FIVE ESTUARIES
OFFSHORE WIND FARM

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PRELIMINARY ENVIRONMENTAL INFORMATION REPORT

VOLUME 3, CHAPTER 6: HYDROLOGY, HYDROGEOLOGY AND FLOOD RISK

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FIGURES

DEFINITION OF ACRONYMS

Term	Definition
AEP	Annual Exceedance Probability
AOD	Above Ordnance Datum
CFMP	Catchment Flood Management Plan
CIRIA	Construction Industry Research and Information Association
CoCP	Code of Construction Practice
DCO	Development Consent Order
ECC	Export Cable Corridor
EA	Environment Agency
EACN	East Anglia Connection Node
EIA	Environmental Impact Assessment
ES	Environmental Statement
ETG	Expert Topic Group
FRA	Flood Risk Assessment
HDD	Horizontal Directional Drilling
IEMA	Institute of Environmental Management and Assessment
LLFA	Lead Local Flood Authority
LNR	Local Nature Reserves
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
PEIR	Preliminary Environmental Information Report
OnSS	Onshore Substation
PWS	Private Water Supply
RBMP	River Basin Management Plans
rBWD	Revised Bathing Waters Directive
SAC	Special Area of Conservation
SFRA	Strategic Flood Risk Assessment
SMP	Shoreline Management Plan
SPA	Special Protection Area
SSSI	Sites of Special Scientific Interest

Term	Definition
SSA East	Substation Search Area East
SSA West	Substation Search Area West
SuDS	Sustainable Drainage Systems
TJB	Transition Joint Bay
uPBTs	ubiquitous, persistent, bioaccumulative, toxic substances
VE	Five Estuaries
VE OWF	Five Estuaries Offshore Wind Farm
WFD	Water Framework Directive
WTGs	VE wind turbine generators
WWTW	Wastewater Treatments Works

GLOSSARY OF TERMS

Term	Definition
Ancient Woodland	Typically, a woodland that has existed continuously since 1600 or before (this can include areas where trees have been cut down and/ or replanted).
Array Areas	The areas where the WTGs will be located.
Cable Works TCC	TCC associated with cable works.
DCO	An order made under the Planning Act 2008 granting development consent for a NSIP from the Secretary of State for Business, Energy and Industrial Strategy.
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact in question with the sensitivity of the receptor in question, in accordance with defined significance criteria.
ES	The documents that collate the processes and results of the EIA.
European sites	Sites designated for nature conservation under the Habitats Directive and Birds Directive, as defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017 and regulation 18 of the Conservation of Offshore Marine Habitats and Species Regulations 2017. These include candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas.
Evidence Plan	A voluntary consultation process with specialist stakeholders to agree the approach to the Environmental Impact Assessment.
Impact	An impact to the receiving environment is defined as any change to its baseline condition, either adverse or beneficial, resulting from the activities associated with the construction, operation and maintenance, or decommissioning of the project.
Habitats Regulations	The Conservation of Habitats and Species Regulations 2010.
Landfall	The landfall denotes the location where the offshore export cables are brought ashore and jointed to the onshore cable circuits in TJBs.
Local Nature Reserve	Statutory designation for places with wildlife or geological features that are of special interest locally.

Term	Definition
Maximum Design Scenario	The maximum design parameters of the combined project assets that result in the greatest potential for change in relation to each impact assessed.
Mitigation	Mitigation measures are commitments made by the project to reduce and/or eliminate the potential for significant effects to arise as a result of the project. Mitigation measures can be embedded (part of the project design) or secondarily added to reduce impacts through the assessment process.
Onshore ECC	At PEIR, the Onshore ECC is the wider cable corridor within which the typically 60 m cable route is located. The Onshore ECC is typically approximately 200m to 250 m wide, however some areas require a wider corridor (such as where trenchless crossing may take place).
OnSS	Where the power supplied from the wind farm is adjusted (including voltage, power quality and power factor as required) to meet the UK System-Operator Transmission-Owner Code for supply to the National Grid substation.
OnSS Access Zone	The area which will contain the final OnSS access route (both construction and operational)
OnSS Construction Zone	The area in which the final OnSS TCC footprint will be located.
OnSS Zone	The area in which the final OnSS footprint will be located.
PEIR	The PEIR is written in the style of a draft ES and forms the basis of statutory consultation. Following that consultation, the PEIR documentation will be updated into the final ES that will accompany the application for the DCO.
River Basin Management Plans	River basin management plans (RBMPs) set the legally binding locally specific environmental objectives that underpin water regulation (such as permitting) and planning activities.
Revised Bathing Water Directive	Revised Bathing Water Directive is required to monitor and assess bathing water. It ensures timely information is given to the public during the bathing season and requires applicants to disseminate information on bathing water quality actively and promptly.
Special Area of Conservation	A special area of conservation is defined in the European Union's Habitats Directive, also known as the Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora.
Shoreline Management Plan	A Shoreline Management Plan (SMP) is a strategy for managing flood and erosion risk for a particular stretch of coastline, over short, medium and long-term periods.

Term	Definition
Water Framework Directive	The Water Framework Directive (WFD) (2000/60/EC) introduced a comprehensive river basin management planning system to help protect and improve the ecological health of our rivers, lakes, estuaries and coastal and groundwaters.
Waste Water Treatment Works	Wastewater treatment which aims to remove contaminants from sewage to produce an effluent that is suitable to discharge to the surrounding environment or an intended reuse application, thereby preventing water pollution from raw sewage discharges.

6 HYDROLOGY, HYDROGEOLOGY AND FLOOD RISK

6.1 INTRODUCTION

6.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the results to date of the Environmental Impact Assessment (EIA) for the potential impacts of the Five Estuaries Offshore Wind Farm (VE) on Onshore Hydrology, Hydrogeology and Flood Risk. Specifically, this chapter considers the potential impact of VE from the landfall, along the onshore Export Cable Corridor (ECC) and incorporating the Onshore Substation (OnSS) during the construction, operation and maintenance (O&M), and decommissioning phases. VE is a Nationally Significant Infrastructure Project (NSIP). An Environmental Statement (ES) will be provided as part of a Development Consent Order (DCO) application under the Planning Act 2008.

6.1.2 VE is a proposed extension to the operational Galloper Offshore Wind Farm (OWF). Full details of the development proposals are set out in Volume 1, Chapter 1: Introduction, of this PEIR.

6.1.3 This chapter has been informed by the following PEIR chapters:

- Volume 2, Chapter 3: Marine Water and Sediment Quality;
- Volume 3, Chapter 1: Onshore Project Description;
- Volume 3, Chapter 4: Onshore Biodiversity and Nature Conservation; and
- Volume 3, Chapter 5: Ground Conditions and Land Use.

6.1.4 This hydrology, hydrogeology and flood risk chapter will:

- Detail the existing baseline established from desk studies, dedicated surveys and consultation;
- Outline the potential environmental effects on hydrology, hydrogeology and flood risk arising from the VE, based on the information gathered and the analysis and assessments undertaken to date and assess whether they are significant (in EIA terms);
- Identify any assumptions and limitations encountered in compiling the environmental information; and
- Highlight any necessary monitoring and/or mitigation measures which could prevent, minimise, reduce, or offset the possible environmental effects identified at the relevant stage in the PEIR process.

6.2 STATUTORY AND POLICY CONTEXT

LEGISLATION AND POLICY GUIDANCE

6.2.1 Regard will be given to technical guidance and other codes of best practice during the design phase of the development, in order to limit:

- The potential for contamination of ground and surface waters;
- The potential for flooding to be caused to the existing water environment and surrounding sensitive users;
- Potential for change to groundwater or surface water hydrology; and
- Other potential impacts on the water environment.

6.2.2 VE will be developed in accordance with the following European legislation, National legislation, National and Local Planning Policy and Strategy, and other relevant guidance.

EUROPEAN LEGISLATION

6.2.3 The Water Framework Directive (2000/60/EC) (the WFD) provides the foundation for the protection of the UK's water environment. The WFD seeks to protect all elements of the water cycle and to enhance the quality of groundwater, surface waters, estuaries, and coastal waters. The WFD is transposed and implemented within England through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. Volume 2 Chapter 3: Marine Water and Sediment Quality also makes reference to the WFD in assessment of the offshore water environment.

6.2.4 The Groundwater Directive (2006/118/EC, including amendments to Annex II detailed under Directive 2014/80/EU) (the GWD) is designed to combat groundwater pollution and sets out procedures for assessing quality of groundwater. Aspects of the GWD are transposed and implemented through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, the Environmental Permitting (England and Wales) Regulations 2016 and the Groundwater (England and Wales) Regulations 2009.

6.2.5 The Floods Directive (2007/60/EC) which requires assessment of all watercourses and coastlines to determine risk of flooding and action to take adequate and coordinated measures to reduce this flood risk. The Flood Risk Regulations 2009 transpose the EU Floods Directive into law in England and Wales.

6.2.6 The revised Bathing Water Directive (rBWD) (2006/7/EC) came into force in March 2006. The rBWD has been implemented in England and Wales via the Bathing Water Regulations 2013 (as amended), with Bathing Waters classified against the standards set by the rBWD since 2015. The rBWD provides more stringent standards than the previous Directive and places an emphasis on providing information to the public.

NATIONAL LEGISLATION

6.2.7 The objectives of the directives discussed above that are relevant to this assessment are met through the following UK legislation, relevant to the protection of the water environment:

- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 transposes the WFD and aspects of the GWD into UK legislation;
- The Environmental Permitting (England and Wales) Regulations 2016 consolidate and replace the Environmental Permitting (England and Wales) Regulations 2010, which have been amended 15 times to date. The 2010 Regulations are still in force and are the main implementing regulations for the environmental permitting regime. The Environmental Permitting (England and Wales) Regulations 2016 also supersede and incorporate the Groundwater (England and Wales) Regulations 2009 which implemented Article 6 of the GWD, detailing measures to prevent or limit inputs of pollutants into groundwater;
- The Flood Risk Regulations 2009 transposes the EU Floods Directive into UK legislation and sets out requirements of the Environment Agency (EA) and local

authorities in preparing assessments and mapping of flood risk for each river basin district in England and Wales;

- Flood and Water Management Act 2010 includes provisions for the management of risk in connection with flooding and sets out requirements for Lead Local Flood Authorities (LLFA) in preparing strategies for local flood risk management;
- The Water Resources Act 1991 regulates water resources, water quality and flood defence. The amendment Regulations, Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009, make changes to the powers for carrying out anti-pollution works and serving notices;
- The Land Drainage Act 1991 and The Land Drainage Act 1994 sets out requirements for maintenance of watercourses by riparian owners;
- The Environment Act 1995 sets out roles and responsibilities for the EA;
- The Private Water Supplies (England) Regulations 2016 and The Private Water Supplies (England) (amendment) Regulations 2018 transpose requirements of European Law on the quality of water intended for human consumption from private abstractions; and
- The Infrastructure Planning (Environmental Impact Assessment (EIA)) Regulations 2017 set out the key stages in the EIA process, including review and monitoring.

NATIONAL AND LOCAL PLANNING POLICY AND STRATEGY

6.2.8 Planning policy on offshore renewable energy NSIPs, specifically in relation to hydrology, hydrogeology and flood risk, is contained in the National Policy Statements (NPSs) for Overarching Energy (EN-1, DECC 2011), Renewable Energy Infrastructure (EN-3, DECC 2011) and Electricity Networks Infrastructure (EN-5, DECC 2011). The principal guidance for the proposals is that provided by the NPSs, together with National Planning Policy Framework (NPPF) and local development plan policies, which provide additional relevant context.

6.2.9 The NPSs identify a number of issues relevant to this chapter. The policies of particular relevance to hydrology, hydrogeology and flood risk from NPS EN-1 and NPS EN-3 are summarised in Table 6.1 below.

6.2.10 Guidance in relation to renewable energy projects is provided within NPS EN-3. For offshore wind farms, this document focuses primarily on the offshore elements of the Project. In relation to flood risk, NPS EN3 refers to NPS EN-1, Section 4.8.

6.2.11 Guidance in relation to the scope of assessment required is provided within NPS EN-3. Assessment should be undertaken for all stages of the lifespan of the proposed wind farm (Paragraph 2.6.190 of NPS EN-3).

6.2.12 Guidance specifically relating to onshore grid connections and climate change adaptation is provided in NPS EN-5. In relation to flood risk, NPS EN 5 refers to NPS EN-1, Section 4.8.

6.2.13 In addition to the current NPS, draft updated NPSs were consulted upon between September and November 2021. The draft updated NPSs have been reviewed to determine the emerging expectations and changes from previous iterations of the NPSs. This includes the Draft Overarching NPS EN-1 (DECC, 2021), Draft EN- 3 (DECC, 2021) and Draft EN- 5 (DECC, 2021). No significant changes with regard to the assessment of onshore hydrology, hydrogeology or flood risk are noted in the emerging draft updated NPS.

NATIONAL PLANNING POLICY FRAMEWORK

6.2.14 The National Planning Policy Framework (NPPF), prepared by the Department for Communities and Local Government was published in March 2012 and revised in July 2021. Chapter 14 of the NPPF, Meeting the challenge of climate change, flooding and coastal change, along with the Planning Practice Guidance (PPG) which expands on policies contained in the NPPF, recommends a proactive strategy to mitigate and adapt to climate change and requires that flood risk, sustainability and water quality are considered. In addition, the NPPF requires that account is taken of the potential for pollution arising from previous use of the land when determining suitability for a proposed use. NPPF (2012) informs section 5.7 Flood Risk of the Overarching National Planning Policy Statement for Energy (EN-1).

6.2.15 Chapter 15 of the NPPF, Conserving and enhancing the natural environment, along with guidance contained within PPG requires that account is taken of the potential for impact on water quality (in relation to water supply and the natural environment) and local hydrological regimes. NPPF informs section 5.15 Water Quality and Resources of the Overarching National Planning Policy Statement for Energy (EN-1).

TENDRING DISTRICT LOCAL PLAN 2013-2033 AND BEYOND PUBLICATION DRAFT, TENDRING DISTRICT COUNCIL, JULY 2017. EMERGING LOCAL PLAN:

6.2.16 The following policies within the emerging Local Plan are considered relevant to the local water environment:

POLICY PPL 1: DEVELOPMENT AND FLOOD RISK

6.2.17 All development proposals should include appropriate measures to respond to the risk of flooding on and/ or off site and within the Flood Zone (which includes Flood Zones 2 and 3, as defined by the EA) shown on the Policies Map and Local Maps, or elsewhere involving sites of 1 ha or more, must be accompanied by a Flood Risk Assessment (FRA). New development in areas of high flood risk must be designed to be resilient in the event of a flood.

6.2.18 Proposals must have regard, as necessary, to the Sequential Test and the Exception Test which should be applied in accordance with NPPF. The aim of the Sequential Test is to steer new development to areas with the lowest risk of flooding from any source. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The application of the Exception Test, where required, will determine the wider sustainability benefits to the community of the development proposals and ensure that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere.

POLICY PPL4: BIODIVERSITY AND GEODIVERSITY

6.2.19 Environmentally designated sites will be protected from any development likely to have an adverse effect on their integrity. As a minimum, there should be no significant impacts upon any protected species, including European Protected Species and schemes should consider the preservation, restoration or re-creation of priority habitats, ecological networks and the protection and recovery of protected species populations.

6.2.20 Proposals for new infrastructure and major development should consider the potential for enhanced biodiversity, appropriate to the site and its location, including, where appropriate, within Green Infrastructure.

POLICY PPL 5: WATER CONSERVATION, DRAINAGE AND SEWERAGE

6.2.21 All new development must make adequate provision for drainage and sewerage and should include Sustainable Drainage Systems (SuDS) as a means of reducing flood risk, improving water quality, enhancing the Green Infrastructure network and providing amenity and biodiversity benefits.

POLICY PPL 13: ARDLEIGH RESERVOIR CATCHMENT AREA.

6.2.22 Ardleigh Reservoir is surrounded by a catchment area within which certain proposals for development will be subject to consultation with the operator of the site. This may result in restrictions being imposed or planning permission being refused if the development could materially affect the quality of water draining into the reservoir.

NORTH ESSEX CATCHMENT FLOOD MANAGEMENT PLAN, ENVIRONMENT AGENCY, DECEMBER 2009:

6.2.23 The Catchment Flood Management Plan (CFMP) provides guidance on understanding the scale and extent of flooding across the region and sets policies for managing flood risk within the catchment. The search area falls largely within the "Coastal Streams" sub-area, governed by Policy 2. A small portion of the search area surrounding Little Clacton falls within the "Clacton-on-Sea" sub-area, governed by Policy 3 (Areas of low to moderate flood risk where we are generally managing existing flood risk effectively).

TENDRING DISTRICT COUNCIL STRATEGIC FLOOD RISK ASSESSMENT, TENDRING DISTRICT COUNCIL, MARCH 2009:

6.2.24 The Strategic Flood Risk Assessment (SFRA) identifies and maps flood risk at a regional scale, including consideration of residual tidal flood risk associated with a breach of defences. The SFRA provides an appraisal of flood risk in the Tendring District and presents recommendations on development and flood risk for the primary purpose of informing the Local Plan.

SHORELINE MANAGEMENT PLAN 8, ESSEX COUNTY COUNCIL:

6.2.25 The Shoreline Management Plan (SMP) outlines strategy for managing flood and erosion risk along the coastline, over short, medium and long-term periods. SMP8 covers the Essex and South Suffolk coastline from Landguard Point to Two Tree Island. The study area is contained within Management Unit C, Tendring Peninsula, and the Policy Development Zones for Holland-on-Sea (PDZ C2) and Clacton-on Sea (PDZ C3). The SMP states that for PDZ C2 the current line will be held until 2055 and from this point a dual policy of either managed realignment or hold the line.

OTHER RELEVANT GUIDANCE

6.2.26 Relevant UK guidance on good practice for construction projects that will be referenced during assessment is detailed in the following documents:

- Control of Water Pollution from Construction Sites (C532), Construction Industry Research and Information Association (CIRIA 2001);

- Environmental Good Practice on Site (C741) (CIRIA, 2015);
- Control of water pollution from linear construction projects (CIRIA, 2006);
- The Environment Agency's approach to groundwater protection, version 1.2, February 2018; and
- The SuDS Manual (C753) (CIRIA, 2015).

6.2.27 The CIRIA guidance provides help on environmental good practice for the control of water pollution arising from construction activities. It focuses on the potential sources of water pollution from within construction sites and the effective methods of preventing its occurrence.

6.2.28 The Environment Agency (EA) guidance is part of a wider suite of documents and guidance relating to groundwater protection which sets out principles for assessing risk, protecting groundwater, and permitting abstractions and discharges from groundwater. The full suite of documents relating to groundwater can be found on the GOV.UK website (GOV (2022).

6.2.29 The SuDS Manual incorporates the latest research, industry practice, and guidance for design, delivery, and maintenance of SuDS.

6.2.30 The relevant legislation and national planning policy for offshore renewable energy NSIPs, specifically in relation to hydrology, hydrogeology and flood risk, is outlined in Table 6.1 below.

Table 6.1 Legislation and policy context.

Legislation/ Policy	Key Provisions	Section where comment is addressed
National Policy Statement for Overarching Energy (NPS EN-1) (2011)	Paragraph 4.8.6 of NPS EN-1 requires that applicants for new energy infrastructure must take into account the potential impacts of climate change using the latest UK Climate Projections available at the time, in order to ensure that appropriate mitigation or adaptation measures have been identified for the estimated lifetime of the new infrastructure.	The characterisation of the flood risk baseline and future baseline has been established using the EA Flood Map for Planning, the local authority Strategic Flood Risk Assessment (SFRA) and data from recent hydraulic models, which take into account climate change effects. This information is contained in Volume 5, Annex 6.1: Onshore ECC Flood Risk Assessment (FRA) and will be covered in separate FRA reporting for the OnSS. Flood risk has been considered for the life of the development in Section 6.7.63 to Section 6.7.67.

Legislation/ Policy	Key Provisions	Section where comment is addressed
NPS EN-1	Paragraph 5.7.4 of NPS EN-1 requires that applications for energy projects of 1 hectare or greater in Flood Zone 1 and all energy projects located in Flood Zones 2 and 3 should be accompanied by a FRA. A FRA may also be required where there maybe flooding issues other than from rivers and the sea (for example from surface water), or where the EA, Drainage Board or other body have indicated that there may be drainage problems. The FRA 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. The minimum requirements for what should be included in a FRA are also outlined at paragraph 5.7.5 of NPS EN-1.	FRA reporting undertaken in consultation with the EA and local authorities, compliant to NPS EN-1, paragraph 5.7.5: Volume 5, Annex 6.1: Onshore ECC FRA. Separate FRA reporting will be prepared for the OnSS at the application stage.
NPS EN-1	Paragraphs 5.7.7 - 5.7.8 of NPS EN-1 require applicants to hold pre-application discussions with the EA and any other relevant bodies. Any concerns regarding flood risk should be discussed and all reasonable steps to agree ways in which the proposal might be amended, or additional information provided, which would alleviate concerns should be taken.	Consultation with the EA has been undertaken as part of the VE Evidence Plan (Hydrology and Flood Risk Expert Topic Group (ETG)) process, as set out in Section 6.3.

Legislation/ Policy	Key Provisions	Section where comment is addressed
NPS EN-1	Paragraph 5.7.9 of NPS EN-1 lists the requirements that the Secretary of State (SoS) should consider, including where relevant: a FRA; application of the sequential test as part of the site selection; sequential approach at the site level to minimise risk; the proposal is in line with relevant local flood risk management strategies; priority has been given to the use of sustainable drainage systems (SuDs); and in flood risk areas the proposals are appropriately flood resilient and resistant to flooding.	FRA reporting has been undertaken in consultation with the EA and local authorities which includes consideration of the sequential approach: Volume 5, Annex 6.1: Onshore ECC Flood Risk Assessment. Separate FRA reporting will be prepared for the OnSS at the application stage that will include consideration of the sequential approach. The OnSS design will include a SuDS based surface water drainage scheme which would manage rainfall runoff from the proposed OnSS and will not increase flood risk locally or in the wider area.
NPS EN-1	Paragraph 5.15.2 of NPS EN-1 requires applicants to undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment where it is considered that a project could have effects on the water environment. Paragraphs 5.15.5 to 5.15.7 ask the SoS to ensure that proposals have regard for River Basin Management Plans (RBMP) and meets the requirements of the WFD.	The baseline environment (Section 6.7) is described for the hydrology, hydrogeology and flood risk study area. An assessment of the impacts on water quality, resources and physical characteristics is provided in Section 6.10, Section 6.11 and Section 6.12. The assessment of sensitivity for environmental receptors takes into consideration RBMPs and WFD status (Section 6.7 and Table 6.10).

Legislation/ Policy	Key Provisions	Section where comment is addressed
Draft National Policy Statement for Overarching Energy (NPS EN-1) (2021)	Paragraph 4.9.7 of the Draft NPS EN-1 requires that applicants for new energy infrastructure must take into account the potential impacts of climate change using the latest UK Climate Projections and associated research available at the time, in order to ensure that appropriate mitigation or adaptation measures have been identified for the estimated lifetime of the new infrastructure.	The characterisation of the flood risk baseline and future baseline has been established using the EA Flood Map for Planning, the local authority SFRA and data from recent hydraulic models, which take into account climate change effects. This information is contained in FRA reporting: Volume 5, Annex 6.1: Onshore ECC Flood Risk Assessment and will be covered in separate FRA reporting for the OnSS. Flood risk has been considered for the life of the development in Section 6.7.63 to Section 6.7.67.
Draft NPS EN-1	Paragraph 5.8.6 of the Draft NPS EN-1 requires that applications for energy projects of 1 hectare or greater in Flood Zone 1 and all energy projects located in Flood Zones 2 and 3 should be accompanied by a FRA. A FRA may also be required where there may be flooding issues other than from rivers and the sea (for example from surface water), or where the EA, Drainage Board or other body have indicated that there may be drainage problems. The FRA 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. The minimum requirements for what should be included in an FRA are also outlined at paragraph 5.8.7 of Draft NPS EN-1.	FRA reporting undertaken in consultation with the EA and local authorities, compliant to NPS EN-1, paragraph 5.7.5: Volume 5, Annex 6.1: Onshore ECC FRA. Separate FRA reporting will be prepared for the OnSS at the application stage.

Legislation/ Policy	Key Provisions	Section where comment is addressed
Draft NPS EN-1	Paragraphs 5.8.9 - 5.8.10 of the Draft NPS EN-1 require applicants to hold pre-application discussions with the EA and any other relevant bodies. Any concerns regarding flood risk should be discussed all reasonable steps to agree ways in which the proposal might be amended, or additional information provided, which would alleviate concerns.	Consultation with the EA has been undertaken as part of the VE Evidence Plan (Hydrology. Hydrogeology and Flood Risk ETG process, as set out in Section 6.3.
Draft NPS EN-1	Paragraph 5.8.11 of the Draft NPS EN-1 lists the requirements that the SoS should consider including where relevant: a FRA; application of the sequential test as part of the site selection; sequential approach at the site level to minimise risk; the proposal is in line with relevant local flood risk management strategies; priority has been given to the use of SuDs; in flood risk areas the proposals are appropriately flood resilient and resistant to flooding; that safe access/escape routes are included and land needed for future flood risk management is safeguarded.	FRA reporting has been undertaken in consultation with the EA and local authorities which includes consideration of the sequential approach: Volume 5, Annex 6.1: Onshore ECC FRA. Separate FRA reporting will be prepared for the OnSS at the application stage that will include consideration of the sequential approach. The OnSS design will include a SuDS based surface water drainage scheme which would manage rainfall runoff from the proposed OnSS and will not increase flood risk locally or in the wider area.

Legislation/ Policy	Key Provisions	Section where comment is addressed
Draft NPS EN-1	Paragraph 5.16.2 of the Draft NPS EN-1 requires applicants to undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment where it is considered that a project could have effects on the water environment. Paragraphs 5.16.7 to 5.16.9 ask the SoS to ensure that proposals have regard for RBMPs and meets the requirements of the WFD.	The baseline environment (Section 6.7) is described for the hydrology, hydrogeology and flood risk study area. An assessment of the impacts on water quality, resources and physical characteristics is provided in Section 6.10, Section 6.11 and Section 6.12. The assessment of sensitivity for environmental receptors takes into consideration RBMPs and WFD status (Section 6.7 and Table 6.10).
National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) (2011)	Paragraph 2.6.43 of NPS EN-3 notes that where precise details of proposed developments are not known, the maximum potential adverse effects of the project should be considered.	Where options exist, the maximum height or footprint (referred to as the Maximum Design Scenario) has been considered within this assessment as described in Section 6.8.
NPS EN-3	Paragraph 2.6.190 of NPS EN-3 states that assessment should be undertaken for all stages of the lifespan of the proposed wind farm.	Environmental assessment has been undertaken for all stages of the lifespan of the proposed wind farm at Section 6.10, Section 6.11 and Section 6.12 for the construction, operation and decommissioning stages respectively.
Draft National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) (2021)	Paragraph 2.58.8 of Draft NPS EN-3 notes that where precise details of proposed developments are not known, the maximum potential adverse effects of the project should be considered.	Where options exist, the maximum height or footprint (referred to as the Maximum Design Scenario) has been considered within this assessment as described in Section 6.8.

Legislation/ Policy	Key Provisions	Section where comment is addressed
Draft NPS EN-3	Paragraph 2.24.5 of Draft NPS EN-3 states that assessment should be undertaken for all stages of the lifespan of the proposed wind farm.	Environmental assessment has been undertaken for all stages of the lifespan of the proposed wind farm at Section 6.10, Section 6.11 and Section 6.12 for the construction, operation and decommissioning stages respectively.
National Planning Policy Framework (NPPF) (2021)	Paragraph 167 of NPPF states that local planning authorities should ensure that flood risk is not increased elsewhere and where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where it can be demonstrated that: > within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location; > the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment; > it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate; > any residual risk can be safely managed; and > safe access and escape routes are included where appropriate, as part of an agreed emergency plan.	Volume 5, Annex 6.1: Onshore ECC FRA. Separate FRA reporting will be prepared for the OnSS at the application stage.

Legislation/ Policy	Key Provisions	Section where comment is addressed
NPPF	Paragraph 169 of NPPF requires that major developments incorporate sustainable drainage systems, in line with Local Authority guidance; have appropriate proposed minimum operational standards; have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and where possible, provide multifunctional benefits.	The potential for the proposed onshore infrastructure associated with VE to cause additional run-off is assessed within the FRA for the onshore ECC provided in Volume 5, Annex 6.1: Onshore ECC Flood Risk Assessment. A separate Flood Risk Assessment report will be prepared for the OnSS at the application stage. The OnSS design will include a SuDS based surface water drainage scheme which would manage rainfall runoff and will not increase flood risk locally or in the wider area.

6.3 CONSULTATION

6.3.1 Consultation is a key part of the Development Consent Order (DCO) application process. Consultation regarding hydrology, hydrogeology and flood risk has been conducted through the Evidence Plan Process (EPP) ETG meetings and the EIA scoping process (VE, 2022).

6.3.2 A Scoping Opinion for VE was sought from the SoS. The Scoping Opinion, which includes responses from the EA, Local Authorities and Anglian Water, identifies areas of the assessment methodology for further consideration. A summary of the key issues raised during consultation to date, specific to hydrology, hydrogeology and flood risk, is outlined in Table 6.2.

6.3.3 Non statutory consultation happened in August 2022 and there were no significant issues raised at this point.

6.3.4 As identified in Volume 1, Chapter 4: Site Selection and Consideration of Alternatives and Volume 3, Chapter 1: Onshore Project Description, the Project design envelope has been refined and will be refined further prior to DCO submission. This process is reliant on stakeholder consultation feedback.

Table 6.2 Summary of consultation relating to Hydrology and Flood Risk

Scoping opinion ID	Scoping Report Reference	Applicant's proposed matters to scope out	Inspectorate's comments
4.18.1	Table 24.4, impact 24.7	Operational effects on WFD status of ground or surface water bodies	The Scoping Report proposes to scope out operational effects as the onshore cable route and landfall will be fully reinstated following construction and thus there will be no significant change to surface land use, hydro-morphology, runoff regimes, hydrogeological recharge and no potential for pollution. On the basis that effects on surface and groundwater during construction will be assessed in the ES, the Inspectorate agrees that this matter can be scoped out of further assessment.
4.18.2	Table 24.4, impact 24.8	Accidental spillages and leakages from all stages of the Proposed Development	The Scoping Report proposed to scope out pollution effects from accidental spillages and leakages due to the implementation of a Code of Construction Practice (CoCP) and containment at source of any potential pollutants during all stages of the Proposed Development. The Inspectorate agrees that this matter can be scoped out of further assessment, subject to the ES identifying the potential sources of pollutants, the measures designed as mitigation and how these measures have been secured. Specific reference should be made to accidental releases of bentonite.
4.18.3	Paragraph 24.5.26	Cumulative effects	The Scoping Report proposes to scope out consideration of cumulative effects from cable laying during operation. The Inspectorate agrees that this matter can be scoped out of further assessment, as there are unlikely to be significant effects once cables are installed.

Scoping opinion ID	Scoping Report Reference	Applicant's proposed matters to scope out	Inspectorate's comments
4.18.4	Paragraph 24.5.28	Transboundary impacts	VE proposes to scope out transboundary effects from the onshore elements of the Proposed Development for hydrology and flood risk because of the localised nature of the effects. The Inspectorate agrees that this matter can be scoped out of further assessment.
4.18.5	Section 24.3	Baseline data	The information listed should also include groundwater vulnerability mapping as advised by the EA in their Scoping Response.
4.18.6	Table 24.1, impact 24.4	Effects on groundwater resources	The ES should provide information on the potential disruption to groundwater flow as a result of excavations in the secondary aquifer and include an assessment if a Likely Significant Effect (LSE) could arise. VE's attention is drawn to the advice on this point from the EA in their Scoping Response.
4.18.7	Table 24.1	Effects from Horizontal Directional Drilling (HDD)	The ES should provide information on the potential effects of HDD, including effects on hydraulic continuity and groundwater quality. If LSE could arise then an assessment of these matters should be included in the ES. VE's attention is drawn to the advice on this point from the EA in their Scoping Response.
4.18.8	-	Impacts on water supply and the public sewerage network	The Scoping Report does not refer to any potential impacts through increased demand during construction or disruption to water supply or sewer systems. The ES should provide information on this point and undertake an assessment if LSE could arise. VEs attention is drawn to the comments from Anglian Water in their Scoping Response.

6.4 SCOPE AND METHODOLOGY

SCOPE OF THE ASSESSMENT

IMPACTS SCOPED IN FOR ASSESSMENT

6.4.1 The following impacts have been scoped into this assessment:

- Construction:
  - Impact 1: Generation of turbid or polluted runoff which could enter the water environment;
  - Impact 2: Changes to surface water runoff patterns which could affect flood risk;
  - Impact 3: Potential for damage to flood defences or surface water drainage infrastructure; and
  - Impact 4: Pollution or disruption of flow to groundwater through ground excavations or piling.
- Operation and maintenance:
  - Impact 5: Changes to surface water drainage at the onshore substation location.
- Decommissioning:
  - Impact 6: Generation of turbid runoff which could enter the water environment.

IMPACTS SCOPED OUT OF ASSESSMENT

6.4.2 Based on the baseline environmental information currently available and the project description outlined in Volume 3, Chapter 1: Onshore Project Description and in accordance with the Scoping Opinion (PINS, 2021), a number of potential impacts have been scoped out, these include:

- Operation and Decommissioning Phases:
  - Any impact on WFD status for assessed surface water or groundwater bodies; and
  - Consideration of cumulative effects from the onshore cabling.
- All phases:
  - Accidental spillages and leakages of oils, fuel and other polluting substances which could potentially enter the water environment; and
  - Consideration of transboundary effects from the onshore elements of the VE for hydrology, hydrogeology and flood risk.

STUDY AREA

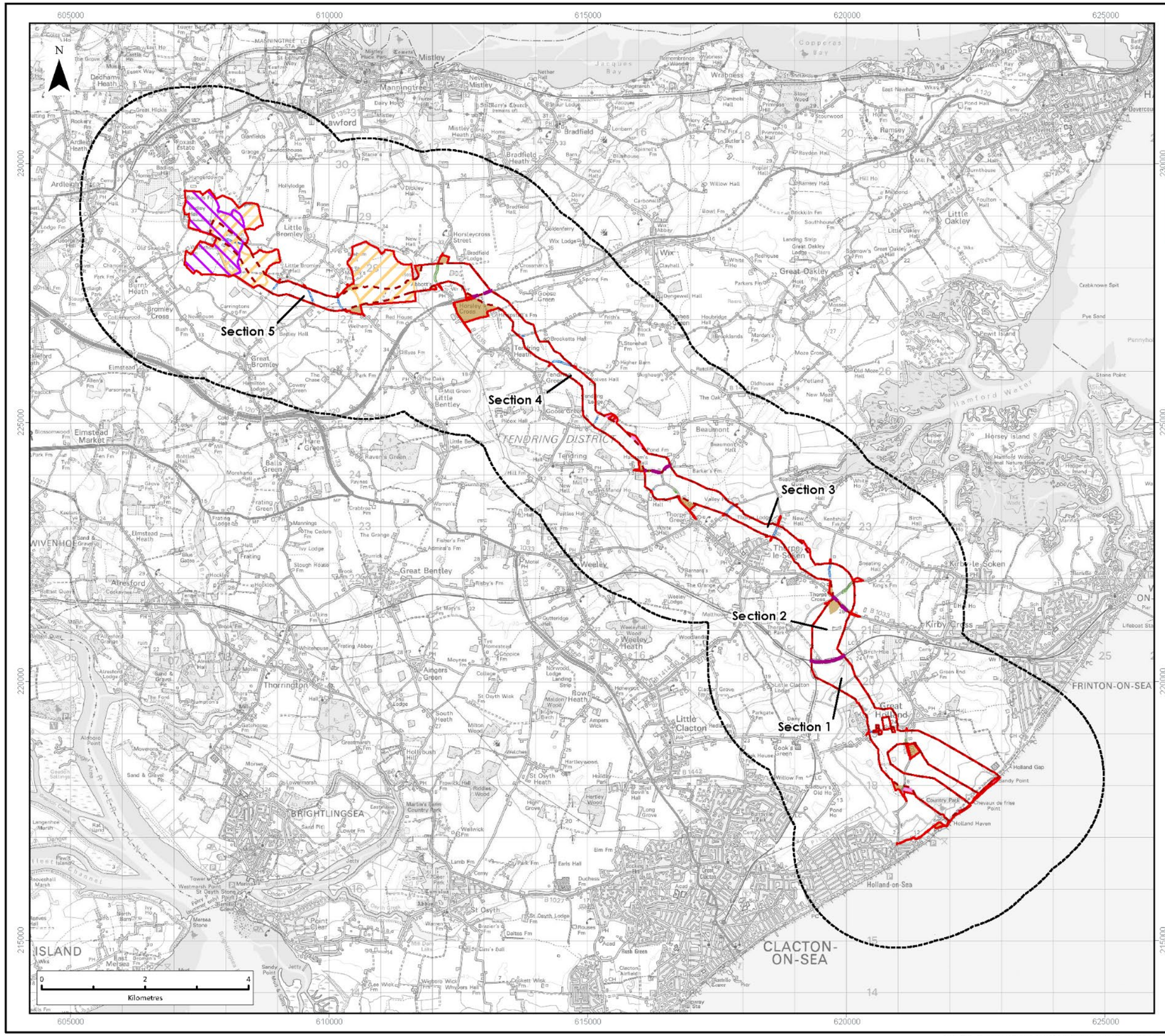
6.4.3 The hydrology, hydrogeology and flood risk VE study area for the onshore elements of the VE (as described in Volume 3, Chapter 1: Project description) extends from the mean high-water spring (MHWS) to the Grid Connection Point onshore, plus a 2 km buffer around the proposed OnSS and the onshore ECC (including landfall, access routes and Temporary Construction Compounds (TCC) areas) as shown in Figure 6.1. The OnSS location is yet to be confirmed, however there are two potential OnSS search areas being considered as part of the assessment (SSA East and SSA West), within which a single OnSS location will be selected.

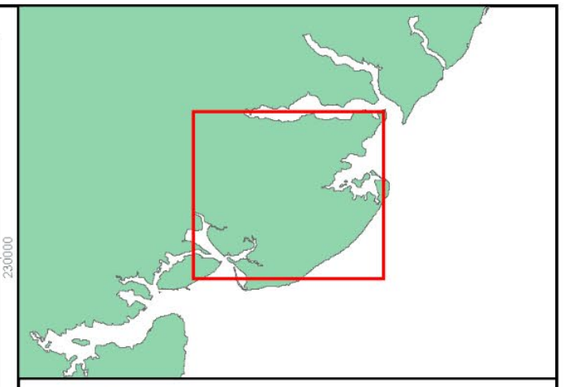
6.4.4 The study area is approximately 120 km^2 and extends a short distance (approximately 3 km) along the Essex coastline from Holland-on-Sea in the south-west to Frinton-on-Sea, and approximately 20 km inland in a north-westerly direction, following the general direction of Holland Brook, towards Ardleigh and the River Stour. The Office for National Statistics suggests that there are no “Built up Areas” in the onshore ECC and OnSS search area boundary. The study area includes smaller settlements including Walton-on-the-Naze, Little Clacton, Thorpe-le-Soken and Bromley Cross.

6.4.5 This study area has been separated into sections which are as follows:

- Section 1 - Landfall to the Sunshine Coast Line railway spur;
- Section 2 - Land north of the Sunshine Coast Line railway spur to the B1033 Frinton Road.
- Section 3 - Land north of the B1033 Frinton Road to the B1035 Thorpe Road/ Swan Road junction;
- Section 4 - Land north of the B1035 Thorpe Road/ Swan Road junction to the A120 Colchester Road; and
- Section 5 - Land north of the A120 Colchester Road to the OnSS.

6.4.6 The buffer size used for the onshore ECC and OnSS study areas were chosen primarily to allow for refinement in the final location and alignments of onshore infrastructure. A 2 km offset buffer distance is considered appropriate for data collection and assessment taking into account the nature of the development and likely zone of influence on hydrological receptors, including upstream and downstream catchments that are in hydrological continuity with the site. The study area and available data have been discussed and agreed with stakeholders and includes receptors downstream of the onshore elements of VE which are considered to be in hydraulic continuity within the study area.





LEGEND

- Onshore Red Line Boundary
- Onshore Red Line Boundary 2 km Buffer
- Onshore Export Cable Corridor
- Onshore Cable Route Section Division
- National Grid Area of Search
- Onshore Substation Areas of Search
- Temporary Construction Compounds
- Works Access Required
- Haul Road Crossings
- Haul Road Access

Data Source:
© Crown copyright [and database rights] (2022) 0100031673 OS OpenData.

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Hydrology, Hydrogeology & Flood Risk Study Area

VER	DATE	REMARKS	Drawn	Checked
1	20/02/2023	PEIR Submission	DB	JS

DRAWING NUMBER:

FIGURE 6.1

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:75,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES OFFSHORE WIND FARM

P:\05356 - GoBe Consultants Ltd\00010 Five Estuaries\Tech\GIS\Dwgs\Mxing\2022 09 PEIR\Chapters\Hydrology\05356 00010 0150.0 Hydrology Hydrogeology and Flood Risk Study Area.mxd

6.4.7 The study area will be refined and amended for future stages (ES) in response to such matters as refinement of the onshore ECC, location of VE infrastructure, feedback from consultees, and/ or the identification of additional constraints (environmental and/ or engineering) including hydraulic conductivity within the study area. This is expected to result in a significant reduction in the size of the study area as it is refined to follow the route of the preferred onshore cable corridor more closely, and locations for the landfall and OnSS when these are confirmed.

DATA SOURCES

BASELINE DATA

6.4.8 Baseline data relevant to hydrology, hydrogeology and flood risk has been sourced from publicly available information and opensource data from a range of sources. The data review includes assessing the following:

- EA data and data.gov.uk:
  - Flood Zone mapping;
  - Spatial flood defence data and mapping;
  - Flood warning and flood alert areas;
  - Main rivers;
  - Ordinary watercourses;
  - Groundwater Source Protection Zones (SPZ); and
  - Water Framework Directive (WFD) surface water and groundwater classification data.
- British Geological Survey (BGS) Mapping:
  - Geology (artificial ground, superficial deposits, bedrock);
  - Borehole/ well data;
  - Aquifer designation; and
  - Groundwater Vulnerability.
- Defra's MAGIC website/ Natural England:
  - Statutory and non-statutory environmental designations.
- Cranfield Soil and Agrifood Institute Soilscapes map viewer:
  - Soil type and character.
- Essex County Council and Tendring District Council:
  - Local Flood Risk Management Strategy;
  - Shoreline Management Plan – SMP8 (Landguard Point to Two Tree Island); and;
  - Strategic Flood Risk Assessment.

- Channel Coastal Observatory:
  - Anglian Coastal Monitoring data and reporting.
- Past planning applications and reporting for other similar local schemes in the area. It is acknowledged that these reports will be specific to cable corridors for other projects and infrastructure locations and as such time may have elapsed since their completion.

6.4.9 Targeted data requests and consultation with a number of stakeholders and regulatory bodies have been submitted. The information requested includes:

- Environment Agency:
  - Flood modelling and mapping, flood defence asset information and flood event history;
  - Catchment data for the operational surface water catchments of Colne Essex and Stour relating to water quality and WFD classification;
  - Catchment data for the Essex Gravels groundwater catchment relating to water quality and WFD classification;
  - Coastal management data; and
  - Licensed abstractions or water users including data supporting groundwater Source Protection Zone (SPZ) designations.
- Essex County Council/ Tendring District Council:
  - Registered private water supplies;
  - Shoreline monitoring data;
  - Sustainable drainage guidance to meet Lead Local Flood Authority (LLFA) requirements; and
  - Local flood event history.
- Review and survey of public or private water supply abstraction. This may include liaison with Envirocheck and water supply companies such as Anglian Water.

DESIGNATED SITES

6.4.10 There are a small number of environmentally designated sites (Ramsar; Special Area of Conservation (SAC); Special Protection Area (SPA); Site of Special Scientific Interest (SSSI); Local Nature Reserves (LNR)) within the study area. There are no Ramsar sites, SAC, or SPA located in the site boundary, however a number of sites with potential hydraulic connection to the site have been identified within the 2 km study area. This is summarised in Table 6.3.

Table 6.3: Statutory designated sites with relevance to hydrology, hydrogeology and flood risk.

Site	Closest Distance to VE	Feature or Description
International		
Hamford Water Ramsar	Within and downstream of north-east boundary of the study area.	Site for nationally and internationally important numbers of wintering and nesting waterbirds, and refuge for migratory waterbirds.
Stour and Orwell Estuaries Ramsar	Approximately 1.2 km north of the study area at Manningtree.	Extensive mudflats, low cliffs, saltmarsh, and areas of vegetated shingle, supports internationally and nationally important numbers of wintering wildfowl and waders, nationally scarce plants and invertebrates.
Colne Estuary (Mid-Essex Coast Phase 2) Ramsar	Approximately 5.3 km west of the study area at Brightlingsea.	International importance for wintering Brent Geese *Branta bernicla bernicla* and Black-tailed Godwit *Limosa limosa*; national importance for breeding little terns and other species of wintering waders and wildfowl.
Hamford Water SPA	Within and downstream of the north-east boundary of the study area.	Site for nationally and internationally important numbers of wintering and nesting waterbirds, and refuge for migratory waterbirds.
Hamford Water SAC	Within and downstream of the north-east boundary of the study area.	The SAC is within the boundary of Hamford Water SPA and Hamford Water Ramsar, important habitat for Fisher's estuarine moth *Gortyna borelii lunata*.
Essex Estuaries SAC	Approximately 5.3 km west of the study area at Brightlingsea.	Estuaries; mudflats and sandflats not covered by seawater at low tide; *Salicornia* and other annuals colonizing mud and sand; Spartina swards *Spartinion maritimae*; Atlantic salt meadows *Glauco-Puccinellietalia maritimae*; Mediterranean and thermo-Atlantic halophilous scrubs *Sarcocornetea fruticosi*.

Site	Closest Distance to VE	Feature or Description
Stour and Orwell Estuaries SPA	Approximately 1.2 km north of the study area at Manningtree.	Extensive mudflats, low cliffs, saltmarsh, and areas of vegetated shingle, supports internationally and nationally important numbers of wintering wildfowl and waders, nationally scarce plants and invertebrates
Colne Estuary (Mid-Essex Coast Phase 2) SPA	Approximately 5.3 km west of the study area at Brightlingsea.	International importance for wintering Brent Geese *Branta bernicla bernicla* and Black-tailed Godwit *Limosa limosa*; national importance for breeding little terns and other species of wintering waders and wildfowl.
National		
Holland Haven Marshes SSSI	Within study area.	Located in the lower reaches of Holland Brook, downstream of the "Sunshine Coast Line" railway, is a 208.8 ha biological SSSI providing important habitat for nationally scarce aquatic plant species, botanically important grasslands and rare invertebrates.
Weeleyhall Wood Nature Reserve SSSI	Approximately 150 m south-west of the study area at Weeley Heath.	Located in the mid to lower end of the search area, is a 32 ha woodland habitat protecting vulnerable flora and fauna.
Riddles Wood SSSI	Approximately 4.1 km south-west of the study area, east of Brightlingsea.	A 37.3 ha biological SSSI, ancient oak-hazel, oak-hornbeam, chestnut coppice, with rich and varied ground flora.
Hamford Water SSSI	Within and downstream of north-east boundary of the study area.	A site for nationally and internationally important numbers of wintering and nesting waterbirds, and refuge for migratory waterbirds.
Stour and Copperas Woods Ramsey SSSI	Approximately 3.9 km north-east of the study area at Wrabness.	A 77.1 ha biological SSSI, ancient coppice woodland with a coppice-with-standards structure containing the only example in the county where coastal and woodland habitats meet.

Site	Closest Distance to VE	Feature or Description
Cattawade Marshes SSSI	Approximately 1.2 km north of the study area at Manningtree.	A 82.2 ha biological SSSI, grazing marshes with associated open water and fen habitats.
Bullock Wood SSSI	Approximately 2.9 km west of the study area.	A 23.3 ha biological SSSI, ancient coppice-with-standards woodland with a wide range of tree species.
Stour Estuary SSSI	Approximately 1.2 km north of the study area at Manningtree.	A 2,523 ha biological and geological SSSI, important for wintering wildfowl, coastal saltmarsh, sheltered muddy shores, two scarce marine invertebrates and a vascular scarce plant assemblage.
Colne Estuary SSSI	Approximately 5.3 km west of the study area at Brightlingsea.	A 2,915 ha biological and geological SSSI, important for wintering wildfowl and breeding, with areas of foreshore of geological interest.
Holland Haven LNR	Within study area.	22.1 ha LNR forming part of the wider SSSI.

ASSESSMENT METHODOLOGY

6.4.11 There are no published guidelines or criteria for assessing and evaluating effects on hydrology within the context of an EIA. The proposed assessment will therefore be based on a methodology derived from the Institute of Environmental Management and Assessment (IEMA) guidance. The methodology sets out a list of criteria for evaluating the environmental effects and is outlined in Volume 1, Chapter 3: Environmental Impact Assessment Methodology.

6.4.12 The terms used to define sensitivity and magnitude of impacts are based on those used in the Design Manual for Roads and Bridges (DMRB) methodology (DMRB 2020). This covers drainage and the water environment.

6.4.13 Professional judgement and a qualitative risk assessment methodology has been used to assess the findings in relation to each of these criteria to give an assessment of significance for each potential impact.

6.4.14 As an impact assessment, this chapter does not explicitly consider the risk of flooding to VE but does consider how the proposals may alter flood risk at the onshore ECC and within the OnSS search areas and elsewhere. The flood risk to the VE is considered separately in the onshore ECC FRA provided in Volume 5, Annex 6.1: Onshore Export Cable Corridor Flood Risk Assessment; and will be covered in a separate FRA for the OnSS.

6.4.15 A qualitative risk assessment methodology has been used to assess the significance of the potential effects associated with the VE. Two factors have been considered using this approach: the sensitivity of the receiving environment and the potential magnitude of impact, should that potential impact occur. This approach provides a mechanism for identifying the areas where site specific mitigation measures are required and for considering the effectiveness of mitigation measures proposed to manage the risk presented by the VE. This approach also allows effort to be focused on reducing risk where the greatest benefit may result.

6.4.16 Effects assessed as minor adverse or less would be considered not significant in terms of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. If the assessment results in moderate or major adverse effects, then this effect would be considered to be significant in EIA terms.

6.4.17 This approach provides a mechanism for identifying the areas where site specific mitigation measures will be required and for identifying mitigation measures appropriate to the risk presented by the development proposals. This approach also allows effort to be focused on reducing risk where the greatest benefit may result.

6.4.18 The approach to assessment and data gathering will be agreed through liaison with relevant bodies prior to commencement and consultation will be undertaken at key stages throughout the EIA process.

6.5 ASSESSMENT CRITERIA AND ASSIGNMENT OF SIGNIFICANCE

6.5.1 The criteria for determining the significance of effects is a two stage process that involves defining the sensitivity of the receptors and the magnitude of the impacts on those receptors. This section describes the criteria applied in this chapter to assign values to the sensitivity of receptors and the magnitude of potential impacts. Unless stated otherwise the terms used to define sensitivity and magnitude are based on those used in the DMRB guidance.

6.5.2 The criteria for sensitivity used in this chapter are outlined in Table 6.4 below. Whilst a sensitivity category of ‘very high’ is proposed as a potential category for sensitivity criteria within the DMRB methodology, for the purposes of the assessment of hydrology, hydrogeology and flood risk effects, the categories within the range of ‘high’ to ‘negligible’ are considered to appropriately cover the potential receptors. Where a receptor could be placed within more than one category of value, professional judgement has been applied to determine which category is appropriate.

Table 6.4: Sensitivity/importance of the environment.

Receptor sensitivity/ importance	Definition	Receptor
High	High importance and rarity, international level and limited potential for substitution.	> Watercourses or water bodies of good chemical status/ high ecological status and/ or high quality targets under the WFD. > Watercourses or water bodies draining through environmentally designated areas of international importance. > Watercourses or water bodies supporting highly sensitive abstractions. > Watercourses, water bodies or floodplain with a designation for ecological/ conservation value. > Development classified as 'highly vulnerable' to flood risk (under NPPF). > Narrow floodplain where a small increase in volume results in a relatively large increase in flood levels. > Public potable water supply from either surface or groundwater source. > Aquifer is a Principal Aquifer providing regionally important potable water supply and classified as SPZ.

Receptor sensitivity/ importance	Definition	Receptor
Medium	Medium importance and rarity, national or regional level, limited potential for substitution	> Watercourses or water bodies of good chemical status/ moderate to good ecological status and/ or moderate to high quality targets under the WFD. > Watercourses or water bodies draining through environmentally designated areas of national importance. > Watercourses or water bodies supporting moderately sensitive abstractions. > Development classified as 'more vulnerable' to flood risk (under NPPF). > Private Water Supply (PWS) for potable use or non-drinking water abstraction for agricultural use from either surface or groundwater source. > Aquifer is a Principal or Secondary A Aquifer not designated as SPZ. > Bathing water monitored water body.
Low	Low importance and rarity, local or district level	> Watercourses or water bodies with a chemical water quality status classed as fail or an ecological water quality status classed as poor and/ or moderate quality targets under the WFD. > Watercourses or water bodies of local importance. > Watercourses or water bodies supporting abstractions of limited sensitivity. > Receptors classified as 'less vulnerable' to flood risk (under NPPF). > Wide floodplain where a large increase in volume results in a small increase in flood levels. > Aquifer is a Secondary A or Secondary B Aquifer.

Receptor sensitivity/ importance	Definition	Receptor
Negligible	Very low importance and rarity, local level	> Watercourses or water bodies with a chemical water quality status classed as fail and an ecological water quality status classed as poor and/ or low-quality targets under the WFD. > Watercourses or water bodies of limited local importance. > Watercourses or water bodies supporting no recorded abstractions. > Non-productive geology in terms of groundwater resource.

6.5.3 The criteria for magnitude of Impact used in this chapter are outlined in Table 6.5 below.

Table 6.5: Impact magnitude definitions

Magnitude	Description/ reason
High	> Long term or permanent loss of resource and/or quality and integrity of resource; likely to cause exceedance of statutory objectives and/or breaches of legislation; severe damage to key characteristics, features or elements (Adverse). > Large scale or major improvement of resource quality; extensive restoration or enhancement; major long-term improvement of attribute quality (Beneficial). > Changes to land within the site boundary resulting in an increase in runoff with flood potential and also significant changes to erosion and sedimentation patterns. > Major changes to groundwater levels, flow regime and risk of groundwater flooding.
Medium	> Loss of resource, but not adversely affecting the overall integrity; partial loss of/damage to key characteristics, features or elements with/without exceedance of statutory objectives or with/without breaches of legislation (Adverse). > Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial). > Moderate changes to erosion and sedimentation patterns. > Moderate changes to groundwater levels, flow regime and risk of groundwater flooding.
Low	> Some measurable change in attributes, quality or vulnerability; reversible or minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse). > Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial). > Minor changes to erosion and sedimentation patterns. > Minor changes to groundwater levels, flow regime and risk of groundwater flooding.

Magnitude	Description/ reason
Negligible	> Very minor or no loss or detrimental alteration to one or more characteristics, features or elements; impact of insufficient magnitude to affect the use/integrity (Adverse). > Very minor or no benefit to or positive addition of one or more characteristics, features or elements; impact of insufficient magnitude to affect the use/integrity (Beneficial). > No alteration or very minor changes with no impact to watercourses, hydrology, hydrodynamics, erosion and sedimentation patterns.

6.5.4 The significance of the effect upon hydrology, hydrogeology and flood risk is determined by correlating the potential magnitude of the impact and sensitivity of the receptor, as defined in the matrix presented at Table 6.6. This approach uses the term "beneficial" for an advantageous or positive effect on an environmental resource or receptor or "adverse", for a detrimental or negative effect on an environmental resource or receptor. Where a range of significance is presented in Table 6.6, the final assessment for each effect is based upon expert judgement.

6.5.5 Adverse effects of moderate and above are considered significant in EIA terms. All beneficial effects and adverse effects below moderate are not considered significant in EIA terms. The broad definitions of the terms used are set out in Volume 1, Chapter 3: Environmental Impact Assessment Methodology.

Table 6.6: Matrix to determine effect significance.

			Sensitivity			
			High	Medium	Low	Negligible
Magnitude	Negative	High	Major	Major	Moderate	Minor
		Medium	Major	Moderate	Minor	Negligible
		Low	Moderate	Minor	Minor	Negligible
	Neutral	Negligible	Minor	Negligible	Negligible	
	Beneficial	Low	Moderate	Minor	Minor	Negligible
		Medium	Major	Moderate	Minor	Negligible
		High	Major	Major	Moderate	Minor

Note: Effects of 'moderate' significance or greater are defined as significant with regards to the EIA Regulations 2017.

6.6 UNCERTAINTY AND TECHNICAL DIFFICULTIES ENCOUNTERED

6.6.1 The assessment is based on publicly available data obtained from the EA, Essex County Council and Tendring District Council and commercial data supply companies, as well as additional information supplied from stakeholders during the scoping and consultation stages.

6.6.2 The assessment is limited by a lack of detailed information on:

- Flow data for all watercourses and drainage channels; and
- Water quality data for specific locations.

6.6.3 Overall, a moderate to high level of certainty has been applied to the study. Where available, catchment data regarding water quality has been used to inform the assessment, with a hydrological site walkover undertaken which included all Main River crossings within the hydrology, hydrogeology and flood risk study area. The information accessible in order to complete the assessment is considered sufficient to establish the baseline within the VE onshore hydrology, hydrogeology and flood risk study area, therefore, there are no data limitations that would affect the conclusions of this assessment.

6.6.4 The Maximum Design Scenario (MDS) identified in Section 6.8 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the details provided in the project description (Volume 3, Chapter 1: Onshore Project Description and Volume 2, Chapter 1: Offshore Project Description). Effects of greater significance are not predicted to arise should any other development scenario to that assessed here be taken forward in the final design scheme, within the assessed boundaries.

6.7 EXISTING ENVIRONMENT

6.7.1 This section provides a general description of the hydrological and hydrogeological resources, flood risk and defines potential environmental receptors within the study area. Observations from the hydrology characterisation survey and desk study have been included where relevant.

6.7.2 The onshore ECC has been broken down into a number of route sections (detailed in paragraph 1.4.5) which describe the route in relation to significant local features.

GENERAL DESCRIPTION AND LAND USE

6.7.3 Land use within the onshore ECC and the wider hydrology, hydrogeology and flood risk study area is predominantly agricultural, passing the northern outskirts of Thorpe-le-Soken and situated between the villages of Little Bromley, Tendring Heath and Great Holland. The ECC extends north-west from landfall, roughly parallel to and north of Holland Brook. The ECC intersects the lower reach of Holland Brook immediately upstream of Holland Sluice outfall. Tendring Brook crosses through the ECC to the north of Tendring village and continues south-west draining into Holland Brook. Kirby Brook meanders parallel to the coastline crossing the entire width of the southernmost section of the onshore ECC.

6.7.4 Land to the west of Holland-on-sea is also built up from the larger town of Clacton-on-Sea. Land to the north of Frinton-on-sea is a mixture of agricultural and the smaller towns of Walton-on-the-Naze and Kirby-le-Soken.

SECTION 1- LANDFALL TO THE SUNSHINE COAST LINE RAILWAY

6.7.5 The coastal area of the proposed landfall is between the towns of Holland-on-sea and Frinton-on-Sea. There are pedestrian walkways adjacent to the coast in the form of a promenade.

6.7.6 Holland Haven Marshes SSSI extends parallel to the coast along the study area. Frinton Golf Course is to the north-east of the site. A water treatment plant is located to the north of Manor Way, immediately south-west of the ECC, adjacent to Holland Haven Country Park.

6.7.7 Man-made sea-defences are present along the coast including engineered high ground, Frinton promenade embankment, groynes and Princes Esplanade Wall.

SECTION 2- LAND NORTH OF THE SUNSHINE COAST LINE RAILWAY TO THE B1033 FRINTON ROAD

6.7.8 Comprises land to the west of Kirby Cross and the main land use is agricultural.

SECTION 3-LAND NORTH OF THE B1033 FRINTON ROAD TO THE B1035 THORPE ROAD/ SWAN ROAD JUNCTION

6.7.9 Covers the south of Tendring, the east of Weeley, Thorpe le Soken, the southern section of Landermere and Beaumont which are small towns. An industrial estate is located near to Frinton Road. The remainder of the cable route within this section is comprised of agricultural land.

6.7.10 Beaumont Cut crosses into the 2 km VE hydrology, hydrogeology and flood risk buffer zone just north of Golden Lane in Thorpe le Soken.

SECTION 4-LAND NORTH OF THE B1035 THORPE ROAD/ SWAN ROAD JUNCTION TO THE A120 COLCHESTER ROAD

6.7.11 This section covers Little Bentley, Tendring Heath, Tendring Green and Stones Green. Wolves Hall Airstrip is present approximately 5 km from the southern boundary of this section at Thorpe Road. Small residential neighborhoods are scattered across this area, with agricultural land being the majority land use of this section.

6.7.12 Tendring Brook crosses from south to north just southwards of Logs Lane.

SECTION 5- LAND NORTH OF THE A120 COLCHESTER ROAD TO THE ONSS

6.7.13 This section is located within Little Bromley where both the proposed Substation Search Areas (SSA West and SSA East) for the OnSS are located.

6.7.14 The OnSS search areas are primarily surrounded by farmland. The 2 km buffer Site boundary borders an industrial estate with a sand, gravel quarry to the west. To the west of the ONSS search areas, greenhouse polytunnel businesses are clustered between Harwich Road and Hundgerdown Lane. Further west of the Great Eastern Main Railway Line in Ardleigh village, Ardleigh reservoir and treatment plant is present.

HYDROLOGICAL SETTING

6.7.15 The proposed landfall site is located at Holland Haven and stretches north eastwards closer to Frinton-on-Sea, on the coastline between Holland-on-Sea and Frinton-on-Sea. The North Sea borders this section of the coastline.

6.7.16 The hydrology, hydrogeology and flood risk study area includes a number of catchments associated with EA statutory Main Rivers and ordinary watercourses. Definitions of these hydrological features are provided below, and their locations are identified in Figure 6.2.

- Main Rivers - watercourses where the EA has permissive powers over their management; and
- Ordinary watercourses - includes rivers, streams, ditches, drains which do not form part of a Main River, and which are managed by Essex County Council.

6.7.17 EA statutory Main Rivers include:

HOLLAND BROOK

6.7.18 Holland Brook is a Main River draining a catchment size of 54.9 km^2 which rises in Little Bromley and flows south eastwards past the towns of Tendring, Weeley and Little Clacton to its mouth at Holland-on-Sea. Further upstream Holland Brook receives inflows from the statutory Main Rivers and tributaries of Tendring Brook, Weeley Brook, Parker's Ditch and Kirby Brook. This river predominantly flows through rural, arable and grassland land-uses and passes beneath the Colchester to Walton-on-the-Naze railway line at Thorpe-le-Soken, and at a point approximately 1.8 km west of Great Holland, along the Colchester to Clacton-on-Sea section of the line.

KIRBY BROOK

6.7.19 Kirby Brook is a Main River draining an upstream catchment size of 6.56 km^2 which rises in farmland south of Kirby Cross village and is a tributary of Holland Brook. Kirby Brook flows south-east towards the coastline south of Frinton-on-Sea, where it then runs southwards parallel to the coastline to its confluence with Holland Brook at Holland-on-Sea, immediately upstream of Holland Sluice. The onshore ECC intersects the lower reach of Kirby Brook at the point where it passes through Holland Haven Country Park to its confluence with Holland Brook. The river flows through a mix of land uses, from agricultural land at its source to the edge of Frinton-on-Sea's residential neighbourhood and the remainder of the watercourse flows through Frinton Golf Course and Holland Haven Marshes SSSI site, bordering the coastline.

TENDRING BROOK

6.7.20 Tendring Brook is a Main River draining an upstream catchment size of 9.81 km^2 and a tributary of Holland Brook. Tendring Brook flows from farmland to the north-east of Tendring towards the south where it meets its confluence with Holland Brook south of Hillhouse Lane. The river runs through rural agricultural land. The onshore ECC crosses Tendring Brook within woodland to the north-east of Tendring.

BEAUMONT CUT

6.7.21 Beaumont Cut is designated as a Main River from a point approximately 150 m north-east of the onshore ECC and drains an upstream catchment of 3.19 km^2. The river flows eastwards into the 7.78 ha coastal embayment of Hamford Water National Nature Reserve. This reserve consists of marsh, mud flats and sand. The onshore ECC does not intersect the Main River reach of this river; however, the headwaters do extend onto land within the ECC, immediately south of Swan Road.

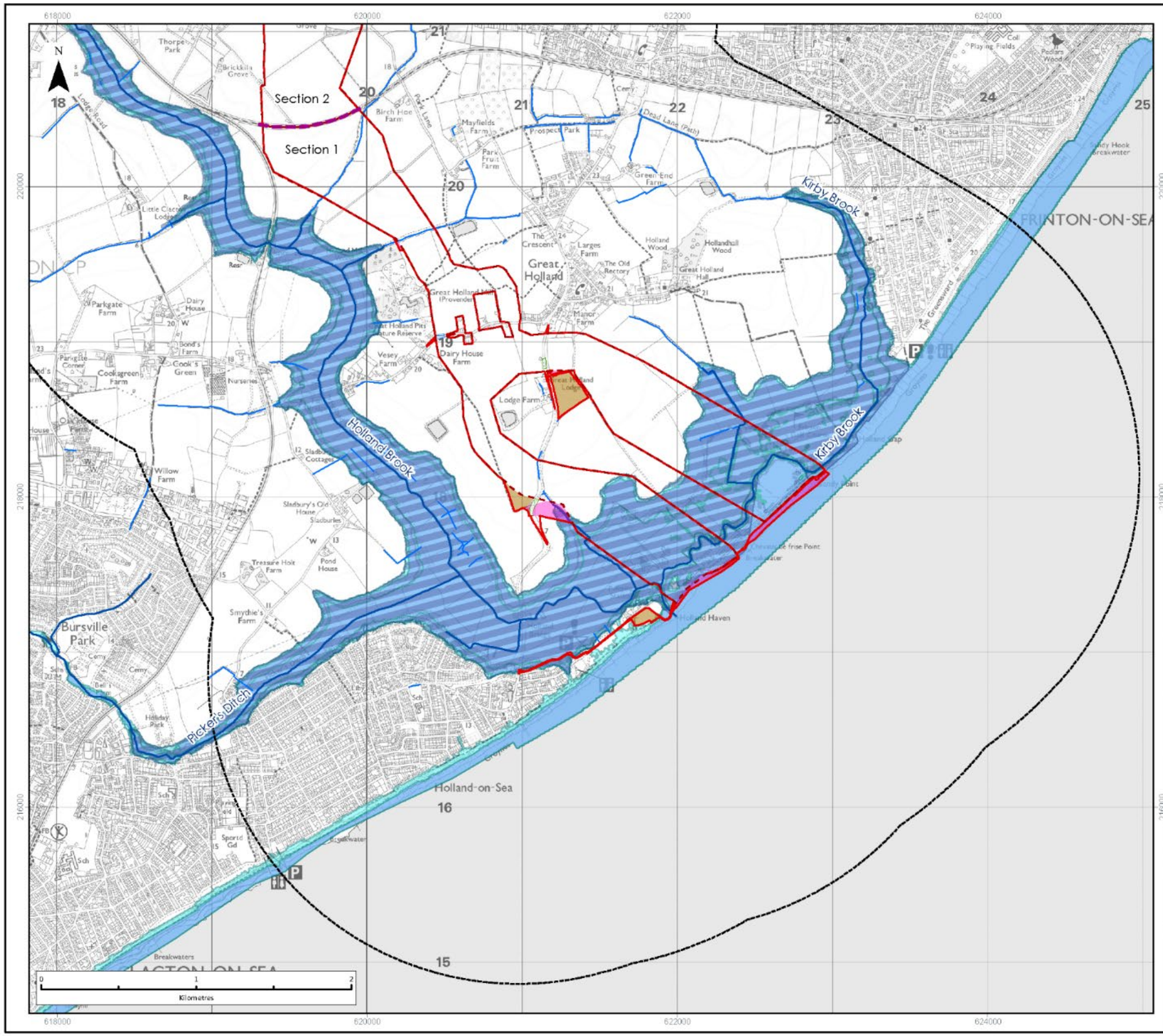
NON-MAIN RIVER WATERCOURSES

6.7.22 The hydrology and flood risk study area crosses several existing field drains, ditches and irrigation channels. Most of the surface water channels crossed are ordinary watercourses and form tributaries to the Main River watercourses detailed above. The exception to this is land to the north-west of the ECC, north of Great Bromley. This land is drained by tributaries of Tenpenny Brook which flow south from the onshore ECC, joining Tenpenny Brook at Great Bromley. Tenpenny Brook continues south, draining into Colne Estuary approximately 10 km downstream of the ECC.

6.7.23 Surface water features are detailed in Figure 6.2 (a- e).

WATERCOURSE SENSITIVITY

6.7.24 Sensitivities have been assigned to all watercourses within the study area as defined in Table 6.10.



LEGEND

- Onshore Red Line Boundary
- Onshore Red Line Boundary 2 km Buffer
- Onshore Export Cable Corridor
- Onshore Cable Route Section Division
- Temporary Construction Compounds
- Works Access Required
- Haul Road Crossings
- Haul Road Access
- Statutory Main River
- Minor Watercourse
- Flood Zone 3
- Flood Zone 2
- Areas Benefiting from Flood Defences

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PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Surface Water Hydrology & Flood Zones

VER	DATE	REMARKS	Drawn	Checked
1	20/02/2023	PEIR Submission	DB	JS

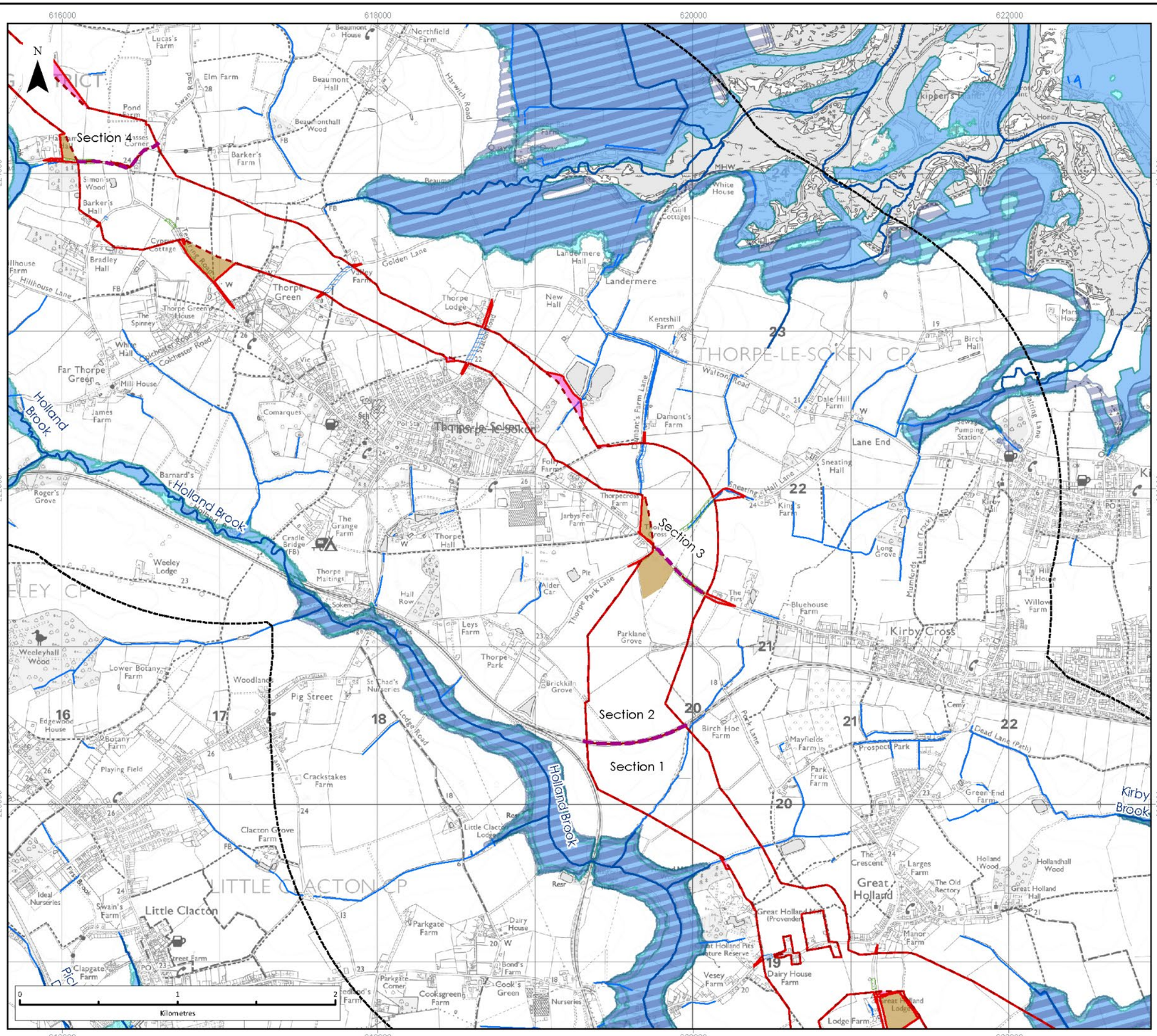
DRAWING NUMBER:

FIGURE 6.2

Page 1 of 5

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:25,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES OFFSHORE WIND FARM



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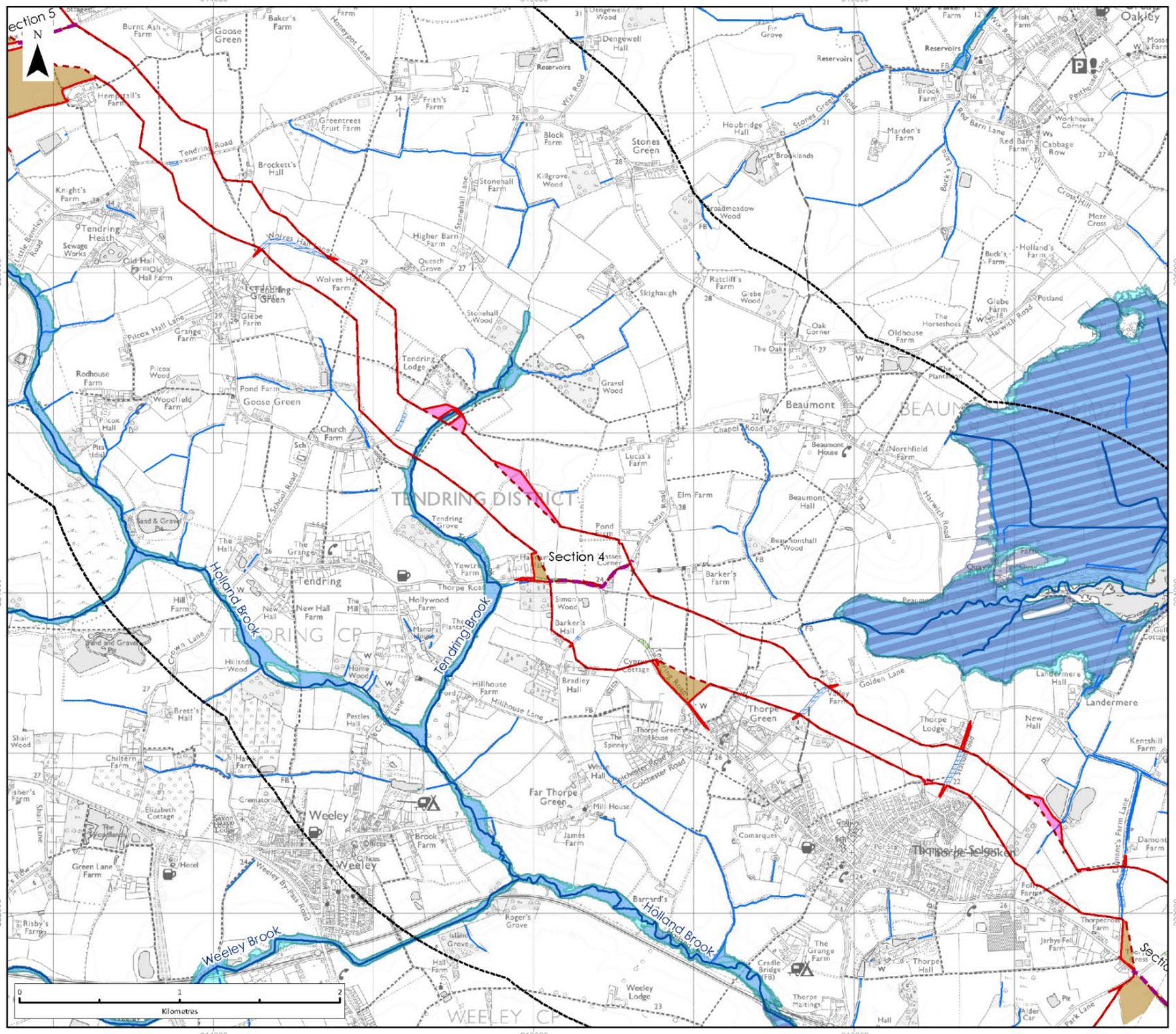
FIVE ESTUARIES OFFSHORE WIND FARM



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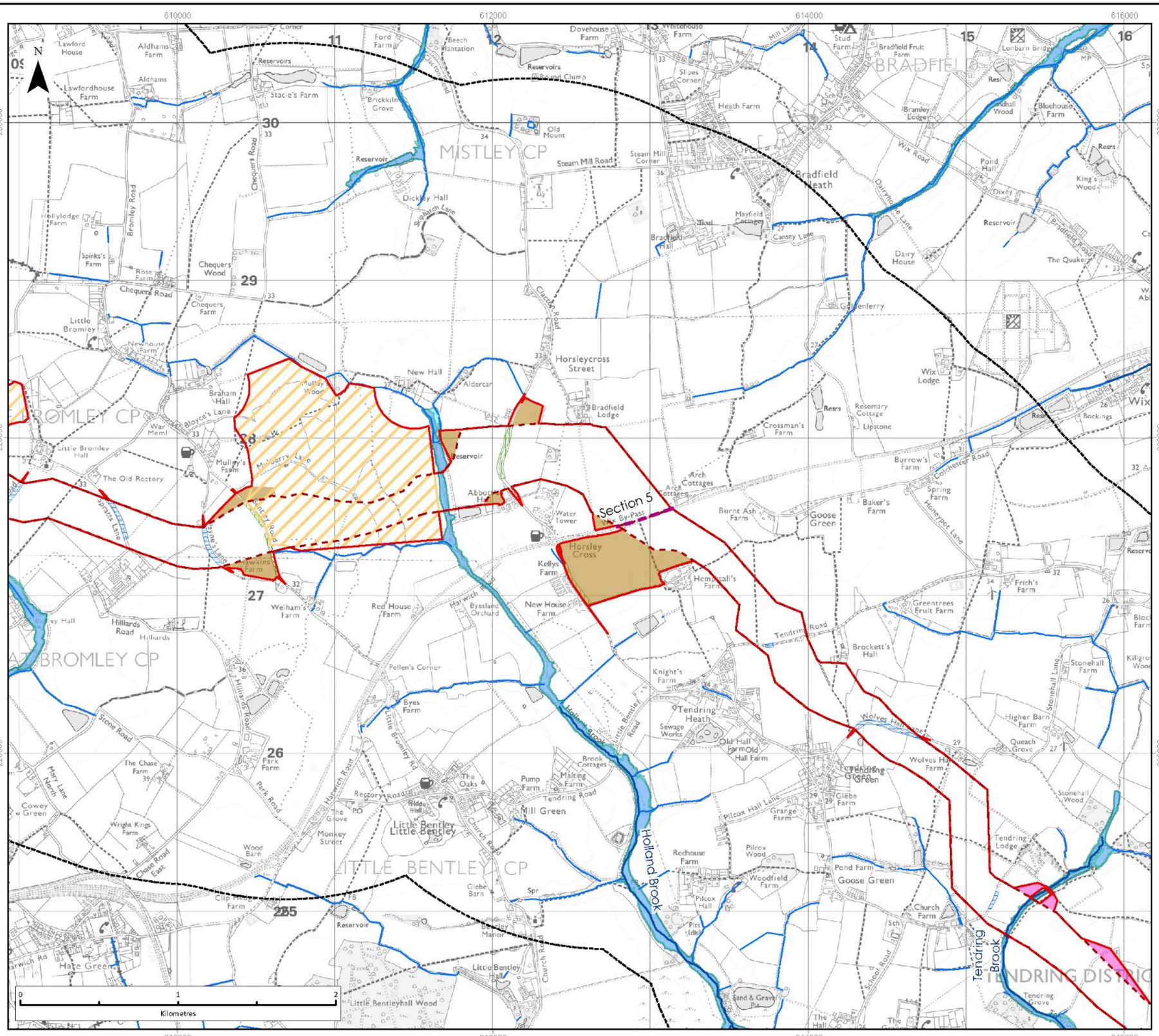

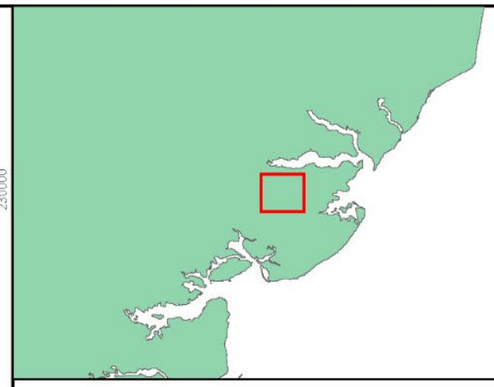

LEGEND

- Onshore Red Line Boundary
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FIGURE 6.2

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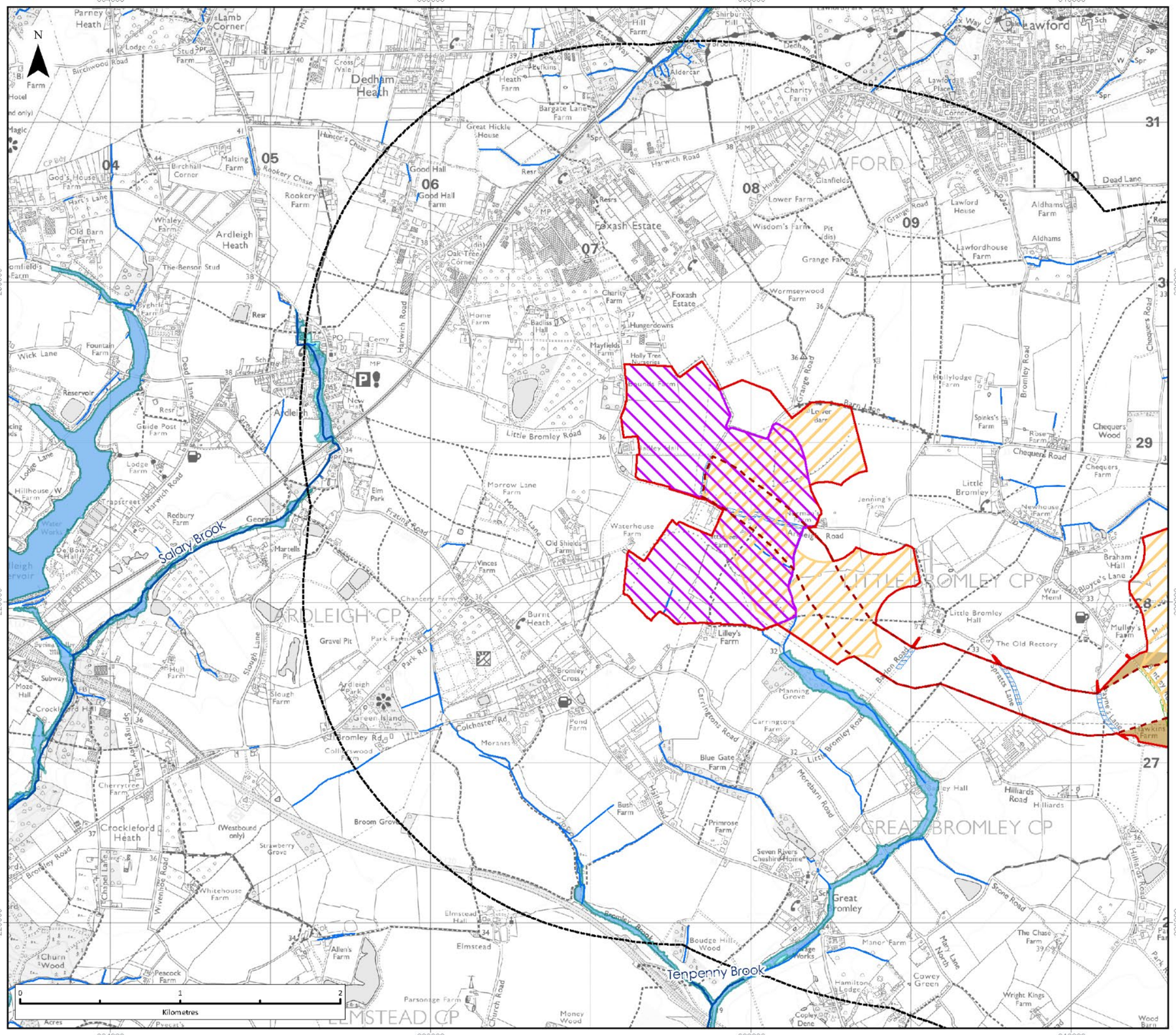
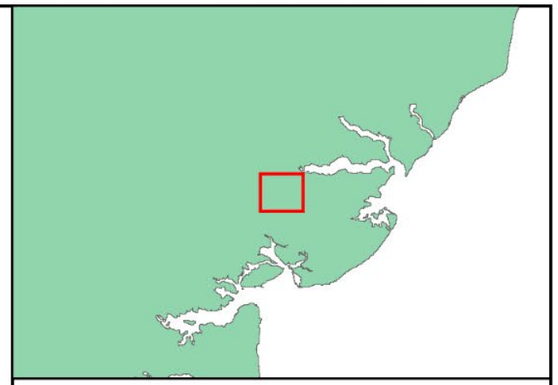
FIVE ESTUARIES
OFFSHORE WIND FARM





LEGEND

- Onshore Red Line Boundary
- Onshore Red Line Boundary 2 km Buffer
- Onshore Export Cable Corridor
- National Grid Area of Search
- Onshore Substation Areas of Search
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FIGURE 6.2

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FIVE ESTUARIES OFFSHORE WIND FARM

GEOLOGICAL AND HYDROGEOLOGICAL SETTING AND GROUND CONDITIONS

6.7.25 The geological and hydrogeological setting of the site and ground conditions are described in detail within Volume 3, Chapter 5: Ground Conditions and Land Use, with geology shown in Figure 6.3.

6.7.26 Bedrock geology underlying the hydrology, hydrogeology and flood risk study area is composed of the Thames Group, Clay, Silt, Sand and Gravel. The bedrock is defined as an unproductive aquifer.

6.7.27 Where present, superficial deposits underlying the study area comprise mainly of Quaternary Diamicton Till in the north; and discrete deposits of Quaternary Sand and Gravel in Tendring and Great Holland in the south. Quaternary Undifferentiated River Terrace deposits are present along the Holland-on-Sea coastline, underlying the proposed beach access route for the ECC. The Quaternary Sand and Gravel is defined as either unproductive aquifer or as Secondary A aquifer while the Till is generally defined as Secondary A aquifer or Secondary B aquifer.

6.7.28 Secondary A and Secondary B aquifers have the potential to store and yield water at a local scale.

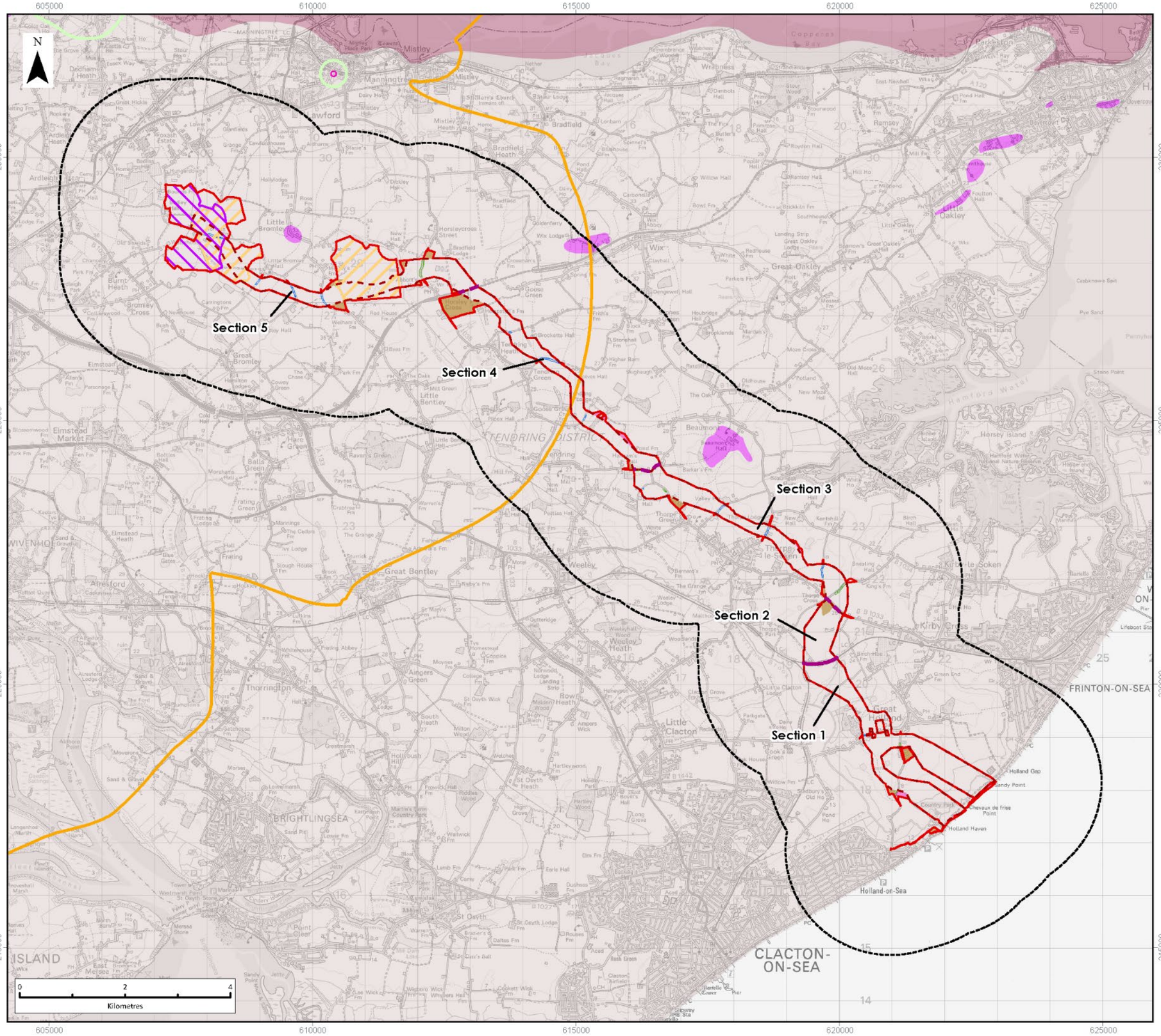
6.7.29 The northernmost section of the hydrology and flood risk study area (from Little Bromley to 0.36 km north of Lodge Lane in Tendring) is within Groundwater Source Protection Zone (SPZ) 3.

6.7.30 Visual observations and anecdotal evidence gathered during walkover surveys have identified the following features which confirm the BGS data and the presence of shallow groundwater within some sections of the study area:

- Groundwater wells in the section of the ECC to the north of the A120 Colchester Road, at Wormseywood Farm, with the water level approximately 6 m below the ground level surface.
- Landowner at Hawkin's Farm on Payne's Lane verbally informed of historic land drainage within fields on the ECC route between Payne's Lane and Bentley Road. Historic chamber may be present close to the existing pylon within the field which collects field drainage and local springs prior to discharge to the headwaters of Holland Brook.
- Several water pipe connecting points which are likely to be used for irrigation purposes on farmland at Thorpe Park Farm, south of the B1033 Frinton Road. Further consultation with landowners will look to confirm the location and purpose of all pipework and any local groundwater abstractions.

GROUNDWATER SENSITIVITY

6.7.31 Sensitivities have been assigned to all groundwater bodies beneath the study area, as defined in Table 6.10.



LEGEND

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- Onshore Cable Route Section Division
- National Grid Area of Search
- Onshore Substation Areas of Search
- Temporary Construction Compounds
- Works Access Required
- Haul Road Crossings
- Haul Road Access

Source Protection Zone (SPZ)

- 1 - Inner Protection Zone
- 2 - Outer Protection
- 3 - Total Catchment

Bedrock Geology

- Red Crag Formation – Sand (CENZOIC)
- Thames Group - Clay, Silt, and Sand (PALAEOGENE)
- Thanet Formation and Lambeth Group (Undifferentiated) - Clay, Silt, and Sand (PALAEOGENE)

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Bedrock Geology data obtained via BGS WMS.
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PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Geology & Groundwater Source Protection Zones

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FIGURE 6.3

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
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FIVE ESTUARIES OFFSHORE WIND FARM

FLOOD RISK

TIDAL AND FLUVIAL FLOOD RISK

6.7.32 The landfall site is located on the coastline between Holland-on-Sea and Frinton-on-Sea. The MHWS level of the North Sea extends over the beach area and is within the onshore ECC. The Essex coastline is served by a range of coastal flood defences including:

- The South Frinton beach groynes;
- Frinton Promenade (embankment);
- Frinton Beach Huts Wall;
- Holland Gap to Chevaux de frise Point (wall);
- Chevaux de fries to Holland Cliffs (wall);
- Defences at Holland Cliffs (wall);
- Defences behind Holland Haven Beach (embankment);
- Defences at Holland Sluice (wall); and
- Martello Bay to Holland Haven (engineered high ground).

6.7.33 The defences run parallel to the coastline and protect the land from Clacton-on-Sea to Frinton-on-Sea, which includes the study area. The defences provide protection against tidal flooding for at least a 1 in 200-year event (0.5% Annual Exceedance Probability (AEP)).

6.7.34 Areas of the ECC at landfall and inland into Holland Haven Marshes and Frinton Golf Course are detailed on the EA Flood Map for Planning (FMfP) to be within Flood Zone 3. EA Flood Zone 3 is defined as 'high risk' areas which are at risk of flooding, in the absence of flood defences, for 1 in 100-year event (1% AEP) or greater from fluvial sources; or with a 1 in 200- year event (0.5% AEP) or greater from sea flooding. Areas inland from the coastal defences, along the alignment of the onshore ECC, through Great Holland northwards, are located within Flood Zone 1. The EA Flood Zone 1 is defined as a 'low risk' and represents land which has a less than 0.1% AEP of flooding.

6.7.35 Away from the landfall area, flood defences are noted to be present along Hamford Water and Beaufort Cut to the north of the study area and along the Holland Brook estuary and the Colne Estuary to the south.

6.7.36 Tendring Brook flows through the onshore ECC at Tendring. The immediate corridor of the watercourse is defined by the EA as Flood Zone 3 for fluvial flood risk. Similarly, the upper reaches of Holland Brook are crossed by the onshore ECC at Horsley Cross and the immediate watercourse corridor is designated as Flood Zone 3. The headwaters of Tenpenny Brook drains land to the north-west of the onshore ECC and the reach of the watercourse immediately downstream of the ECC has some Flood Zone 3 flood risk associated with it. EA modelling does not extend to the upper reaches of Tenpenny Brook, within the ECC, and some minor fluvial risk along the watercourse corridor may be present on the site.

6.7.37 There have not been any recorded historical flood events noted by the EA within the hydrology, hydrogeology and flood risk study area.

FLOOD RISK FROM OTHER SOURCES

6.7.38 The EA data indicates that a part of the floodplain of Holland Brook upstream of Clacton Road is potentially susceptible to flooding in the event of a reservoir failure under a 'dry day' scenario when the river is at normal levels. This area does not extend to land within the study area. The EA 'wet day' scenario map indicates that Holland Brook floodplain upstream of its estuary; the most downstream section of Picker's Ditch; Kirby Brook extending through Holland Haven Marshes SSSI site, are all susceptible to reservoir failure flooding. Sections of these areas are within the onshore landfall site.

6.7.39 Given that the Holland Haven SSSI Marshes covers the coastal section of the onshore ECC, it is reasonable to determine that it is unlikely there will be formal, below ground, drainage infrastructure controlling surface runoff from these areas. Due to the presence of the wetland, during a rainfall event surface water is expected to infiltrate and provide natural attenuation before following the topographical slope into open drainage ditches/ streams or the main watercourse networks.

6.7.40 All areas discussed as being potentially at risk of coastal flooding are located within areas served by EA Flood Alerts and Flood Warning System, for potential fluvial and/or tidal flood events.

6.7.41 Surface water flood risk mapping provided by the EA's Long Term Flood Risk mapping service shows areas of the onshore ECC that are potentially at risk of flooding. These areas generally align with surface water features discussed above and any risk is limited to the immediate corridor of existing watercourses during more extreme events. Some isolated areas of ponding are predicted for more extreme 0.1% AEP rainfall events which correspond to localised low topographical points within open ground.

6.7.42 The low-lying land at Holland Haven Marshes is shown to potentially be at risk of surface water flooding, with some potential for an overland flow pathway into the marshes from the B1032 Main Road to the south.

6.7.43 Other sources of flood risk are considered within the Onshore ECC FRA at Volume 5, Annex 6.1: Onshore ECC Flood Risk Assessment.

FLOODPLAIN SENSITIVITY

6.7.44 Sensitivity has been assigned to the floodplains within the study area, as defined in Table 6.10.

WATER QUALITY

6.7.45 Envirocheck reports have been used to inform the following section on water quality, discharge consents and water abstractions. The data reports which are complete in detail regarding information on integrated pollution and control measures; pollution incidents to controlled waters, discharge consents, water abstraction licenses; are included below. The search area of the Envirocheck reports extends to within 1000 m of the proposed OnSS substation search areas.

RIVER WATER QUALITY

6.7.46 Under the Anglian river basin district RBMP (EA 2016), which was produced in accordance with the requirements of the WFD, the monitored watercourses and water bodies within the river basin area have been grouped into management catchments which are made up of smaller water body catchments. Each water body is classified based on assessment of monitored data for ecological criteria (possible categories of 'high'; 'good'; 'moderate'; 'poor'; or 'bad') and chemical criteria (possible categories of 'good'; or 'fail'), with an overall status classification based on these assessments.

6.7.47 The water body catchments assessed as part of the RBMP and which are within or immediately downstream of the study area include:

- Holland Brook – moderate ecological status and good chemical status (excluding ubiquitous, persistent, bioaccumulative, toxic substances [uPBTs]);
- Wrabness Brook – good ecological status and good chemical status (excluding uPBTs); and
- Tenpenny Brook – moderate ecological status and good chemical status (excluding uPBTs).

COASTAL/ TRANSITIONAL WATER QUALITY

6.7.48 The coastal waters are also monitored as the Essex coastal water body, the Colne transitional water body and the Stour transitional water body, all of which have moderate ecological status and good chemical status (excluding uPBTs).

BATHING WATER QUALITY

6.7.49 The EA is responsible for monitoring bathing waters in England. Monitoring locations in close proximity to the study area include:

- Walton;
- Frinton;
- Holland;
- Clacton; and
- Clacton Beach Martello Tower.

6.7.50 The classification of the identified Bathing Waters, reported between 2017 and 2021, are presented below. Data for 2020 is missing due to lack of monitoring during Covid restrictions.

Table 6.7 Bathing Water status classification (EA, 2022)

Name	Classification				
	2017	2018	2019	2020	2021
Walton	Good	Good	Excellent	-	Good
Frinton	Good	Good	Good	-	Good
Holland	Excellent	Excellent	Excellent	-	Excellent
Clacton	Excellent	Excellent	Excellent	-	Excellent
Clacton Beach Martello Tower	Good	Good	Good	-	Good

6.7.51 These results mean that the waters meet the criteria for the stricter UK guideline standards of the rBWD.

GROUNDWATER QUALITY

6.7.52 Under the Anglian RBMP the monitored groundwater bodies within the river basin area have been grouped into management catchments. Each groundwater body is classified based on assessment of monitored data for quantitative criteria (possible categories of 'good' or 'poor') and chemical criteria (possible categories of 'good'; or 'poor'), with an overall status classification based on these assessments.

6.7.53 There is a single groundwater catchment assessed as part of the RBMP which is within or immediately downstream of the study area. This is the Essex Gravels water body associated with superficial geology beneath the study area.

- The water body has poor overall status with good quantitative status and poor chemical status.

POLLUTION CONTROL AND POLLUTION INCIDENTS

SUBSTATION SEARCH AREAS

6.7.54 Envirocheck Reporting has identified active integrated pollution and control measures for the following:

- Hiskeys Farm, Spratts Lane, Little Bromley, Manningtree, CO11 2PR; Intensive farming;
- An intensive farm with poultry in Little Bromley, Manningtree; and
- Wix Farms Poultry Ltd, Kellys Farm, Clacton Road, Horsley Cross, Manningtree, Essex, CO11 2NZ.

6.7.55 Pollution incidents to controlled waters have been recorded. The severity of these incidents' ranges from minor to significant and the most detailed reports are listed below. It is noted that a number of the incidents recorded are isolated incidents and are over 20 years old and as such are not considered significant.

- A 'significant' incident on 6 January 1992 in the Kelvedon District, with an 'unknown' pollutant entering a tributary of Holland Brook;
- A 'significant' incident was recorded on 29 September 1992 in the Kelvedon District affecting Holland Brook;
- A 'minor' incident on 9 January 1993 in the Kelvedon District where a tributary of Holland Brook was polluted by inert suspended solids caused by a leaking underground pipe;
- A 'minor' incident on 30 March 1994 in the Kelvedon District where a tributary of Holland Brook was polluted with oil, caused by a fire;
- A 'minor' incident in the Kelvedon District on 13 February 1995 where inadequate construction caused organic wastes to enter Tenpenny Brook Tributary;
- A 'minor' incident on a poultry yard in Kelvedon District was recorded on 13 and 15 February 1995 affecting Tenpenny Brook tributary with organic waste (solid poultry manure), caused by inadequate construction;
- A 'minor' incident was recorded on 4 December 1997 in Kelvedon District affecting a ditch tributary of Holland Brook with organic waste (solid horse manure), caused by poor operational practice;

- A 'significant' incident on 15 October 1994 in the Kelvedon District where Ramsey River tributary was polluted with oil from agricultural sources and diesel due to a collision;
- A 'minor' incident on 21 November 1994 in the Kelvedon District where sewerage (septic tank effluent) entered a tributary of Holland Brook, caused by 'inadequate construction'; and
- An incident with 'significant' water impact on the Substantiated Pollution Incident Register was recorded on 15 July 2014 in the Anglian Region, Central Area by a microbiological pollutant;

CABLE ROUTE

6.7.56 Further detail on pollution control and pollution incidents with respect to the ECC will be included within the ES at the application stage.

ONSHORE WATERCOURSES, NEAR-SHORE COASTAL WATERS AND THE COLNE AND STOUR TRANSITIONAL WATERS SENSITIVITY

6.7.57 Sensitivity has been assigned to all watercourses, near-shore coastal waters, transitional waters and groundwater as defined in Table 6.10.

DISCHARGE CONSENTS

6.7.58 Table 6.8 shows discharge consents which are recorded within 2 km of the study area.

Table 6.8: Discharge Consents

Permit Holder	Source	Outfall Location with Respect to ECC and SSA Boundaries	Discharge Type	Receiving Water
L Barrell	Domestic	30 m west of PEIR boundary	Sewerage effluent	Holland Brook
Horton	Domestic	On PEIR boundary to north of East Anglia Connection Node Substation area	Sewerage effluent	Holland Brook
Eastern Electricity Plc	Lawford Substation	On site boundary to the south of SSA West area	Surface Water	Tenpenny Brook
L Barrell	Domestic	0.6 km north east of PEIR boundary	Sewerage effluent	Tributary of Holland Brook
Horton	WWTW (not water company)	0.6 km north east of PEIR boundary	Sewerage effluent	Ditch to Holland Brook
W.R.D Marshall	WWTW (not water company)	0.6 km north east of PEIR boundary	Sewerage effluent	Tributary of Holland Brook

Permit Holder	Source	Outfall Location with Respect to ECC and SSA Boundaries	Discharge Type	Receiving Water
J Vickers	Domestic	0.6 km north east of PEIR boundary	Sewerage effluent	Tributary of Tenpenny Brook
Everitt	Domestic	0.6 km north east of PEIR boundary	Sewerage effluent	Tributary of Holland Brook
Sissons	WWTW (not water company)	0.6 km north east of PEIR boundary	Sewerage effluent	Tributary of Holland Brook
Affinity Water Limited	Undefined or other	0.28 km north of the PEIR boundary. The PEIR boundary crosses the same road southwards of this point	Trade Discharge - Process Water	Holland Brook
Tendring Hundred Waterworks Co	Undefined or other	0.28 km north of the PEIR boundary. The PEIR boundary crosses the same road southwards of this point	Trade Discharge - Process Water	Holland Brook
R.W Ireland	Domestic	0.28 km north of the PEIR boundary. The PEIR boundary crosses the same road southwards of this point	Sewerage effluent	Land/ Soakaway
Tendring D.C.	Domestic	0.28 km north of the PEIR boundary. The PEIR boundary crosses the same road southwards of this point	Sewerage effluent	Tributary of Holland Brook
B & A Soames	Domestic	0.28 km north of the PEIR boundary. The PEIR boundary crosses the same road southwards of this point	Sewerage effluent	Surface Water
Cooper and Dolphin	Domestic	0.28 km north of the PEIR boundary. The PEIR boundary crosses the same road southwards of this point	Sewerage effluent	Surface Water
Howells	Domestic	1.8 km north of the OnSS	Sewerage effluent	Ditch to Holland Brook
Chidgey	Domestic	Unable to confirm exact location. Ardleigh road runs through and within the PEIR boundary	Sewerage effluent	Tributary of Tenpenny Brook

Permit Holder	Source	Outfall Location with Respect to ECC and SSA Boundaries	Discharge Type	Receiving Water
Eastern Electricity Plc.	Not supplied	Unable to confirm exact location. Ardleigh road runs through and within the PEIR boundary	Discharge of other matter-surface water	Tributary of Tenpenny Brook
J Smith	WWTW (not water company)	South of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Tributary of Tenpenny Brook
M. Barrett	Domestic	South of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Tributary of Tenpenny Brook
S Rendell and K Hayward	WWTW (not water company)	South of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Tributary of Tenpenny Brook
P. Allum	Domestic	South of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Tributary of Tenpenny Brook
A Marshall	WWTW (not water company)	North of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Tributary of Tenpenny Brook
The Occupier	Domestic	North of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Tributary of Tenpenny Brook
J.W. Gibb	Domestic	North of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Tributary of Tenpenny Brook
G.W. Bloomfield	Domestic	North of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Tributary of Tenpenny Brook
Blakey	Domestic	North of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Tributary of Tenpenny Brook
M.G Shute	Domestic	North of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Tributary of Tenpenny Brook
A.Warnes	Domestic	North of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Tributary of Tenpenny Brook

Permit Holder	Source	Outfall Location with Respect to ECC and SSA Boundaries	Discharge Type	Receiving Water
The Occupier	Domestic	North of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Tributary of Tenpenny Brook
S. Simpson & G.Edwards	Domestic	North of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Holland And Hamford
Sauka	Domestic	North of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Tributary Holland Brook
L. Joplin and P. Gardner	Domestic	North of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Tributary of Tenpenny Brook
Spurgin and Pleass	Domestic	North of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Holland Brook
R.M.Steed	Domestic	North of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Tributary of Tenpenny Brook
R.K Hayward	Domestic	South of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Tributary of Tenpenny Brook
Howlett	Domestic	North of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Tributary of Tenpenny Brook
R.J. Middleton	Domestic	North of PEIR Boundary – unable to confirm exact location	Sewerage effluent	Tributary of Tenpenny Brook

ABSTRACTIONS

6.7.59 Table 6.9 shows permitted abstractions recorded within 2 km of the study area.

Table 6.9: Permitted Abstractions

Licence	Location	Source	Abstraction Location with Respect to SSA	Use
8/37/25/*g/316	Hungerdown House	Groundwater sands and gravels	North of SSA West	Spray irrigation
8/36/19/*G/0033	Grange Farm, Lawford	Groundwater, Glacial Sand and Gravel	To the north-east of SSA West search area	General farming and domestic purposes
8/37/25/*g/264	69 Hungerdown Lane	Groundwater, Fluvial Sand and Gravel	North of SSA West	Spray Irrigation
8/37/25/*G/0265	71 Hungerdown Lane, Lawford	Groundwater, Glacial Sand and Gravel	North of SSA West	General farming and domestic
8/37/25/*g/266	72 Hungerdown Lane, Lawford	Groundwater, Glacial Sand and Gravel	North of SSA West	General farming and domestic
8/37/25/*G/0268	74 Hungerdown Lane, Lawford	Groundwater, Glacial Sand and Gravel	North of SSA West	General farming and domestic
8/37/25/*G/0267	Well- Hungerdown Lane, Lawford	Groundwater, Glacial Sand and Gravel	North of SSA West	General farming and domestic
8/37/25/*G/0270	77 Hungerdown Lane, Lawford	Groundwater, Glacial Sand and Gravel	North of SSA West	General agriculture: spray irrigation - direct
8/37/25/*G/0271	78 Hungerdown Lane, Lawford	Groundwater, Glacial Sand and Gravel	North of SSA West	General farming and domestic

Licence	Location	Source	Abstraction Location with Respect to SSA	Use
8/37/25/*G/0272	79 Hungerdown Lane, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	Spray irrigation
8/37/25/*g/273	80 Hungerdown Lane, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	Spray irrigation
8/37/25/*g/274	81 Hungerdown Lane, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General agriculture
8/37/25/*G/0275	84 Hungerdown Lane, Lawford	Groundwater, Glacial Sand and Gravel	North of SSA West	General farming and domestic
8/37/25/*G/0276	85 Hungerdown Lane, Lawford	Groundwater, Glacial Sand and Gravel	North of SSA West	General farming and domestic
8/37/25/*G/0277	86 Hungerdown Lane, Lawford	Groundwater, Glacial Sand and Gravel	North of SSA West	General farming and domestic
8/37/25/*G/0278	87 Hungerdown Lane, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General farming and domestic
8/37/25/*G/0279	89 Hungerdown Lane, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General agriculture spray irrigation - direct
8/37/25/*G/0260	62 Tile Barn Lane, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General farming and domestic

Licence	Location	Source	Abstraction Location with Respect to SSA	Use
8/37/25/*g/261	63 Tile Barn Lane, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	Agriculture
8/37/25/*G/0262	64 Tile Barn Lane, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General farming and domestic
8/37/25/*g/263	Well-65 Tile Barn Lane, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	Agriculture
8/37/25/*G/0281	4 Tubewells, Badliss Hall	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	Unable to identify the address	General agriculture spray irrigation
8/37/25/*G/0256	34 Harwich Road, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General farming and domestic
8/37/25/*G/0257	36 Harwich Road, Lawford	Not specified	North of SSA West	General farming and domestic
8/37/25/*G/0258	38 Harwich Road, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General farming and domestic
8/36/18/*G/0045	45 Harwich Road, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General agriculture spray irrigation

Licence	Location	Source	Abstraction Location with Respect to SSA	Use
8/37/25/*G/0259	47 ‘A&B ’ Harwich Road, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General farming and domestic
8/36/18/*G/046	49 Harwich Road, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General farming and domestic
8/36/18/*g/047	52 Harwich Road, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General agriculture: spray irrigation
8/36/18/*g/048	53 Harwich Road, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	Not specified
8/36/18/*g/049	55 Harwich Road, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	Not specified
8/36/18/*g/050	57 Harwich Road, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	Not specified
8/36/18/*g/051	59 Harwich Road, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	Not specified

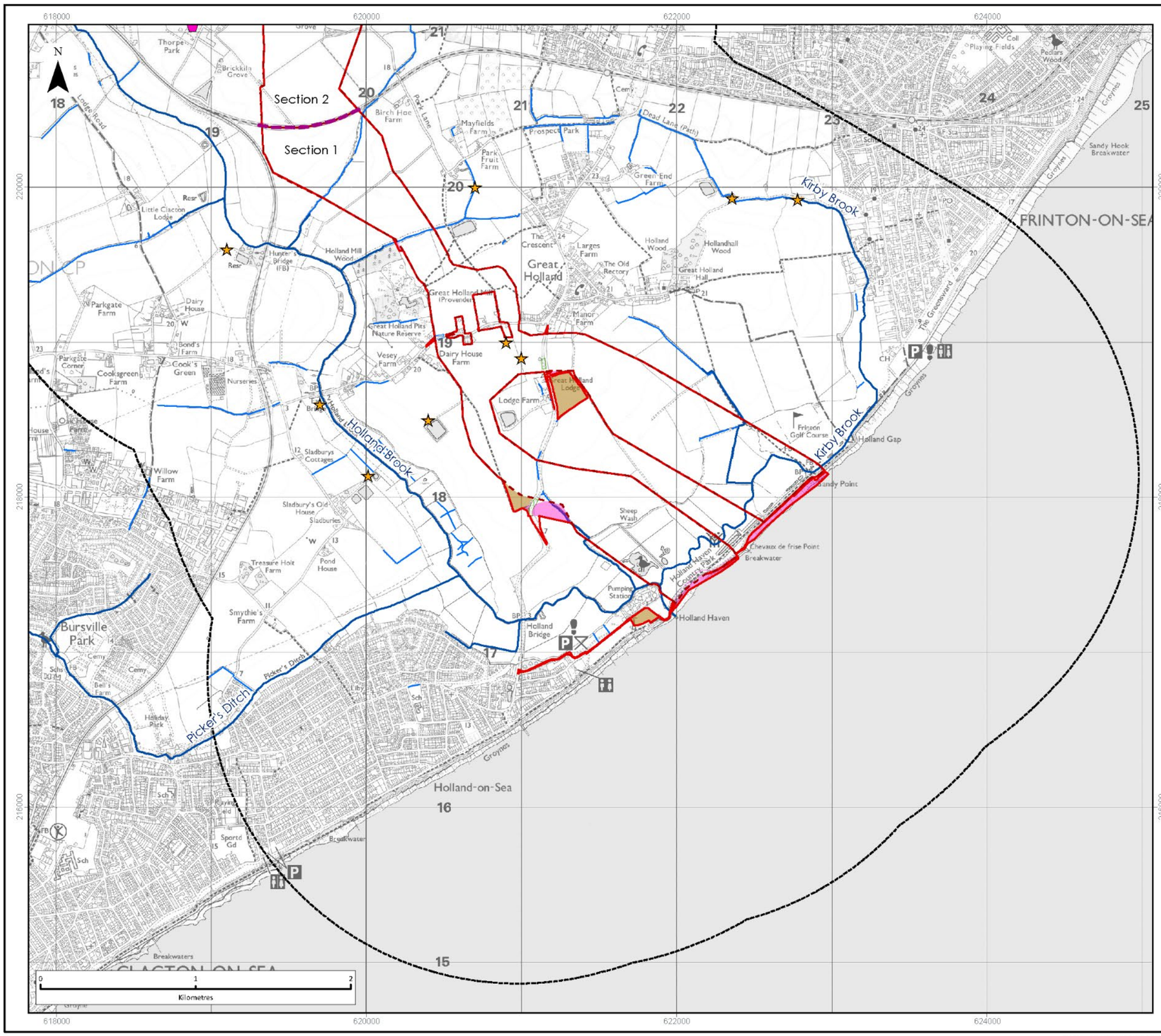
Licence	Location	Source	Abstraction Location with Respect to SSA	Use
8/37/25/*G/0336	Abbotsfield Ardleigh	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	West of SSA West	General agriculture: spray irrigation
8/36/18/*G/0050	Riddlesdale Farm, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	West of SSA West	General agriculture spray irrigation - direct
8/36/19/*G/0033	Aldhams Farm, Lawford	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	Unable to locate	General farming and domestic
8/36/19/*G/0014	Braham Hall Farm, Little Bromley	Groundwater,	Unable to locate	General farming and domestic
8/37/26/*G/0016	Mulleys Farm, Lt. Bromley	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North East of SSA West	General farming and domestic
8/37/26/*G/0021	Welhams Farm, Lt. Bentley	Groundwater;E chalk; Status: Perpetuity	North East of SSA West	General farming and domestic
8/37/26/*G/0038	Welhams Farm, Lt. Bentley	Groundwater;E chalk; Status: Perpetuity	North East of SSA West	General farming and domestic
8/37/25/*G/0066	Moorhouse Farms Ltd, Lt. Bromley Hall Fm, Lt.Bromley	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	North East of SSA West	General farming and domestic
8/37/26/*G/0080	Little Bromley Hall, Lt.Bromley	Groundwater, Glacial Sand and Gravel; Status: Perpetuity	East of SSA West	General agriculture: spray irrigation

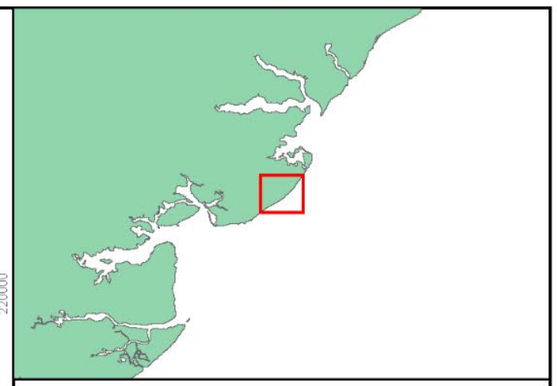
Licence	Location	Source	Abstraction Location with Respect to SSA	Use
8/37/26/*G/0055	Park Farm, Mistley No 2	Groundwater	Unable to locate	General agriculture: spray irrigation
8/37/25/*g/215	Badley Hall, Great Bromley	Groundwater fed reservoir; Glacial Sand and Gravel; Status: Perpetuity	South of SSA East	General agriculture: spray irrigation
8/37/25/*G/0146	Badley Hall, Great Bromley	Groundwater; Glacial Sand and Gravel; Status: Perpetuity	South of SSA East	General farming and domestic
8/36/19/*G/0136	New Hall Farm	Groundwater; Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General agriculture spray irrigation - direct
8/37/25/*G/0236	Well At Ardleigh	Groundwater; Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General agriculture spray irrigation - direct
8/36/19/*G/0014	Lawford House Farm	Groundwater; Glacial Sand and Gravel; Status: Perpetuity	Unable to locate	General farming and domestic
8/36/19/*G/0032	Dickley Hall, Mistley	Groundwater; Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General farming and domestic

Licence	Location	Source	Abstraction Location with Respect to SSA	Use
8/36/19/*G/0133	10 Jet Wells at Bradfield Hall	Groundwater; Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General agriculture spray irrigation - direct
8/36/19/*G/0091	Res Bradfield Hall, Manningtree	Groundwater; Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General agriculture spray irrigation - direct
8/36/19/*G/0091	Well 1 Bradfield Hall, Manningtree	Groundwater; Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General farming and domestic
8/37/25/*G/0172	Norman/Cattsgreen Fms, Mistley	Groundwater; Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General agriculture spray irrigation - direct
8/37/25/*G/0143	Old Shields Farm 1 & 2, Ardleigh	Groundwater; Glacial Sand and Gravel; Status: Perpetuity	North of SSA West	General agriculture spray irrigation – direct; - anti frost
8/37/25/*G/0153	Blue Gates Farm, Gt. Bromley	Groundwater Glacial Sand and Gravel; Status: Perpetuity	South of SSA East	General farming and domestic
8/37/25/*G/0036	Morrow Lane Farm, Ardleigh	Groundwater Glacial Sand and Gravel; Status: Perpetuity	North West of SSA West	General agriculture spray irrigation - direct

Licence	Location	Source	Abstraction Location with Respect to SSA	Use
8/37/25/*G/0101	Hall Farm, Great Bromley	Groundwater Glacial Sand and Gravel; Status: Perpetuity	South of SSA East	General farming and domestic
8/36/19/*G/0136	Stacies Farm, Mistley	Groundwater Glacial Sand and Gravel; Status: Perpetuity	South of SSA East	General agriculture: spray irrigation
8/37/25/*G/0108	Well at Morants Farm, Ardleigh	Groundwater; hydrogeology was not supplied	North West of SSA West	General agriculture: spray irrigation
8/37/25/*G/0116	Chancery Farm, Ardleigh	Groundwater E chalk; Status: Perpetuity	North West of SSA West	General farming and domestic
An/037/0025/035	Tenpenny Brook at Little Bromley	Surface-Tenpenny Brook	East of SSA West	General agriculture: spray irrigation and storage
8/37/26/*S/0067	New Hall Farm	Surface Holland Brook	Unable to locate	General agriculture: spray irrigation - storage
8/37/25/*S/0197	Reservoir on Tenpenny Brook	Surface-Tenpenny Brook	Unable to locate	General agriculture: spray irrigation - direct
8/37/25/*s/186	Bluegates Farm, Great Bromley	Surface stream-not specified	South of SSA East	Not supplied
8/37/25/*S/0076	Newhouse Farm, Gt. Bromley	Surface (water body not specified)	South of SSA East	General agriculture: spray irrigation - storage

Licence	Location	Source	Abstraction Location with Respect to SSA	Use
8/37/25/*S/0045	Badley Hall Reservoir, Great Bromley Colchester Essex	Surface (water body not specified)	South of SSA East	General agriculture: spray irrigation - direct
An/037/0026/006	Holland Brook at Braham Hall, Little Bromley	Surface Holland Brook	East of SSA West	General agriculture: spray irrigation - storage
8/36/19/*S/0066	Stour Stacies Farm 2, Mistley	Surface (water body not specified)	East of SSA West	General agriculture: spray irrigation
8/36/19/*s/107	Dickley Hall, Mistley	Surface- stream (stream not specified)	East of SSA West	impounding
8/36/19/*S/0107	Trib of River Stour at Dickley Hall, Mistley	Surface (the tributary of River Stour is not specified)	East of SSA West	General agriculture: spray irrigation





LEGEND

- Onshore Red Line Boundary
- Onshore Red Line Boundary 2 km Buffer
- Onshore Export Cable Corridor
- Onshore Cable Route Section Division
- Temporary Construction Compounds
- Works Access Required
- Haul Road Crossings
- Haul Road Access
- Licensed Abstraction
- Private Water Supply
- Statutory Main River
- Minor Watercourse

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PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Water Users

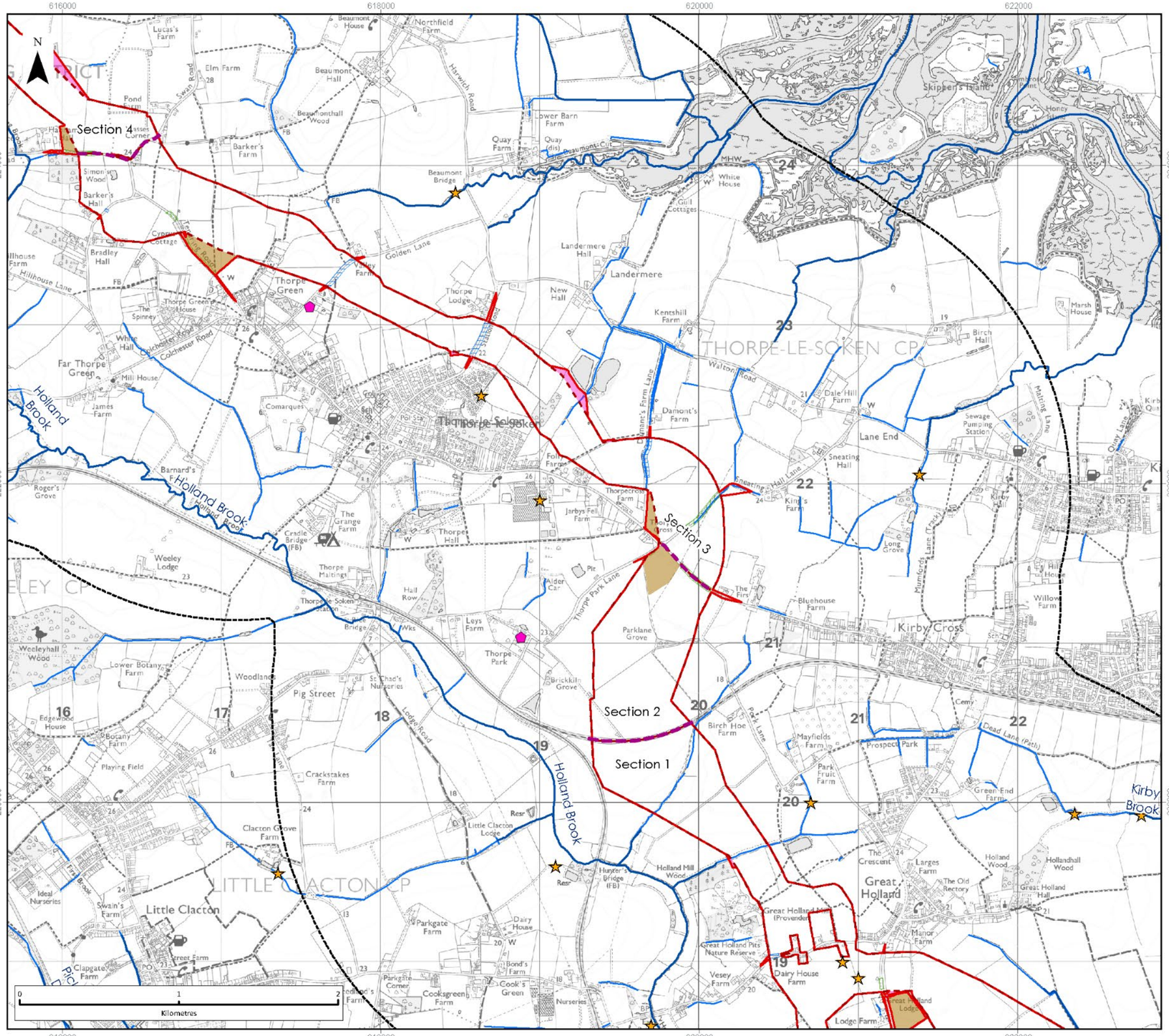
VER	DATE	REMARKS	Drawn	Checked
1	20/02/2023	PEIR Submission	DB	JS

DRAWING NUMBER:

FIGURE 6.4

SCALE:	PLOT SIZE:	DATUM:	COORDINATE SYSTEM:
1:25,000	A3	OSGB 1936	British National Grid

FIVE ESTUARIES OFFSHORE WIND FARM



LEGEND

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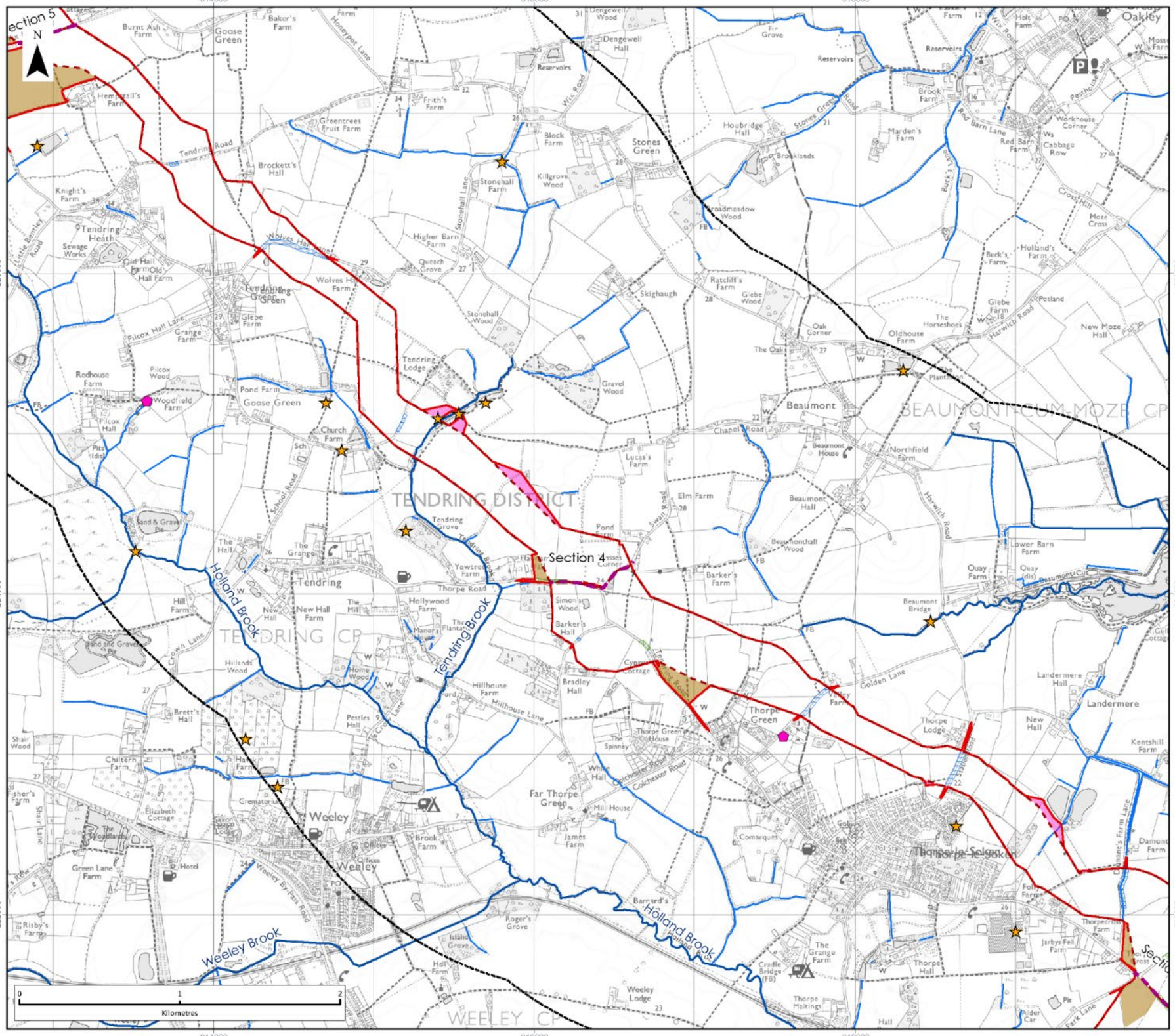
FIVE ESTUARIES
OFFSHORE WIND FARM



LEGEND

- Onshore Red Line Boundary
- Onshore Red Line Boundary 2 km Buffer
- Onshore Export Cable Corridor
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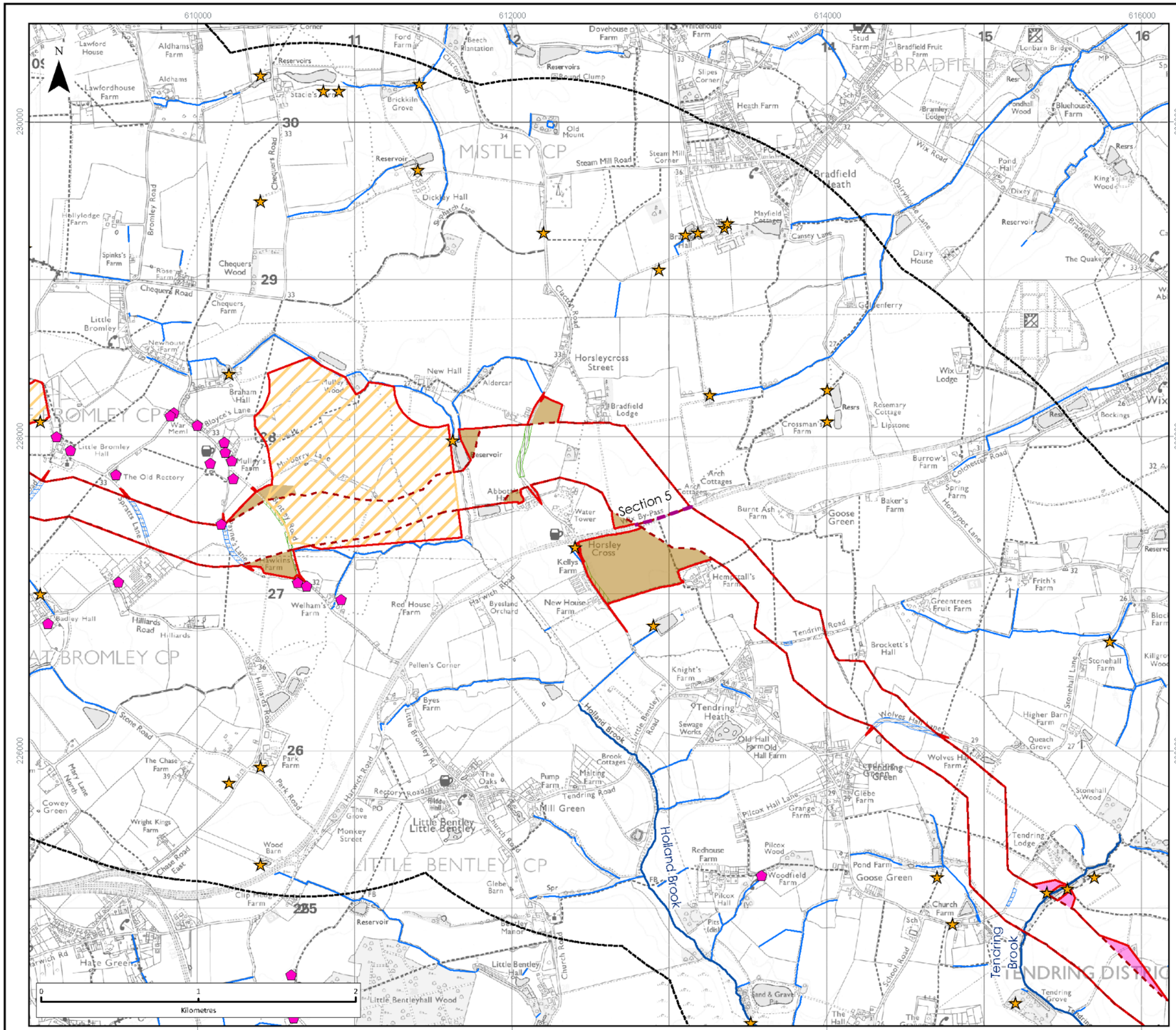

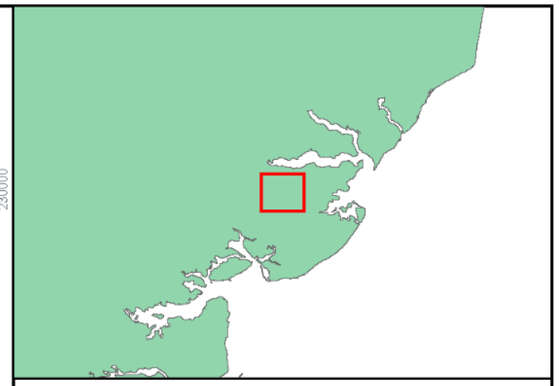

LEGEND

- Onshore Red Line Boundary
- Onshore Red Line Boundary 2 km Buffer
- Onshore Export Cable Corridor
- Onshore Cable Route Section Division
- Onshore Substation Areas of Search
- Temporary Construction Compounds
- Works Access Required
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- Haul Road Access
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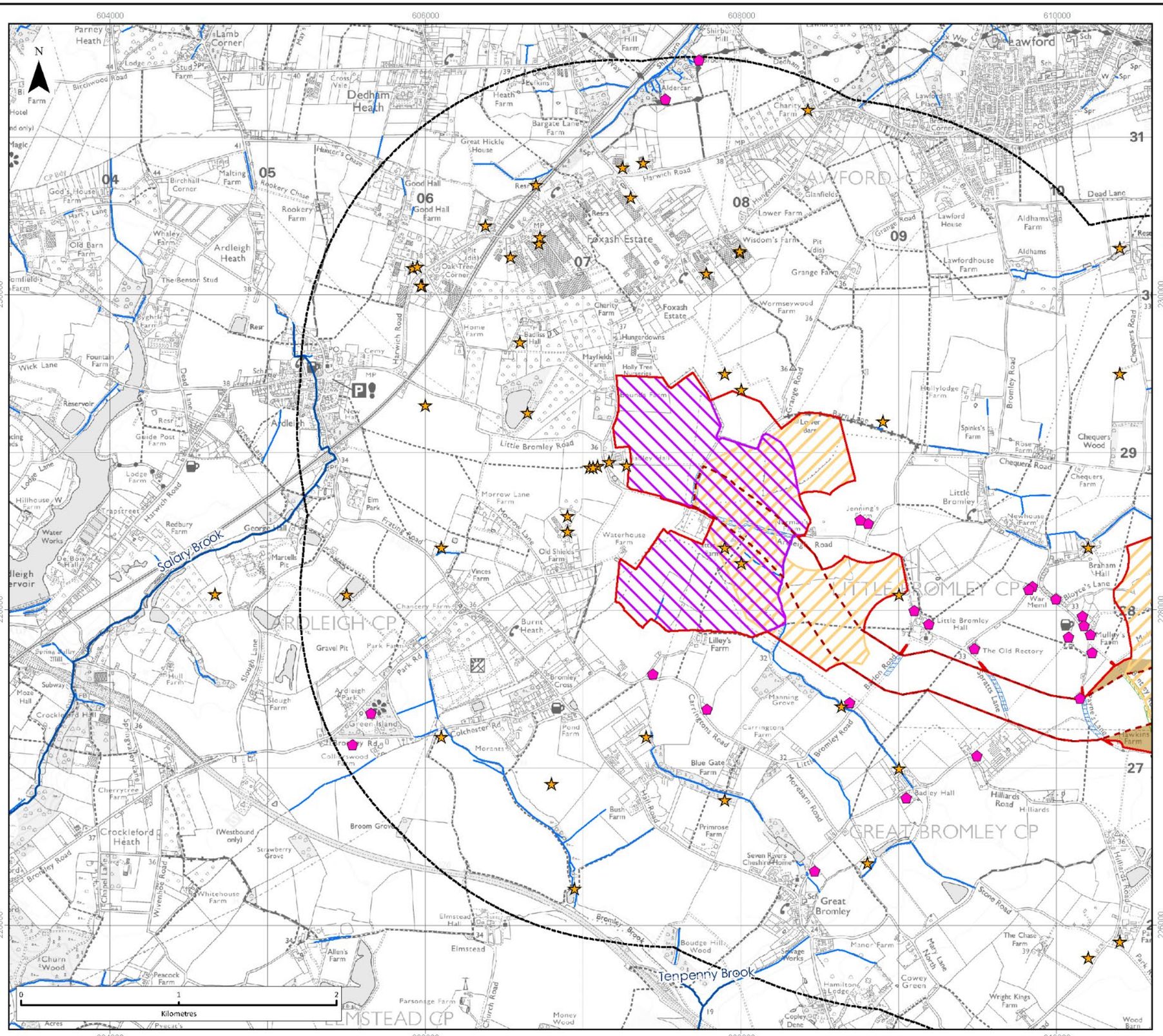
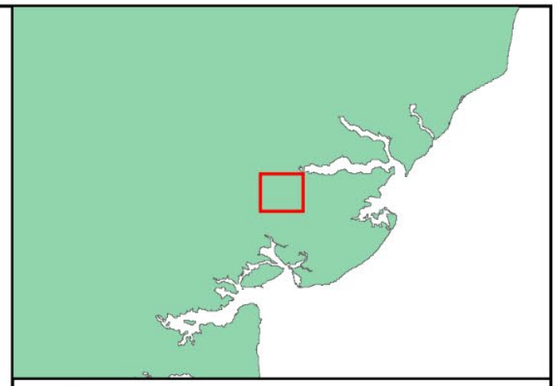
FIVE ESTUARIES OFFSHORE WIND FARM





LEGEND

- Onshore Red Line Boundary
- Onshore Red Line Boundary 2 km Buffer
- Onshore Export Cable Corridor
- National Grid Area of Search
- Onshore Substation Areas of Search
- Temporary Construction Compounds
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- Haul Road Access
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FIGURE 6.4

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FIVE ESTUARIES
OFFSHORE WIND FARM

TEMPORAL CHANGE

6.7.60 Future climate change has the potential to have an impact on tidal, fluvial and surface water flood risk through the anticipated increase in sea level, river flows and levels and rainfall intensity.

6.7.61 The sea levels during extreme events along the coast close to the landfall site, as provided by the EA, are detailed in the onshore ECC FRA, provided at Volume 5, Annex 6.1. This includes the 0.5% AEP (1 in 200 chance annually) and the 0.1% AEP (1 in 1,000 chance annually) events.

6.7.62 The risk of tidal flooding to the land behind the defences has been considered and assessed for the construction phase and the defences are considered adequate to provide protection to this land for this phase of the development. During operation the installed cable would be buried underground and is not considered to be vulnerable to flooding. It is noted in the SMP that for the landfall reach of coastline, the current defence line will be held until 2055. From this point a dual policy of either managed realignment or hold the line will be adopted. VE will ensure design of the cable route from landfall inland is congnisant of the potential for managed realignment towards the end of the design life of the onshore cable.

6.7.63 The recommended national climate change allowances for peak river flow for the Combined Essex Management Catchment peak river flow allowances suggest a 38% increase in peak river flow intensity up to the 2080s epoch (2070 – 2115), as defined by the EA, which would be appropriate for the proposed lifespan of VE. Increased peak river flow would potentially increase the frequency, extent or depth of flooding associated with fluvial flood events. Based on an assessment of the location and topography of the onshore ECC and Substation Search Areas the extent and shape of the present-day fluvial floodplain and the distance of the onshore ECC and Substation Search Areas to fluvial watercourses, it is considered unlikely that fluvial flood risk would increase over the lifetime of the VE.

6.7.64 The recommended climate change allowance for peak rainfall intensity have been set for the Combined Essex Management Catchment (DEFRA 2022). Peak rainfall intensities used in the assessment are increased in line with this guidance, using the Central allowance for the 1% AEP event in the 2050s epoch (2022 to 2060) for the temporary works, and using the Central allowance for the 1% AEP event in the 2070s epoch (2061 to 2125) for the permanent works. This means a consideration of a 20% increase in peak rainfall intensity for the construction phase and a consideration of a 25% increase in rainfall intensity for the operational phase.

THE ONSHORE ECC AND SUBSTATION

6.7.65 Full details of the onshore ECC, OnSS and all associated infrastructure are included in Volume 3, Chapter 1: Onshore Project Description.

6.7.66 Baseline surveys and data review for the hydrology, hydrogeology and flood risk study area includes the land within the PEIR boundary with a buffer of 2 km to account for any potential hydraulic conductivity.

6.7.67 Collection and presentation of baseline information for the study area will allow flexibility to make changes to the preferred cable route within the ECC as assessment and design options evolve.

BASELINE SENSITIVITY

6.7.68 Based on Table 6.4 sensitivity values have been assigned to potential receptors, as presented in Table 6.10. Overall, the inland watercourse receptors range in sensitivity from **low** to **high**; the near-shore coastal waters of the North Sea are considered to have a **medium** sensitivity; and the floodplain within the study area is considered to be of a **low** sensitivity.

Table 6.10: Sensitivity values for potential receptors

Receptor	Value (Sensitivity)	Justification
Holland Brook	High	The river flows into Holland Haven Marshes SSSI.
Kirby Brook	High	The river course flows across the Holland Haven Marshes SSSI.
Tendring Brook	Medium	A smaller river which does not cross through protected sites, but is a tributary which flows into Holland Brook and SSSIs.
Beaumont Cut	High	The watercourse flows through Hamford Water National Nature Reserve.
Tenpenny Brook	Low	Discharge consents indicate that this watercourse is a discharge point for sewerage.
Various smaller drains and streams	Low	Not assessed for ecological or chemical quality status under River Basin Management Plan/ WFD; Small watercourses of local importance.
Thames group bedrock	Negligible	Unproductive aquifer.
Superficial deposits of Till, Sands and Gravels	Low	Groundwater is potentially present, perched in superficial deposits underlying the onshore ECC. Groundwater bodies are classed as Secondary aquifers (Secondary A or Secondary B).

Receptor	Value (Sensitivity)	Justification
Areas of floodplain within the study area	Low	Large proportion of the study area is within Flood Zone 1, i.e. outside of the tidal and fluvial floodplain; The tidal and fluvial floodplain within the study area is located on land uses which are undeveloped with few buildings. There are no urbanised areas within the areas of floodplain that are within the study area. All land uses are 'less vulnerable'; The tidal and fluvial floodplain within the study area is relatively wide and accommodates a large volume of water relative to the volume potentially displaced/increased by the proposed onshore infrastructure. It is considered to have a low sensitivity in terms of changes in flood levels and floodplain shape.
Near-shore coastal waters of the North Sea	Medium	Assessed water body under River Basin Management Plan/ WFD. Coastal waters are classified as good for chemical status and moderate for ecological status. Bathing water quality at the coastline is classified as good to excellent.
Transitional coastal waters (Colne and Stour)	High	Estuaries have international environmental designation. Assessed water body under River Basin Management Plan/ WFD. Transitional waters are classified as good for chemical status and moderate for ecological status. Bathing water quality at the Colne estuary is classified as excellent.
Water abstractions	Medium	A number of groundwater and surface water abstractions for agricultural and domestic uses.

EVOLUTION OF THE BASELINE

6.7.69 The baseline will evolve over a period of time regardless of the VE development. The most significant change with regard to hydrology, hydrogeology and flood risk will be due to climate change and the impact of this change on hydrological regimes and flooding. Guidance is provided by UK Government, as referenced in Section 6.7.61 to 6.7.65, with regard to the anticipated changes in rainfall intensity, peak river flows and increases in sea levels and coastal action. These climatic changes and subsequent impacts are predicted to take place based on national and global modelling.

6.7.70 The landfall area is covered by the SMP Management Unit C for Tendring Peninsula. More specifically the area falls within the Policy Development Zones for Holland-on-Sea (PDZ C2) and Clacton-on Sea (PDZ C3). The SMP states that for PDZ C2 the current line will be held until 2055 with little or no change to the current baseline in terms of coastal flood defence protection until this time. From 2055 the EA will consider a dual policy of either managed realignment or hold the line. For PDZ C3 the policy is to hold the line of current defences throughout the life of the proposed development.

6.7.71 It is assumed that the EA will continue to work towards improvements in WFD classification for water bodies within the study area. This work may include strategies which would see physical geomorphological changes to existing surface water features; changes in local land use to improve chemical water quality of runoff reaching monitored water bodies; and/ or other schemes such as ecological improvement projects which could impact on existing surface water quality.

6.8 KEY PARAMETERS FOR ASSESSMENT

6.8.1 The MDS criteria identified in Table 6.11 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These criteria have been selected from the details provided in the onshore project description (Volume 3, Chapter 1: Onshore Project Description). Effects of greater significance are not predicted to arise should any other development scenario, based on details within the project design envelope, to that assessed here be taken forward in the final design scheme.

6.8.2 The following section identifies the MDS in environmental terms, defined by the project design envelope. This is to establish the maximum potential impact associated with the project. It should also consider any designed-in mitigation.

Table 6.11: Maximum Design Scenario for the project.

Potential effect	Maximum Adverse Scenario Assessed	Justification
Construction		
Onshore ECC Increase in flood risk or change in water quality	For the assessment presented in this chapter, the onshore ECC is defined as the cable corridor within which the typically 60 m cable route is located. The Onshore ECC is typically approximately 200 m to 250 m wide, with some areas requiring a wider corridor (such as where trenchless crossing may take place). The Onshore ECC is approximately to 27 km in length to accommodate the greatest extent of disturbance. The corridor will be wider at HDD crossing points.	The MDS includes the maximum number of cables anticipated and assumes disturbance throughout the onshore ECC area, therefore the greatest area of land disturbance. Open trenching as a crossing option for smaller watercourse crossings has been considered to represent the greatest potential for change to surface hydrology and effect on water quality.
	Cables will be installed directly or in ducts, with installation undertaken in sections. The cables will be installed in one trench per circuit (maximum of 4 trenches for up to 3 circuits), with each trench up to 3.5 m wide and up to 2 m deep.	
	Eight TCC locations along the onshore ECC.	
	Trenched crossing of smaller watercourses (see crossings register provided in Volume 7, Report 4: Crossings Register.	
OnSS Increase in flood risk or change in water quality	The OnSS will include the footprint of the substation infrastructure and development platform (including landscaping).	The MDS includes the maximum development footprint (temporary and permanent) and therefore the largest possible area of disturbance to surface water features.
	Two potential substation locations are currently included (SSA West and SSA East) in the assessment.	
	One TCC work area is included (at each location) to accommodate offices, welfare facilities, car parking, workshops and storage areas. Indicative maximum TCC area of 37,500 m^2 is assumed for the substation TCC.	
HDD (or alternate trenchless crossing works)	HDD (or alternative trenchless crossing technique) crossings required for larger surface watercourses; key roads; and some utility crossings.	HDD (or other trenchless crossing) techniques present a risk of indirectly contaminating surface watercourses or

Potential effect	Maximum Adverse Scenario Assessed	Justification
Increase in flood risk or change in water quality	HDD TCCs would be located at each end of the crossing, requiring an associated TCC, either with permeable surfacing or suitable drainage where non permeable surfacing used.	groundwater where they are hydraulically connected with surface runoff caused by spillages and the movement of excavated earth/ sediments.
Landfall Increase in flood risk or change in water quality	HDD (or alternative trenchless crossing technique) for up to 5 bores (one per circuit plus one spare) will be used from landfall to cross the coastal flood defence line and Kirby Brook watercourse.	The MDS includes the maximum number of cables anticipated at landfall and therefore, the maximum working corridor required. A number of access options for landfall are included in the MDS.
	Temporary access will be required which may cross beach groynes.	
Operation		
OnSS Increase in flood risk	Permanent area of the OnSS footprint assumes an Air Insulated Switchgear (AIS) substation which has the greater footprint of 280 m x 210 m, plus an operational access road. Further design detail will be available at the application stage which will guide the design process for surface water runoff management.	The MDS for flood risk at the OnSS requires the largest footprint for design resulting in the largest possible area of disturbance and largest potential for impermeable ground cover.
OnSS Routine maintenance works affecting surface watercourses	Routine maintenance of the OnSS.	The MDS for water quality of main watercourses during operation is that chemicals and oils would be used in the routine maintenance of OnSS. The onshore ECC provides potential lateral pathways for water flow which could indirectly affect water quality.
	Permanent onshore cables will be buried (apart from joint bay access points).	

Potential effect	Maximum Adverse Scenario Assessed	Justification
Decommissioning		
OnSS Change to flood risk	Removal of the OnSS including any areas of hardstanding. Buried cables to be de-energized with the ends sealed and left in place to avoid ground disturbance. Temporary Joint Bays (TJBs) at landfall to be left in place. Any final decommissioning methodology will adhere to industry best practice, rules and regulations at the time of decommissioning.	The MDS for flood risk on the surrounding environment during decommissioning is the removal of the OnSS. The change in surfacing and removal of attenuation storage associated with the OnSS could affect flood risk as it would take the natural environment a period of time to re-establish itself to provide natural attenuation.
OnSS Works affecting surface watercourses		The MDS for water quality of watercourses during decommissioning is the removal of the OnSS. The onshore export cable remaining in situ provides potential lateral pathways for water flow which could indirectly affect water quality.
Cumulative Effects		
Effects on the water environment during construction	Overlap of construction phase with construction of nearby developments including capital programme schemes in the area.	Overlapping construction phases would be the period of highest risk to the water environment, due to receptors being affected by more than one project.
Effects on flood risk during operation	Combined effect of increased areas of hardstanding	Combined effects of increased hardstanding could lead to increased potential for runoff.

6.9 EMBEDDED MITIGATION

6.9.1 The embedded mitigation contained in Table 6.12 are mitigation measures or commitments that have been identified and adopted as part of the evolution of the project design of relevance to the topic, these include project design measures, compliance with elements of good practice and use of standard protocols. Where the assessment determined significant effects accounting for embedded mitigation, further measures may be required, which are presented as additional mitigation. Table 6.14 presents additional mitigation measures. These have typically been put forward where:

- An effect is significant in EIA terms, even with embedded mitigation, but additional mitigation measures are available to reduce the level of effect; or
- Mitigation has been proposed but has not yet been agreed with regulators, stakeholders, etc. or it is unproven.

6.9.2 The mitigation includes embedded measures such as design changes and applied mitigation which is subject to further study or approval of details; these include avoidance measures that will be informed by pre-construction surveys, and necessary additional consents where relevant. The composite of embedded and applied mitigation measures apply to all parts of the VE development works, including pre-construction, construction, O&M and decommissioning.

Table 6.12: Embedded mitigation relating to hydrology, hydrogeology and flood risk.

Parameter	Mitigation measures embedded into the project design
General	
Project Design and Route Selection	Careful routing of the onshore ECC to avoid main rivers.
	Design of key crossing points (sea defence structures, main rivers, non-main and ordinary watercourses, roads, utilities etc.), including the use of HDD (or other alternative trenchless crossing techniques), to avoid key areas of sensitivity.
Construction	
Code of Construction Practice	A final CoCP will be submitted as part of the DCO application. The CoCP will include measures to control the impacts of watercourse crossings and crossings beneath flood defences.
	A draft version of the CoCP is provided with this PEIR (Volume 7, Report 3), in which includes control measures for minimising impacts at watercourse crossings.
Surface Water Drainage	The design of the OnSS may result in the construction of low permeability surfacing, increasing the rate of surface water runoff from the site. A surface water drainage scheme is required to ensure the existing runoff rates to the surrounding water environment are maintained at pre-development rates. An outline surface water drainage scheme will be provided as part of the OnSS FRA, when developed.
	The detailed (post-consent) design of the surface water drainage scheme would be based on a series of infiltration/soakaway tests carried out on site and the required attenuation volumes will be outlined in the supporting OnSS FRA. The tests will be undertaken prior to construction and in accordance with the BRE Digest 365 Guidelines in order to determine the suitability of ground for accepting a drainage discharge.
	Construction of the onshore OnSS will require temporary management of surface water during construction. Control measures will be included within the CoCP to minimise the risk of water pollution.
	Construction of the onshore ECC will require temporary management of surface water along the route. Control measures will be included within the CoCP to minimise the risk of water pollution..
Flood Risk	Cable trenching, construction haul roads and construction site accesses which cross surface watercourses will require measures to ensure that the water quality and flow rates are unaffected either directly or indirectly. These measures will be secured as part of the CoCP.
	The onshore ECC and the construction haul roads will be designed to minimise land take and to avoid, where possible, impacts on existing drainage networks and features.

Parameter	Mitigation measures embedded into the project design
	Within the CoCP a flood response plan will set out actions in the event of flooding or a flood warning during construction works within a flood zone. This would include a procedure for evacuation of personnel and the securing or relocating sensitive equipment and/ or materials stored in bulk.
	The onshore TCC and construction access and haul roads would comprise, where practical, permeable gravel overlying a permeable geotextile membrane of an appropriate standard.
	Cable entry and exit points within jointing bays and TJBs will be sealed with an appropriate waterproofing material to mitigate flood risk.
	Where required and practical, drainage would be installed either side of the onshore ECC to ensure existing land drainage flow regimes are maintained.
	Surface water flowing into the trenches and work areas during the construction period will be pumped via settling tanks or ponds to remove sediment and potential contaminants, before being discharged into local ditches or drains via temporary interceptor drains. Where gradients on site are significant, cable trenches will include a hydraulic brake (bentonite or natural clay seals) to reduce flow rates along trenches and hence reduce local erosion.
	Any field drainage intercepted during the cable installation will either be reinstated following the installation of the cable or diverted to a secondary channel through agreement with the appropriate stakeholders.
	Any stockpiles along the cable route will have gaps to allow surface water runoff to pass through.
Pollution Prevention	Areas at risk of spillage, such as vehicle maintenance areas and hazardous substance stores (including fuel, oils and chemicals) will be bunded and carefully sited to minimise the risk of hazardous substances entering drainage systems or local watercourses. Additionally, the bunded areas will have impermeable bases to limit the potential for migration of contaminants into groundwater following any leakage/spillage. Bunds used to store fuel, oil etc. will have a 110% capacity.
	Any refuelling of machinery will be undertaken within designated areas where spillages can be easily contained.
	Machinery will be routinely checked to ensure it is in good working condition to reduce the risk of leaks.
	Any tanks and associated pipe work containing oils and fuels will be double skinned and be provided with intermediate leak detection equipment.
	A spill procedure will be documented, and spill kits kept in the vicinity of potentially hazardous materials storage areas.
	Disturbance to areas close to watercourses will be reduced to the minimum necessary for the work.

Parameter	Mitigation measures embedded into the project design
	Excavated material will be placed in such a way as to avoid any disturbance of areas close to the banks of watercourses and to prevent spillage into water features.
	Use of sediment fences along watercourses when working in close proximity, to prevent sediment being washed into watercourses.
	Covers will be used by lorries transporting materials to/ from site to prevent releases of dust/ sediment to watercourses or drains.
	If applicable, storage of stockpiled materials should be covered when not in use to prevent materials being dispersed by wind or rainfall runoff.
	Any visual/ olfactory signs of contamination encountered during excavation should be reported and investigated.
	A briefing will be included within the site induction highlighting the importance of water quality, the location of watercourses and pollution prevention measures.
	Drainage works to be constructed to relevant statutory guidance.
Best Practice	All construction work will be undertaken in accordance with the CoCP. A draft version of the CoCP is provided in Volume 7, Report 3 which will be secured as part of the DCO. The CoCP will be drafted having consideration of good practice guidance including, but not limited to: > Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors CIRIA (C532) (CIRIA 2001); > CIRIA – SuDS Manual (C753) (CIRIA, 2015b);
Operation	
General	The OnSS would contain potential pollutants which could include cooling oils, lubricants, fuels, greases, etc. The design, maintenance and operation of the facility would follow good practice in line with the prevailing guidance and legislation with regard to measures such as the storage and management of potentially polluting substances, emergency spill response procedures, clean up and control of any potentially contaminated surface water runoff and routine inspection to prevent or contain leaks of any pollutants.
Decommissioning	
General	Decommissioning practices will incorporate measures similar to the construction phase, to prevent pollution and increased flood risk. These measures will include emergency spill response procedures, control of surface water and clean up and remediation of any contaminated soils. Exposed cables ducts will be sealed with an appropriate waterproofing material to mitigate flood risk or creation of preferential flow pathways.
	Decommissioning will be undertaken in accordance with relevant guidelines at the time of decommissioning and will include measures to protect the water environment.

6.10 ENVIRONMENTAL ASSESSMENT: CONSTRUCTION PHASE

6.10.1 The impacts of the onshore construction of VE have been assessed on hydrology, hydrogeology and flood risk in the onshore study area. The impacts are assessed against the MDS in Table 6.11.

6.10.2 A description of the potential effect on hydrology, hydrogeology and flood risk receptors caused by each identified impact is given below. In general, the environmental effects arising from the construction of the project are temporary, as they only occur during the construction phase.

6.10.3 The onshore ECC FRA (Volume 5, Annex 6.1: Onshore ECC FRA) and the OnSS FRA will each assess the effects of flood risk on the temporary works areas associated with the construction phase and demonstrate how the significance of these effects can be reduced to an acceptable level through best practice and mitigation measures.

CABLE ROUTE INSTALLATION

IMPACT 1: GENERATION OF TURBID OR POLLUTED RUNOFF WHICH COULD ENTER THE WATER ENVIRONMENT

6.10.4 Several sections of the onshore ECC involve or require crossing a Main River or ordinary watercourses or drainage ditches, as shown in Figure 6.2 and listed in the Crossing Schedule (Volume 7, Report 4). Along its route, the onshore ECC passes through land, which is within tidal and fluvial floodplain, some of which is afforded protection by the coastal sea wall defences. Assessment of impact relating to HDD (or other trenchless crossing techniques) is discussed below from paragraph 6.10.50.

6.10.5 Landfall HDD (or other trenchless crossing technique) exit pits may be located within the intertidal zone or the shallow subtidal zone. Depending on the final methodology and location, it may be necessary to install temporary sheet piled exit pits to prevent water intrusion to provide a dry working area and to retain drilling fluid (bentonite). Assessment of impact relating to Landfall construction is discussed below from paragraph 6.10.80.

6.10.6 The draft CoCP identifies that contractors will require a flood response plan (or similar) to ensure that procedures are in place in the event of a flood warning or the onset of flooding during the construction phase. Through measures such as the ceasing of works, relocation or securing of sensitive equipment and/ or materials and evacuation of workforce personnel, the CoCP will reduce the likelihood of construction activities resulting in incidents detrimental to water quality occurring in the event of flooding and reduce the magnitude of the impact of any such incidents.

6.10.7 The CoCP will also include measures to control runoff from the construction works. This could include, for example, sediment fences when working in proximity to open watercourses, containment of storage areas and treatment of any runoff from work areas or water from dewatering of trenches. Such measures would prevent the potential reduction in water quality associated with increased sediment loading affecting nearby tidal waters, fluvial watercourses or drainage ditches during cable route construction works, especially during excavations or earthwork activities.

6.10.8 Stockpiling of excavated materials during earthworks would be temporary and would only be permitted in designated areas. Designated stockpile areas would be a minimum of 10 m from any open watercourse features. The potential for contaminants contained within the stockpiled materials to be leached into water bodies, resulting in a reduction in the quality of the receiving waters, would be reduced through the implementation of embedded mitigation, discussed in Section 6.9, and mitigation measures proposed within the CoCP, including secondary containment of bulk storage areas.

6.10.9 The embedded mitigation measures discussed at Section 6.9 includes the implementation of spill procedures and use of spill kits. These measures together with appropriate drainage systems and containment will minimise the potential for any reduction in water quality associated with spills or leaks of stored oils/ fuels/ chemicals or other polluting substances migrating into nearby water bodies.

6.10.10 The potential presence of ground contamination and the potential for this to migrate into underlying groundwater and resulting effects on the quality of water receptors is considered in Volume 3, Chapter 5: Ground Conditions and Land Use.

6.10.11 For watercourses, it is predicted that any impact on water quality from the ECC construction works would be direct through pollution from spills and of an intermittent nature and of short duration.

6.10.12 The sensitivity of onshore watercourse receptors ranges from **low** to **high**. Given the mitigation in place and that any direct pollution from spills would be small, the magnitude of impacts to watercourses directly draining the ECC and substation search areas (Holland Brook, Kirby Brook, Tendring Brook and smaller tributaries and ditches) is deemed to be **low**. The magnitude of impact to watercourses downstream of the PEIR boundary is deemed to be **negligible**. The significance of effect is therefore considered to be **minor adverse** for watercourses directly draining the ECC and substation search areas and **minor adverse** or **negligible** for watercourses downstream of the PEIR boundary. There are no significant effects predicted in EIA terms.

6.10.13 For the near shore coastal water body and the Colne and Stour transitional water bodies, the impact on water quality from the ECC construction works would be direct (landfall works only) and indirect (via onshore watercourses discharging to the coast or estuarine environments) and of an intermittent nature and of short duration.

6.10.14 The sensitivity of the near shore water body is **medium** and the transitional water bodies are **high**. Potential for water quality impacts from shore works is **negligible** as any excavations will only have potential to mobilise sands and any direct pollution from spills will be very small relative to the receiving environment.

6.10.15 The mechanism for water quality impacts on the near shore coastal water body and transitional water bodies from inland works will be indirect, via watercourses. These watercourses will reduce any potential impacts from sediment entrainment and spills through settlement and dilution respectively.

6.10.16 The magnitude of impact with controls in place is assessed to be **negligible**. The significance of effect on near shore coastal water is therefore considered to be **minor adverse**, which is not significant in EIA terms.

IMPACT 2: CHANGES TO SURFACE WATER RUNOFF PATTERNS WHICH COULD AFFECT FLOOD RISK IMPACT

6.10.17 Spills of bulk materials such as concrete or entrainment of stockpiled material from excavations during cabling works could result in watercourses or drainage ditches becoming restricted or blocked. This could impact flow regimes and could result in an increase in fluvial flood risk.

6.10.18 Implementation of the mitigation measures discussed at section 6.9 and further measures which will be proposed within the CoCP, would reduce the likelihood of construction activities resulting in spillage incidents occurring and will ensure that there is very limited chance of stockpiled material becoming entrained and entering watercourses. This would reduce the magnitude of impact of any such incident.

6.10.19 Large stockpiles of excavated/ construction materials could block overland flow of surface water during heavy rainfall events and could also affect the routing and extent of fluvial flood risk from main rivers or tidal flood risk. This could result in changes to existing surface water hydrology and an increase in surface water flood risk.

6.10.20 The laying of temporary surfacing material for the working area (which includes the corridor in which the haul road, cable trenches, excavated material and equipment are located) could result in a reduction in the permeability of the ground and therefore an increase in surface water flood risk.

6.10.21 These effects would be mitigated through the appropriate siting of stockpiles, provision of gaps to allow passage of surface water and development of a drainage strategy. Therefore, the effects of construction on surface water flood risk would be largely mitigated through the measures proposed within the CoCP.

6.10.22 The onshore ECC crosses main rivers, ordinary watercourses and drainage ditches along its route. At any watercourse crossing there will be potential for the construction works associated with the crossing to increase fluvial flood risk through altering the existing hydrological regime.

6.10.23 The CoCP will specify mitigation measures including emergency and contingency plans for flooding incidents which may affect the works. The CoCP will specify the need for a minimum cover depth between the cable and hard bed level of the watercourse being crossed.

6.10.24 Overall, it is predicted that the impact on flood risk from construction of the onshore ECC (including crossing of watercourses) would be direct and of an intermittent nature and of short duration.

6.10.25 The sensitivity of the receptor (the fluvial and tidal floodplain) is considered to be **low** and the magnitude of impact is deemed to be **negligible**. The significance of effect would, therefore, be **negligible**, which is not significant in EIA terms.

IMPACT 3: POTENTIAL FOR DAMAGE TO FLOOD DEFENCES OR SURFACE WATER DRAINAGE INFRASTRUCTURE

6.10.26 The onshore ECC assets defined by the EA as flood defences on the coastline at landfall, and along the embankments of Kirby Brook, Holland Brook and Tendring Brook. At any crossing point there will be potential for the construction works associated with the crossing to damage or alter the nature of the flood defence, potentially increasing flood risk.

6.10.27 Overall, it is predicted that the impact on flood risk from construction of the onshore ECC would be direct and of an intermittent nature and of short duration.

6.10.28 The sensitivity of the receptor (the fluvial and tidal floodplain) is considered to be **low** and the magnitude of impact is deemed to be **negligible**. The significance of effect would, therefore, be **negligible**, which is not significant in EIA terms.

IMPACT 4: POLLUTION OR DISRUPTION OF FLOW TO GROUNDWATER THROUGH GROUND EXCAVATIONS OR PILING

6.10.29 As confirmed in Volume 3, Chapter 5: Ground Conditions and Land Use, there are no known point sources of contamination within the study area, however, on a precautionary basis, there is the potential for limited contamination to exist as a result of previous land uses, including agriculture and the use of nitrogen-based fertilisers. Any contamination is likely to be localised in its extent given the sources of contaminants and the characteristics of the underlying geology.

6.10.30 Whilst there is the potential for the construction of the cable trench to introduce a pathway for contaminants, the permeability of the underlying strata is likely to limit the migration of potential contaminants. Across the onshore ECC, the underlying bedrock does not contain significant quantities of groundwater and is considered unproductive as an aquifer. Some areas of the site are underlain by superficial deposits of Sand and Gravels which may contain some limited shallow groundwater. Excavations for the cable route will be shallow (up to 2 m depth) and as a result, groundwater is unlikely to be encountered. Any groundwater seepage is likely to be minor and it would be managed in accordance with controls set out in the CoCP.

6.10.31 Overall, it is predicted that the magnitude of impact on shallow groundwater will be **low** and direct, and of short duration. The sensitivity of the shallow groundwater receptor is considered to be **low** (bedrock groundwater sensitivity is **negligible**). Given the low sensitivity of the superficial deposits, the effect will, therefore, be **minor adverse**, which is not significant in EIA terms.

ONSHORE SUBSTATION CONSTRUCTION

IMPACT 1: GENERATION OF TURBID OR POLLUTED RUNOFF WHICH COULD ENTER THE WATER ENVIRONMENT

6.10.32 As set out for the onshore ECC works above, implementation of the mitigation measures discussed in Section 6.9 and the measures proposed within the CoCP would reduce the likelihood of construction activities associated with the OnSS resulting in incidents detrimental to water quality occurring. The proposed measures would include controls to prevent the potential reduction in water quality associated with increased sediment loading (including potentially contaminated sediment) entering nearby fluvial watercourses or drainage ditches during construction works, especially during excavating works.

6.10.33 Materials excavated during construction works would be stockpiled temporarily in designated areas. All designated stockpile areas would be a minimum of 10 m from any open watercourse features. The potential for contaminants to be contained within the stockpiled materials that could be leached into nearby fluvial watercourses or drainage ditches is not considered likely as contaminated land from pre-existing ground conditions has been effectively ruled out of assessment in Volume 3, Chapter 5, as no contamination sources have been identified along the route. Where practical, where soil is to be stored for over 6 months it will be covered to minimise erosion or allowed to re-vegetate naturally.

6.10.34 The mitigation measures discussed at Section 6.9 includes the implementation of spill procedures and use of spill kits on site. This should prevent any potential reduction in water quality associated with spills or leaks of stored oils, fuels or chemicals used during the construction works migrating into nearby watercourses or drainage ditches.

6.10.35 The potential presence of ground contamination and resulting effects on the quality of water receptors is considered in Volume 3, Chapter 5: Ground Conditions and Land Use.

6.10.36 Overall, it is predicted that the impact on water quality would be direct and of an intermittent nature and of short duration. The sensitivity of the receptors (receiving watercourses within the vicinity of either of the two substation search areas) is **low** to **medium** and the magnitude of impact is deemed to be **low**. The significance of effect would, therefore, be **minor adverse**, which is not significant in EIA terms.

IMPACT 2: CHANGES TO SURFACE WATER RUNOFF PATTERNS WHICH COULD AFFECT FLOOD RISK

6.10.37 Spills of bulk materials such as concrete or entrainment of stockpiled material from excavations during OnSS construction could result in watercourses or drainage ditches becoming restricted or blocked. This could impact flow regimes and could result in an increase in localised fluvial flood risk.

6.10.38 Implementation of the embedded mitigation measures discussed at Section 6.9 and measures which will be proposed within the CoCP, would reduce the likelihood of construction activities resulting in spillage incidents occurring and will ensure that there is very limited chance of stockpiled material becoming entrained to potentially enter watercourses. This would reduce the magnitude of impact of any such incidents.

6.10.39 Large stockpiles of excavated/ construction materials could block overland flow of surface water during heavy rainfall events and result in changes to existing surface water hydrology and an increase in surface water flood risk.

6.10.40 The laying of temporary surfacing material for access roads, TCC areas and any designated stockpile areas could result in a reduction in the permeability of the ground and therefore lead to an increase in surface water flood risk. The small-scale nature of the construction works in relation to the overall size of the groundwater aquifer means there is negligible potential for impact on groundwater levels.

6.10.41 These effects would be mitigated through the appropriate siting of stockpiles, provision of gaps to allow passage of surface water and development of a drainage strategy. Therefore, the effects of construction on surface water flood risk would be largely mitigated through the measures proposed within the CoCP.

6.10.42 The OnSS construction area (including land for access road options) may disturb existing surface water drainage features (ordinary watercourses) which may require diversion..

6.10.43 Any diversion or alteration to existing watercourse features would be undertaken need to ensure that works do not result in an increase in flood risk. The final design will consider mitigation measures including emergency and contingency plans for flooding incidents which may affect the works.

6.10.44 The proposed OnSS search areas are of a low risk of fluvial (and tidal) flooding. The activities carried out during construction phase would not impede floodplain flows arising from a tidal or fluvial flood event or reduce floodplain storage.

6.10.45 It is predicted that the impact on flood risk in this regard would be direct and of an intermittent nature and of short duration. The sensitivity of the receptor (the fluvial floodplain is considered to be **low** and the magnitude of impact is deemed to be **negligible**. The significance of effect would therefore be **negligible**, which is not significant in EIA terms.

6.10.46 TCC area(s) would be used during construction of the OnSS. This would be in addition to the land required for the OnSS and they would be used to store plant and equipment whilst construction is being undertaken. The TCC would not be located within the floodplain.

6.10.47 Overall, it is predicted that the impact on flood risk from the TCC areas would be direct and of an intermittent nature and of short duration. The sensitivity of the receptor (the fluvial floodplain) is considered to be **low** and the magnitude of impact is deemed to be **negligible**. The significance of effect would therefore be **negligible**, which is not significant in EIA terms.

IMPACT 4: POLLUTION OR DISRUPTION OF FLOW TO GROUNDWATER THROUGH GROUND EXCAVATIONS OR PILING

6.10.48 There is potential for a piled foundation being required as part of the OnSS design, subject to post –consent ground investigations. The OnSS search areas are in agricultural land and there is no record of any potentially contaminative land use on this part of the site. Therefore, the probability of contamination to groundwater is considered to be low. Overall, it is predicted that the impact on groundwater quality will be direct and of a continuous nature and of short duration.

6.10.49 The sensitivity of the groundwater receptor is considered to be **low** (bedrock groundwater sensitivity is negligible) and the magnitude is deemed to be **negligible**. The effect will, therefore, be **negligible** which is not significant in EIA terms.

HORIZONTAL DIRECTIONAL DRILLING (HDD) WORKS

IMPACT 1: GENERATION OF TURBID OR POLLUTED RUNOFF WHICH COULD ENTER THE WATER ENVIRONMENT

6.10.50 As set out for the onshore ECC works above, implementation of the mitigation measures discussed at Section 6.9 and the measures proposed within the CoCP would ensure that the potential for incidents detrimental to water quality occurring is minimised and would reduce the magnitude of the impact of any such incidents.

6.10.51 The final CoCP will also include measures to include in a flood response plan to ensure that procedures are in place in the event of flooding during any HDD (or other trenchless crossing technique) activity. In the event of a flood warning being received for an area where trenchless crossing works are taking place, any activity would be stopped and where possible, all sensitive equipment or plant would be relocated from the risk area and material secured. Workforce personnel would be evacuated from the work area until any such warning was over. These measures will reduce the likelihood of construction activities resulting in incidents detrimental to water quality occurring in the event of flooding and reduce the magnitude of the impact of any such incidents.

6.10.52 Materials excavated during initial excavations or during trenchless crossing works would be stockpiled temporarily in designated areas. All designated stockpile areas would be a minimum of 10 m from any open watercourse features where practicable. The potential for contaminants contained within the stockpiled materials that could be leached into nearby fluvial watercourses or drainage ditches is not considered likely as contaminated land from pre-existing ground conditions has been effectively ruled out of assessment in Volume 3, Chapter 5: Ground Conditions and Land Use, as no contamination sources have been identified along the route. If required and where practical, where soil is to be stored for over 6 months it will be covered to minimise erosion or allowed to re-vegetate naturally.

6.10.53 The potential presence of ground contamination and resulting effects on the quality of water receptors is considered in Volume 3, Chapter 5: Ground Conditions and Land Use.

6.10.54 The proposed measures would include controls to prevent the potential reduction in water quality associated with increased sediment loading (including potentially contaminated sediment), the breakout of drilling fluid (bentonite) and with spills or leaks of oils, fuels or chemicals used during the trenchless crossing works migrating into nearby fluvial or tidal watercourses or drainage ditches during construction works, especially during excavation earthworks and management of spoil from drilling.

6.10.55 For the near shore coastal water body and the Colne and Stour transitional water bodies, the impact on water quality from the trenchless crossing works would be direct (landfall works only) and indirect (via onshore watercourses discharging to the coast or estuarine environments) and of an intermittent nature and of short duration. The sensitivity of the near shore water body is **medium** and the transitional water bodies are **high**. Potential for water quality impacts from shore works is **low** as any excavations are likely to only have potential to mobilise sands and any direct pollution from spills will be very small relative to the receiving environment.

6.10.56 The mechanism for water quality impacts on the near shore coastal water body and transitional water bodies from inland HDD activity will be indirect, via watercourses. These watercourses will reduce any potential impacts from sediment entrainment and spills through settlement and dilution respectively.

6.10.57 The magnitude of impact with controls in place is assessed to be **negligible**. The significance of effect on near shore coastal water is therefore considered to be **minor adverse**, which is not significant in EIA terms.

6.10.58 For inland watercourses the impact on water quality from the trenchless crossing works would be direct and of an intermittent nature and of short duration.

6.10.59 The sensitivity of the receptors range from is **low** to **high**. Given the mitigation in place and that any direct pollution from activities would be small, the magnitude of impacts to watercourses directly draining the inland trenchless crossing areas (Holland Brook, Kirby Brook, Tendring Brook and smaller tributaries and ditches) is deemed to be **low**. The magnitude of impact to watercourses downstream of the PEIR boundary is deemed to be **negligible**. The significance of effect on inland watercourses would, therefore, be **minor adverse** for watercourses directly draining the trenchless crossing work areas and **minor adverse** or **negligible** for watercourses downstream of the PEIR boundary. These are not significant effects in EIA terms.

6.10.60 The trenchless crossing proposed for landfall and the coastal defences is assessed under Section 6.10.80 onwards. For crossings where trenchless crossing techniques may be used, land use is primarily agricultural, and no land uses with potential sources of contamination in the vicinity of the trenchless crossing works have been identified. However, the potential for localised contaminants as a result of runoff from the adjacent road or work areas has been considered.

IMPACT 2: CHANGES TO SURFACE WATER RUNOFF PATTERNS WHICH COULD AFFECT FLOOD RISK

6.10.61 Spills of bulk materials such as concrete or entrainment of stockpiled material from excavations or spoil from drilling during trenchless crossing works could result in watercourses or drainage ditches becoming restricted or blocked. This could impact flow regimes and could result in an increase in fluvial flood risk.

6.10.62 Implementation of the embedded mitigation measures discussed at Section 6.9 and further measures which will be proposed within the CoCP, would reduce the likelihood of construction activities resulting in spillage incidents occurring and will ensure that there is very limited chance of stockpiled material becoming entrained and entering watercourses. This would reduce the magnitude of impact of any such incident.

6.10.63 Large stockpiles of excavated/ construction materials could block overland flow of surface water during heavy rainfall events and result in changes to existing surface water hydrology and an increase in surface water flood risk.

6.10.64 The laying of temporary surfacing material for the trenchless crossing working areas could result in a reduction in the permeability of the ground and therefore an increase in surface water flood risk. The small-scale nature of the construction works in relation to the overall size of the groundwater aquifer means there is negligible potential for impact on groundwater levels.

6.10.65 These effects would be mitigated through the appropriate siting of stockpiles, provision of gaps to allow passage of surface water and development of a drainage strategy. Therefore, the effects of construction on surface water flood risk would be largely mitigated through the measures proposed within the outline CoCP.

6.10.66 The proposed trenchless crossing works will be used to cross existing flood defences and a number of Main River channels along the ECC. At any watercourse crossing there will be potential for the trenchless crossing works associated with the crossing to increase fluvial flood risk through altering the existing hydrological regime.

6.10.67 Overall, it is predicted that the impact on tidal and fluvial flood risk from trenchless crossings would be direct and of an intermittent nature and of short duration.

6.10.68 The sensitivity of the receptor (the fluvial and tidal floodplain) is considered to be **low** and the magnitude of impact is deemed to be **negligible**. The significance of effect would therefore be **negligible**, which is not significant in EIA terms.

6.10.69 Trenchless crossing compounds would be used during the construction phase, which would be used to store plant and equipment whilst works are being undertaken. There is potential for the TCCs to be located within the fluvial or tidal floodplain and therefore a FRA for these elements has been produced (Volume 5, Chapter 6.1: Onshore ECC Flood Risk Assessment).

6.10.70 The FRA identifies appropriate mitigation measures to ensure that the flood risk associated with the TCCs is minimised to an acceptable level, including a flood warning service in the event of a potential flood threat to the area in which the TCC is located.

6.10.71 Overall, it is predicted that the impact on flood risk associated with Trenchless crossing TCCs would be direct and of an intermittent nature and of short duration.

6.10.72 The sensitivity of the receptor (fluvial and tidal floodplain) is considered to be **low** and the magnitude of impact is deemed to be **negligible.** The significance of effect would therefore be **negligible**, which is not significant in EIA terms.

IMPACT 3: POTENTIAL FOR DAMAGE TO FLOOD DEFENCES OR SURFACE WATER DRAINAGE INFRASTRUCTURE

6.10.73 The onshore ECC assets defined by the EA as flood defences on the coastline at landfall, and along the embankments of Kirby Brook, Holland Brook and Tendring Brook. At any crossing point there will be potential for the construction works associated with the crossing to damage or alter the nature of the flood defence, potentially increasing flood risk.

6.10.74 A

6.10.75 Construction activities would be undertaken in accordance with measures set out in the CoCP to ensure that construction does not result in damage to any flood defences. This will specify the need for a minimum cover depth between the cable and the defences being crossed.

6.10.76 Overall, it is predicted that the impact on flood risk from construction of the onshore ECC would be direct and of an intermittent nature and of short duration.

6.10.77 The sensitivity of the receptor (the fluvial and tidal floodplain) is considered to be **low** and the magnitude of impact is deemed to be **negligible**. The significance of effect would, therefore, be **negligible**, which is not significant in EIA terms.

IMPACT 4: POLLUTION OR DISRPTION OF FLOW TO GROUNDWATER THROUGH GROUND EXCAVATIONS

6.10.78 Where groundwater is encountered it will be sensitive to accidental spillages and runoff from the trenchless crossing works. Measures in the outline CoCP to control the storage and use of materials and chemicals would be implemented, which would limit the magnitude of impact.

6.10.79 The magnitude of the impact would be **low** to **negligible**. The sensitivity of the shallow groundwater receptor is considered to be **low** (bedrock groundwater sensitivity is **negligible**). Given the low sensitivity of the superficial deposits, the effect will, therefore, be **minor adverse** to **negligible**, which is not significant in EIA terms.

LANDFALL INSTALLATION

IMPACT 1: GENERATION OF TURBID OR POLLUTED RUNOFF WHICH COULD ENTER THE WATER ENVIRONMENT

6.10.80 As set out for the onshore ECC works above, implementation of the embedded mitigation measures discussed at Section 6.9 and the measures proposed within the Draft CoCP would reduce the likelihood of construction activities resulting in incidents detrimental to tidal water quality occurring and reduce the magnitude of the impact of any such incidents. Potential impacts to water quality associated with the 'offshore' construction works, from mean high water springs to the array, will be mitigated through measures set out in Volume 2, Chapter 3: Marine Water and Sediment Quality.

6.10.81 The proposed measures would include controls to prevent the potential reduction in water quality associated with increased sediment loading (including potentially contaminated sediment) entering nearby tidal waters during excavation works or trenchless crossing activities.

6.10.82 Stockpiling of materials during earthworks would be temporary and would only be permitted in designated areas. The potential for contaminants contained within the stockpiled materials or associated with spills or leaks of stored oils, fuels or chemicals becoming mobilised into tidal waters, would be reduced through the implementation of mitigation, discussed at Section 6.9 and mitigation measures proposed within the CoCP.

6.10.83 Should a tidal flood event associated with extreme sea levels occur whilst construction works are in progress, there is the potential for stored materials (e.g. stockpiled soils and excavated material) to be mobilised by the floodwaters and washed into coastal waters, potentially resulting in a reduction in local tidal water quality.

6.10.84 The CoCP will include measures such as a flood response plan to ensure that procedures are in place in the event of flooding during the construction phase. Through measures such as the ceasing of works, relocation or securing of materials and evacuation of workforce personnel, the CoCP will reduce the likelihood of construction activities resulting in incidents detrimental to water quality occurring in the event of flooding and will reduce the magnitude of the impact of any such incidents.

6.10.85 The potential volume and concentration of any contaminated water entering tidal waters as a result of construction activities is considered to be low compared to that of the receiving tidal waters. The mitigation measures discussed at Section 6.9 includes the implementation of spill procedures and use of spill kits. These measures will minimise the potential for any reduction in water quality associated with breakout of drilling fluid (bentonite), spills or leaks migrating into tidal waters.

6.10.86 No potential sources of contamination have been identified from former land uses at landfall and therefore, the probability of mobilising existing contaminants in the vicinity is considered unlikely. The onshore cable would be installed by HDD (or other trenchless crossing technique) under the sea defences and Holland Haven Marshes. A TCC compound would be established at the trenchless crossing TJB working area, with another TCC located near the exit pit works within the beach area, which are likely to incorporate a storage area for fuels and chemicals. As a result, there is the potential for contaminants to be released as a result of accidental spillage or inappropriate storage and therefore, potentially affect the underlying groundwater.

6.10.87 The mechanism for water quality impacts on the near shore coastal water body from inland trenchless crossing activity will be via watercourses.

6.10.88 The sensitivity of the near shore water body is **medium**. Potential for water quality impacts from shore works is **negligible** as any excavations are likely to only have potential to mobilise sands and any direct pollution from spills will be very small relative to the receiving environment. The significance of effect on near shore coastal water is therefore considered to be **minor adverse**, which is not significant in EIA terms.

6.10.89 For inland watercourses along the onshore ECC the impact on water quality from the trenchless crossing works would be direct and of an intermittent nature and of short duration.

6.10.90 The sensitivity of the watercourse receptors close to landfall range from **low** to **medium** and the magnitude of impact is deemed to be **low**. The significance of effect on watercourses would, therefore, be **minor adverse**, which is not significant in EIA terms.

IMPACT 2: CHANGES TO SURFACE WATER RUNOFF PATTERNS WHICH COULD AFFECT FLOOD RISK

6.10.91 The laying of temporary surfacing material for the landfall access road, TCC and any designated stockpile area could result in a reduction in the permeability of the ground and therefore an increase in surface water flood risk. The increase in surface water runoff volume arising on the impermeable areas is likely to be relatively minor and would discharge directly to tidal waters. The effect of these works on flood risk is assessed in more detail in the FRA (Volume 5, Chapter 6.1).

6.10.92 Overall, it is predicted that the impact on surface water flood risk would be direct and of an intermittent nature and of short duration.

6.10.93 The sensitivity of the receptor (the fluvial and tidal floodplain) is considered to be **low** and the magnitude of impact is deemed to be **negligible**. The significance of effect would therefore be **negligible**, which is not significant in EIA terms.

6.10.94 Export cables will be installed by trenchless crossing techniques, passing beneath the coastal flood defences. The potential impact from impairment of the coastal defence structure would result in an increase in tidal flood risk.

6.10.95 Overall, it is predicted that the impact on tidal flood risk would be direct and of an intermittent nature and of short duration.

6.10.96 The sensitivity of the receptor (the fluvial and tidal floodplain) is considered to be **low** and the magnitude of impact is deemed to be **negligible**. The significance of effect would therefore be **negligible,** which is not significant in EIA terms.

IMPACT 4: POLLUTION OR DISRUPTION OF FLOW TO GROUNDWATER THROUGH GROUND EXCAVATIONS OR PILING

6.10.97 For the landfall trenchless crossing, the underlying superficial geology is of **low** sensitivity, however the quality of the groundwater is likely to be affected with elevated levels of salinity, which may reduce its importance/ sensitivity. The implementation the CoCP would control the storage and use of fuels and chemicals within the TCCs and therefore reduce the likelihood of contamination occurring. Any risk of increased salinity to groundwater will be localised and small.

6.10.98 It is predicted that the magnitude of impact of trenchless crossing mobilising contaminants at the landfall crossing will be **low**, direct and of a continuous nature and of short duration. The sensitivity of the groundwater receptor is considered to be **low**. The effect will, therefore, be **minor adverse**, which is not significant in EIA terms.

6.11 ENVIRONENTAL ASSESSMENT: OPERATIONAL PHASE

6.11.1 The impacts of the operation and maintenance of VE have been assessed on hydrology, hydrogeology and flood risk in the onshore study area. The impacts arising from the operation of the project are detailed in Table 6.11 above, along with the MDS against which each operational phase impact has been assessed.

6.11.2 A description of the potential effect on hydrology, hydrogeology and flood risk receptors caused by each identified impact is given below.

6.11.3 The onshore ECC FRA (Volume 5, Annex 6.1) and the OnSS FRA (when prepared) assess the effects of flood risk on the permanent infrastructure associated with the operational phase and demonstrate how the significance of these effects can be reduced to an acceptable level through mitigation measures.

ONSHORE SUBSTATION

IMPACT 5: CHANGES TO SURFACE WATER DRAINAGE AT THE ONSHORE SUBSTATION LOCATION

6.11.4 The development of the OnSS and permanent access route would result in an increase in impermeable surfacing. The maximum footprint of the substation compound would be 280 m by 210 m. The majority of the compound would remain permeable. Through the introduction of impermeable surfacing associated with the substation building and access track, there is a potential increase in surface water flood risk due to the greater volume and rate of runoff arising from reduced infiltration potential to ground. The small-scale nature of the reduced infiltration potential in relation to the overall size of the groundwater aquifer means there is negligible potential for impact on groundwater levels.

6.11.5 Appropriate surface water drainage would be implemented to mitigate against this potential risk. Surface water drainage measures would be implemented to ensure that runoff from the site is managed and restricted to rates agreed with the LLFA, thereby not increasing surface water flood risk. A range of feasible SuDS techniques could be used to achieve this, e.g., infiltration features or surface water detention areas.

6.11.6 The OnSS search areas are within Flood Zone 1, i.e. outside of the tidal and fluvial floodplain There would be no effect on the fluvial or tidal floodplain (and therefore no effect on flood risk) associated with the substation during the operational phase.

6.11.7 Overall, it is predicted that the impact on flood risk to the site would be direct and of a continuous nature and of medium to long duration.

6.11.8 The sensitivity of the receptor (the floodplain) is considered to be **low** and the magnitude of impact is deemed to be **negligible**. The significance of effect would therefore be **negligible**, which is not significant in EIA terms.

6.11.9 The OnSS would contain potential pollutants which could include cooling oils, lubricants, fuels, greases, etc. The design, maintenance and operation of the facility would be set out in a site operating plan which will include routine inspection to prevent or contain leaks of any pollutants from the substation, thereby mitigating against the potential for these contaminants to migrate into the local drainage ditch network and cause a reduction in water quality.

6.11.10 Overall, it is predicted that the impact on water quality would be direct and of a continuous nature and of medium to long duration.

6.11.11 The sensitivity of the receptors (watercourses and groundwater) is considered to range from **low** to **medium** in the vicinity of the substation search areas and the magnitude of impact is deemed to be **negligible**. The significance of effect would therefore be **minor adverse** or **negligible**, which is not significant in EIA terms.

PERMANENT CABLE ROUTE INFRASTRUCTURE AND TRENCHLESS CROSSINGS

6.11.12 The onshore cable would be buried underground. Full restoration of land above the cables would be included in the construction phase, ensuring that the former land use is retained.

6.11.13 Following construction, the trenchless crossing work areas would be restored, with the former land use retained. The only permanent features on the surface of the onshore ECC would be the jointing bays, which would be buried.

6.11.14 Adequate surface water drainage measures would be implemented during the construction phase to mitigate against this potential risk by ensuring that runoff from the access routes is restricted to acceptable rates (to be agreed with the LLFA) or passes to tidal waters, thereby not increasing surface water flood risk. Environmental assessment: decommissioning phase

6.11.15 The impacts of the decommissioning of the VE have been assessed on hydrology, hydrogeology and flood risk in the onshore study area. The impacts arising from the decommissioning of the project are detailed in Table 6.11 above, along with the MDS against which each decommissioning phase impact has been assessed.

IMPACT 6: GENERATION OF TURBID RUNOFF WHICH COULD ENTER THE WATER ENVIRONMENT

6.11.16 The significance of effects associated with the temporary impacts on water quality would be **minor adverse** or **negligible**, as assessed in the construction phase detailed above, which is not significant in EIA terms.

6.11.17 Post-decommissioning, the long-term effects of the decommissioned VE are described below.

6.12 ENVIRONENTAL ASSESSMENT: DECOMMISSIONING PHASE

6.12.1 During the decommissioning phase, the impacts on hydrology, hydrogeology and flood risk will be similar to those assessed for the construction phase. Good practice measures (similar to those identified within the CoCP) would be employed during decommissioning and would be agreed with statutory authorities at the time of decommissioning through a decommissioning plan.

DECOMMISSIONING OF CABLE ROUTE

6.12.2 With respect to the buried onshore cables, these would be left in place during decommissioning. Allowing the cables to remain in place is considered an acceptable option with minimal environmental impact. TJBs may be removed, depending on agreements reached with the regulatory authorities and landowners in place at the time. Removal of TJB structures would return the site to its pre-development state. The MDS in terms of potential effects is therefore for the jointing bays to remain in place.

DECOMMISSIONING OF ONSHORE SUBSTATION

6.12.3 It is anticipated that the OnSS would be gradually dismantled on site with certain infrastructure removed for recycling or reuse. Following this, the area is likely to be remediated and restored.

6.12.4 The decommissioning works may involve removal of some or all of the impermeable hard-standing surfacing and restoration of the permeable greenfield land present prior to construction. This action would result in the surface water flood risk being returned to its pre-development state. Specific decommissioning requirements and potential concerns with regards to hydrology, hydrogeology and flood risk would be discussed with the relevant statutory consultees at the time.

6.13 ENVIRONMENTAL ASSESSMENT: CUMULATIVE EFFECTS

6.13.1 The cumulative impacts of the onshore elements of VE have been assessed on hydrology, hydrogeology and flood risk receptors in the study area. A list of other major developments has been compiled for the onshore assessment of cumulative effects, which includes other projects that are considered likely to be present in the area of the onshore works once VE is operational, or where there may be some overlap in respective construction phases and in decommissioning if appropriate.

6.13.2 For the purposes of assessing the impact of the VE on hydrology, hydrogeology and flood risk in the region, the cumulative effect assessment technical note submitted through the EIA Evidence Plan screened in a number of projects and plans as presented in Table 6.13.

6.13.3 Temporary surface water drainage will be provided for all TCC areas during the construction phase to control the rate of runoff and to ensure there is no significant effect on water quality in downstream watercourses. The development of new buildings at Horsley Cross (22/01047/FUL) will incorporate management of surface water runoff. As the location of the three buildings is immediately adjacent to Holland Brook it is not anticipated that there will be any direct interaction between the two projects or any cumulative effects.

6.13.4 The proposed mixed-use development at Weeley (22/00979/DETAIL) is remote from the ECC and is on the opposite side of Holland Brook to the ECC. It is not anticipated that there will be any direct interaction between the two projects or any cumulative effects.

6.13.5 Temporary surface water drainage will be provided for all grid connection areas during the construction and operational phase of VE to control the rate of runoff and to ensure there is no significant effect on water quality in downstream watercourses. The development of a Battery Energy Storage System on land adjacent to Lawford substation (21/02070/FUL) will benefit from a system to control surface water runoff from the site. The land here and within the adjacent East Anglia Connection Node (EACN) substation search area is within the headwaters of Tenpenny Brook and runoff control can be achieved independently. It is not anticipated that there will be any direct interaction between the two projects or any cumulative effects.

6.13.6 The removal of high voltage overhead electricity spans at Thorpe-le-Soken (21/01058/OHL) is remote from the ECC and will not involve works that could potentially impact on the water environment. It is not anticipated that there will be any direct interaction between the two projects or any cumulative effects.

6.13.7 Temporary surface water drainage will be provided for all ECC works (including trenchless crossings) during the construction phase of VE to control the rate of runoff and to ensure there is no significant effect on water quality in downstream watercourses. The proposed solar energy scheme within and to the west of the ECC, on land between the rail line branches to Clacton-on-Sea and Frinton-on-Sea (21/00393/EIASCR), will benefit from a system to control surface water runoff from the site. Consideration will be required with regard to timing of development as the VE cabling could disrupt the solar farm development if this is under construction or operational. Provided VE is constructed prior to the solar development, it is not anticipated that there will be any direct interaction between the two projects or any cumulative effects.

6.13.8 The proposed residential development to the east of Little Clacton (20/00179/FUL) is remote from the ECC and is on the opposite side of Holland Brook to the ECC. The residential scheme will benefit from a system to control surface water runoff from the site for the life of the development. It is not anticipated that there will be any direct interaction between the two projects or any cumulative effects.

6.13.9 The modification to part of the 132kV overhead line network at Lawford substation (18/00832/OHL) will not involve works that could potentially impact on the water environment. It is not anticipated that there will be any direct interaction between the two projects or any cumulative effects.

6.13.10 The proposed residential development in Kings Cross (17/01988/FUL) is remote from the ECC and is not in the Holland Brook catchment. The residential scheme will benefit from a system to control surface water runoff from the site for the life of the development. It is not anticipated that there will be any direct interaction between the two projects or any cumulative effects.

6.13.11 The minor diversion refurbishment of existing overhead lines at Kirby-le-Soken (17/01130/OHL) will not involve works that could potentially impact on the water environment. It is not anticipated that there will be any direct interaction between the two projects or any cumulative effects.

6.13.12 The North Falls OWF project and the EACN substation project are at scoping stage and as a result no definitive layouts or construction programme are available to assess whether the projects overlap with VE. However, a worse case scenario will be assumed for this assessment whereby the projects overlap with VE spatially and temporally.

6.13.13 Given the timing of proposed construction activities for the projects detailed in Table 6.13, the scale of developments, their proximity away from the ECC and the requirements to control potential detrimental effects of any development on flood risk and water quality, no significant cumulative hydrology, hydrogeology and flood risk effects arising during the construction phase of these new developments are likely. All other onshore projects are noted to be beyond the study area or are in separate hydraulic catchments to the onshore ECC.

6.13.14 Furthermore, it is expected that the onshore elements of VE would not have any impact on the measures that other developments within the vicinity of the onshore works would need to incorporate during the construction phase to prevent detrimental hydrology, hydrogeology or flood risk effects elsewhere.

6.13.15 Other than the projects discussed above, many of the receptors potentially affected by the onshore elements of VE are different to those potentially affected by the projects considered in Volume 1, Annex 3.1: Cumulative Affects Assessment Matrix. In cases where the receptors are the same, the relative location and distance of the other projects to VE mean that there is no significant hydraulic connectivity between them and therefore no potential for cumulative effects.

6.13.16 In assessing the potential cumulative impacts for VE, it is important to consider that other projects that are currently proposed may or may not be taken forward for development. To build in some consideration of certainty (or uncertainty) the projects and plans discussed above have been allocated into 'Tiers' reflecting their current status within the planning and development process. These Tiers are included in Table 6.13 and are described in Table 6.13.

Table 6.13: Description of Tiers of other developments considered for cumulative effect assessment.

Tiers	Development Stage
Tier 1	Projects under construction.
	Permitted applications, whether under the Planning Act 2008 or other regimes, but not yet implemented.
	Submitted applications, whether under the Planning Act 2008 or other regimes, but not yet determined.
Tier 2	Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has been submitted.
	Projects under the Planning Act 2008 where a PEIR has been submitted for consultation.
Tier 3	Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has not been submitted.
	Identified in the relevant Development Plan (and emerging Development Plans with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited.
	Identified in other plans and programmes (as appropriate) which set the framework for future development consents/ approvals, where such development is reasonably likely to come forward.

FURTHER MITIGATION AND FUTURE MONITORING

6.13.17 No further mitigation or monitoring measures are considered necessary, except insofar as good construction practice involves matters like land or watercourse restoration in aftercare and if necessary remedial works to achieve desired standards.

Table 6.14 Projects considered within the hydrology, hydrogeology, and flood risk cumulative effect assessment.

Development type	Project	Status	Data confidence assessment/ phase	Tier
Energy – North Falls Offshore Wind Farm (OWF)	EN010119	Scoping Opinion. 16 July 2021. Application is expected to be submitted to the Planning Inspectorate Summer 2023	Low data confidence – no data available. Sourced from PINS Onshore cable route thought to be through Tendring District.	Tier 2
Electricity Transmission - East Anglia Connection Node substation		Request for a Scoping Opinion. 7 November 2022. Application is expected to be submitted to the Planning Inspectorate Q4 2024	Low data confidence – no data available. Sourced from PINS Part of the application boundary is located on land adjacent to Lawford Grid Substation, Little Bromley.	Tier 2
General industrial and storage buildings	22/01047/FUL	Awaiting decision (20 Jun 2022)	High data confidence - sourced from Tendring District Council. The site is located at Horsley Cross to the west of the B1035 which forms the ECC boundary for a TCC. Three new buildings, new access and highway works, parking and servicing and hard and soft landscaping are proposed to the west of existing buildings adjacent to Holland Brook.	Tier 2

Development type	Project	Status	Data confidence assessment/ phase	Tier
Mixed use development	22/00979/DETAIL	Awaiting decision (24 Jun 2022)	High data confidence - sourced from Tendring District Council. The site is located to the north of Weeley, approximately 1.8 km west from the ECC. Mixed use development including 280 homes, offices, land for a new primary school, railway footbridge, attenuation basins, open space, play equipment and associated infrastructure.	Tier 1
Energy transmission	21/02070/FUL	Awaiting Decision (15 Dec 2021)	High data confidence - sourced from Tendring District Council. The site is located on land to the west of Lawford substation, adjacent to the grid connection land within the ECC. Construction and operation of a 50MW Battery Energy Storage System.	Tier 1
Energy transmission	21/01058/OHL	Deemed Consent (29 Jul 2021)	High data confidence - sourced from Tendring District Council The site is located to the west of Kirby-le-Soken, approximately 1.7 km south-east of the ECC. Proposed removal of several spans of high voltage overhead electricity network.	Tier 1
Energy	21/00393/EIASCR	EIA Screening Request (09 Apr 2021)	High data confidence - sourced from Tendring District Council The site is located within and to the west of the ECC on land between the rail line branches to Clacton-on-Sea and Frinton-on-Sea. Proposed Solar Energy Scheme	Tier 2

Development type	Project	Status	Data confidence assessment/ phase	Tier
Residential	20/00179/FUL	Approved (18 Jan 2022)	High data confidence - sourced from Tendring District Council The site is located to the East of Little Clacton on Thorpe Road, approximately 1.9 km south-west of the ECC. 50 residential dwellings.	Tier 1
Energy transmission	18/00832/OHL	Permitted development (10 Jul 2018)	High data confidence - sourced from Tendring District Council. The site is located on land to the west of Lawford substation, adjacent to the grid connection land within the ECC. Proposed modification to part of the 132kV overhead line network.	Tier 1
Residential	17/01988/FUL	Approved (11 Jun 2019)	High data confidence - sourced from Tendring District Council. The site is located on the B1032 in Kings Cross approximately 1.7 km to the south-east of the ECC. Residential development providing 41 dwellings for over 55s including apartments and houses; parking and landscaping.	Tier 1
Energy transmission	17/01130/OHL	To be determined by another Authority (24 Jul 2017)	High - sourced from Tendring District Council The site is located in Kirby-le-Soken, approximately 1.9 km to the south-east of the ECC. Proposed minor diversion refurbishment of existing overhead lines.	Tier 2

6.14 INTER-RELATIONSHIPS

6.14.1 This chapter has considered the effect of the onshore elements of VE on groundwater and surface water quality and flood risk in relation to the proposed onshore infrastructure. Effects on geology are considered in Volume 3, Chapter 5: Ground Conditions and Land Use. Effects on offshore water quality are considered in Volume 2, Chapter 3 Marine Water and Sediment Quality.

6.14.2 The potential for effects of VE to result in consequential effects on receptors would be controlled by the measures set out in this chapter. The effects identified within this chapter are predicted to be **minor adverse** or **negligible**. None of these effects would be significant in EIA terms. Given the localised nature of the effects, there is not considered to be potential for significant inter-related effects on any offshore receptors.

6.14.3 Impacts on water quality arising from spillages or leaching of potentially polluting material may result in contamination of the ground through pollutants being mobilised to ground in water. With the implementation of the mitigation measures detailed in this chapter, the effect on groundwater would be **negligible**.

6.14.4 Impacts on the volume of sediment entering watercourses or coastal waters arising from excavation of ground materials during drilling or trenching may result in increased sedimentation of water bodies. With the implementation of mitigation measures detailed in this chapter, the effect on surface water or near shore coastal waters would be **negligible**.

6.14.5 There are not considered to be any significant inter-related effects between offshore and onshore parts of VE in terms of hydrology, hydrogeology and flood risk.

6.15 TRANSBOUNDARY EFFECTS

6.15.1 The likely effects of VE would be localised. It is not considered likely that there would be any trans-boundary effects in relation to hydrology, hydrogeology or flood risk. This has been agreed through scoping (Table 6.2).

6.16 SUMMARY OF EFFECTS

6.16.1 The potential hydrological and hydrogeological receptors in the study area comprise the tidal and fluvial floodplain; various watercourses; including Main Rivers and ordinary watercourses or drains; the near-shore tidal waters of the North Sea; and underlying groundwater bodies. These receptors vary in their environmental sensitivity from low to high.

6.16.2 The assessed magnitude of the various identified impacts of the onshore elements of VE on water quality and flood risk varies from **minor adverse** to **negligible**. Overall, through the implementation of mitigation measures, including those specified in the CoCP, it is considered that the likely overall effect of the onshore elements of VE on water quality and flood risk throughout the construction, operation and decommissioning of VE is **not significant** in EIA terms.

Table 6.15: Summary of effects.

Description of effect	Effect	Additional mitigation measures	Residual effects
Construction			
Onshore ECC installation: Impact 1: Generation of turbid or polluted runoff which could enter the water environment	Minor adverse or Negligible	None in addition to mitigation within the CoCP	Minor adverse or Negligible
Onshore ECC installation: Impact 2: Changes to surface water runoff patterns which could affect flood risk	Negligible	None in addition to mitigation within the CoCP	Negligible
Onshore ECC installation: Impact 3: Potential for damage to flood defences or surface water drainage infrastructure	Negligible	None in addition to mitigation within the CoCP	Negligible
Onshore ECC installation: Impact 4: Pollution or disruption of flow to groundwater through ground excavations or pilling	Minor adverse	None in addition to mitigation within the CoCP and onshore ECC FRA	Minor adverse
OnSS construction: Impact 1: Generation of turbid or polluted runoff which could enter the water environment	Minor adverse	None in addition to mitigation within the CoCP	Minor adverse
OnSS construction: Impact 2: Changes to surface water runoff patterns which could affect flood risk	Negligible	None in addition to mitigation within the CoCP	Negligible

Description of effect	Effect	Additional mitigation measures	Residual effects
OnSS construction: Impact 4: Pollution or disruption of flow to groundwater through ground excavations or pilling	Negligible	None in addition to mitigation within the CoCP and OnSS FRA	Negligible
Trenchless crossing works: Impact 1: Generation of turbid or polluted runoff which could enter the water environment	Minor adverse or Negligible	None in addition to mitigation within the CoCP	Minor adverse or Negligible
Trenchless crossing works: Impact 2: Changes to surface water runoff patterns which could affect flood risk	Negligible	None in addition to mitigation within the CoCP	Negligible
Trenchless crossing works: Impact 3: Potential for damage to flood defences or surface water drainage infrastructure	Negligible	None in addition to mitigation within the CoCP	Negligible
Trenchless crossing works: Impact 4: Pollution or disruption of flow to groundwater through ground excavations or pilling	Minor adverse to Negligible	None in addition to mitigation within the CoCP and onshore ECC FRA	Minor adverse to Negligible
Landfall installation: Impact 1: Generation of turbid or polluted runoff which could enter the water environment	Minor adverse	None in addition to mitigation within the CoCP	Minor adverse

Description of effect	Effect	Additional mitigation measures	Residual effects
Landfall installation: Impact 2: Changes to surface water runoff patterns which could affect flood risk	Negligible	None in addition to mitigation within the CoCP	Negligible
Landfall installation: Impact 4: Pollution or disruption of flow to groundwater through ground excavations or pilling	Minor adverse	None in addition to mitigation within the CoCP	Minor adverse
Operation			
OnSS: Impact 5: Changes to surface water drainage at the Onshore Substation location	Minor adverse to Negligible	None required	Minor adverse to Negligible
Decommissioning			
Impact 6: Generation of turbid or polluted runoff which could enter the water environment	Minor adverse or Negligible	None required	Minor adverse or Negligible

6.17 NEXT STEPS

6.17.1 The following steps will be undertaken in order to progress the assessment from PEIR stage to DCO Application stage:

- Once more detailed project design information with regard to cable route alignment within the ECC is available, the assessment presented in this chapter along with the proposed mitigation will be reviewed, updated if necessary, and presented in the DCO application.
- Any feedback received from consultees in relation to the PEIR will be reviewed, a response provided, and if any updates to the assessment and / or the proposed mitigation are required this will be done as part of the DCO application; and
- The OnSS FRA will be undertaken once a selection has been made on the location of the OnSS.

6.18 REFERENCES

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