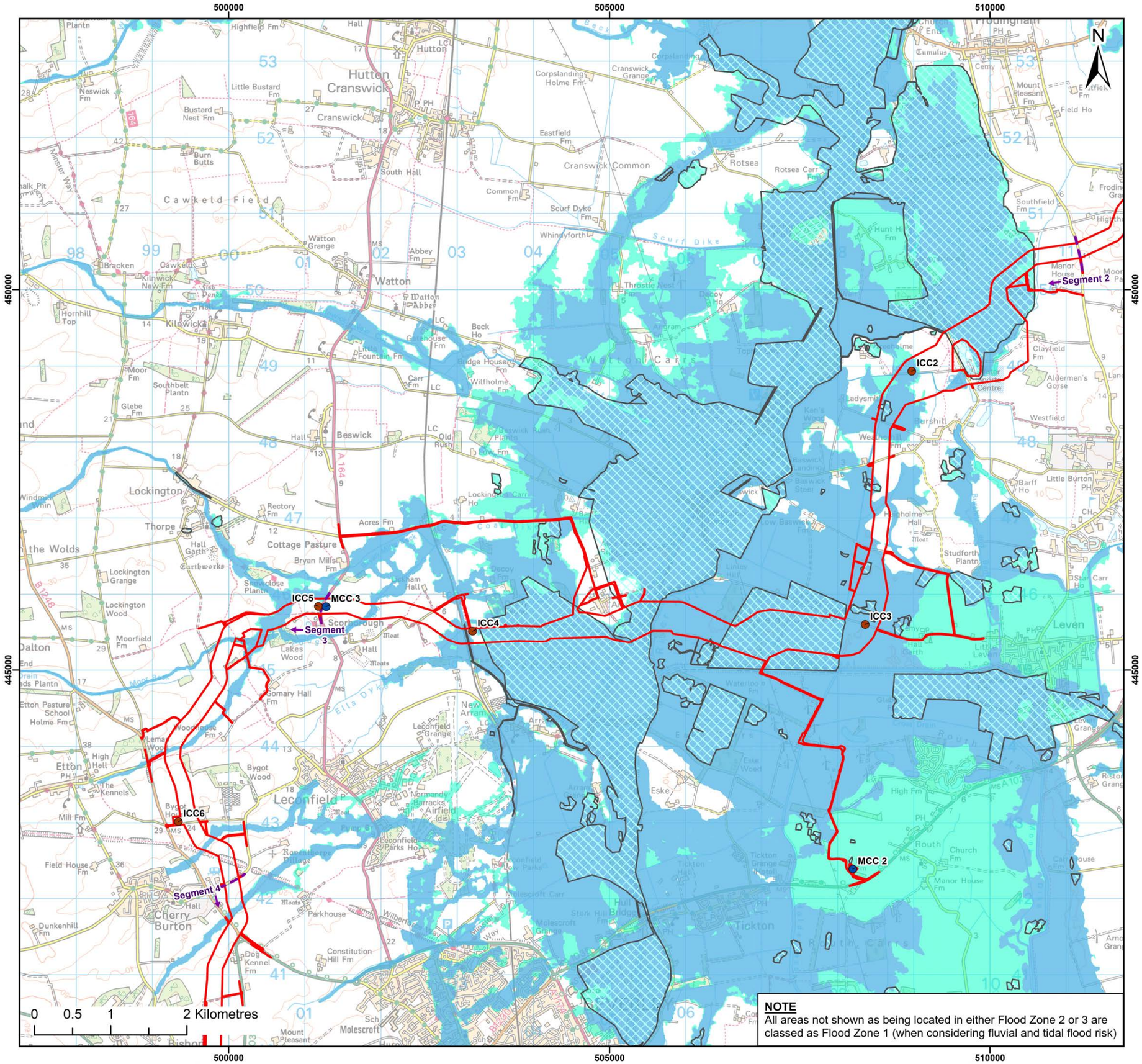

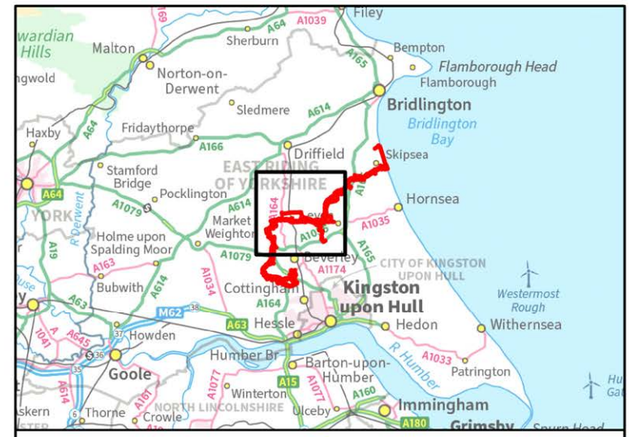

Legend:

- Onshore Development Area
- Flood Zone 3
- Flood Zone 2
- Historic Flood Extent
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works

Project:
Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Environment Agency Flood Zones and Historic Flood Extent within the Onshore Development Area - Sheet 2 of 3

Figure: 21.3-5

Drawing No: PC6250-RHD-XX-ON-DR-GS-0301

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

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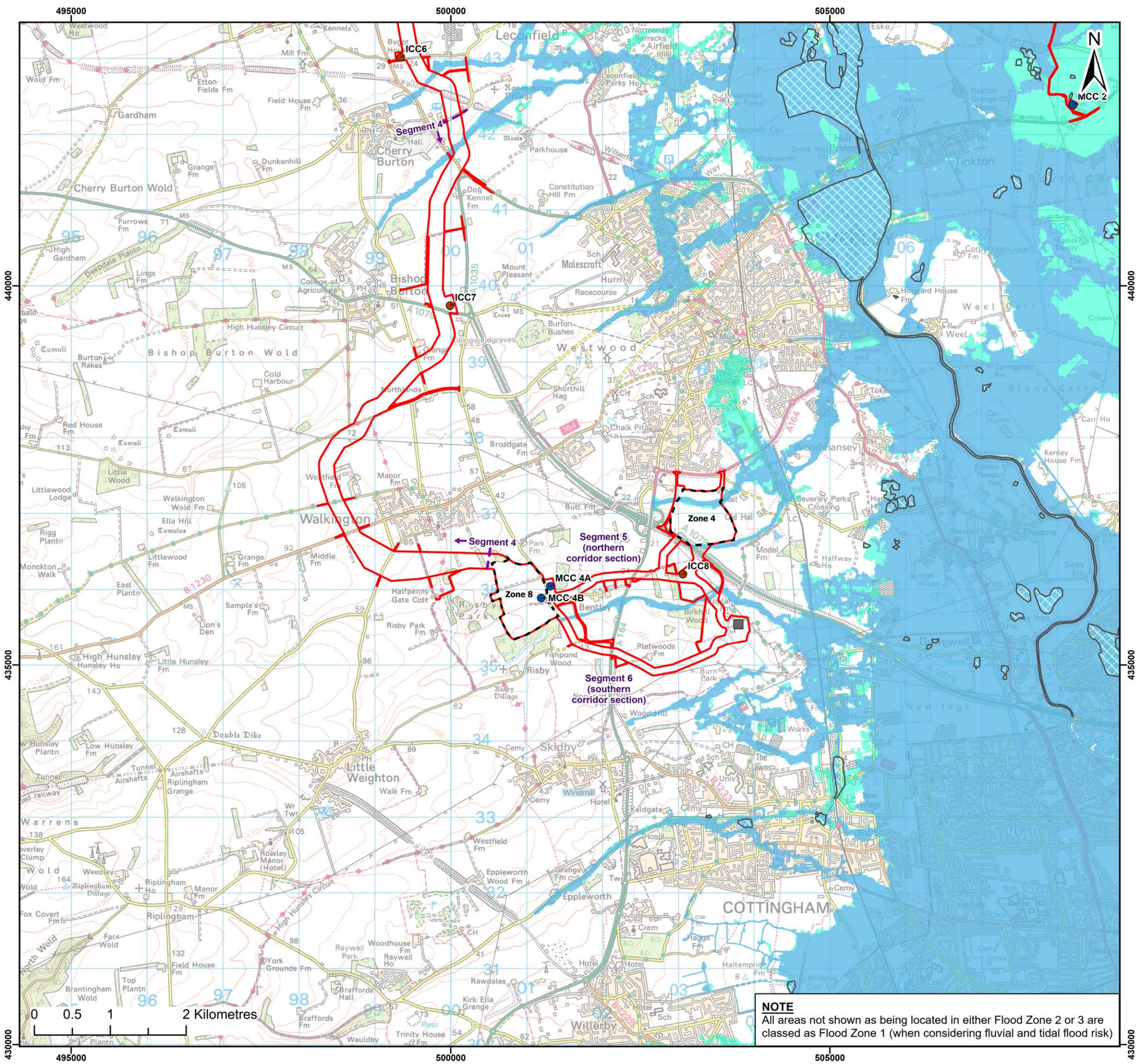

Legend:

- Onshore Development Area
- Onshore Converter Station Zone Options
- Indicative Birkhill Wood Substation Location
- Flood Zone 3
- Flood Zone 2
- Historic Flood Extent
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works

Note: Two additional construction compounds for the Onshore Converter Station and Energy Storage Balancing Infrastructure will be required. These will be sited within the Onshore Converter Station zone.

NOTE
All areas not shown as being located in either Flood Zone 2 or 3 are classed as Flood Zone 1 (when considering fluvial and tidal flood risk)

Project:
Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Environment Agency Flood Zones and Historic Flood Extent within the Onshore Development Area - Sheet 3 of 3

Figure: 21.3-5
Drawing No: PC6250-RHD-XX-ON-DR-GS-0301

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Co-ordinate system: British National Grid

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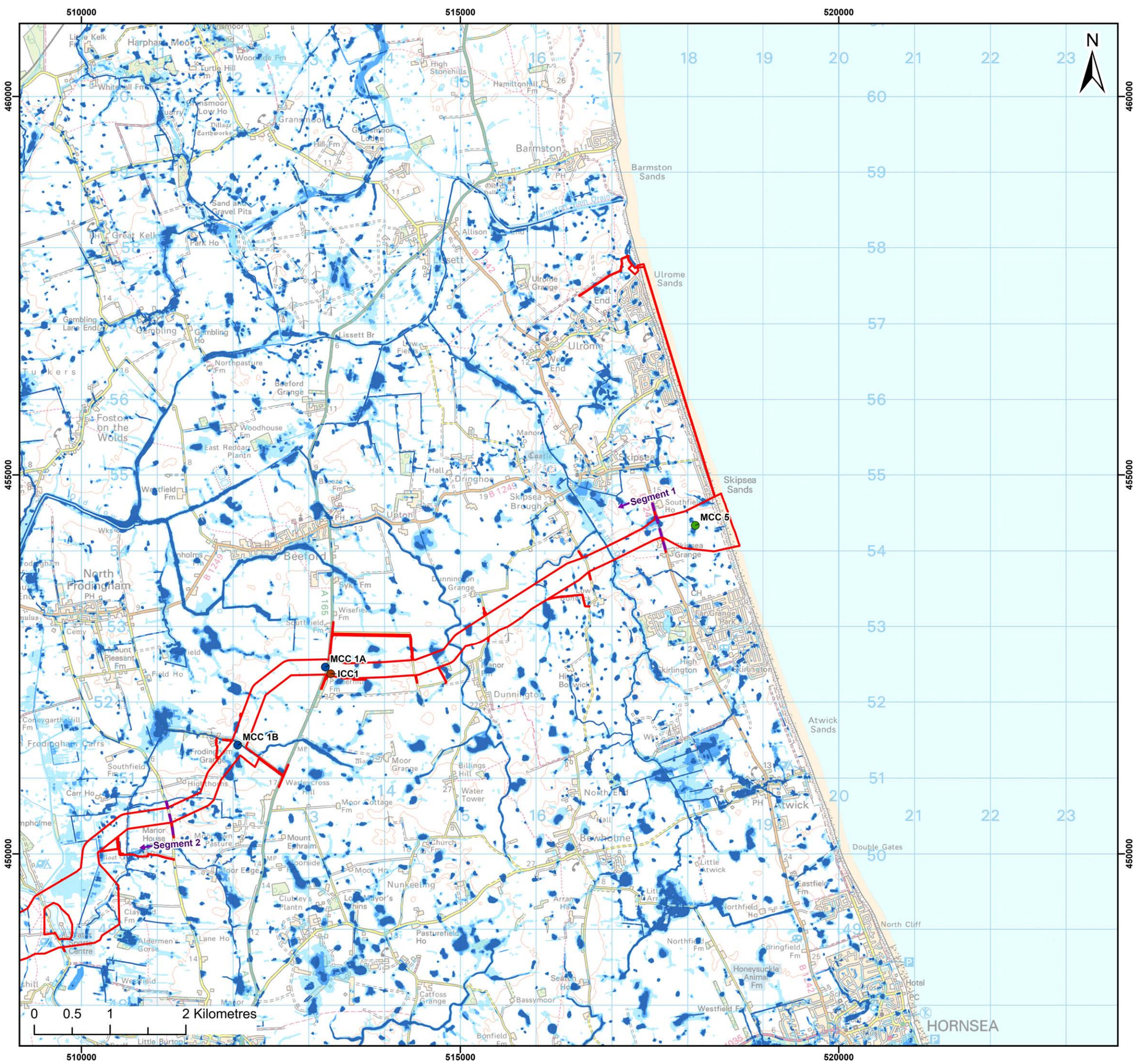

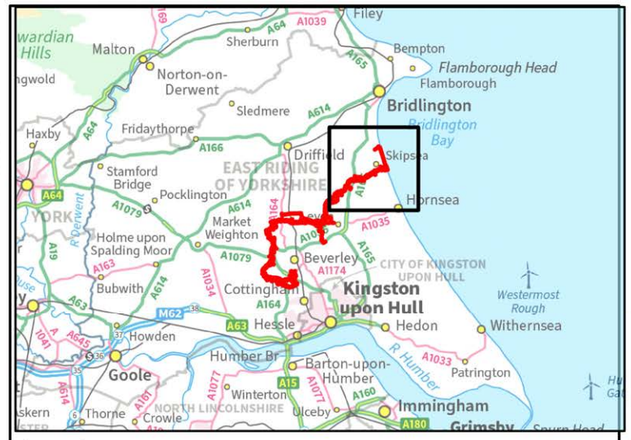

Legend:

- Onshore Development Area
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works
- Landfall Construction Compound

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:

Environment Agency Surface Water Flood Risk within the Onshore Development Area - Sheet 1 of 3

Figure: 21.3-6

Drawing No: PC6250-RHD-XX-ON-DR-GS-0302

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

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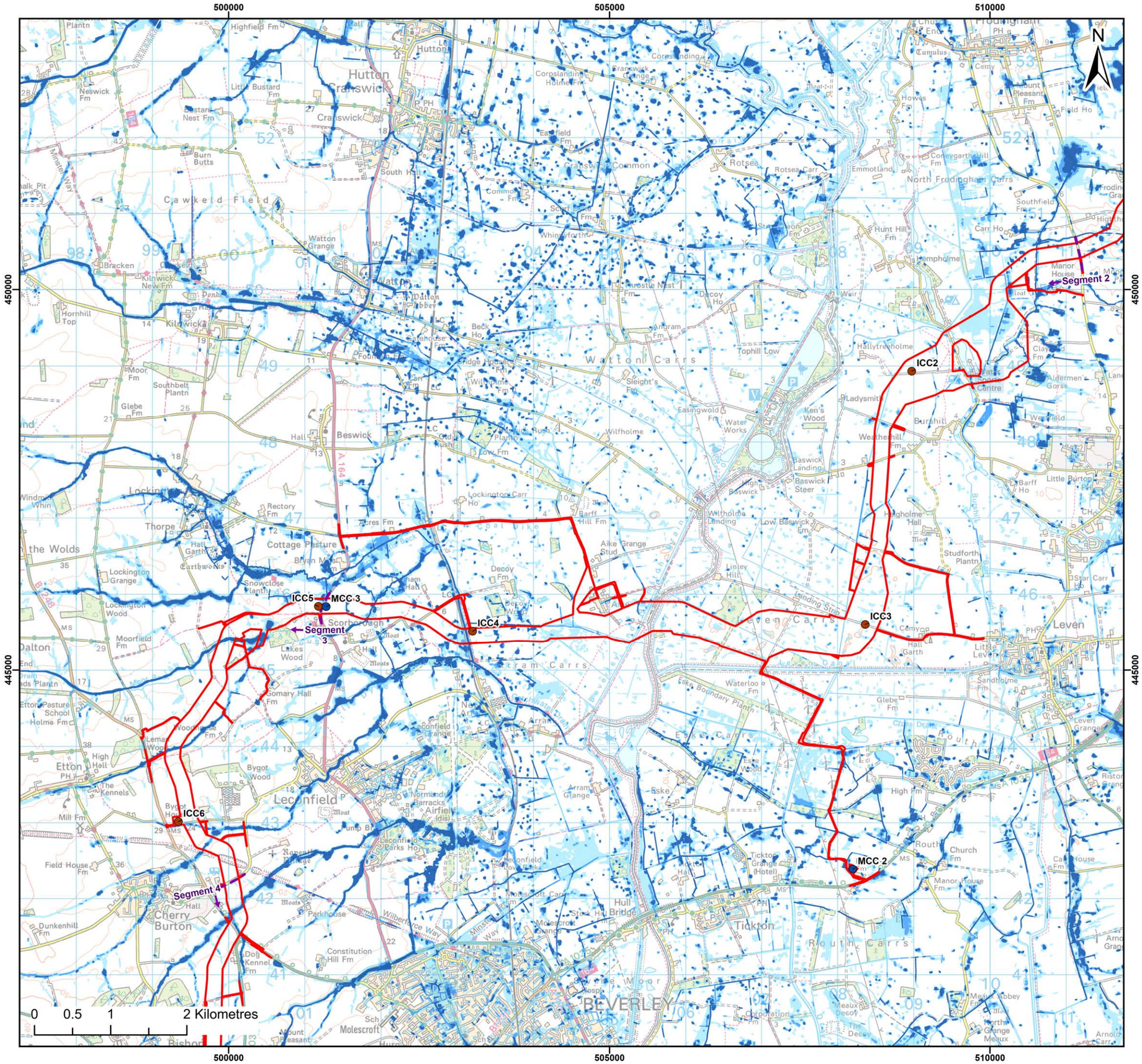

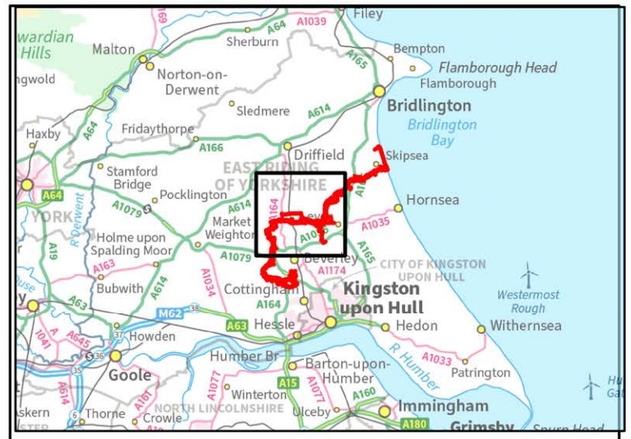

Legend:

- Onshore Development Area
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works

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:

Environment Agency Surface Water Flood Risk within the Onshore Development Area - Sheet 2 of 3

Figure: 21.3-6

Drawing No: PC6250-RHD-XX-ON-DR-GS-0302

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Co-ordinate system: British National Grid

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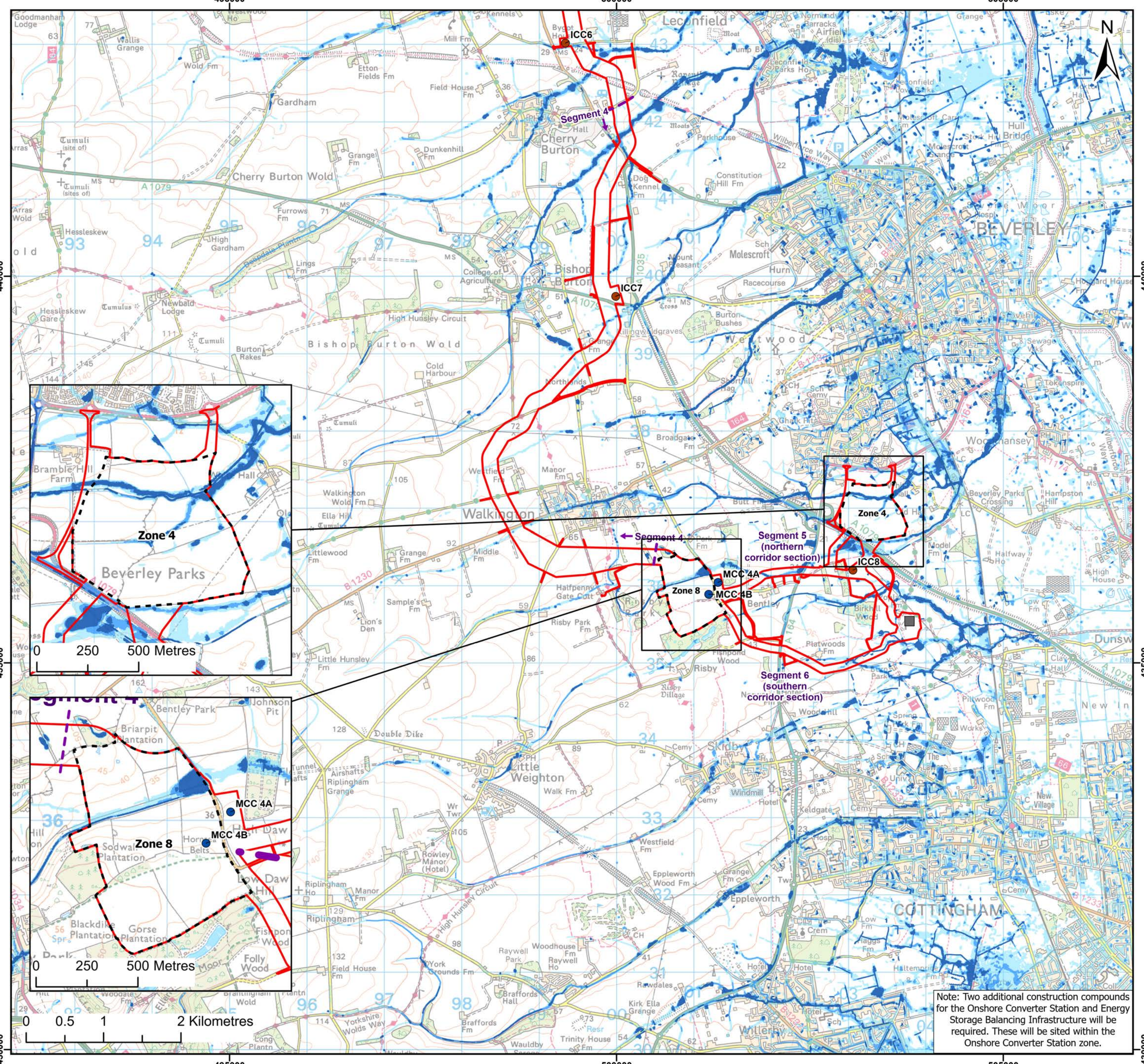

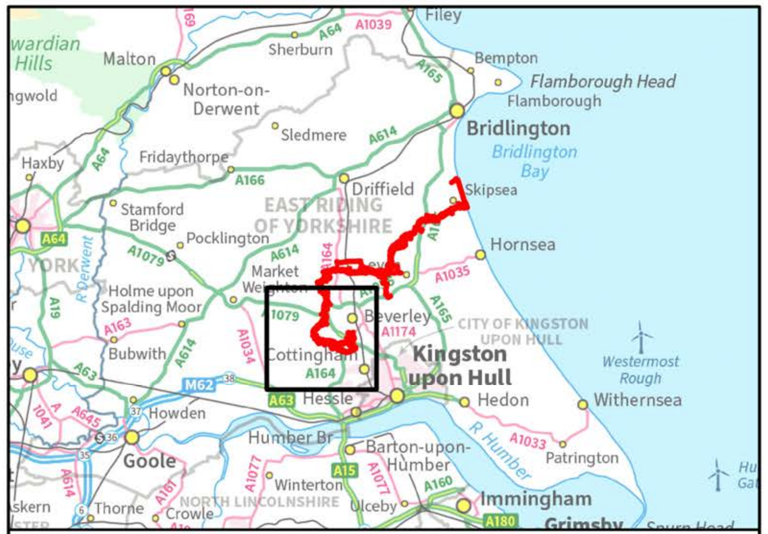

Legend:

- Onshore Development Area
- Onshore Converter Station Zone Options
- Indicative Birkhill Wood Substation Location
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works

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: Environment Agency Surface Water Flood Risk within the Onshore Development Area - Sheet 3 of 3

Figure: 21.3-6

Drawing No: PC6250-RHD-XX-ON-DR-GS-0302

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

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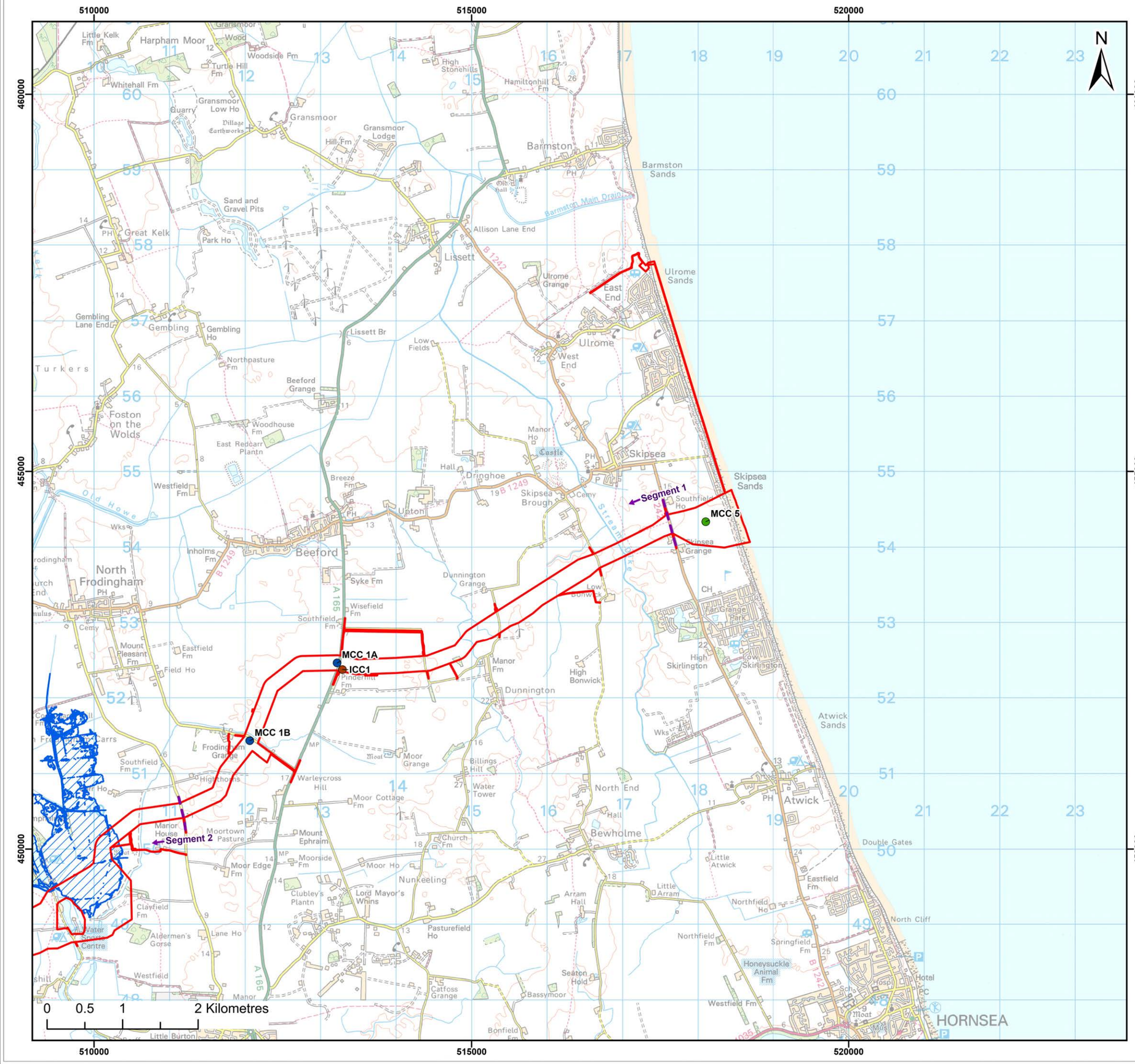

Legend:

- Onshore Development Area
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works
- Landfall Construction Compound

Risk of Flooding from Reservoir or Dam Failure

- Wet Day Scenario (i.e. when there is also flooding from rivers)

Project:

Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Environment Agency Reservoir Flooding Extents within the Onshore Development Area - Sheet 1 of 3

Figure: 21.3-7

Drawing No: PC6250-RHD-XX-ON-DR-GS-0303

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

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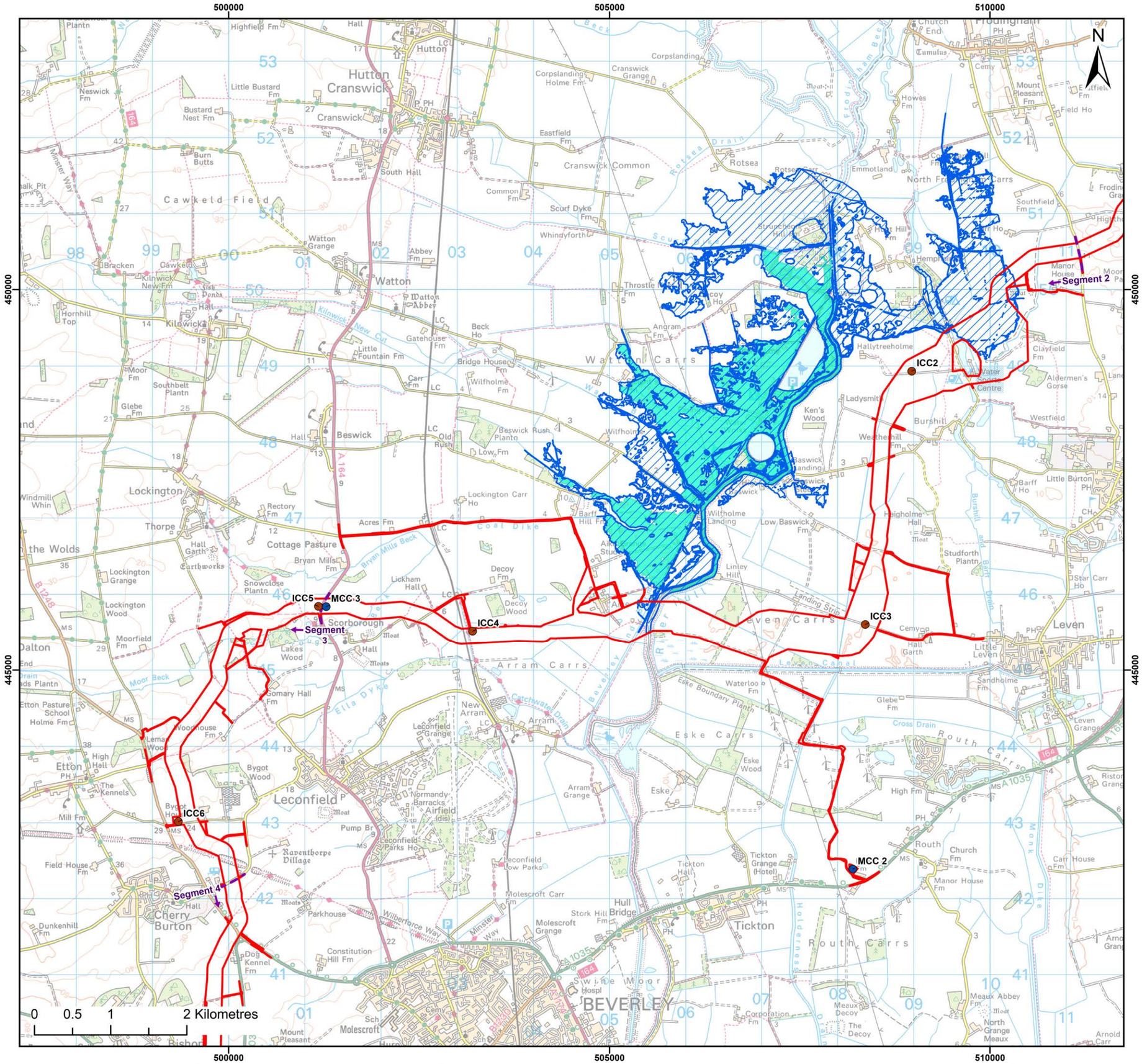

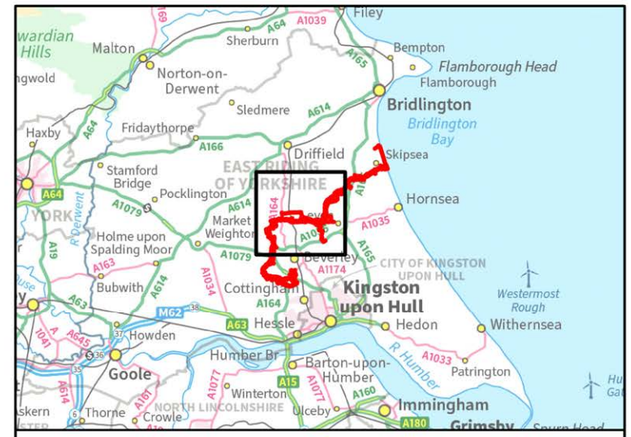

Legend:

- Onshore Development Area
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works

Risk of Flooding from Reservoir or Dam Failure

- Wet Day Scenario (i.e. when there is also flooding from rivers)
- Dry Day Scenario (i.e. when river levels are normal)

Project:

Dogger Bank D
Offshore Wind Farm

DOGGER BANK WIND FARM

Title:

Environment Agency Reservoir Flooding Extents within the Onshore Development Area - Sheet 2 of 3

Figure: 21.3-7

Drawing No: PC6250-RHD-XX-ON-DR-GS-0303

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

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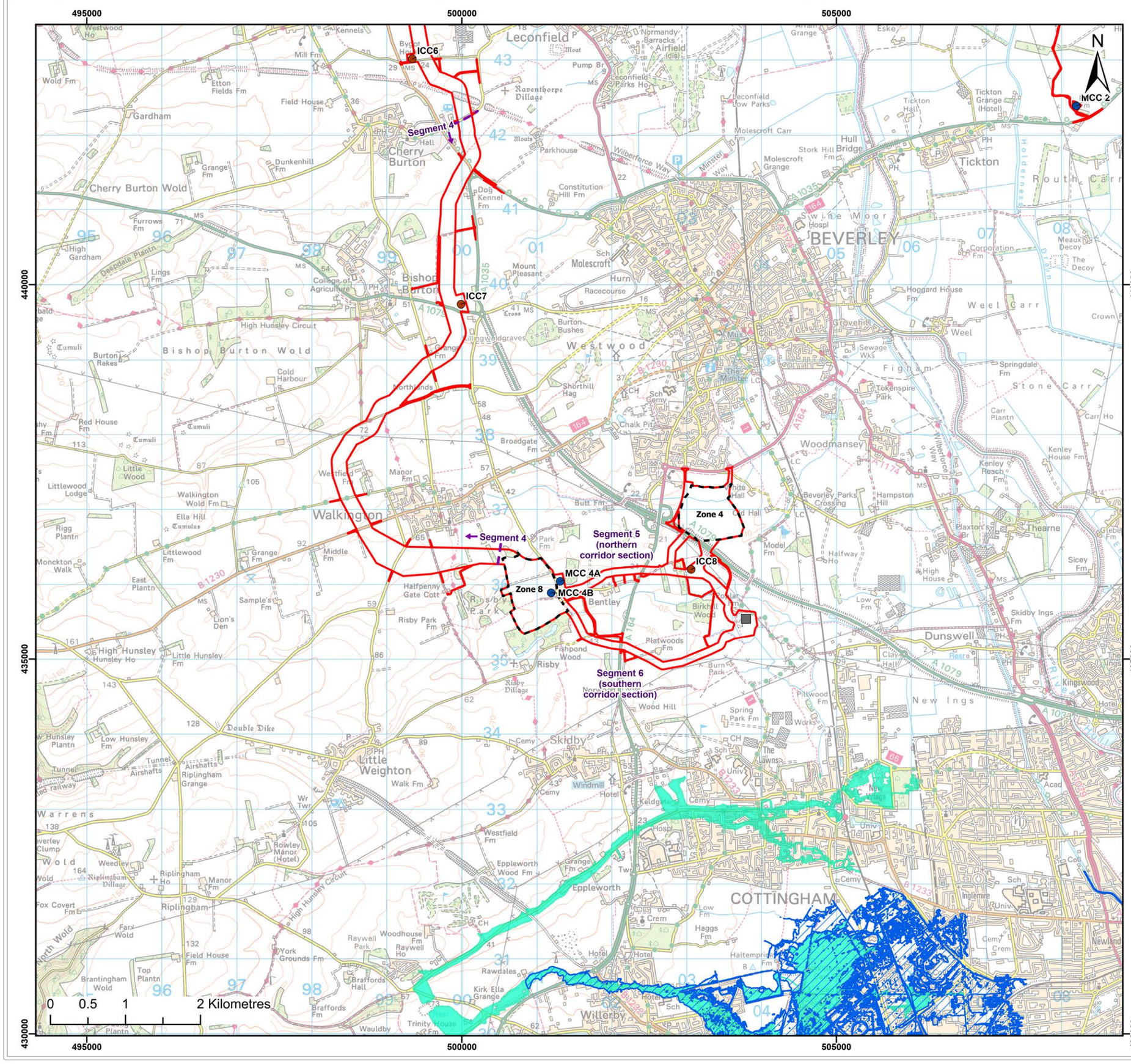

Legend:

- Onshore Development Area
- Onshore Converter Station Zone Options
- Indicative Birkhill Wood Substation Location
- Onshore Export Cable Corridor Segments for Flood Risk Assessment Reporting

Indicative Construction Compound Locations

- Intermediate Construction Compound for Onshore Export Cable Works
- Main Construction Compound for Onshore Export Cable Works

Risk of Flooding from Reservoir or Dam Failure

- Wet Day Scenario (i.e. when there is also flooding from rivers)
- Dry Day Scenario (i.e. when river levels are normal)

Note: Two additional construction compounds for the Onshore Converter Station and Energy Storage Balancing Infrastructure will be required. These will be sited within the Onshore Converter Station zone.

Project:
Dogger Bank D Offshore Wind Farm

DOGGER BANK WIND FARM

Title:
Environment Agency Reservoir Flooding Extents within the Onshore Development Area - Sheet 3 of 3

Figure: 21.3-7
Drawing No: PC6250-RHD-XX-ON-DR-GS-0303

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Co-ordinate system: British National Grid

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21.3.7 Landfall

21.3.7.1 Overview of the Proposed Activities

86. The landfall infrastructure includes the Transition Joint Bay (TJB), which is an underground structure that houses the cable joints between the offshore and onshore export cables, and an associated underground link box. During construction, temporary infrastructure will also be sited at the landfall, including the landfall construction compound and construction accesses.

87. The offshore export cables will come ashore on land south-east of Skipsea and will be jointed to the onshore export cables at the TJB, which will be located at the landward extent of the landfall.

88. A trenchless installation technique will be used to install the cable ducts under the beach at the landfall. It is proposed that up to three cable ducts would be installed to accommodate the two offshore export cables brought ashore. It is likely that two cable ducts would be required, but an allowance for a spare duct has been made for contingency purposes.

89. The ducts will be installed from the TJB to a subtidal exit location on the seabed located below MLWS, and the offshore export cables will be pulled ashore through these pre-installed ducts.

90. Given that no open cut trenching is proposed for landfall construction, and a trenchless installation exit in the subtidal zone will be used, there is no requirement for dewatering or temporary water exclusion using cofferdams or other similar temporary structures in the intertidal zone.

91. The TJB is an underground structure where the offshore and onshore export cables are joined in a clean, dry environment. The TJB will be sited inland with a sufficient setback distance from the cliff top to provide space for temporary construction logistics and account for natural coastal erosion plus climate change allowance, ensuring that the installed cable ducts remain buried throughout the Project's operational lifetime. This includes consideration of cliffs or areas impacted by environmentally sensitive geomorphic systems such as sand dunes. Further details are provided in **Appendix 31.4 Coastal Erosion Report**.

92. An underground link box will be installed in proximity to the TJB to allow inspection and monitoring of cable joints during operation.

93. Further details on landfall infrastructure and proposed activities are provided in **Volume 1, Chapter 4 Project Description**.

94. For the purpose of reporting within this FRA, the landfall is the area between the coastal frontage to the south-east of Skipsea and Hornsea Road (B1242).

21.3.7.2 Historical Flooding

95. To understand the likely risk of flooding to the Project, a review of the Environment Agency's historic flood mapping has been undertaken, as shown on **Figure 21.3-5** (Environment Agency, 2024).

96. This review aims to provide context in relation to any historical flooding. However, it should be noted that the absence of historical flooding does not necessarily confirm that flooding has not occurred, it may simply indicate that the Environment Agency does not hold records of it.

97. **Figure 21.3-5** shows that the landfall is situated in an area which has no records indicating that historic flooding has occurred. However, approximately 800m beyond the north-western boundary is an area where a historic flood event has been recorded.

21.3.7.3 Flood Zones

98. As indicated on **Figure 23.3-5**, the eastern extent of the landfall is shown to be located in Flood Zone 3 (approximately 20%), with the potential flood risk limited to a stretch along the beach / frontage. However, the remainder of the landfall is located within Flood Zone 1 (approximately 80%).

99. The indicative location for the landfall construction compound (see MCC5 on **Figure 23.3-1**) within which the TJB and underground link box will be constructed would be located sufficiently inland such that they would be located within Flood Zone 1.

21.3.7.4 Flooding From Rivers

100. Given that the landfall is located along the Skipsea coastal frontage in close proximity to the North Sea, there is no risk of flooding from fluvial water sources at the landfall due to the absence of fluvial sources. The main sources of flooding at this location are from tidal sources.

101. Therefore, it is concluded that there is no fluvial flood risk to the landfall based on the existing flood risk.

102. Given that a trenchless installation technique is proposed at the landfall and that the landfall infrastructure will be located below ground once operational, they will not be affected by any potential flood risk.

21.3.7.5 Flooding from the Sea

103. The eastern extent of the landfall is situated within Flood Zone 3 along the coastal frontage of Skipsea. It is therefore concluded that there is a tidal flood risk due to the proximity of the landfall to the North Sea. During the construction phase, there is the potential for a tidal risk to landfall activities. However, this risk would primarily be limited to the coastal frontage below the cliff. The inland extent of the landfall will not be at risk from tidal flooding.

104. Given that a trenchless installation technique is proposed at the landfall, which will involve the installation of cable ducts underneath the beach from the landfall construction compound on the cliff top to the exit pits in the subtidal zone, the tidal flood risk both during construction and once operational is considered to be low.

21.3.7.6 Flooding from Surface Water

105. The Environment Agency has produced a map to show the Risk of Surface Water Flooding, which is available online and has also been reproduced on **Figure 21.3-6**. The mapping assesses the risk of surface water flooding based on the classifications as defined in **Table 21.3-3.**

106. Towards the western extent of the landfall, bordering Hornsea Road, there is an area classed as being at high risk from surface water flooding. The risk is likely to be associated with a topographical low point adjacent to the highway.

107. There are several isolated areas of low risk to high risk surface water flooding across the rest of the landfall, which appear to be as a result of agricultural drains or the presence of topographical low points. The remainder of the landfall is assessed as having limited risk of flooding from surface water.

108. Any surface water flood risk to the landfall will be temporary in nature and limited to the construction phase, as all landfall infrastructure will be located below ground during operation. Furthermore, land at the landfall will be reinstated after construction, and existing ground levels will be maintained.

109. On this basis, the risk of flooding from surface water is considered to be low for the landfall once operational. However, there is an increased risk of localised surface water flooding during the construction phase.

21.3.7.7 Flooding from Groundwater

110. The landfall is underlain by a single groundwater body, the Rowe Chalk Formation, which is a Principal Aquifer. This is defined as a formation which provides a high level of water storage and may support water supply and / or river baseflow on a strategic scale.

111. The landfall is located in an area with superficial deposits of Till, Devensian – Diamicton, Lacustrine Deposits – sand, silt and clay, and also Alluvium – Clay, silt, sand and gravel. The superficial deposits are assessed as being Secondary B and Secondary (undifferentiated) Aquifers.

112. Secondary B Aquifers are defined as predominantly lower permeability layers which may store limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers. Secondary (undifferentiated) Aquifers are defined as layers which have previously been designated as both minor and non-minor aquifers, which can vary in different locations due to variable characteristics of rock type.

113. The Level 1 SFRA shows the areas susceptible to groundwater flooding in a strategic scale map showing groundwater flood areas based on a 1km square grid. The data shows the proportion of each 1km grid square where geological and hydrogeological conditions indicate groundwater might emerge.

114. The mapping demonstrates that the landfall is situated in an area where less than 25% of the area is classified as being at risk of groundwater emergence.

115. The nearest BGS borehole to the landfall, reference TA15NE3, is located approximately 900m to the north-west. The borehole has superficial deposits of Boulder Clay and a bedrock of Chalk. The water level in the borehole was noted as being 17 feet below the surface.

116. Once operational, the effect that the landfall will have on groundwater flows will be minimal, as the target burial depth of trenchless installation at the landfall will be between approximately 5m to 25m below the base of the cliff.

117. As the landfall construction works require earthworks such as excavations for the installation of the underground TJB and associated underground link box, it is important to note that perched groundwater may be present and could be encountered during below-ground engineering works.

118. The potential presence of groundwater will be identified during pre-construction ground investigations. If groundwater were to be encountered, it would need to be mitigated through the use of appropriate construction techniques and in accordance with an appropriate method statement. The proposed approach to potential mitigation measures is summarised in the draft version of the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), which will be updated at ES stage.

119. On the basis of the above, there is likely to be a low risk of groundwater flooding at the landfall during construction and any risk will be mitigated, as outlined above.

21.3.7.8 Flooding From Sewers

120. Sewer flooding occurs when a rainfall event exceeds the maximum capacity of the surrounding network. The most common causes of flooding from sewers are inadequate flow capacity, blockages, pumping station failures, burst water mains, water inflow from rivers or the sea, tide locking, siltation, fats / greases and sewer collapse.

121. If any of these events occur, there is a risk of flooding within the vicinity of the sewer via surcharge where the flood is in excess of the sewer capacity.

122. The landfall predominantly comprises agricultural land and the coastal shoreline. The presence of sewerage is unlikely, however, the presence of third party assets will be confirmed prior to the commencement of construction works, and the relevant asset owner / operator will be consulted. Overall, the risk of flooding from sewers is considered to be low.

21.3.7.9 Flooding from Reservoirs

123. The Environment Agency reservoir flood mapping (available online) is presented on **Figure 21.3-7** (Environment Agency, 2024). The mapping indicates that the landfall is not at risk from reservoir flooding, therefore there is no risk of flooding from reservoirs.

21.3.7.10 Flooding From Canals and Other Artificial Sources

124. The Level 1 SFRA flood risk mapping has been reviewed alongside other mapping, and it appears that the landfall is not located near any canals or artificial sources. As such, there is no risk of flooding from canals or other artificial sources to the landfall.

21.3.7.11 Summary of Landfall Flooding

125. Overall, the landfall is not at risk from flooding from reservoirs, canals and other artificial sources. Furthermore, there is no risk of fluvial flooding (Main Rivers) given the absence of fluvial watercourses.

126. The risk of flooding associated with groundwater at the landfall is considered to be low.

127. The eastern extent of the landfall is located within Flood Zone 3, with the risk associated with tidal flooding along the coastal frontage limited to the beach area below the cliff. The inland extent of the landfall will not be at risk from tidal flooding. There is no risk from tidal flooding during operation as the landfall infrastructure will be located below ground. Whilst there may be a limited risk to the landfall during construction, given that a trenchless installation technique will be used to install cable ducts underneath the beach from the landfall construction compound on the cliff top to the exit pits in the subtidal zone, the tidal flood risk during construction is considered to be low.

128. The landfall is considered to be at low risk of surface water flooding, however there are a number of areas of increased risk present across the landfall. These are associated with the presence of agricultural drains and topographical low points causing localised areas of surface water flooding. As the landfall infrastructure will be located below ground, this is not to be considered at risk once operational. However, during construction, there will be a need for a temporary drainage strategy to control the surface water runoff. Construction surface water management measures are proposed in the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), a draft version of which is provided at PEIR stage. These measures will be further refined at ES stage.

21.3.8 Onshore Export Cable Corridor

129. This section of the FRA covers the entirety of the onshore ECC from the landfall to the OCS zones and onwards to the grid connection point at Birkhill Wood Substation. The onshore ECC is wholly located within the East Riding of Yorkshire administrative area.

130. As described in **Section 21.3.2**, the onshore ECC includes one route from the landfall to OCS Zone 8 and then diverges east of OCS Zone 8 into a northern and southern corridor section. This is to maintain flexibility for routeing onshore export cables to / from the two OCS zone options under consideration and onwards to Birkhill Wood Substation. Within the assessment, these two corridor sections are assessed separately where relevant. However, only one corridor section will be taken forward to development.

131. For the purpose of reporting within this FRA, the assessment of the onshore ECC has been split as follows as shown on **Figure 21.3-1**:

- Segment 1: From the landfall south-east of Skipsea to Frodingham Road;
- Segment 2: From Frodingham Road to the A164 west of Scorborough;
- Segment 3: The A164 west of Scorborough to Main Street (located to the east of Cherry Burton);
- Segment 4: Main Street to land adjacent to Risby Lane (South of Walkington) and the boundary of OCS Zone 8;
- Segment 5 (northern corridor section): Coppleflat Lane at the boundary of OCS Zone 8 to Birkhill Wood Substation, including two crossing locations of the A1079 into OCS Zone 4; and
- Segment 6 (southern corridor section): Coppleflat Lane at the boundary of OCS Zone 8 to Birkhill Wood Substation.

21.3.8.1 Overview of the Proposed Activities

132. The Onshore Development Area includes a broad onshore ECC with a width of approximately 200m. At certain locations, the corridor width varies for limited lengths to account for specific environmental, land or engineering constraints. The temporary and permanent land requirements for the onshore export cable infrastructure will be accommodated within this broad onshore ECC. The onshore ECC will be further refined at ES stage for the DCO application submission.

133. Two types of onshore export cable systems will be required for the Project: High Voltage Direct Current (HVDC) and High Voltage Alternating Current (HVAC). The HVDC export cables will be installed from the TJB at landfall to the OCS zone. The HVAC export cables will be installed from the OCS zone to Birkhill Wood Substation.

134. During construction, the standard corridor width for the HVDC export cable system will be approximately 32m and 55m for the HVAC export cable system. At trenchless crossing locations and where additional land is required for engineering flexibility, the corridor width would extend to approximately 50m for the HVDC export cable system and 60m for the HVAC export cable system.

135. The majority of export cable works within the onshore ECC will be undertaken using open cut trenching. Where this method is not suitable, trenchless installation techniques will be adopted.

136. Along the onshore ECC, underground structures known as jointing bays will be constructed at regular intervals to enable cable pull-in and jointing of discrete sections of onshore export cables. In addition, link boxes will be installed at regular intervals in proximity to jointing bays to allow for inspection and monitoring of cable joints during operation. Link boxes associated with the onshore ECC may either be installed as underground or above-ground structures. At this stage, it is anticipated 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 (out of a total of 56 link box locations).

137. The northern corridor section is being considered for both OCS Zone 4 and Zone 8. If Zone 4 is taken forward, the northern corridor section would be used for both the HVDC and HVAC export cables. If Zone 8 is taken forward, the northern corridor section would only be used for the HVAC export cables. The southern corridor section is only being considered for Zone 8 and will only be used for the HVAC export cables.

138. During operation, most of the onshore export cable infrastructure will be located below-ground, except for above-ground link boxes where required.

139. Further details on onshore export cable infrastructure are provided in **Volume 1, Chapter 4 Project Description.**

21.3.8.2 Historical Flooding

140. To understand the likely risk of flooding to the Project, a review of the Environment Agency historic flood mapping has been undertaken, as shown on **Figure 21.3-5** (Environment Agency, 2024).

141. This review aims to provide context in relation to any historical flooding along the onshore ECC. However, it should be noted that any absence of historical flooding does not necessarily confirm that flooding has not occurred, it may simply indicate that the Environment Agency does not hold records of it.

142. **Figure 21.3-5** indicates that there have been multiple historic flood events along Segment 2 of the onshore ECC:

- There are records of historic flooding where the onshore ECC crosses Frodingham Road, and in this location, the flooding appears to be associated with the agricultural drain network including the Holts Drain, Halls Drain and New Cross Drain.
- Historic flooding has also occurred to the south of Farriers Lodge, which appears to be localised flooding resulting from the agricultural drainage network.
- As the onshore ECC passes to the south of Beverley Airfield, it passes through another area which has experienced historic flooding, which is likely to be associated with Leven South Carr Drain.
- As the onshore ECC passes in proximity to the White Water Drain, the historic mapping indicates this area has also previously experienced flooding.

143. The mapping indicates that there are no records of historic flooding along the other segments of the onshore ECC.

21.3.8.3 Flood Zones

144. The Flood Map for Planning is available online (Environment Agency, 2024) and is presented on **Figure 21.3-5**. The length of the onshore ECC means that it is located across areas of Flood Zones 1, 2 and 3.

145. In Segment 1, the majority of the onshore ECC is classified as being in Flood Zone 1. There are two areas where Flood Zone 3 bisects the onshore ECC. This flooding is associated with the Skipsea Drain (West Branch) and Dunnington Sewer Drain.

146. In Segment 2, the majority of the onshore ECC is located within Flood Zones 2 and 3. This segment of the onshore ECC crosses four Main Rivers and multiple Ordinary Watercourses.

147. Segment 3 of the onshore ECC is primarily located in Flood Zone 1. However, there are several areas within Flood Zones 2 and 3 associated with Ordinary Watercourses, comprising local agricultural drains.

148. Segment 4 of the onshore ECC is mainly located in Flood Zone 1, with the route crossing one area of Flood Zones 2 and 3 associated with the presence of an agricultural drain.

149. In Segment 5 (northern corridor section), the onshore ECC is primarily located in Flood Zone 1. However, where the northern corridor section bounds OCS Zone 4 and crosses an Ordinary Watercourse, it passes through areas of Flood Zones 2 and 3. The onshore ECC also passes through areas of Flood Zones 2 and 3 near Poplar Farm as the onshore ECC progresses towards Birkhill Wood Substation. The risk is primarily associated with the agricultural drainage ditches and naturally occurring topographical low points.

150. In Segment 6 (southern corridor section), the onshore ECC is primarily located in Flood Zone 1. However, the southern corridor section crosses an Ordinary Watercourse, where it passes through an area of Flood Zones 2 and 3. This risk is primarily associated with the agricultural drainage ditches, which is a fluvial source.

21.3.8.4 Flooding From Rivers

151. As noted above, there are several locations where Segments 1 to 4 of the onshore ECC will pass under watercourses with a risk of fluvial flood risk. The most significant of these areas is likely to be Segment 2 of the onshore ECC. Details of this have been provided in **Section 21.3.8.3** and, as such, are not considered again in this section of the FRA.

152. In Segment 5 (northern corridor section), the northern and eastern extent of the onshore ECC has flooding associated with Ordinary Watercourses. At the northern extent, the northern corridor section crosses the fluvial flood extent. The fluvial flood extent is a result of a topographical low point and an Ordinary Watercourse. The Ordinary Watercourse is located to the east of the northern corridor section. This results in the onshore ECC crossing Flood Zones 2 and 3.

153. At the eastern extent, of Segment 5, the northern corridor section crosses another Ordinary Watercourse, resulting in the onshore ECC crossing through Flood Zones 2 and 3. The flood extent is classed as fluvial and is associated with the Ordinary Watercourse. The remainder of the northern corridor section is in Flood Zone 1.

154. In Segment 6 (southern corridor section), the western extent of the onshore ECC crosses an Ordinary Watercourse resulting in the crossing of Flood Zones 2 and 3. Due to the presence of the Ordinary Watercourse, the flood extent is related to the agricultural drainage ditches, which is a fluvial source. The remainder of the southern corridor section is in Flood Zone 1.

155. **Appendix 4.3 Crossing Schedule – Onshore** provides a summary of the watercourse crossings that have been identified along the onshore ECC as well as the proposed crossing method. These watercourse crossing locations and proposed crossing method are shown on **Figure 21.3-1**.

156. It is proposed that all Environment Agency Main Rivers and IDB maintained drains will be crossed using trenchless techniques with respect to cable duct installation for the onshore export cables (see Commitment ID CO32 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk).** This will mitigate the potential impact of the Project on the fluvial flood risk at these locations.

157. Furthermore, it is acknowledged that there may be a fluvial flood risk associated with Ordinary Watercourses which are likely to be passed under by the onshore ECC.

158. Where minor Ordinary Watercourses, such as agricultural field drains are to be crossed, methods such as open trenching combined with temporary damming and diversion of the watercourse is likely to be used. The crossing methodology for Ordinary Watercourses will be considered and confirmed during the detailed design stage post-consent.

159. Any fluvial flood risk related to the above ground link boxes will be considered to be low due to their small surface area. Furthermore, mitigation measures can be incorporated so that the above ground link boxes will not impact flood risk elsewhere, which will be confirmed at ES stage if required.

160. Consent will need to be gained from the relevant authorities such as the Environment Agency, LLFA and the IDB for the construction phase. This is to ensure that the construction of the onshore ECC does not increase fluvial flood risk to, or from, the Project, for both Main Rivers and Ordinary Watercourses.

21.3.8.5 Flooding from the Sea

161. All segments of the onshore ECC are not considered to be at risk of tidal flooding as it is located inland away from this source of flood risk. Whilst a review of the Flood Zone mapping indicates parts of the onshore ECC are located within Flood Zones 2 and 3, this flood risk is associated with fluvial flooding. Therefore, it is concluded that there would be no tidal flood risk to onshore ECC either during construction or operation.

21.3.8.6 Flooding from Surface Water

162. The Environment Agency has produced a map to show the Risk of Surface Water Flooding, which is available online and has also been reproduced on **Figure 21.3-6.** The mapping assesses the risk of surface water flooding based on the classifications as defined in **Table 21.3-3.**

163. The Environment Agency's Surface Water Flood Risk Map **(Figure 21.3-6)** indicates that there are multiple areas of low to high risk of surface water flooding along the onshore ECC. Some of these isolated areas appear to be as a result of topographical low points which can lead to pooling and increase the risk of surface water.

164. In Segment 1, there are multiple individual areas of low to high risk of surface water flooding due to topographical low points. The areas of flood risk that bisect the onshore ECC are usually associated with an agricultural drain or other Ordinary Watercourse which are identified as being at an increased risk of surface water flooding. For the majority of these locations, the surface water flood risk appears to be limited to within the banks of the watercourse, the channel itself, as well as the adjacent lower lying land draining into it.

165. Segment 2 is classed as being at low or medium risk of surface water flooding. The surface water flood risk in this location is associated with lower lying land used for agriculture, which is susceptible to pooling of surface water.

166. Segments 3 and 4 are classed as being at varying risk of surface water flooding with some areas at low to high risk.

167. The majority of Segment 5 (northern corridor section) is not at risk from surface water flooding. However, there are several overland flow routes, drainage ditches and topographical low points across the corridor, ranging from low to high risk. Where the risk is in relation to the drainage ditch, the surface water risk is shown on the mapping as being retained within the channel. In addition, where there are naturally occurring topographical low points along the overland flow route, this tends to result in the surface water to pool resulting in a high risk. Furthermore, the northern corridor section crosses a small area of Flood Zone 3, which is also shown to be at risk from surface water flooding. In this location, the crossing method will be considered on an individual basis and agreed with the LLFA at the detailed design stage post-consent.

168. The majority of Segment 6 (southern corridor section) is not at risk of flooding from surface water. However, there are areas of low to high risk at several points along the route, and these are primarily associated with the agricultural drainage ditch, overland flow route and a topographical low point. The risk along this corridor section is associated with the drainage ditch, and in this location, the surface water is retained within the drainage channel. However, there are some small areas of high risk within the overland flow route, with the remainder being low.

169. Further information on watercourse crossings is discussed in **Section 21.3.13.**

170. Any surface water flood risk to the onshore ECC will be temporary in nature and will be limited to the construction phase, as most of the onshore export cable infrastructure will be located below ground during operation, and the land will be reinstated after construction with the existing ground levels maintained.

171. Any surface water risk to the above ground link boxes will be considered to be low due to their small surface area. Furthermore, mitigation measures can be incorporated so that the above ground link boxes will not impact flood risk elsewhere, which will be confirmed at ES stage if required.

172. Furthermore, construction surface water management measures are proposed in the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), a draft version of which is provided at PEIR stage. These measures will be further refined at ES stage.

21.3.8.7 Flooding from Groundwater

173. Segments 1 to 4 are underlain by the following groundwater bodies: Rowe Chalk Formation – Chalk, Flamborough Chalk Formation – Chalk and Burnham Chalk Formation – Chalk.

174. Segment 5 (northern corridor section) is underlain by a bedrock deposit of Flamborough Chalk Formation and Burnham Chalk Formation both of which are formed of chalk.

175. Segment 6 (southern corridor section) is underlain by a bedrock of Burnham Chalk formation formed of chalk.

176. The bedrock within all segments of the onshore ECC is underlain by a Principal Aquifer, which is defined as formations which provide a high level of water storage and may support water supply and / or river baseflow on a strategic scale.

177. Segments 1 to 4 are situated over superficial deposits of Marine Deposits - Sand and gravel, Alluvium - Clay, silt, sand and gravel, Glaciofluvial Deposits, Devensian - Sand and gravel and Till, Devensian – Diamicton. These superficial deposits are classified as Secondary (undifferentiated), Secondary A and Secondary B aquifers.

178. The bedrock within Segment 5 (northern corridor section) is overlain by superficial deposits of Till, Devensian formed of Diamicton, superficial deposits of Head formed of clay, silt, sand and gravel and superficial deposits of sand and gravel. The superficial deposits underlying the majority of the northern corridor section are classed as Secondary (undifferentiated) Aquifer, with a small section of a Secondary A Aquifer.

179. The bedrock within Segment 6 (southern corridor section) is overlain by superficial deposits of Till, Devensian formed of Diamicton, which are entirely classed as a Secondary (undifferentiated) Aquifer.

180. Secondary (undifferentiated) Aquifers are described as layers which have previously been designated as both minor and non-minor aquifers. They can vary in different locations as a result of the variable characteristics of different rock types.

181. Secondary A Aquifers are described as permeable layers capable of supporting water supplies at local rather than strategic scale, and in some cases forming an important source of baseflow to rivers. These are generally aquifers formerly classified as minor aquifers.

182. Secondary B aquifers are formed of predominantly lower permeability layers which may store limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

183. The Level 1 SFRA shows the areas susceptible to groundwater flooding, which is a strategic scale map showing groundwater flood areas based on a 1km square grid. The data shows the proportion of each 1km grid square where geological and hydrogeological conditions indicate groundwater might emerge.

184. The mapping demonstrates that the onshore ECC passes through several areas susceptible to groundwater emergence.

185. In Segment 1, the onshore ECC passes through areas where the likelihood of groundwater flooding is less than 25%. In some areas, no data is available regarding groundwater flooding.

186. In Segment 2, the onshore ECC passes an area with a greater or equal to 75% chance of groundwater flooding.

187. In Segment 3, the northern part of the onshore ECC passes through an area with a greater or equal to 75% chance of groundwater flooding. Towards the centre of the segment, there are areas with susceptibility ranging between less than 25% and 75% chance of ground water flooding. Towards the southern part of the segment, mapping indicates that no data is held for the area.

188. In Segment 4, the majority of the onshore ECC traverses an area where no data is available regarding groundwater flooding. Towards the start and end of this segment, there are some areas of less than 25% chance of groundwater emergence.

189. In Segments 5 and 6, the mapping indicates that no data is held for the area in which the majority of the northern and southern corridor sections are located. However, areas located at the eastern extent of these corridor sections are indicated to have less than a 25% chance of being susceptible to groundwater flooding.

190. Once in operation, the effect that the onshore export cables will have on groundwater flows is likely to be low. Where open cut trenching is used, the onshore export cables will be buried at a target minimum burial depth of approximately 1.2m (see Commitment ID CO41 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**). Where a trenchless installation technique is used, the onshore export cables will be installed at a target burial depth of between approximately 3.5m and 20m. Jointing bays and underground link boxes along the onshore ECC will be buried at a maximum depth of 2.5m and 2m respectively. Given the burial depth of the onshore export cable infrastructure, it is likely that the infrastructure will be installed within the superficial deposits.

191. As the construction works along the onshore ECC require earthworks such as excavations of cable trenches for trenched duct installation, entry and exit pits for trenchless duct installation and excavations for jointing bays and underground link boxes, it is important to note that perched groundwater may be present and could be encountered during below-ground engineering works.

192. The potential presence of groundwater will be identified during pre-construction ground investigations. If groundwater were to be encountered, it would need to be mitigated by appropriate construction techniques and in accordance with an appropriate method statement. The proposed approach to potential mitigation measures is summarised in the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), a draft version of which is provided at PEIR stage.

193. On the basis of the above, it is concluded that the risk of groundwater flooding is likely to be low to medium in Segments 1 to 4 of the onshore ECC. The risk of groundwater flooding is likely to be low along Segments 5 and 6 (northern and southern corridor sections).

21.3.8.8 Flooding from Sewers

194. Sewer flooding occurs when a rainfall event exceeds the maximum capacity of the surrounding network. The main causes are usually as a result of inadequate flow capacity, blockages, pumping station failures, burst water mains, water inflow from rivers or the sea, tide locking, siltation, fats / greases and sewer collapse.

195. The Level 1 SFRA has been assessed to review the potential sewer flood risk to the onshore ECC. The Level 1 SFRA states the following:

"New Sewer systems are typically designed to accommodate the 3.3% AP storm without flooding at the ground surface in accordance with Sewers for Adoption. However, many of the existing sewers were not built to this specification. These sewers can become overloaded as new development adds to the loads on the network.

Even when sewers are built to the current specification, they may become overwhelmed by events with a higher magnitude. Sewer flooding can also be caused due to blockages, collapses or equipment (e.g. Pumping station) failure.

Many of the systems in East Riding were constructed prior to the introduction of the now required design standard of 3.3% AP (1 in 30 years). The limitations of the sewer system were highlighted in 2007, when the existing drainage structure and public sewers were overwhelmed by the prolonged and heavy rainfall. However, since then Yorkshire Water have undertaken work to update and improve the sewer system in East Riding."

196. There is no specific information in the Level 1 SFRA to indicate sewer flooding is an issue along all segments of the onshore ECC.

197. In addition, all segments of the onshore ECC are predominantly located on land which comprises agricultural and rural land uses. The presence of sewerage is unlikely, however, the presence of third party assets will be confirmed prior to the commencement of construction works, and the relevant asset owner / operator will be consulted. Overall, the risk of flooding from sewers is considered to be low.

21.3.8.9 Flooding from Reservoirs

198. The Environment Agency's reservoir flood mapping (available online) is presented on **Figure 21.3-7** (Environment Agency, 2024). This mapping indicates that the majority of Segments 1 to 4 of the onshore ECC are not at risk from reservoir flooding, with the exception of two areas within Segment 2, which are discussed further below. Segments 5 and 6 (northern and southern corridor sections) are not at risk from reservoir flooding during all scenarios, including Wet Day and Dry Day scenarios.

199. The Environment Agency reservoir flood maps indicates that where Segment 2 of the onshore ECC crosses the Clayfield area and Halls Drain, there is a potential risk from reservoir flooding during a Wet Day Scenario.

200. A Wet Day Scenario predicts how much worse a reservoir flooding scenario might be if a river is already experiencing an extreme natural flood event. This flood risk is likely to be associated with the increased fluvial risk from the Roam Drain, New Cross Drain, Holts Drain and Halls Drain. This reservoir flood risk is associated with the Tophill Low reservoirs located to the west of the onshore ECC.

201. It is also noted that the onshore ECC is located outside the extent for the reservoir flooding during the Dry Day Scenario, and therefore is not considered to be at risk from reservoir flooding on its own. As such, it is concluded that the flood risk in the Wet Day Scenario is predominantly driven by the fluvial flood risk. A review of the mapping extent for a fluvial event in this location supports this conclusion. As such, this area of Segment 2 is considered to be at low risk of flooding from the Tophill Low reservoirs.

202. Where Segment 2 of the onshore ECC crosses the River Hull and the Beverley and Barmston Drain, there is a small risk of reservoir flooding in both the Wet Day and Dry Day scenarios. The extent for the Dry Day scenario appears to be present for the Beverley and Barmston Drain only and is retained within the channel.

203. The area around the River Hull is affected by the Wet Day scenario, with the flood risk appearing to exceed the banks of the River Hull. This reservoir flood risk at this location also appears to be associated with the Tophill Low reservoirs. A similar review of the mapping indicates that the flood risk in the Wet Day Scenario is predominantly driven by the fluvial flood risk, and the mapping extent for a fluvial event in this location supports this conclusion. As such, this area of Segment 2 is considered to be at low risk of flooding from the Tophill Low reservoirs.

204. Furthermore, the chance of reservoir flooding occurring is considered to be extremely low due the regular inspection and maintenance regime which is in place for large reservoirs. The likelihood of catastrophic failure, and therefore, risk of flooding to the Project from this source is unlikely to occur.

205. As most of the onshore export cable infrastructure will be located below ground during operation, in a worst-case scenario event of a reservoir failure causing flooding, the onshore ECC would only be at risk during the construction phase.

206. Any link boxes situated above ground will be considered to be at low risk of flooding from reservoirs as a result of their small surface area. Furthermore, mitigation measures can be incorporated into the design so that they will not increase flood risk elsewhere, which will be confirmed at ES stage if required.

207. Overall, there is no risk of reservoir flooding in Segment 1 and Segments 3 to 6 of the onshore ECC. The risk of reservoir flooding in Segment 2 is considered to be low.

21.3.8.10 Flooding from Canals and Other Artificial Sources

208. The Level 1 SFRA has been reviewed alongside other online mapping, which indicates that the southern boundary of Segment 2 of the onshore ECC crosses Leven Canal for the purposes of construction access only. The Leven Canal has been identified as a canal within the Level 1 SFRA. As this is a temporary construction access, appropriate mitigation measures related to watercourse crossings have been included within the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), a draft version of which is provided at PEIR stage.

209. Given there are no other canals or artificial infrastructure identified along the onshore ECC, it is concluded that there is no risk of flooding from these sources in all segments of the onshore ECC.

21.3.8.11 Summary of Onshore Export Cable Corridor

210. Overall, Segments 1 to 4 of the onshore ECC are not at risk from flooding from tidal, sewers, canals and other artificial sources. There is a variable risk of groundwater flooding along parts of the onshore ECC (low to medium risk). Segments 1, 3 and 4 are not at risk from reservoir flooding, however, part of Segment 2 is considered to be at low risk from reservoir flooding. The main risk of flooding to these segments of the onshore ECC is from fluvial flooding.

211. Whilst large sections of Segments 1 to 4 of the onshore ECC are located within Flood Zone 1 (i.e. at low risk), there are key sections in Segment 2 which are located within Flood Zones 2 and 3. The fluvial flood risk is associated with a number of Main Rivers and Ordinary Watercourses, including minor watercourses such as agricultural land drains. Mitigation measures to ensure there is not an increased risk of flooding either to, or from, the onshore ECC, during a fluvial event are set out in the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), a draft version of which is provided at PEIR stage.

212. Segments 1 to 4 of the onshore ECC are also at variable risk from surface water flooding. There are multiple isolated areas of low to high risk of surface water flooding across the onshore ECC, which appear to be related to agricultural drains and topographical low points. There is also an increased risk of surface water flooding where the onshore ECC passes under Ordinary Watercourses; however, this is primarily limited to the width of the watercourse channel and relates to the channel area and the lower lying land draining into it.

213. Segments 5 and 6 of the onshore ECC (northern and southern corridor sections) are not at risk of flooding from tidal, sewers, reservoirs, canals and other artificial sources. The risk of groundwater flooding along Segments 5 and 6 are considered to be low. The main risk to both Segments 5 and 6 of the onshore ECC are from fluvial and surface water sources.

214. In Segment 5, as the northern corridor section travels from OCS Zone 4 to Birkhill Wood Substation, it is partially located within Flood Zones 2 and 3. The flood risk in this location is primarily fluvial and associated with a topographical low point and Ordinary Watercourses. The remainder of the northern corridor section is located in Flood Zone 1. Similarly to the fluvial flood risk, the surface water flood risk is primarily associated with the agricultural drainage ditches, topographical low points and overland flow routes. However, this risk is primarily limited to the width of the watercourse channel and relates to channel area and the lower lying land draining into it.

215. In Segment 6, as the southern corridor section travels from OCS Zone 8 to Birkhill Wood Substation, it is partially located within Flood Zones 2 and 3 where it crosses Ordinary Watercourses. The remainder of the southern corridor section is located within Flood Zone 1. The surface water flood risk is associated with the agricultural drainage ditch, overland flow route and a topographical low point. However, this risk is primarily limited to the width of the watercourse channel and relates to channel area and the lower lying land draining into it.

216. Any surface water risk to the onshore ECC will be temporary and limited to the construction phase, as most of the onshore export cable infrastructure will be located below ground during operation.

217. Any surface water risk to the above ground link boxes will be considered to be low due to their small surface area. Furthermore, mitigation measures can be incorporated so that the above ground link boxes will not impact flood risk elsewhere. which will be confirmed at ES stage if required.

218. A summary of mitigation measures is provided in **Section 21.3.13** Further information on measures to address the flood risk along the onshore ECC are provided within the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), a draft version of which is provided at PEIR stage.

21.3.9 Onshore Converter Station Zone(s)

21.3.9.1 Overview of Proposed Activities

219. As described in **Section 21.3.2**, two OCS zone options (i.e. Zone 4 and Zone 8) remain under consideration at this stage, as shown on **Figure 21.3-1**. However, only one OCS zone option will be taken forward to development, and both the OCS and ESBI will be co-located within the selected zone.

220. With respect to the FRA, there is the potential for the assessment for the OCS zone infrastructure to differ between the two OCS zones. Where relevant, the assessment outcomes discussed below have been set out separately.

221. The OCS will comprise a fenced compound to house electrical equipment for converting the electricity generated by the Project into a suitable voltage as required to meet the UK Grid Code for connection into the National Grid electricity transmission network.

222. The ESBI will comprise a fenced compound(s) to provide a storage solution for energy generated from the wind farm and allow flexibility during intermittent wind generation output.

223. At this stage, layout configurations of infrastructure within both OCS zones are still under development. The Project Design Envelope with respect to the OCS and ESBI has been defined based on the maximum land and infrastructure requirements from the range of design and technology options under consideration.

224. The maximum developable area within the OCS zone for the OCS and ESBI is 25ha, which includes 20.5ha of permanent area and 4.5ha of temporary construction area. These areas include, but not limited to, the platform footprint, landscaping, access, drainage and attenuation but exclude areas for ecological mitigation / enhancement.

21.3.9.2 Historical Flooding

225. To understand the likely risk of flooding to the Project, a review of the Environment Agency's historic flood mapping has been undertaken, as shown on **Figure 21.3-5** (Environment Agency, 2024).

226. This review aims to provide context in relation to any historical flooding in the OCS zones. However, it should be noted that any absence of historical flooding does not necessarily confirm that flooding has not occurred, it may simply indicate that the Environment Agency does not hold records of it.

227. **Figure 21.3-5** indicates that both OCS Zone 4 and OCS Zone 8 are located within an area which is not shown to have been historically affected by flooding.

21.3.9.3 Flood Zones

228. The Environment Agency Flood Map for Planning is available online (Environment Agency, 2024) and is presented on **Figure 21.3-5.**

229. OCS Zone 4 is shown as being located within Flood Zones 1, 2 and 3. Flood Zones 2 and 3 are situated in the northern extent of OCS Zone 4. The flood risk is fluvial and associated with the Autherd Drain which bisects OCS Zone 4, as shown on **Figure 21.3-5**. Along the southern boundary of OCS Zone 4, there are also areas of Flood Zones 2 and 3, which are likely to be associated with the agricultural drain located to the east combined with a topographical low point.

230. OCS Zone 8 is wholly located in Flood Zone 1. However, beyond its south-east boundary, there is an area in Flood Zones 2 and 3 which is associated with an agricultural drain.

21.3.9.4 Flooding From Rivers

231. A review of the mapping for OCS Zone 4, presented on **Figure 21.3-1,** indicates that there are three agricultural drains that divide the zone, with two being located in the northern extent and one in the southern extent. The agricultural drains in the northern extent of the zone have a fluvial flood risk, resulting in this area of OCS Zone 4 being located in Flood Zones 2 and 3. There is another agricultural drain located along the southern boundary. However, as indicated in the Environment Agency Flood Map for Planning (Environment Agency, 2024), the remaining area of OCS Zone 4 is classed as Flood Zone 1, which is deemed to be at low risk of fluvial flooding.

232. If the OCS and ESBI are all located within areas of Flood Zone 1 within OCS Zone 4, it can be concluded that the fluvial flood risk is relatively low. However, if the OCS and ESBI are located within Flood Zones 2 or 3, the fluvial flood risk can be classed as medium to high. As such, mitigation measures would need to be implemented at detailed design stage post-consent to ensure that the Project remains flood free for its design life, as well as ensuring that the flood risk is not increased elsewhere.

233. A review of the mapping for OCS Zone 8, presented on **Figure 21.3-1**, indicates there are no Ordinary Watercourses or Main Rivers located within the boundary of the zone. Therefore, there is no fluvial risk, and it remains wholly located within Flood Zone 1. As such, it can be concluded that the fluvial flood risk is low to the OCS and ESBI if located in OCS Zone 8.

21.3.9.5 Flooding from the Sea

234. OCS Zone 4 and OCS Zone 8 are located approximately 20.5km and 22.5km west of the nearest coastline respectively. Therefore, it can be concluded that both zones are not at risk from tidal flooding.

21.3.9.6 Flooding from Surface Water

235. The Environment Agency has produced a map to show the Risk of Surface Water Flooding, which is available online and has also been reproduced on **Figure 21.3-6.** The mapping assesses the risk of surface water flooding based on the classifications as defined in **Table 21.3-3**.

21.3.9.6.1 Onshore Converter Station Zone 4

236. OCS Zone 4 is indicated to have varying risk from low to high risk of surface water flooding, as shown on **Figure 21.3-6**. Bisecting the zone is an area of low to high risk, associated with the Autherd Drain, which flows in an easterly direction. There are two other drainage ditches, located to the south-east of the Autherd Drain which progress into an overland flow route and flow in an easterly direction where they also join the Autherd Drain. The surface water then appears to pond in the eastern extent of the zone due a natural topographical low point.

237. The main flow path in OCS Zone 4 is considered to be at high risk of surface water flooding; however, the south-eastern overland flow paths are at medium or low risk of surface water flooding.

238. If the OCS and ESBI are located in areas not shown to be at risk, the risk of surface water flooding can be considered to be low. However, if the OCS and ESBI are located in areas at increased risk (low to high), the risk from surface water flooding can be considered to be high and will need appropriate mitigation measures at detailed design stage post-consent.

239. In addition to the above, if the OCS and ESBI are located in this zone, the wider potential surface water flood risks during operation will need to be considered in the Outline Operational Drainage Strategy, which will be produced at ES stage for the DCO application submission (see Commitment ID CO44 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

21.3.9.6.2 Onshore Converter Station Zone 8

240. OCS Zone 8 is shown to have a varying risk of surface water flooding, ranging from low to high, as shown on **Figure 21.3-6**.

241. The area at increased risk is primarily associated with the agricultural drain which bisects the zone. The surface water is expected to flow in an easterly direction and whilst it appears to remain within the channel in the high and medium surface water events, there is likely to be wider flooding in the low surface water event. Surface water flows in an easterly direction and then ponds to the west of Coppleflat Lane due to the local topography.

242. If the OCS and ESBI are located in areas not shown to be at risk, the risk of surface water flooding can be considered to be low. However, if the OCS and ESBI are located in areas at increased risk (low to high), the risk from surface water flooding can be considered to be high and will need appropriate mitigation measures at detailed design stage post-consent.

243. In addition to the above, if the OCS and ESBI are located in this zone, the wider potential surface water flood risks during operation will need to be considered in the Outline Operational Drainage Strategy, which will be produced at ES stage for the DCO application submission (see Commitment ID CO44 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

21.3.9.7 Flooding from Groundwater

21.3.9.7.1 Onshore Converter Station Zone 4

244. OCS Zone 4 is underlain by a single bedrock of Flamborough Chalk Formation. The bedrock aquifer in this area is classified as a Principal Aquifer, which means it consists of formations which provide a high level of water storage and may support water supply and / or river baseflow on a strategic scale.

245. OCS Zone 4 is located over superficial deposits of Till, Devensian – Diamicton, Alluvium formed of clay, silt, sand and gravel. These are underlain by superficial aquifer of Secondary (undifferentiated), which is described as layers which have previously been designated as both minor and non-minor aquifer in different locations due to the variable characteristics of rock type.

246. Along the northern boundary of the zone, there is an area of a Secondary A aquifer present. Secondary A aquifers are defined as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

247. The Level 1 SFRA shows the areas susceptible to groundwater flooding, which is a strategic map showing groundwater flood areas based on a 1km square grid. The data indicates the proportion of each 1km grid square where geological and hydrogeological conditions suggest where groundwater may surface.

248. The Level 1 SFRA mapping does not provide any mapped data for OCS Zone 4. Therefore, the risk from groundwater flooding is unknown. However, the potential presence of groundwater will be identified as part of pre-construction ground investigations, and appropriate mitigation measures will be incorporated as required. If groundwater to be encountered, it would need to be mitigated by appropriate construction techniques in accordance with appropriate method statements. This is set out in the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), a draft version of which is provided at PEIR stage.

249. Overall, it is concluded that the risk of groundwater flooding in OCS Zone 4 is considered to be low.

21.3.9.7.2 Onshore Converter Station Zone 8

250. OCS Zone 8 is underlain by a single bedrock of Burnham Chalk Formation. The bedrock aquifer present for this area is a Principal Aquifer, which means it consists of formations which provide a high level of water storage and may support water supply and / or river baseflow on a strategic scale.

251. OCS Zone 8 is located over superficial deposits of Till, Devensian – Diamicton and Head formed of Clay, Silt, Sand and Gravel. These are underlain by superficial aquifer of Secondary (undifferentiated), which is described as having layers which previously been designated as both minor and non-minor aquifer in different locations due to the variable characteristics of rock type.

252. The Level 1 SFRA shows the areas susceptible to groundwater flooding, which is a strategic map showing groundwater flood areas based on a 1km square grid. The data indicates the proportion of each 1km grid square where geological and hydrogeological conditions suggest where groundwater may surface.

253. The Level 1 SFRA mapping does not provide any mapped data for OCS Zone 8. Therefore, the risk from groundwater flooding is unknown. However, the potential presence of groundwater will be identified as part of pre-construction ground investigations and appropriate mitigation measures will be incorporated as required. If groundwater were to be encountered, it would need to be mitigated by appropriate construction techniques in accordance with appropriate method statements. This is set out in the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), a draft version of which is provided at PEIR stage.

254. Overall, it is concluded that the risk of groundwater flooding in OCS Zone 8 is considered to be low.

21.3.9.8 Flooding from Sewers

255. Sewer flooding occurs when a rainfall event exceeds the maximum capacity of the surrounding network. The main causes are usually as a result of inadequate flow capacity, blockages, pumping station failures, burst water mains, water inflow from rivers or the sea, tide locking, siltation, fats / greases and sewer collapse.

256. The Level 1 SFRA has been reviewed to assess the risk of sewer flooding to the OCS zones. The Level 1 SFRA has not provided any specific data or mapping to show that sewer flooding has occurred within OCS Zone 4 or OCS Zone 8.

257. Additionally, as the OCS zones are located in an area which predominantly comprises agricultural and rural land, it is likely that there is limited sewage infrastructure present. However, the presence of third party assets will be confirmed prior to the commencement of construction works, and the relevant asset owner / operator will be consulted.

258. Therefore, the risk of flooding from sewers is considered to be low for both OCS Zone 4 and OCS Zone 8.

21.3.9.9 Flooding from Reservoirs

259. The Environment Agency's reservoir flood mapping (available online) is presented on **Figure 21.3-7** (Environment Agency, 2024). This mapping indicates that the entirety of OCS Zone 4 and OSC Zone 8 are not at risk from reservoir flooding during both the wet day and dry day extents.

260. Therefore, it is concluded that there is no risk of flooding from reservoirs for both OCS Zone 4 and OCS Zone 8.

21.3.9.10 Flooding from Canals and Other Artificial Sources

261. The Level 1 SFRA confirms that OCS Zone 4 and OCS Zone 8 are not located within areas at risk of flooding from canals or other artificial sources. As such, there is no risk of flooding from canals or other artificial sources.

21.3.9.11 Summary of Flood Risk at the Onshore Converter Station Zone(s)

21.3.9.11.1 Onshore Converter Station Zone 4

262. Overall, OCS Zone 4 is not considered to be at risk of flooding from tidal, sewers, reservoirs, canals and other artificial sources. It can also be considered to be at low risk from groundwater flooding.

263. The Environment Agency's Flood Map for Planning as presented on **Figure 21.3-5** indicates that the majority of the zone is in Flood Zone 1 which is at low risk of fluvial flooding. However, there are areas of Flood Zones 2 and 3 associated with the Autherd Drain in the northern extent and along the southern boundary of OCS Zone 4, which is deemed to be medium to high risk.

264. The Environment Agency Surface Water Flood Map (Environment Agency, 2024) indicates there are three Ordinary Watercourses within the OCS Zone 4 as presented on **Figure 21.3-6.** These Ordinary Watercourses include areas at high risk of surface water flooding.

265. Two Ordinary Watercourses join Autherd Drain, which flows in an easterly direction. Mapping indicates surface water ponds on the eastern boundary of the zone due to a topographical low point. There is also an overland flow route which travels in an easterly direction and also joins the Autherd Drain.

266. The main flow path in OCS Zone 4 is considered to be at high risk of surface water flooding; however, the south-eastern overland flow paths are at medium or low risk of surface water flooding.

267. If the OCS and ESBI are located in areas not shown to be at risk, the risk of surface water flooding will be considered to be low. However, if the OCS and ESBI are located in areas at increased risk, the risk from surface water flooding will be considered to be high and will need appropriate mitigation measures at detailed design stage post-consent.

268. A summary of mitigation measures is provided in **Section 21.3.13** including the need for construction and operational drainage and consideration of flood warning plans.

269. In addition to the above, if the OCS and ESBI are located in this zone, the wider potential surface water flood risks will need to be considered and any operational surface water drainage requirements will need to be addressed at ES stage in the Outline Operational Drainage Strategy (see Commitment ID CO44 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

270. Furthermore, mitigation measures to address flood risk during construction in the OCS zone are included in the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), a draft version of which is provided at PEIR stage.

21.3.9.11.2 Onshore Converter Station Zone 8

271. Overall, the OCS Zone 8 is not considered to be at risk of flooding from tidal, sewers, reservoirs, canals and other artificial sources. It can also be considered to be at low risk from groundwater flooding.

272. The Environment Agency's Flood Map for Planning as presented on **Figure 21.3-5** indicates that the OCS Zone 8 is wholly located in Flood Zone 1 which is at low risk of fluvial flooding.

273. The Environment Agency Surface Water Flood Map (Environment Agency, 2024) indicates that the OCS Zone 8 has an agricultural drain bisecting the site, resulting in a varying low to high surface water flood risk, as shown on **Figure 21.3-6**.

274. The surface water flows in an easterly direction where it ponds west of Coppleflat Lane due to the local topography. Overall, the surface water appears to remain within the channel in the high and medium event, whilst there is likely to be wider flooding in the low event.

275. If the OCS and ESBI are located in areas not shown to be at risk of surface water flooding it can be considered to be low. However, if the OCS and ESBI are located in areas at increased risk from surface water flooding, it can be considered to be high and will need appropriate mitigation measures at detailed design stage post-consent.

276. A summary of mitigation measures is provided in **Section 21.3.13,** including the need for construction and operational drainage and consideration of flood warning plans.

277. In addition to the above, if the OCS and ESBI are located in this zone, the wider potential surface water flood risks will need to be considered and any operational surface water drainage requirements will need to be addressed at ES stage in the Outline Operational Drainage Strategy (see Commitment ID CO44 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

278. Furthermore, mitigation measures to address flood risk during construction in the OCS zone are included in the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), a draft version of which is provided at PEIR stage.

21.3.10 Temporary Construction Compounds

279. Temporary construction compounds will be required to facilitate the construction of the onshore elements of the Project. This section focusses on the compounds required for the construction of the onshore export cable infrastructure. Flood risk at the landfall construction compound is discussed in **Section 21.3.7.** In addition, two temporary construction compounds will be required for the OCS and ESBI. However, these compounds will be located within the boundary of the OCS zone, and therefore, the flood risk are discussed in **Section 21.3.9** as part of OCS Zone 4 and Zone 8.

21.3.10.1 Overview of Proposed Activities

280. Three types of temporary construction compounds will be required for the onshore export cable construction works:

- Main construction compounds;
- Intermediate construction compounds; and
- Trenchless installation compounds.

281. Approximately four main construction compounds will be positioned at strategic locations along the onshore ECC with good vehicular access from the local road network. They are likely to include laydown areas for construction materials and plant and equipment, storage areas for construction waste, bunded storage areas, vehicle parking areas, welfare facilities, wheel washing facilities, workshops and offices.

282. Intermediate construction compounds will be positioned between the main construction compound locations and will be smaller in size than the main construction compounds. Approximately eight intermediate construction compounds will be established along the onshore ECC and may house welfare facilities, workshops and offices, smaller laydown areas for construction materials and plant and equipment and storage areas for construction waste. These will serve as localised support bases for the main construction compounds and will have direct access to the temporary construction corridor.

283. Trenchless installation compounds will be established at each location where a trenchless installation is undertaken at the entry and exit pits. Trenchless installation compounds will house the trenchless installation equipment, control room, power packs and generators, drilling fluid management system, laydown area for construction materials and plant and equipment, storage areas for construction waste, welfare facilities, workshops and offices.

284. All temporary construction compounds for the onshore export cable construction works will be located within the Onshore Development Area. The indicative locations of the main and intermediate construction compounds which are considered at this stage are shown on **Figure 21.3-1**. These locations will be confirmed for the DCO application and presented in the ES. The final micro-siting and layout of each temporary construction compound within the compound areas identified in the ES will be determined during detailed design post-consent.

285. Further details are provided in **Volume 1, Chapter 4 Project Description**.

21.3.10.2 Review of Flood Risk from all Sources

286. The indicative locations of the majority of the temporary construction compounds are located in Flood Zone 1, as shown on **Figure 21.3-5**.

287. A review of the Environment Agency Flood Zone mapping (Environment Agency, 2024) shows there are three temporary construction compounds likely to be located in Flood Zone 3, as seen on **Figure 21.3-5**. These are as follows:

- An intermediate construction compound north-west of Burshill (ICC2);
- An intermediate construction compound west of Leven (ICC3); and
- An intermediate construction compound north-east of Leconfield (immediately to the east of the railway line) (ICC4).

288. Whilst many of the indicative temporary construction compound locations appear to be located in areas of limited risk from surface water flooding, there are small areas of surface water flooding, including areas of ponding as well as overland flow paths, as shown on **Figure 21.3-6**.

289. The temporary construction compounds are located within existing agricultural land and therefore it is likely that there is a limited foul sewer network within proximity of their locations. However, the presence of third party assets will be confirmed prior to the commencement of construction works, and the relevant asset owner / operator will be consulted. The risk of flooding from sewers is therefore considered to be low for the temporary construction compounds.

290. In addition, the indicative locations of the temporary construction compounds are at variable risk of groundwater flooding. However, overall, the risk of groundwater flooding is considered to be low. This will be confirmed once further details on the proposed locations for the temporary construction compounds are known.

291. The indicative locations for the temporary construction compounds are in areas that are not at risk of flooding from reservoirs under any of the modelled scenarios. Therefore, there is no risk of flooding from this source.

292. The temporary construction compounds are not located near to any canal or other artificial sources. As such, there is no risk of flooding from canals or other artificial sources.

293. To address the flood risk from both fluvial flooding and surface water flooding, there is a need to ensure that the impact is mitigated by the use of appropriate construction techniques and in accordance with an appropriate method statements.

294. Measures to ensure any wider flood risk to or from the temporary construction compounds are summarised in **Section 21.3.13**. In addition, construction surface water management measures are proposed in the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), a draft version of which is provided at PEIR stage. These measures will be further refined at ES stage.

295. Once construction is complete, all land used for the temporary construction compounds will be fully reinstated and would have no operational use and therefore no further mitigation would be required.

21.3.11 Climate Change

296. Climate change allowances have been considered by the Project throughout the preparation of this FRA. This is to minimise the vulnerability of the development and provide resilience to flooding and coastal change. Due to the predicted effects of climate change, it is likely that the risk of flooding from all potential sources will increase in the future.

297. PPG for Flood Risk and Coastal Change (MHCLG, 2022) provides guidance on development lifetime and specifically states in Paragraph 6:

"The lifetime of a non-residential development depends on the characteristics of that development but a period of at least 75 years is likely to form a starting point for assessment."

298. In line with the information provided in **Volume 1, Chapter 4 Project Description**, the Project is noted to be non-residential and is expected to have an O&M phase of approximately 35 years. The earliest start year of construction is 2029 with the Project anticipated to become fully operational by 2033. To ensure consistency in approach, this FRA has adopted 35 years as the development lifetime in the assessment.

299. The OCS and ESBI will form an area of large permanent above-ground infrastructure co-located within an OCS zone. If OCS Zone 8 is taken forward to development, the OCS and ESBI will be entirely located in Flood Zone 1 as shown on **Figure 21.3-5**, which is described as having a less than 1 in 1,000 chance of flooding from fluvial or coastal sources. As a result, it is considered unlikely that future climate change will have a significant influence on the Project.

300. If OCS Zone 4 is taken forward to development, an area of Flood Zones 2 and 3 bisects it, as shown on **Figure 21.3-5.** Flood Zone 2 is described as having a 1 in 100 to 1 in 1,000 annual probability of river flooding, while Flood Zone 3 has 1 in 100 or greater annual probability of river flooding.

301. In addition to the OCS and ESBI, another element of above-infrastructure associated with the Project is the above-ground link boxes along the onshore ECC. At this stage, it is anticipated 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 (out of a total of 56 link box locations). The remaining link boxes will be located below ground. Each above-ground link box will have a maximum footprint of $3m^2$ and a maximum height of 2m. The final design, numbers and locations of link boxes within the onshore ECC will be determined during detailed design stage post-consent, therefore, above-ground link boxes could be located in Flood Zones 1, 2 or 3. Where link boxes are required to be located above-ground, they will be micro-sited away from Flood Zones 2 and 3 and within Flood Zone 1 wherever reasonably practicable. Given the small size of above-ground link boxes, it is unlikely that they will have an impact on flood risk when taking climate change allowances into consideration.

302. It is therefore considered likely that climate change will have an influence on the Project in the future with respect to the OCS and ESBI if OCS Zone 4 is taken forward to development, and therefore, climate change allowances have been considered in this FRA in this context only.

303. There are two main aspects of climate change which are likely to impact the Project in terms of flood risk to infrastructure and increasing the potential for off-site impacts on other receptors. These are increased peak river flows and more intense and prolonged rainfall events, both of which are likely to increase the severity of surface water flooding.

304. Whilst storm surges and waves are likely to be larger in the future, and sea levels will be higher than the present day, this is unlikely to have any adverse effect on the Project. As the landfall infrastructure, including the TJB and associated underground link box and the cable joints between the offshore and onshore export cables, will be located below ground, they would not be affected by this source of flooding during operation. Furthermore, the OCS and ESBI elements of the Project and onshore ECC from the landfall will be located inland away from any potential coastal risk.

305. The Project is classed as an NSIP and therefore consideration must be given to the Environment Agency guidance related to the credible maximum scenario. This guidance sets out the following key criteria, which it also notes should be used as a 'sensitivity test':

- The H++ climate change allowances for sea level rise;
- The upper end allowance for peak river flow;
- The sensitivity test allowances for offshore wind speed and extreme wave height; and
- An additional 2mm for each year on top of sea level rise allowances from 2017 for storm surge.

306. OCS Zone 8 is entirely located in Flood Zone 1 (i.e. at low risk from either coastal or fluvial flooding). Therefore, it is not deemed necessary to further assess the maximum credible flooding scenario for OCS Zone 8.

307. However, if OCS Zone 4 is taken forward to development, this zone is bisected by an area of Flood Zone 2 (i.e. at medium risk of fluvial flooding) and Flood Zone 3 (i.e. at high risk of fluvial flooding). This flooding is associated with the existing agricultural drain running through the zone.

308. Across the Project, future flood risk, taking into account climate change, will only affect the OCS zone, which are located inland and are not at risk from coastal flooding. Therefore, the only key criteria for the maximum credible flooding scenario considered to be relevant are those related to the Upper End allowance for peak river flow. This is discussed further in **Section 21.3.11.1**.

21.3.11.1 Peak River Flow Allowances

309. The latest climate change guidance sets out the Environment Agency's recommended climate change allowances for developments when considering flood risk and coastal change for planning purposes (Environment Agency, 2022).

310. As noted above, the guidance provided on climate change allowances from the Environment Agency in relation to the peak river flow and fluvial flooding is likely to be relevant only to the OCS and ESBI within OCS Zone 4.

311. OCS Zone 4 is located in close proximity to an existing agricultural drain, which contributes to the presence of Flood Zones 2 and 3 due to fluvial flooding in the zone. Therefore, any increases in climate change may exacerbate the risk and intensity of the flooding already present.

312. The risks present for OCS Zone 4 will be assessed and addressed as part of the proposed mitigation measures relating to localised drain ditches. Proposed measures are set out in the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), a draft version of which is provided at PEIR stage. These measures will be further refined at ES stage.

313. In addition, this will be considered within the Outline Operational Drainage Strategy which will be developed at ES stage (see Commitment ID CO44 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

314. With respect to the other onshore elements of the Project, once operational, the majority of the onshore export cable infrastructure will be located below ground, with the exception of above-ground link boxes where required along the onshore ECC, and therefore, they will not be impacted by flooding when taking climate change allowances into consideration.

315. As the final locations of the above ground link boxes along the onshore ECC are unknown at this stage, they may be located in Flood Zone 2 or Flood Zone 3. However, due to their small footprint, it is unlikely that above-ground link boxes will have an impact on flood risk when taking climate change allowances into consideration.

316. Moreover, OCS Zone 8 is located solely within Flood Zone 1, and therefore, should the OCS and ESBI be located in this zone, they would not be at risk from fluvial flooding either now or in the future.

317. The Onshore Development Area is solely located in the Hull and East Riding Management Catchment. **Table 21.3-5** presents the anticipated increase in peak river flows for this catchment.

Table 21.3-5 Hull and East Riding Management Catchment Peak River Flow Allowances

Allowance Category	Central	Higher	Upper
2020s	9%	15%	33%
2050s	9%	17%	37%
2080s	20%	33%	66%

21.3.11.2 Peak Rainfall Allowances

318. Peak rainfall allowances are used to assess how the increase in rainfall affects the surface water flood risk for developments and the impact on drainage systems and their capacity. For the Project, assessment of peak rainfall allowances is only applicable to the OCS and ESBI and will be considered in their operational drainage design.

319. The anticipated increased rainfall for the Hull and East Riding Management Catchment are presented in **Table 21.3-6** for the 3.3% Annual Exceedance Rainfall Event.

Table 21.3-6 Hull and East Riding Management Catchment Peak Rainfall Allowances for the 3.3% Annual Exceedance Event

Epoch	Central	Upper
2050s	20%	35%
2070s	25%	35%

320. The anticipated increased rainfall for the Hull and East Riding Management Catchment are presented in **Table 21.3-7** below for the 1% Annual Exceedance Rainfall Event.

Table 21.3-7 Hull and East Riding Management Peak Rainfall Allowances for the 1% Annual Exceedance Event

Epoch	Central	Upper
2050s	20%	40%
2070s	25%	40%

321. The Environment Agency guidance (Environment Agency, 2022) recommends calculating the lifetime of a development when determining which annual exceedance events to consider:

"Developments with a lifetime beyond 2100 must assess the upper end allowances for the 2070s epoch. The development should be designed that in the upper end allowance, 1% annual exceedance probability event, that the Project does not increase the flood risk elsewhere and that the Project is safe from surface water flooding.

For developments with a lifetime between 2061 and 2100 should take the same approach but the use the central allowance for the 2070s epoch.

For developments with a lifetime up to 2060 are to take the same approach but use the central allowance for the 2050s epoch."

322. It is expected that the Project will have a development lifetime of approximately 35 years. Therefore, based on the above Environment Agency guidance, the Project is expected to have a 2070s epoch and therefore should use the central allowance, meaning a 25% climate change allowance should be used for the peak rainfall event.

323. However, ERYC has provided local guidance in their Combined Planning Note and Standing Advice on SuDS and Surface Water Drainage Requirements for New Developments, which was published in September 2016 and states the following:

"Climate Change

Rainfall – The drainage design should accommodate expected increases in rainfall volume due to climate change over the lifetime of the development. This should be demonstrated by increasing peak rainfall volume in hydraulic calculations by 30% or by increasing on-site by an additional 30%."

324. As such, the Project will adopt a conservative approach of a 30% allowance, and this will be considered within the Outline Operational Drainage Strategy which will be developed at ES stage (see Commitment ID CO44 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

21.3.12 Consideration of the Sequential and Exception Test

21.3.12.1 Overview of National Guidance

325. The NPPF requires the application of the Sequential Test and, where necessary, the Exception Test.

326. Guidance on the application of the Sequential Test is provided in the PPG for Flood Risk and Coastal Change (updated on 25th August 2022), which provides criteria in relation to the appropriate allocation of development types and flood risk.

327. Paragraph 23 of the PPG states:

"The approach of the sequential test is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. This means avoiding, so far as possible, development in current and future medium and high flood risk areas considering all sources of flooding including areas at risk of surface water flooding. Avoiding flood risk through the sequential test is the most effective way of addressing flood risk because it places the least reliance on measures like flood defences, flood warnings and property level resilience features.

The Sequential Test ensures that a sequential, risk-based approach is followed to steer new development to areas with the lowest risk of flooding, taking all sources of flood risk and climate change into account. Where it is not possible to locate development in low-risk areas, the Sequential Test should go on to compare reasonably available sites:

- *Within medium risk areas; and*
- *Then, only where there are no reasonably available sites in low and medium risk areas, within high-risk areas."*

328. Paragraph 21 of the PPG states:

"The Exception Test is not a tool to justify development in flood risk areas when the Sequential Test has already show that there are reasonably available, lower risk sites, appropriate for the proposed development. It would only ever be appropriate to move onto the Exception Test in these cases where, accounting for wider sustainable development objectives, application of relevant local and national policies would provide a clear reason for refusing development in any alternative locations identified.

The Exception Test should only be applied if the Sequential Test has shown that there are no reasonably available, lower-risk sites, suitable for the proposed development, to which the development could be steered."

329. Following the consideration of the Sequential Test, the need for the Exception Test depends on the potential vulnerability of the Project based on the Flood Risk Vulnerability Classification and the Flood Zone within which it would be located, as summarised in Table 2 of the PPG which has been reproduced as **Table 21.3-8.**

330. Paragraph 31 of the PPG provides the following guidance on the criteria required to pass the Exception Test, whereby it should be demonstrated that:

"development that has to be in a flood risk area will provide wider sustainability benefits to the community that outweigh flood risk; and

the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall."

331. The NPPF clarifies that both elements of the Exception Test should be satisfied for the Project to be allocated or permitted in situations where suitable sites at lower risk of flooding are not available following application of the Sequential Test.

Table 21.3-8 Flood Risk Vulnerability and Flood Zone 'Incompatibility' Table 2 of the PPG

Flood Zones	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Flood Zone 1	✓	✓	✓	✓	✓
Flood Zone 2	✓	Exception Test Required	✓	✓	✓
Flood Zone 3a†	Exception Test Required †	X	Exception Test Required	✓	✓
Flood Zone 3b*	Exception Test Required*	X	X	X	✓*

✓ Exception Test is not required.

X Development should not be permitted.

† In Flood Zone 3a, essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

* In Flood Zone 3b (functional floodplain), essential infrastructure that has passed the Exception Test, and water-compatible uses, should be designed and constructed to remain operational and safe for users in times of flood, result in no net loss of floodplain storage and not impede water flows and not increase flood risk elsewhere.

21.3.12.2 Project-Specific Considerations

332. Based on the guidance in both the NPPF and the supporting PPG, the Project is classed as 'Essential Infrastructure', which is defined in Annex 3 of the Flood Risk Vulnerability classification as:

"Essential Transport infrastructure (including mass evacuation routes) which has to cross the area at risk;

Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including infrastructure for electricity supply including generation, storage and distribution systems;

including electricity generating power stations, grid and primary substations storage;

and water treatment works that need to remain operational in times of flood.

Wind turbines; and

Solar Farms."

333. Based on the guidance set out in the PPG, development classed as 'Essential Infrastructure' is considered acceptable in Flood Zones 1 and 2. However, development located in Flood Zone 3 is required to pass the Exception Test.

21.3.12.3 Application of the Sequential Test

334. Applying the Sequential Test to the Project for all sources of flood risk, it is noted that a large proportion of the onshore elements of the Project are proposed to be located in Flood Zone 1, including significant areas of the onshore ECC, OCS Zone 8 and OCS Zone 4. However, some sections of the landfall, onshore ECC and OCS Zone 4 are located in Flood Zones 2 and 3. The application of the sequential test is discussed below.

21.3.12.3.1 Landfall

335. Only the eastern extent of the landfall is shown to be located in Flood Zone 3, with the potential flood risk limited to a stretch along the beach / frontage, below the cliffs. However, the remainder of the landfall is located within Flood Zone 1. The surface water flood risk is indicated to vary between low to high risk at the landfall, with the majority of it classed as being outside the surface water flood extent.

336. Due to the requirement to connect the offshore and onshore export cables at the landfall, it is acknowledged that the Project will need to pass under Flood Zone 3 and cannot be re-routed or micro-sited away to areas with lower flood risk.

337. Given that a trenchless installation technique is proposed at the landfall and that the landfall infrastructure will be located below ground once operational, they will not be affected by any potential flood risk, and it is considered that this is in accordance with the Sequential Test.

21.3.12.3.2 Onshore Export Cable Corridor

338. Along the onshore ECC, the onshore export cables and associated jointing bays and underground link boxes are located below ground and therefore are classed as a subterranean development. Whilst these are largely located in Flood Zone 1, there are some segments of the onshore ECC which are located within Flood Zone 2 or Flood Zone 3, primarily where it is required to pass under, or in close proximity to existing watercourses.

339. Due to the length of the onshore ECC required to connect the landfall on the coast to the OCS zone and onwards to the grid connection point at Birkhill Wood Substation which are located inland, it is acknowledged that parts of the onshore ECC will be located in Flood Zone 3 and cannot be rerouted or micro-sited away to areas with lower flood risk due to unavoidable overlap with Flood Zones extent. It is also noted that the principal interaction with Flood Zones 2 and 3 is mainly in Segment 2 of the onshore ECC where it is required to cross multiple Main Rivers and Ordinary Watercourses.

340. The linear nature of the onshore ECC means that it is not possible to entirely avoid areas of Flood Zone 2 or Flood Zone 3 as the Project's onshore export cable infrastructure cannot be located elsewhere. The sections of the onshore ECC and any above ground link boxes located in Flood Zone 3 will require consideration of the Exception Test, whereas the sections located in Flood Zone 1 or Flood Zone 2 are in accordance with the Sequential Test.

341. Whilst the onshore ECC may pass through areas at increased risk of surface water flooding, most of the onshore export cable infrastructure will be located below ground once operational and therefore the greatest risk will be during the construction phase.

21.3.12.3.3 Onshore Converter Station Zone 4

342. Should OCS Zone 4 be taken forward to development, the permanent above-ground infrastructure to be located within this zone would include the OCS and ESBI, which would be located primarily within Flood Zone 1. However, there is an area of Flood Zones 2 and 3 which bisects the zone. If OCS and ESBI were located within an area of Flood Zone 1 and Flood Zone 2 within the zone, and not in Flood Zone 3, it would be in accordance with the Sequential Test.

343. If the OCS and ESBI were located in an area of Flood Zone 3 within the zone, the Exception Test would need to be applied.

344. Whilst there are areas within OCS Zone 4 which are likely to be at increased surface water flood risk, the majority of the risk relates to the agricultural drainage ditch. The risk can therefore be considered relatively localised to the existing drainage ditches. As such, mitigation measures have been identified (see **Section 21.3.13**) in the design to ensure that no adverse impact on flood risk occurs as a result of the construction or operation of the Project.

21.3.12.3.4 Onshore Converter Station Zone 8

345. Should OCS Zone 8 be taken forward to development, the permanent above-ground infrastructure to be located within this zone (OCS and ESBI) would be located wholly within Flood Zone 1. This therefore meets the requirements of the Sequential Test and is in accordance with associated guidance by placing the development in the lowest risk areas.

346. Whilst there are areas within OCS Zone 8 which are likely to be at increased surface water flood risk, the majority of the risk in OCS Zone 8 relates to the agricultural drainage ditch which bisects the zone. This can be considered relatively localised to the existing drainage ditches, and as such mitigation measures required to be implemented within the design have been identified (see **Section 21.3.13**) to ensure that no adverse impact on flood risk occurs as a result of the construction or operation of the Project.

21.3.12.3.5 Conclusion

347. It is considered that any potential flood risk concerns have been fully and appropriately mitigated. On this basis, the Project is in accordance with the requirements set out in the Sequential Test, as areas at low risk have been prioritised over those at high risk. The adoption of appropriate mitigation measures will ensure that flood risk is not increased elsewhere.

348. Some sections of the onshore ECC and any above ground link boxes located in Flood Zone 3 will require consideration of the Exception Test. It should be noted that if OCS Zone 4 is taken forward with the OCS and ESBI located in Flood Zone 3, it will need to be included in the Exception Test.

349. In relation to the risk of flooding from other sources such as groundwater, sewers, reservoirs, canals and other artificial sources, these have all been assessed as no or low risk.

350. On this basis, it is concluded that the Project can be appropriately sequentially located, in accordance with the guidance set out in the PPG.

21.3.12.4 Application of the Exception Test

351. The scale and nature of the Project means that it cannot be placed wholly away from areas that may be at increased risk of flooding from all sources. Therefore, the Project must meet the two additional elements of the Exception Test as set out in Paragraph 170 of the NPPF.

352. Following the guidance set out in the PPG, it is necessary to consider the requirements of the Exception Test for the elements of the Project which are located in Flood Zone 3 or at high risk of flooding from other sources. These include some sections of the onshore ECC, above ground link boxes, and the OCS and ESBI should they be located in OCS Zone 4.

353. The first element of the Exception Test, as set out in Paragraph 31 of the PPG, states that to pass the Exception Test it should be demonstrated that:

"development that has to be in a flood risk area will provide wider sustainability benefits to the community that outweighs the flood risk."

354. This is demonstrated by the Project due to it being an NSIP which aims to provide energy from a sustainable and renewable source at a national scale.

355. The second element of the Exception Test states that:

"the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall."

356. With regard to the second part of the Exception Test, the Project must be considered in the context of its scale whilst remaining aware that the majority of the landfall and onshore ECC are not located within an area that is at risk from fluvial or tidal flooding.

357. Elements that are likely to pass through areas at increased risk of flooding, i.e. Flood Zone 3 or high surface water flood risk, comprise the subterranean development such as the onshore export cables and associated jointing bays and underground link boxes along the onshore ECC and the TJB, underground link box and cable joints between the offshore and onshore export cables at the landfall.

358. For the subterranean infrastructure, it is only during construction that there is the potential for a temporary increase in flood risk. This will be mitigated through the use of appropriate measures, and as such, the subterranean infrastructure will not be vulnerable to flood risk during its operational lifetime and will not increase flood risk elsewhere.

359. Within the onshore ECC, if any of the above-ground link boxes are located in Flood Zone 3, their built footprints would be minimal and, as a result, would not impact the wider flood extent due to the size and nature of Flood Zone 3. Therefore, the second element of the Exception Test is met. Additionally, if above-ground link boxes are sited in Flood Zone 3, appropriate mitigation measures would be implemented, which will be confirmed at ES stage.

360. If the OCS and ESBI is located within OCS Zone 8 (i.e. wholly within Flood Zone 1) or areas of Flood Zone 1 of OCS Zone 4 and away from the risk of fluvial sources, the second element of the Exception Test will be met. However, if the OCS and ESBI are situated in Flood Zone 3 within OCS Zone 4, in order to meet the second element of the Exception Test, the Project will need to ensure that mitigation measures are provided to keep it safe for its lifetime and such that it will not increase flood risk elsewhere. As a site selection refinement principle, the Project will aim to micro-site the elements of critical infrastructure associated with the OCS and ESBI within areas of Flood Zone 1 within OCS Zone 4 to reduce the flood risk (see **Volume 1, Chapter 5 Site Selection and Consideration of Alternatives**). However, if this is not possible, appropriate mitigation measures will need to be identified at ES stage.

361. The main risk associated with the subterranean infrastructure of the Project is associated with the construction phase and not during operation. During the construction phase, there is the potential for a temporary increase in flood risk. However, as noted above, this potential increase in flood risk has been considered in the mitigation measures outlined within **Section 21.3.13** and further set out within the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), a draft version of which is provided at PEIR stage.

362. Overall, the Exception Test has been considered, and the first part has been met.

363. In addition, it is likely that the Project can be made safe through suitable design measures such as micro-siting. However, until further information on the location and layout of the OCS and ESBI components within the OCS zone become available, it is not possible to fully assess the Exception Test at this time. The Project will be reassessed at ES stage where any potential flood risk both to the site or elsewhere will be considered and addressed by identifying suitable design and mitigation measures.

21.3.13 Flood Risk Mitigation Measures

364. Residual risk is the risk that remains after flood management or mitigation measures have been implemented or included within the design. This FRA has considered the embedded mitigation measures inherently included in the design of the Project, the residual flood risk to and from the Project and whether there is a need for additional mitigation measures to manage the remaining residual flood risk.

21.3.13.1 Design Mitigation

21.3.13.1.1 Landfall

365. During the construction phase at landfall, a trenchless technique will be used to install the cable ducts. The ducts will be installed from the TJB located within the landfall construction compound on the cliff top to a subtidal exit location on the seabed, and the offshore export cables will be pulled ashore through these pre-installed ducts to be jointed with the onshore export cables at the TJB.

366. As the flood risk at landfall is only considered to be tidal, the landfall construction compound will be located in Flood Zone 1 (i.e. at low risk from tidal and coastal flooding) and at low risk of surface water flooding.

367. Due to the trenchless nature of duct installation, prolonged periods of access restrictions or closures to the beach will not be required, but emergency landfall works may be required to be performed on the beach, which would involve short periods of restricted access.

368. Access and egress will need to be available at the landfall. Access to the landfall construction compound will be via Hornsea Road (B1242), and a haul road will be constructed to provide safe vehicular access to the site. In addition, offshore vessels will be sited in the nearshore to support landfall construction activities.

369. During landfall construction, there will be no direct access to the beach from the landfall construction compound, with the only access to the beach being via an emergency access route. This will be located along the beach running south to the landfall from an emergency laydown area at the end of North Turnpike Road. This access and laydown area will only be in place for the duration of landfall construction works and used in the event of emergencies such as in response to a drilling fluid frac-out event. Should emergency works be required at the beach, this emergency access route can be used for safe access and egress.

370. During the O&M phase of the Project, all landfall infrastructure, including the TJB and associated underground link box and the cable joints between the offshore and onshore export cables will be underground. The underground link box will be installed in proximity to the TJB and will comprise a watertight and lockable manhole present at ground level to provide access for O&M activities.

21.3.13.1.2 Onshore Export Cable Corridor

371. Installation of cable ducts at crossings of all Main Rivers and IDB-maintained drains will be undertaken using trenchless techniques to avoid direct contact and minimise interaction with the watercourse, as the onshore export cables would be installed underneath the watercourse (see Commitment ID CO32 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

372. The trenchless crossing entry and exit pits will be located at least 20m from the bank of the Main River or the nearest landward toe of any associated flood defence structures. Where trenchless crossings are proposed for IDB-maintained drains and other Ordinary Watercourses, the crossing entry and exit pits will be located at least 9m from the bank of the watercourse (see Commitment ID CO33 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

373. In proximity to the Hempholme Pumping Station, a more complex flood risk interaction occurs with the onshore ECC. A trenchless crossing will be undertaken at this location, and the crossing will be a minimum 30m from the sheet piles associated with the pumping station. The onshore export cables will be installed at a minimum depth of 5m below the bed level of Mickley Dike and associated flood defence structures (see Commitment ID CO104 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

374. Where Ordinary Watercourses are to be crossed using open cut trenching techniques, this will be undertaken with temporary damming and diversion of the watercourse. There is the potential for open cut techniques to affect the bed and the banks of the watercourse as a result of the flow of the stream being altered. This could indirectly change the flood risk and will need to be managed during the construction phase in accordance with Commitment ID CO35 (see **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

375. To protect groundwater bodies, the depth of excavation works will be kept as shallow as possible and limited to construction and operational requirements. The target minimum burial depth of onshore export cables will be approximately 1.2m to the top of the protective covers over the installed cable ducts, except where trenchless installation techniques are used or where deeper burial depth would be required due to other restrictions (see Commitment ID CO41 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

376. At watercourse crossings, onshore export cables will be installed at a minimum depth of 2m below the channel bed of watercourses, including the landward toe of any associated flood defences. The depth at each watercourse crossing will be dependent on local geology and geomorphology risks and take into consideration anticipated climate change-related changes in fluvial flows and erosion that may occur over time (see Commitment ID CO36 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**). This will ensure sufficient clearance for any current or future flood defences.

377. A Watercourse Crossing Method Statement (WCMS) will be provided as part of the CoCP submitted post-consent. The WCMS will be developed in accordance with the Outline CoCP submitted as part of the application for development consent and agreed with the relevant authorities prior to the commencement of the relevant stage of construction works. The WCMS will include details of the crossing technique and construction methodology to be undertaken at each crossing and associated environmental mitigation measures (see Commitment ID CO35 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

378. The crossing methods for Ordinary Watercourses will be considered on an individual basis, following discussion with the LLFA and Beverley and North Holderness IDB. The proposed approach to Ordinary Watercourse crossings and summary of the methodology is provided in **Appendix 4.3 Crossing Schedule – Onshore**. A summary of the proposed watercourse crossing methods are shown on **Figure 21.3-1.**

379. Each crossing will be individually reviewed at detailed design stage post-consent to confirm the crossing methodology based on pre-construction surveys and engineering design studies. Where flexibility is retained to either undertake duct installation using open cut trenching or a trenchless installation technique, the worst-case scenario has been assessed within the PEIR to understand the potential impact on flood risk.

380. The temporary construction corridor will consist of the cable trenches, working areas for the jointing bays and link boxes, soil storage areas, temporary construction compounds, haul roads and other temporary infrastructure such as construction drainage. A temporary drainage system will be installed along the length of the temporary construction corridor to manage surface water run-offs and flows during construction and connect into the local drainage network. The temporary drainage system will prevent increasing any flood risk along the onshore ECC. Any water from the drainage system will either be absorbed into the ground or discharged into the local drainage network. Post-construction, land drainage within the corridor will be reinstated to pre-construction conditions as practicable, including replacing any drains that were damaged or altered during construction. (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

381. With the exception of the above-ground link boxes where required, all other onshore export cable infrastructure, including the onshore export cables, jointing bays and underground link boxes will be buried. Underground link boxes will be installed in proximity to the jointing bays and will comprise a watertight and lockable manhole present at ground level to provide access for O&M activities. Further information on the design and flood risk compatibility of above-ground link boxes will be considered at ES stage if available.

382. Where reasonably practicable, topsoil and subsoil stockpiling within a floodplain (defined as areas of Flood Zones 2 or 3, as identified in the Environment Agency's Flood Map for Planning, of any main river) 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 (see Commitment ID CO45 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

383. Further measures to address the flood risk along the onshore ECC are outlined within the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), a draft version of which is provided at PEIR stage. These measures will be further refined at ES stage.

21.3.13.1.3 Onshore Converter Station Zone 4

384. Overall, OCS Zone 4 is not considered to be at risk of flooding from tidal, sewers, reservoirs, canals and other artificial sources. It can also be considered to be at low risk from groundwater flooding.

385. OCS Zone 4 is located in Flood Zones 1, 2 and 3 associated with a fluvial flood risk. The majority of the zone is located with Flood Zone 1. However, the centre of the zone is bisected by Flood Zones 2 and 3 associated with the Autherd Drain. Along the southern boundary of the zone, there are further areas of Flood Zones 2 and 3.

386. As established previously in this FRA, this flood risk is associated with the existing agricultural drains. Subject to the location of the OCS and ESBI within Zone 4, the permanent infrastructure could be located solely within Flood Zone 1 (i.e. outside an area at risk from fluvial flooding).

387. The majority of the OCS zone is at low risk from surface water; however, where the existing agricultural drainage channel divides the site, there is a high risk, which then results in ponding due to the low topography in the eastern extent. This is also accompanied by an overland flow route.

388. Flood risk to the OCS and ESBI during operation will be considered within the Outline Operational Drainage Strategy to be provided at ES stage (see Commitment ID CO44 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

21.3.13.1.4 Onshore Converter Station Zone 8

389. Overall, the OCS Zone 8 is not considered to be at risk of flooding from tidal, sewers, reservoirs, canals and other artificial sources. It can also be considered to be at low risk from groundwater flooding.

390. OCS Zone 8 is located wholly within Flood Zone 1 (i.e. at low risk of flooding from fluvial sources). There is limited risk of surface water flooding for the majority of the zone, except in the area in proximity to and associated with the existing agricultural drainage ditch where there is a high risk.

391. As such, within the design of the Project, the sequential approach has been adopted in regard to the location of the OCS and ESBI (i.e. located in Flood Zone 1 and in areas at low risk of surface water flooding).

392. Flood risk to the OCS and ESBI during operation will be considered within the Outline Operational Drainage Strategy to be provided at ES stage (see Commitment ID CO44 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

21.3.13.2 Surface Water Drainage

393. Surface water drainage at all phases of the Project will be subject to consideration to ensure there is no increase in flood risk as a result of the Project. This is summarised in the sections below.

21.3.13.2.1 Pre-Construction: All Onshore Infrastructure

394. Prior to commencement of the relevant stage of construction works, detailed drainage surveys and ground investigations will be undertaken to support the development of the detailed drainage design for all elements of the onshore infrastructure.

395. The drainage infrastructure will be developed and agreed with the relevant authorities prior to the commencement of the relevant stage of construction works and implemented to minimise water within the working areas, ensure ongoing drainage of surrounding land and that there is no increase in surface water flood risk.

396. Design of drainage infrastructure will consider the current and proposed runoff rates, volume of storage required and the proposed approach for discharge of water from the Project, in accordance with the requirements of the LLFA and Environment Agency.

397. Temporary drainage and other construction surface water management measures are proposed in the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), a draft version of which is provided at PEIR stage. These measures will be further refined at ES stage.

21.3.13.2.2 Construction: Landfall and Onshore Export Cable Corridor

398. The landfall and onshore ECC will only be at risk of flooding during the construction phase, as landfall infrastructure and the majority of onshore export cable infrastructure will be located below ground and away from the flood risk during the O&M phase.

399. However, during the construction phase, there is a risk that drainage ditches and surface water flow routes could be adversely affected should the works not be appropriately managed, or the ground not reinstated properly.

400. Where reasonably practicable, topsoil and subsoil stockpiling within a floodplain (defined as areas of Flood Zones 2 or 3, as identified in the Environment Agency's Flood Map for Planning, of any main river) 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 (see Commitment ID CO45 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

401. During the construction phase, to ensure that the risk from surface water flooding is not increased, it is considered necessary for additional field drainage to be installed running alongside / parallel to the temporary construction corridor. This ensures that there is no increase in flood risk to on- and off- site receptors both during construction (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

402. The detailed crossing methodology of all watercourses crossed by the onshore ECC will be agreed with the relevant authorities prior to the commencement of the relevant stage of construction works through the WCMS (see Commitment ID CO35 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

21.3.13.2.3 Construction: Temporary Construction Compounds

403. The FRA has identified and assessed the risk of flooding at each of the indicative temporary construction compound locations for the onshore export cable works, as shown on **Figure 21.3-1.** The installation of temporary construction compounds along the onshore ECC is likely to increase surface water during the construction phase due to the expected increase in impermeable areas. As a result, appropriate temporary drainage systems would need to be installed.

404. The provision of temporary surface water drainage for the temporary construction compounds are summarised in the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), a draft version of which is provided at PEIR stage. These measures will be further refined at ES stage.

405. The risk of either fluvial or surface water flooding to temporary construction compounds will only be a risk during construction, as the land required for compounds and any associated temporary access tracks will be fully reinstated following the completion of the relevant construction works.

21.3.13.2.4 Operational: Landfall and Onshore Export Cable Corridor

406. During operation, all landfall infrastructure and the majority of the onshore export cable infrastructure along the onshore ECC will be below ground. The only exception is where above-ground link boxes are required along the onshore ECC.

407. Following the completion of construction works, land drainage will be reinstated to pre-construction conditions as practicable, including replacing any drains that were damaged or altered during construction, to ensure that there would be no impact on surface water drainage (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

21.3.13.2.5 Operational: Onshore Converter Station Zone

408. As part of this FRA, the discharge of surface water from the OCS zone has been considered within the context of the surface water flood risk and the need to ensure that any drainage solutions do not result in an increase in flood risk either to or from the Project.

409. The surface water drainage requirements for the Project will be designed to meet the requirements of the NPPF, NPS EN-1 and the Construction Industry Research and Information Practice (CIRIA) SuDS Manual C753 (CIRIA, 2015), as well as ERYC's Combined Planning Note and Standing Advice on SuDS & Surface Water Drainage Requirements for New Development (2016). As such, runoff from the OCS and ESBI within the zone will be limited and discharged in accordance with best practice.

410. A summary of the SuDS hierarchy is provided as follows:

- Rainwater re-use (rainwater harvesting / greywater recycling);
- Soakaway or other infiltration system;
- Hybrid solution of infiltration and discharging to a surface water body;
- To a surface water body (e.g. an ordinary watercourse);
- To a surface water sewer, highway drain, or other drainage system; and
- To a combined sewer.

411. The Outline Operational Drainage Strategy for the OCS and ESBI will be developed at ES stage (see Commitment ID CO44 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**) in consultation with ERYC (as the LLFA). The strategy will provide details of the proposed operational surface water drainage design, including the approach to the adoption of the SuDS Hierarchy. It will include confirmation that sufficient storage will be provided to attenuate surface water and discharge it at a controlled rate following a rainfall event, in accordance with best practice guidance and policy including that set out by ERYC. It will also discuss the management and maintenance plan for the operational surface water drainage infrastructure.

21.3.14 Flood Warning and Evacuation

412. A Flood Warning and Evacuation Plan will be developed by the Principal Contractor(s) and included in the Project Emergency Response Plan (part of the CoCP developed post-consent for each stage of onshore construction works) 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 plan should be easy to communicate and identify clear roles and responsibilities in the event of flooding. Further details are provided in the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO108 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), a draft version of which is provided at PEIR stage.

413. The Flood Warning and Evacuation Plan will need to include the following aspects:

- Key contacts, including Flood Line, emergency services, utilities companies and insurance providers;
- A description or map showing locations of service shut off points;
- Basic strategies for protecting property, machinery of materials, including moving assets to safety where possible, turning off or isolating services and moving to safety; and
- Safe access and egress routes.

414. 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;
- 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;
- 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.

415. A Flood Warning and Evacuation Plan is especially important in areas where there is a known flood risk such as construction works at watercourse crossing locations along the onshore ECC where personnel or materials may be located in Flood Zone 2 or Flood Zone 3 and at the landfall where workers may, albeit temporarily, be located in Flood Zone 2 or Flood Zone 3.

416. All site personnel including visitors to the site should be made aware of any access routes and all flood warnings issues. Access routes will be kept clear at all times when not in use.

417. It should be noted that parts of the onshore ECC are located in rural areas and that some rural undeveloped areas may not be covered by flood warnings.

418. Furthermore, it is important to note that the Environment Agency's flood alerts and warnings are not issued in a response to surface water flooding.

419. As such, the Flood Warning and Evacuation Plan will need to include independent checks of adverse weather conditions (i.e. Met Office weather warnings) alongside any alerts or warnings issued by the Environment Agency. These checks will also account for risks outside flood alerts or flood warnings (i.e. heavy rainfall or potential surface water flooding events) and will enable the Principal Contractor(s) to consider how this information will affect the planned works, especially in areas in proximity to key watercourses.

420. During construction, the Principal Contractor(s) should liaise with the relevant risk management authorities and emergency planning officers so they are aware of any forecast related to heavy rainfall events. The potential for flooding can then be assessed to enable work to stop, especially in areas in close proximity to key watercourses, and the site cleared of all personnel, as required.

421. Once the OCS and ESBI are operational, the requirements for personnel to access the site will be limited and transient in nature, i.e. there will be no requirements for permanent on-site personnel presence and visits will be limited to routine and unplanned inspection and maintenance activities.

422. As such, the OCS and ESBI could be evacuated, upon receipt of a heavy rainfall warning, prior to an event. This ensures that O&M personnel and visitors to the OCS and ESBI would not be placed at risk during such an event.

423. The risk of surface water flooding is relatively localised in nature and egress routes from the OCS and ESBI would be readily available to areas which are not identified as areas at being at risk.

424. Depending on the OCS zone selected, there may be a need to prepare a site-specific Flood Warning and Evacuation Plan for the O&M phase. Further details will be provided at ES stage.

21.3.15 Conclusion

425. The Project has been considered within the context of the guidance set out in the NPS, NPPF and the supporting PPG. On this basis, all potential sources of flood risk to the onshore infrastructure within the Onshore Development Area have been considered.

21.3.15.1 Landfall

426. Overall, the landfall is not at risk from flooding from sewers, reservoirs, canals and other artificial sources. Furthermore, there is no risk of fluvial flooding (Main Rivers) given the absence of fluvial watercourses.

427. Where the offshore export cables come ashore, it is expected to pass under Flood Zones 2 and 3, where there is a coastal / tidal flood risk. However, given that the landfall cable ducts will be installed using a trenchless installation technique from the landfall construction compound on the cliff top to the exit pits in the subtidal zone, the risk to the Project is low.

428. Once operational, all landfall infrastructure will be below ground. It can be considered that the landfall infrastructure will not be at risk of flooding once operational, with the main risk likely to occur during the construction phase.

429. There are some isolated areas of surface water flood risk at landfall, primarily inland. The flood risk from surface water will be during construction only, however mitigation measures have been identified in this FRA. These measures are included in the **Outline Code of Construction Practice** (document reference 8.9) (see Commitment ID CO43 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**), a draft version of which is provided at PEIR stage. These measures will be further refined at ES stage.

21.3.15.2 Onshore Export Cable Corridor

430. A flood risk review has been undertaken along the onshore ECC, and it has been noted that the corridor will pass through areas of Flood Zones 1, 2 and 3.

431. Overall, Segments 1 to 4 of the onshore ECC are not at risk from flooding from tidal, sewers, canals and other artificial sources. There is a variable risk of groundwater flooding along parts of the onshore ECC. Segments 1, 3 and 4 are not at risk of reservoir flooding, however Segment 2 is at risk of reservoir flooding. The main risk of flooding to the onshore ECC is from fluvial flooding.

432. Large sections of the Segments 1 to 4 of the onshore ECC are located in Flood Zone 1 which is classed as low risk. However, in Segment 2, the majority of the onshore ECC is located within Flood Zone 2 or Flood Zone 3, which is classed as medium and high risk respectively. The sections within Flood Zone 2 or Flood Zone 3 are primarily associated with fluvial flooding from a number of Main Rivers and Ordinary Watercourses.

433. In addition, where the onshore ECC crosses Ordinary Watercourses / drainage ditches, there are areas at increased risk of surface water flooding. This is primarily associated with the watercourse and is likely to be retained within the channel or the lower lying area of land draining into it.

434. Across the remainder of Segments 1 to 4 of the onshore ECC, there are multiple isolated areas of surface water risk, which are a result of natural topographical low points.

435. Segments 5 and 6 of the onshore ECC (northern and southern corridor sections) are not at risk of flooding from tidal, sewers, reservoirs, canals and other artificial sources. The risk of groundwater flooding along Segments 5 and 6 are considered to be low. The main risk to both Segments 5 and 6 of the onshore ECC are from fluvial and surface water sources.

436. The majority of both the northern and southern corridor sections will be located in Flood Zone 1, which represents low risk however there are areas within Flood Zones 2 and 3, which represent medium and high risk respectively.

437. With regard to the surface water flood risk, the Environment Agency Surface Water Flood Map, shown on **Figure 21.3-6**, indicates that the majority of northern and southern corridor sections are at low risk, however there are several overland flow routes and drainage ditches which they must pass under which vary from low to high risk.

438. Where a trenchless installation is used for the cable duct installation at crossings of Main Rivers and IDB-maintained drains, the flood risk in these locations can be considered to be low (see Commitment ID CO32 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

439. Where open cut trenching is proposed for crossings of Ordinary Watercourses, temporary damming and the temporary diversion of watercourses and other mitigation measures will be implemented. Any temporary damming or diversions will be assessed on an individual basis and be designed to ensure that the flood risk does not increase elsewhere by ensuring that the existing volumes and rates are maintained. Once construction works are completed, the channel bed and banks will be reinstated to the original level, position and profile (see Commitment ID CO35 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

440. A WCMS will be provided as part of the CoCP submitted post-consent. The WCMS will be developed in accordance with the Outline CoCP submitted as part of the application for development consent and agreed with the relevant authorities prior to the commencement of the relevant stage of construction works. The WCMS will include details of the crossing technique and construction methodology to be undertaken at each crossing and associated environmental mitigation measures (see Commitment ID CO35 in **Table 21-4** of **Volume 1, Chapter 21 Water Resources and Flood Risk**).

441. Once operational, the majority of onshore export cable infrastructure will be buried and therefore not at risk from flooding. Residual risk from groundwater flooding shall be mitigated through waterproofing the design of buried infrastructure such as the onshore export cables and jointing bays.

442. Where link boxes are required to be sited above-ground, these will be at varying flood risk depending on their location. However, since the footprint of these above-ground link boxes is small, they would not significantly impact the wider flood extent. Additionally, if above-ground link boxes are sited in Flood Zone 2 or Flood Zone 3, appropriate mitigation measures would be implemented which will be confirmed at ES stage, if required.

21.3.15.3 Onshore Converter Station Zone

443. OCS Zone 4 is considered to be at low to high risk of fluvial flooding. The majority of the area is located in Flood Zone 1, however Flood Zones 2 and 3 bisects the zone associated with the Autherd Drain. Further information on the layout of infrastructure within the OCS zone will be provided at ES stage, however, it will be a principle of site selection refinement that critical infrastructure associated with the OCS and ESBI is micro-sited away from Flood Zones 2 and 3 (see **Volume 1, Chapter 5 Site Selection and Consideration of Alternatives**). If the OCS and ESBI is located within Flood Zone 2 or Flood Zone 3, appropriate mitigation measures will need to be implemented to ensure the development will be safe from flooding and does not increase flood risk elsewhere, however, this will be confirmed at ES stage.

444. OCS Zone 8 is considered to be at low risk of fluvial flooding, as the zone is fully located in Flood Zone 1.

445. OCS Zone 4 and OCS Zone 8 are not considered to be at risk from flooding from tidal, sewers, reservoirs, canals and other artificial sources. They are also considered to be at low risk from groundwater flooding.

446. As shown on the Environment Agency Surface Water Flood Risk Map, on **Figure 21.3-6**, there is a high risk of surface water flooding associated with the drainage ditches and a flow path present on site for OCS Zone 4. As the layout of the OCS and ESBI within the zone is yet to be confirmed, should it be sited in an area of high risk, appropriate mitigation measures will need to be considered and confirmed during the detailed design stage post-consent. However, the remainder of the zone is outside the extent of any surface water flooding.

447. OCS Zone 8 has a high risk of surface water associated with the existing drainage ditches bisecting it and a topographical low point. As the layout of the OCS and ESBI within the zone is yet to be confirmed, should it be sited in an area of high risk, appropriate mitigation measures will need to be considered and confirmed during the detailed design stage post-consent. However, the remainder of the zone is outside the extent of any surface water flooding.

448. Furthermore, any surface water drainage for the OCS and ESBI will need to take the SuDS hierarchy into account to meet the relevant policy and guidance. It will also need to be designed to take into account the relevant greenfield runoff rate, proposed runoff rate and volume of storage required.

449. Once the OCS and ESBI are operational, the requirements for personnel to access the site will be limited and transient in nature, i.e. there will be no requirements for permanent on-site personnel presence and visits will be limited to routine and unplanned inspection and maintenance activities. The OCS and ESBI can be evacuated, upon receipt of a heavy rainfall warning. This ensures that O&M personnel present on-site would not be placed at risk during such event.

21.3.15.4 Summary of Flood Risk

450. In summary, this FRA has been undertaken in accordance with the relevant NPS, NPPF and the methodology and criteria provided for the application of the Sequential Test and Exception Test within the PPG.

451. Due to the large-scale and linear nature of the works, it is acknowledged that there are locations where infrastructure is required to pass through or be located in Flood Zone 3 or at increased risk of surface water flooding such as the onshore ECC and the coastal extent of the landfall. It is also noted that the principal interaction with Flood Zone 3 is at key locations along the onshore ECC associated with the need to cross existing watercourses.

452. As noted previously, the Onshore Development Area is located within Flood Zones 1, 2 and 3, as shown on **Figure 21.3-5.** There is a varying low to high risk from surface water flooding to the Project. However, there is no to low risk of flooding from all other sources of flood risk.

453. If OCS Zone 4 is selected, the OCS and ESBI would be located within Flood Zones 1, 2 and 3. If permanent infrastructure is determined to be located within Flood Zone 1, it will be in accordance with the Sequential Test guidance, which states that developments should be placed in areas at the lowest flood risk. However, if the permanent infrastructure is situated in Flood Zone 2 or Flood Zone 3, there will be a need for mitigation measures to be included within the detailed design. However, it will be a principle of site selection refinement that any critical infrastructure associated with the OCS and ESBI would be micro-sited away from Flood Zone 2 and Flood Zone 3 and placed in Flood Zone 1 (see **Volume 1, Chapter 5 Site Selection and Consideration of Alternatives**).

454. If OCS Zone 8 is selected, the OCS and ESBI would be located within Flood Zone 1 and is therefore, in accordance with the Sequential Test guidance, which states that developments should be placed in areas at the lowest flood risk.

455. Once operational, the majority of onshore export cable infrastructure will be located below ground. Large sections of the onshore ECC are located in Flood Zone 1, with a length in the middle of the onshore ECC (Segment 2), located in either Flood Zone 2 or Flood Zone 3, where it is required to pass under existing watercourses. Where above-ground link boxes are required, these will have a small footprint and will not cause further impact to the flood extent.

456. Based on the above, as the risk is limited to the construction phase only, it is considered that flood risk concerns can be appropriately mitigated within the detailed design.

457. Due to the linear nature of the onshore ECC, it is not possible to completely avoid areas with increased flood risk or areas of Flood Zones 2 and 3. Whilst these areas have been avoided where possible, some cannot be avoided.

458. As such, it is concluded that the Project is in accordance with the Sequential Test, in that areas which are principally at low risk have been identified over those areas at increased risk.

459. It has been identified that there is a need to consider the Exception Test, given the flood risk and vulnerability classification of the Project.

460. The Exception Test is formed of two parts. The Project satisfies the first part of the Exception Test as it provides wider sustainability benefits to the community and, as an NSIP, it provides energy certainty through the use of a sustainable and renewable source of energy at a national scale. Therefore, the Exception Test has been considered and the first part has been passed.

461. With regard to the second part of the Exception Test, it is necessary to consider the Project in the context of its scale and that large sections of the landfall, onshore ECC and OCS Zone 8 are not located within areas considered to be at risk of fluvial or tidal flooding.

462. Infrastructure within OCS Zone 4 will be located in Flood Zones 1, 2 and 3 and as such are subject to consideration in the context of the Exception Test. If the OCS and ESBI are located in Flood Zone 3, appropriate mitigation and drainage design will need to be included at ES stage to ensure it will not be vulnerable to flood risk during its operational lifetime and will not increase flood risk elsewhere. Appropriate mitigation including micro-siting within OCS Zone 4 to place infrastructure in Flood Zone 1 will be considered as a site selection refinement principle (see **Volume 1, Chapter 5 Site Selection and Consideration of Alternatives**).

463. Other elements, such as some sections of the onshore ECC which have to pass through areas of Flood Zone 3 and / or areas of high surface water flood risk, are primarily subterranean development. Once construction is complete, these elements will not be vulnerable to flood risk during their operational lifetime and will not increase flood risk elsewhere. Where above-ground link boxes are required along the onshore ECC, these will have a small footprint and are not considered to cause further impact to the flood extent.

464. For the subterranean development, the flood risk is only present during the construction phase. During this time, there may be potential for a temporary increase in flood risk, which will be mitigated through appropriate management measures.

465. Furthermore, it is concluded that the Project can be made safe through suitable design measures such as micro-siting. Until further information on the design and location of above-ground infrastructure becomes available, it is not possible to wholly assess the Exception Test at this time.

466. The Project will be reassessed at ES stage where further location and design information will become available to allow for suitable mitigation measures to be proposed, which will demonstrate that the Project will be safe for its lifetime, without increasing flood risk elsewhere. The assessment will also be updated using the latest Environment Agency data for flood risk and surface water flood risk.

467. On the basis of the flood risk identified both to and from the Project and consideration of both the Sequential Test and Exception Test, it is concluded that the Project is appropriate in terms of flood risk and is in accordance with the relevant NPS and NPPF.

References

Department for Energy Security and Net Zero (2024). EN-1 Overarching National Policy Statement for Energy. Available at: https://assets.publishing.service.gov.uk/media/65bbfbdc709fe1000f637052/overarching-nps-for-energy-en1.pdf [Accessed: 12th November 2024].

Department for Energy Security and Net Zero (2024). EN-3 National Policy Statement for renewable energy infrastructure. Available at: https://assets.publishing.service.gov.uk/media/65a7889996a5ec000d731aba/nps-renewable-energy-infrastructure-en3.pdf [Accessed: 12th November 2024].

Department for Energy Security and Net Zero (2024). EN-5 National Policy Statement for electricity networks infrastructure. Available at: https://assets.publishing.service.gov.uk/media/65a78a5496a5ec000d731abb/nps-electricity-networks-infrastructure-en5.pdf [Accessed: 12th November 2024].

East Riding of Yorkshire Council (2015). East Riding Local Flood Risk Management Strategy (2015 -2027). Available at: downloads.eastriding.org.uk/corporate/pages/local-flood-risk-management-strategy/Local Flood Risk Management Strategy.pdf [Accessed: 12th November 2024].

East Riding of Yorkshire Council (2016). East Riding Local Plan (adopted April 2016). Available at: https://www.eastriding.gov.uk/planning-permission-and-building-control/planning-policy-and-the-local-plan/east-riding-local-plan/ [Accessed: 12th November 2024].

East Riding of Yorkshire Council (2019). Strategic Flood Risk Assessment: Level 1. Available at: https://www.eastriding.gov.uk/planning-permission-and-building-control/planning-policy-and-the-local-plan/strategic-flood-risk-assessment/ [Accessed: 12th November 2024].

East Riding of Yorkshire Council (2020). Strategic Flood Risk Assessments for Goole and Hedon Level 2. Available at: https://www.eastriding.gov.uk/planning-permission-and-building-control/planning-policy-and-the-local-plan/strategic-flood-risk-assessment/ [Accessed: 12th November 2024].

East Riding of Yorkshire Council (2021). Draft East Riding Flood Risk Management Strategy 2 (2021-2027 and beyond). Available at: https://www.eastriding.gov.uk/council/plans-and-policies/other-plans-and-policies-information/flood-risk/local-flood-risk-management-strategy/ [Accessed: 12th November 2024].

East Riding of Yorkshire Council (2021). East Riding Local Plan Update 2020 – 2039 Draft Strategy Document Update. Available at: https://downloads.eastriding.org.uk/corporate/easysite-assets/799604/Local%20Plan%20Strategy%20Document%20Update.pdf [Accessed: 12th November 2024].

East Riding of Yorkshire Council (2022). East Riding Local Plan Update 2020 – 2039. Proposed Submission Strategy Document Update https://downloads.eastriding.org.uk/corporate/easysite-assets/831356/REG19%20LP%20Strategy%20Document%20Update%20-%20Contents%20Button.pdf [Accessed: 19th December 2024].

East Riding of Yorkshire Council (2021). Flood Risk Sequential and Exception Test Supplementary Planning Document. Available at: https://downloads.eastriding.org.uk/corporate/pages/supplementary-planning-documents/Flood%20Risk%20Sequential%20and%20Exception%20Test%20-%20%20Supplementary%20Planning%20Document.pdf [Accessed: 12th November 2024].

Environment Agency (2010). Hull and Coastal Streams Catchment Flood Management Plan. Available at: https://assets.publishing.service.gov.uk/media/5a7c548f40f0b62dffde1640/River_Hull_and_Coastal_Streams_Catchment_Flood_Management_Plan.pdf [Accessed: 12th November 2024].

Environment Agency (2022). Flood Risk Assessments: Climate Change Allowances Guidance. Available at: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#peak-river-flow-allowances [Accessed: 12th November 2024].

Environment Agency (2024). Flood Map for Planning. Available at: https://flood-map-for-planning.service.gov.uk/ [Accessed: 12th November 2024].

GOV.UK (2024). Check the long term flood risk for an area in England. Available at: https://www.gov.uk/check-long-term-flood-risk [Accessed: 12th November 2024].

Humber Estuary Coastal Authorities Group (2010). Flamborough Head to Gibraltar Point Shoreline Management Plan. Available at: https://urbanrim.org.uk/cache/Shoreline%20Management%20Plan%202010.pdf [Accessed: 12th November 2024].

Ministry of Housing, Communities & Local Government (2023). National Planning Policy Framework (NPPF). Available at: https://www.gov.uk/guidance/national-planning-policy-framework / [Accessed: 12th November 2024].

Ministry of Housing, Communities & Local Government (2024). National Planning Policy Framework (NPPF). Chapter 14. Meeting the challenge of climate change, flooding and coastal change. Available at: https://www.gov.uk/guidance/national-planning-policy-framework/14-meeting-the-challenge-of-climate-change-flooding-and-coastal-change [Accessed: 12th December 2024].

List of Tables and Figures

List of Tables

List of Figures

List of Acronyms

Acronym	Definition
BGS	British Geological Survey
CCMA	Coastal Change Management Area
CFMP	Catchment Flood Management Plan
CoCP	Code of Construction Practice
CIRIA	Construction Industry Research and Information Practice
DBD	Dogger Bank D
DCO	Development Consent Order
ECC	Export Cable Corridor
EIA	Environment Impact Assessment
EPP	Evidence Plan Process
ES	Environmental Statement
ESBI	Energy Storage and Balancing Infrastructure
ETG	Expert Topic Group
FRA	Flood Risk Assessment
FRR	Flood Risk Regulations
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IDB	Internal Drainage Board
IDD	Internal Drainage District
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
MHWS	Mean High Water Springs
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	National Significant Infrastructure Project
OCS	Onshore Convertor Station
PEIR	Preliminary Environmental Information Report
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
RBMP	River Basin Management Plan
SFRA	Strategic Flood Risk Assessment
SMP	Shoreline Management Plan
SPD	Supplementary Planning Document
SuDS	Sustainable Drainage Systems
TJB	Transition Joint Bay