NORTH FALLS

Offshore Wind Farm

PRELIMINARY ENVIRONMENTAL INFORMATION REPORT

Appendix 21.3 Flood Risk Assessment

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Glossary of Acronyms

AEP	Annual Exceedance Probability
AIL	Abnormal indivisible loads
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
AP	Annual Probability
AStGWF	Areas Susceptible to Groundwater Flooding
BEIS	Department for Business, Energy and Industrial Strategy
BGS	British Geological Survey
CDA	Critical Drainage Area
CFMP	Catchment Flood Management Plan
CIRIA	Construction Industry Research and Information Association
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
Defra	Department for the Environment and Rural Affairs
DNO	Distribution Network Operation
EIA	Environmental Impact Assessment
EN-1	Overarching National Policy Statement for Energy
ES	Environmental Statement
FRA	Flood Risk Assessment
HDD	Horizontal Directional Drilling
HDPE	High-density polyethylene
HGV	Heavy Goods Vehicle
IDB	Internal Drainage Board
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LNR	Local Nature Reserve
MLWS	Mean Low Water Springs
NFM	Natural Flood Management
NFOW	North Falls Offshore Wind Limited
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
PEIR	Preliminary Environmental Information Report
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
RBD	River Basin District
RBMP	River Basin Management Plan
SAC	Special Area of Conservation
SFRA	Strategic Flood Risk Assessment

SMP	Shoreline Management Plan
SPA	Special Protection Area
SPZ	Source Protection Zones
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
TJB	Transition joint bays
UKCP18	United Kingdom Climate Projections 2018
WFD	Water Framework Directive

Glossary of Terminology

Aquifer	Geological strata that hold water.
Coastal catchment	Land which drains directly to the coastal or estuarine waters, rather than through a river water body – not part of a river water body catchment.
Coastal / tidal flooding	When high tide events overtop the shoreline to cause flooding to land behind.
Fluvial flooding	When flows within watercourses exceed the capacity of the watercourse causing out of bank flows.
Geomorphology	The study of landforms and the processes that shape them.
Groundwater	Water stored below the ground in rocks or other geological strata.
Horizontal directional drilling (HDD)	Trenchless technique to bring the offshore cables ashore at the landfall. The technique will also be used for installation of the onshore export cables at sensitive areas of the onshore cable route.
Landfall construction compound	Compound at landfall within which HDD or other trenchless technique would take place.
Landfall search area	Locations being considered for the landfall, comprising the Essex coast between Clacton-on-Sea and Frinton-on-Sea.
Main River	Usually larger rivers and streams. The Environment Agency carries out maintenance, improvement or construction work on Main Rivers to manage flood risk.
National Grid connection point	The grid connection location for the Project. National Grid are proposing to construct new electrical infrastructure (a new substation) to allow the Project to connect to the grid, and this new infrastructure will be located at the National Grid connection point.
Onshore cable corridor(s)	Onshore corridor(s) within which the onshore export cables and associated infrastructure will be located. A final onshore cable route for which consent will be sought will be selected from within these corridor(s).
Onshore project area	The boundary in which all onshore infrastructure required for the Project will be located (i.e. landfall; onshore cable route, accesses, construction compounds; onshore substation and National Grid substation extension), as considered within the PEIR.
Onshore scoping area	The boundary in which all onshore infrastructure required for the Project will be located, as considered within the North Falls EIA Scoping Report.
Onshore substation	A compound containing electrical equipment required to transform and stabilise electricity generated by the Project so that it can be connected to the National Grid.
Onshore substation zone	Area within which the onshore substation will be located.
Ordinary Watercourse	Other rivers are called 'Ordinary Watercourses'. Lead Local Flood Authorities, District Councils and Internal Drainage Boards carry out flood risk management work on Ordinary Watercourses.
The Applicant	North Falls Offshore Wind Farm Limited (NFOW).
The Project Or 'North Falls'	North Falls Offshore Wind Farm, including all onshore and offshore infrastructure.
Transition joint bay	Underground structures that house the joints between the offshore export cables and the onshore export cables.
Surface water flooding	Surface water flooding occurs when rainwater does not drain away through normal drainage systems or soak into the ground but lies on or flows over the ground instead.

1 Introduction

1.1 Project overview

1. North Falls Offshore Wind Farm Limited (hereafter 'the Applicant') is proposing to construct an offshore wind farm off the coast of Essex, with the landfall zone between Clacton-on-Sea and Frinton-on-Sea, named the North Falls Offshore Wind Farm (hereafter 'North Falls' or 'the Project'). North Falls will include a number of offshore and onshore elements, including an offshore wind farm, offshore export cables to landfall, onshore export cables and an onshore substation for connection to the electricity transmission network.
2. It is noted that the North Falls Environmental Impact Assessment (EIA), reported in this Preliminary Environmental Information Report (PEIR), is based on a design envelope approach. For example, the siting of the Project infrastructure is limited to the identification of a number of search areas and zones.
3. As such this is based on the current understanding of the Project with the final location of the onshore substation, onshore export cables and onshore substation to be confirmed.
4. Furthermore, should refinements to the Project design be required following consultation on the PEIR, these will be reported on and assessed in the Environmental Statement (ES) which will support the Development Consent Order (DCO) application, including an updated Flood Risk Assessment (FRA).
5. The final design and siting of the Project infrastructure will be confirmed through detailed engineering design studies that will be undertaken post-consent. In order to provide a precautionary yet robust assessment at this stage of the development process, a worst-case scenario has been considered in terms of the potential flood risk impact that may arise.
6. The following document comprises a FRA to support Chapter 21 Water Resources and Flood Risk (Volume I) of the PEIR.

1.2 Aims

7. The aim of this FRA is to provide sufficient justification to regulators and other stakeholders that the Project is appropriate and in line with planning and national policy requirements regarding flood risk.
8. The aims of this FRA are:
   - To establish whether the Project is likely to be affected by current or future flooding from any source of flood risk;
   - To assess and identify the potential for the Project to increase flood risk elsewhere to off-site receptors;
   - To provide recommendations on potential measures required to reduce flood risk, if applicable; and

- To provide information required to support the PEIR with regards to flooding, supported by the application of the Sequential Test and, where necessary, the Exception Test.

1.3 Methodology

9. This FRA has been prepared in accordance with the methodology and guidance set out in EN-1 Overarching National Policy Statement for Energy (Department of Energy & Climate Change, 2011), the Draft EN-1 Overarching National Policy Statement (NPS) for Energy (Department for Business, Energy & Industrial Strategy, 2021), National Planning Policy Framework (NPPF) (Ministry of Housing, Communities & Local Government, 2021), Planning Practice Guidance (PPG) for Flood Risk and Coastal Change (Ministry of Housing, Communities & Local Government, 2022) and the Environment Agency's climate change allowance guidance (Environment Agency, 2022).

10. The Draft EN-1 Overarching NPS for Energy (2021) comprises an update to the EN-1 Overarching National Policy Statement (NPS) for Energy (2011). It includes policy with regard to flood risk in Section 5.8 of the document, including the requirement for a site-specific Flood Risk Assessment for all energy projects in Flood Zones 2 and 3.

11. It is noted that the policy set out within the Draft EN-1 Overarching NPS for Energy (2021) is aligned with the guidance set out in NPPF and the supporting PPG, which were current at the time of its publication.

12. The Draft EN-1 NPS states in Paragraph 5.8.5 that:

    "The aims of planning policy on development and flood risk are to ensure that flood risk from all sources of flooding is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to steer new development to areas with the lowest risk of flooding. Where new energy infrastructure is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and, where possible, by reducing flood risk overall. It should also be designed and constructed to remain operational in times of flood."

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

14. The latest climate change guidance sets out the Environment Agency's recommended climate change allowances for development when considering flood risk and coastal change for planning purposes (Environment Agency, 2022). The principal aim of these policies and guidance documents is to avoid inappropriate development in areas at risk of flooding and, wherever possible, to direct development away from the areas at highest flood risk.

15. The updated guidance comprised a number of amendments, including updates on the values to be used and how to apply the peak river allowances as well as updates to the approach with regard to peak rainfall allowances. The updated guidance on peak river flow allowances included amendments to utilise the UK Climate Projections 2018 (UKCP18) and provided a change of approach from the use of river basin districts to the use of management catchments.

Additionally, there was a change in guidance on how to apply peak river flow allowances such that the central allowance is to be adopted for all assessments except for essential infrastructure, where the higher central allowance is to be applied.

16. The updated guidance on the values for peak rainfall allowance are now provided for 1% annual probability (AP) events and for 3.3% AP events, as well as 2 future epochs rather than 3 epochs. Furthermore, the guidance on the approach to adopt for the application of peak rainfall allowances has changed, using the central allowance for development with a lifetime up to 2100 and the upper end allowance for development with a lifetime from 2100 to 2125.

17. The relevance and the applicability of the updated climate change guidance has been considered within this FRA. In addition, the appropriate climate change allowances have been reviewed and included within Section 6 of this FRA.

1.4 Study Area

18. Due to the scale of the Project spanning an area from the Essex coastline to approximately 24km inland from the coast, the flood risk varies across the study area. Therefore, to aid in this assessment, the onshore project area has been sub-divided into key sections within this document.

19. The flood risk to the landfall search area, onshore cable corridor(s) and onshore substation zone are identified separately within this FRA.

20. Furthermore, the assessment relating to flood risk connected to the onshore cable corridor(s) is further sub-divided into categories based on the Water Framework Directive (WFD) Surface Water Operational Catchments (see Figure 21.1, Volume II) as outlined below:

- Landfall search area and Onshore Cable Corridor(s) Section 1 – Holland Brook (South);
- Onshore Cable Corridor(s) Section 2 – Coastal Catchment;
- Onshore Cable Corridor(s) Section 3 – Holland Brook (North) and Wrabness Brook; and
- Onshore Cable Corridor(s) Section 4 – Tenpenny Brook.

21. This FRA is structured to introduce all relevant polices and guidance for FRAs and identify the existing flood risk within the study area for each element of the Project.

22. Following the identification of the flood risk to each element of the Project, mitigation measures related to the construction and operation of these are then discussed to ensure that there is no increase in flood risk either to, or as a result of, the Project.

2 Policy, Guidance and Consultation

2.1 Policy and Guidance Overview

23. Table 1 outlines all documents that are referenced in this FRA. Beneath the table, the documents and their constraints related to the Project are discussed in greater detail.

Table 1 Policy or Guidance Documents Referenced in this FRA

Policy or Guidance Document	Author / Produced on behalf of	Year Published
EN-1 Overarching National Policy Statement for Energy	Department of Energy & Climate Change / Department for Business, Energy and Industrial Strategy	2011, draft update in 2021
National Planning Policy Framework	Ministry of Housing, Communities and Local Government	2012, updated 2021
Planning Practice Guidance (NPPF PPG) for Flood Risk and Coastal Change	Ministry of Housing, Communities & Local Government	2014, updated 2022
Flood risk assessments: climate change allowances guidance	Environment Agency	2016, latest update in May 2022
Essex Lead Local Flood Authority (LLFA) Design Guide	Essex County Council	Version 6, March 2019, updated 2022
Preliminary Flood Risk Assessment (PFRA)	Essex County Council	2011
Strategic Flood Risk Assessment (SFRA) Level 1 Tendring SFRA	Tendring District Council	2017
Tendring Local Plan 2013 – 2033	Tendring District Council	Adopted January 2021
Core Strategy for Tendring	Tendring District Council	Adopted 2010
Essex Local Flood Risk Management Strategy (LFRMS)	Essex County Council	2018
North Essex Catchment Flood Management Plan (CFMP)	Environment Agency	2009
SMP8: Landguard Point to Two Tree Island (SMP)	East Anglia Coastal Group	2012

2.2 Draft EN-1 Overarching National Policy Statement for Energy

24. The Draft EN-1 Overarching NPS for Energy (2021) comprises an update to the EN-1 Overarching National Policy Statement (NPS) for Energy (2011). It includes policy with regard to flood risk in Section 5.8 of the document, including the requirement for a site-specific Flood Risk Assessment for all energy projects in Flood Zones 2 and 3.

25. It is noted that the policy set out within the Draft EN-1 Overarching NPS for Energy (2021) is aligned with the guidance set out in NPPF and the supporting PPG, which were current at the time of its publication.

26. The Draft EN-1 NPS states in Paragraph 5.8.5 that:

"The aims of planning policy on development and flood risk are to ensure that flood risk from all sources of flooding is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to steer new development to areas with the lowest risk of flooding. Where new energy infrastructure is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and, where possible, by reducing flood risk overall. It should also be designed and constructed to remain operational in times of flood."

27. It provides guidance on the decision-making process to the adopted by the Secretary of State, application of the Sequential Test (and Exception Test, where required) as well as a summary on the need for appropriate mitigation measures.

28. This assessment has sought to consider the policy with regards to flood risk as set out in the Draft EN-1 Overarching NPS for Energy (2021), wherever possible, to mitigate the impact of flood risk both to and from the Project.

2.3 National Planning Policy Framework

29. NPPF (Ministry of Housing, Communities and Local Government, 2021), PPG for Flood Risk and Coastal Change (Ministry of Housing, Communities and Local Government, 2021) and 'Flood risk assessments: climate change allowances guidance' (Environment Agency, 2022) provide direction on how flood risk should be considered at all stages of the planning and development process.

30. The planning system should ensure that new development is safe and not exposed unnecessarily to the risks associated with flooding. This FRA sets out the planning and wider context within which the Project needs to be considered along with the flood risk to the onshore study area (as defined in Section 1.4).

31. The revised NPPF (2021) provides clarification that all strategic policies / plans should apply a sequential, risk-based approach to the location of development taking into account all sources of flood risk. It also provides guidance on how this is to be considered in the context of the location of site-specific development.

32. Further guidance, on the application of the Sequential Test and Exception Test is provided in the supporting PPG (Ministry of Levelling Up, Communities and Local Government, 2022) in terms of all sources of flood risk, Flood Zones and the Vulnerability Classification relevant to the development.

33. Within the supporting PPG (Paragraph 027), it is noted that:

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

34. The 2022 update to the PPG (published on 25th August 2022) requires the Sequential Test to assess the flood risk from all sources, in terms of development vulnerability for reasonably alternative sites.

35. For the purposes of the FRA, based on the indicative flood risk issues in relation to the Project, the application of a sequential approach has been considered, specifically with regard to the onshore substation zone.

36. This assessment has sought to consider the potential flood risk from all sources in greater detail with the aim of sequentially locating it, wherever possible, to avoid the risk.

2.4 Tendring Local Plan 2013 – 2033

37. The Tendring Local Plan was adopted in January 2021. Of specific relevance to the Project is *Policy PPL 1 Development and Flood Risk* which states:

"All development proposals should include appropriate measures to respond to the risk of flooding on and/or off site. Within the Flood Zone (which includes Flood Zones 2 and 3, as defined by the Environment Agency) shown on the Policies Map and Local Maps, or elsewhere involving sites of 1ha or more, development proposals must be accompanied by a Flood Risk Assessment. Where development is classified as "more vulnerable" the Flood Risk Assessment (FRA) should demonstrate that there will be no internal flooding in the event of a "design event flood". The FRA should demonstrate that in the event of a breach or failure of flood defence infrastructure, refuge will be available above flood levels and that a means of escape is possible from first floor level.

All development classified as "More Vulnerable" or "Highly Vulnerable" within Flood Zone 2 and 3 should set finished floor levels 300mm above the known or modelled 1 in 100 annual probability (1% Annual Exceedance Probability (AEP)) flood level including an allowance for climate change.

All new development within Flood Zones 2 and 3 must not result in a net loss of flood storage capacity, unless there is compensation on site or, if not possible, adjacent offsite capacity. Where possible opportunities should be sought to achieve an increase in floodplain storage.

All major development proposals should consider the potential for new Blue and Green Infrastructure to help mitigate potential flood risk and include such Green Infrastructure, where appropriate.

All development proposals will be considered against the National Planning Policy Framework's 'Sequential Test', to direct development toward sites at the lowest risk of flooding, unless they involve land specifically allocated for development on the Policies Maps or Local Maps.

Where new development cannot be located in an area of lower flood risk and is otherwise sustainable, the Exception Test will be applied in accordance with the National Planning Policy Framework so that it is safe and meets wider sustainability needs."

38. The remainder of this FRA demonstrates how the Project will be delivered in accordance with the guidance set out in Policy PPL 1 above.

2.5 Preliminary Flood Risk Assessment

39. The most recent Preliminary Flood Risk Assessment (PFRA) for the county was produced by Essex County Council in July 2011 (Essex County Council, 2011) to assist in its duties to manage local flood risk and deliver its requirements under the Flood Risk Regulations 2009.

40. The PFRA provides a high-level overview of the potential risk of flooding from local sources and identifies areas at flood risk which may require more detailed studies. The PFRA is used to inform the development of the Local Flood Risk Management Strategy.

2.6 Local Flood Risk Management Strategy

41. Essex County Council produced the North Essex Local Flood Risk Management Strategy (LFRMS) in 2018 (Essex County Council, 2018), which outlines the aims and objectives of the Council in their role as the Lead Local Flood Authority (LLFA) and provides policies based on these aims.

42. The Town and Country Planning (Consultation) (England) Direction 2021 notes that flood risk areas include *"Flood Zone 1 which has critical drainage problems, and which has been notified for the purposes of article 10 of the Order to the local planning authority by the Environment Agency"*.

43. These are identified by the Environment Agency as Critical Drainage Areas (CDAs).

44. Consideration of CDAs is necessary to inform key flood risk priorities. From a review of the LFRMS none of the locations within the onshore study area appear to be within areas designated as CDAs.

2.7 Strategic Flood Risk Assessment

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

46. Tendring District Council produced the Tendring District Level 1 and Level 2 SFRA in 2009. In addition, an addendum to the Tendring SFRA was published in 2017. This included a review of updates to the modelling for the Holland Brook and the Kirby Brook, which are considered to be relevant to the Project.

47. The Level 1 Tendring District SFRA informs the Local Plan for development by delineating areas that are at high risk of flooding from tidal, fluvial and surface water sources. Therefore, development sites will be required to pass the Sequential and, where necessary, Exception Tests in accordance with the NPPF. The onshore substation zone is partially located within the area defined by the site allocation '3 Parcels land Newhall Farm Horsley Cross, Bromley Rd Lt Bromley Ardleigh Rd Little Bromley UC4.5 (165)', although the SFRA notes that there is a varying flood risk for this site allocation parcel of land.

2.8 Catchment Flood Management Plan

48. Catchment Flood Management Plans (CFMPs) consider all types of inland flooding including from rivers, groundwater, surface water and tidal flooding. Flooding directly from the sea (coastal flooding) is covered in Shoreline Management Plans (SMPs) (Section 2.9). CFMPs consider the likely impacts of climate change, the effects of how we manage the land and how areas can be developed sustainably to establish flood risk management policies which will deliver sustainable flood risk management for the long term.

49. The onshore project area is covered by the North Essex CFMP (2009). The onshore project area is located in Sub-area 1. Blackwater and Chelmer, Upper Reaches and Coastal Stream. The policy for this Sub-area is Policy 2 which is classed as '*areas of low to moderate flood risk where the Environment Agency can generally reduce flood risk management activitie*s'.

50. The onshore project area includes the relatively small Environment Agency Main River, the Holland Brook, which drains southwards into the North Sea at Holland Haven, numerous Ordinary Watercourses which also drain into the North Sea, either at Hamford Water National Nature Reserve to the east, or into Holland Haven to the south.

51. The North Essex CFMP indicates the main source of flood risk within this Sub-area is tidal flooding from the North Sea in the southern extent of the Project, and fluvial flooding from the Holland Brook to the inland elements of the onshore cable corridor(s). The Holland Brook outfalls through coastal defences, so is prone to tidal locking, which could be exacerbated by future sea level rises.

2.9 Shoreline Management Plan

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

53. The onshore project area is covered by SMP8: Languard Point to Two Tree Island. Specifically, the landfall is located within Policy Unit C2: Holland Haven.

54. The preferred policy for the short term (present day - 2025) and medium term (2025 – 2055) for this policy unit is 'Hold the Line'. In addition, the preferred policy for the long term (2055 – 2105) is 'Hold the Line / Managed Realignment (low lying ground at risk)'.

55. The Languard Point to Two Tree Island SMP states the following regarding Policy Unit C2:

"At Holland Haven (PDZ C2) the defences are under pressure and a landward realignment would create a more sustainable situation by reducing the pressure on defences and moving towards a more natural coastal frontage. However, the situation is complex and sensitive.

The SMP's intent of management for Holland-on-Sea is to support a long term sustainable solution and adaptation. In the short term and the medium term, the intent is to hold the existing frontline defences where they are now.

After 2055 a dual policy means that the existing frontline defences may be held where they are currently, or some form of Managed realignment may be *implemented. It needs to be noted that in the long term, holding the line at this frontage will be challenging, and funding may have to come from a variety of sources. In both cases, so also if Managed realignment takes place, all dwellings and infrastructure will remain protected, which will require moving some of the defences to a more sustainable sheltered position.*

Whether the policy in Epoch 3 is Hold the line or Managed realignment, all dwellings and infrastructure will remain protected, which will require moving some of the defences to a more sustainable sheltered position but this would need to be explored more fully in the future with full community consultation before finalising a policy option. The importance of protecting Holland Sewerage Treatment Works was recognised by the Elected Members Forum and this was seen as a priority for protection for the next 100 years.

This realignment would impact on the Holland Haven Country Park and the Frinton-on-Sea Golf Course. The realignment would create new intertidal habitats and opportunities for new forms of tourism and recreation. It would have some impact on heritage assets, particularly the archaeological potential within the realignment area, which would require mitigation by design and recording as part of implementation of the Plan. The footpaths on top of and toward the sea bank to be breached would need to be sustained, for example through re-routing. The impact of the potential realignment on tourism and recreation is difficult to quantify, and realignments can have both positive and negative impacts. This impact will be taken into account during project appraisal and scheme development, which would be carried out with full stakeholder involvement before any works start."

56. As the Project would make landfall in proximity to a number of the features identified within Policy Unit C2, this should be considered with regard to any long term impacts this may have on the Project once operational.

2.10 Flood Risk Stakeholders and Consultation

57. The onshore project area is located within the authority area of Essex County Council, as the LLFA, and Tendring District Council.

58. Under the Flood and Water Management Act 2010 LLFAs are responsible for managing flooding from surface water, groundwater and Ordinary Watercourses. Among other responsibilities they are required to deliver a strategy for local flood risk management in their areas, to investigate flooding and to maintain a register of flood risk assets.

59. As the LLFA, Essex County Council is also responsible for consenting works that affect the flow of an Ordinary Watercourse under the terms of the Flood and Water Management Act 2010, Land Drainage Act 1991 and Water Resources Act 1991.

60. A review of the mapping provided by the Association of Drainage Authorities has confirmed that the onshore project area is not situated within an Internal Drainage Board (IDB).

61. The Environment Agency is also a key flood risk stakeholder in this Project, due to their management of the Main Rivers that the onshore cable corridor(s) will be required to cross.

2.11 Potential Permitting / Consenting Requirements

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

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

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

64. All Main Rivers and Ordinary Watercourses identified to be crossed by the Project have been identified as part of the Crossing Schedule (see Chapter 5 Project Description (Volume I), Appendix 5.1 Crossing Schedule (Volume III)).

65. It is likely the Applicant will seek to disapply the requirement to obtain various consents within its DCO application (as is standard for NSIP projects), with the consent of the relevant consenting authority. If that is not the case, then all necessary applications for watercourse consents will be made to and agreed with the appropriate authority post-DCO consent.

2.12 Data collection and consultation

66. To accurately ascertain potential flood risk to the Project, Product 4, 5 and 8 data packages were requested from the Environment Agency, and information provided on 5th October 2022 for key locations related to strategic watercourse crossings along the onshore cable corridor(s), landfall search area and the onshore substation zone.

67. At the time of writing this FRA the above data has not been received and publicly available online mapping has been used. However, the Product 4, 5 and 8 information will be incorporated into the FRA once received for submission alongside the ES, which will support the DCO application.

68. In addition, an email data request was submitted to Essex County Council, as the LLFA, on 5th October 2022, and a response was received on the same date (5th October 2022).

69. Within the email response, guidance was provided confirming that basic information such as flood risk, flood assets and previous flood investigations can be found on their website. On this basis, the online information has been reviewed as part of this FRA.

3 Baseline Environment

3.1 Hydrology

70. The review of the hydrology for the Project has been based on river water body catchments as defined by the Environment Agency and illustrated in Figure 21.1 (Volume II). Receptors are those river water bodies that are crossed, or their catchments are crossed, by the onshore project area, as well as those that are located downstream. Water body catchments are grouped within their respective operational catchments.

71. The onshore infrastructure associated with the Project lies within two operational catchments:

- Colne Essex operational catchment
  - Holland Brook; and
  - Tenpenny Brook.
- Stour operational catchment
  - Wrabness Brook; and
  - Coastal catchment associated with Hamford Water.

3.1.1 Holland Brook Catchment

72. The Holland Brook (Main River) rises near Little Bromley and flows in a south-easterly direction to Holland Haven where it meets the sea. It is a largely rural catchment and is fed by numerous tributaries. These include Tendring Brook, Weeley Brook and Kirby Brook (all classified as Main Rivers).

73. In the lower reaches of the catchment, the Main River flows through Holland Haven Marshes Site of Special Scientific Interest (SSSI), which is an area of neutral grassland, reclaimed estuarine saltmarsh and freshwater marsh with an extensive ditch system (Natural England, 2022a). The SSSI extends upstream on Holland Brook as far as Hunter's Bridge. The main tributary watercourse in the SSSI is Kirby Brook, which flows west from Frinton-on-Sea into the Holland Brook, close to its mouth.

3.1.2 Tenpennny Brook Catchment

74. The Tenpenny Brook (Main River) rises south-west of Great Bromley, from where it flows in a southerly direction towards Mill Dam and into Alresford Creek and the Colne Estuary. The latter is designated as a SSSI for littoral sediment, inshore sublittoral sediment and neutral grassland (Natural England, 2022b).

3.1.3 Wrabness Brook

75. The Wrabness Brook is an Ordinary Watercourse, apart from a short section of Main River close to its confluence with the Stour. It rises north of the A120 near Horsleycross Street. It then flows in a north easterly direction to join the River Stour at Wrabness Point. The catchment is rural and for most of its length the watercourse flows in a relatively narrow, confined valley. At the coast the

channel is straight and is joined by other engineered ditches in a relatively wide valley, that is protected from inundation by an embankment.

76. The lower course of the Wrabness Brook overlaps with several designated sites. These are: Stour Estuary SSSI, Stour and Orwell Estuaries Special Protection Area (SPA), Stour and Orwell Estuaries Ramsar, Suffolk Coasts Heaths Area of Outstanding Natural Beauty (AONB) and Wrabness Local Nature Reserve (LNR).

77. The SSSI is nationally important for 13 species of wintering waterfowl and three species on autumn passage. The estuary is also of national importance for coastal saltmarsh, sheltered muddy shores, two scarce marine invertebrates and a scarce vascular plant assemblage (Natural England, 2022c).

3.1.4 Coastal Catchment associated with Hamford Water

78. The coastal catchment associated with Hamford Water has an area of approximately 40 km^2. The onshore project area crosses a tributary section of Main River that rises near Beaumont and flows in a southerly and then easterly direction to join Beaumont Cut near Quay Farm. Beaumont Cut joins Landermere Creek, which then flows to Hamford Water.

79. The catchment is predominantly rural and the channel flows in a relatively narrow valley before turning east towards Beaumont Bridge, where it occupies a wide and shallow east facing valley. Hamford Water is a Special Protection Area (SPA) designated for its internationally important populations of breeding little terns and wintering dark-bellied brent geese, wildfowl and waders. It also supports communities of coastal plants which are rare or extremely local in Britain, including hog's fennel *Peucedanum officinale* (Natural England, 2022d) and is a Special Area of Conservation (SAC) for its population of Fisher's Estuarine moth. Hamford Water is also a SSSI and a Ramsar site for its various waterbird populations and wetland habitats.

3.2 Existing Surface Water Drainage System

80. In addition to the above information, it is noted that the Project will be located on predominantly rural, agricultural land, where there is likely to be limited existing formal surface water drainage systems.

81. However, as noted above there are a large number of agricultural land drains and Ordinary Watercourses that will need to be crossed along the onshore cable corridor(s).

3.3 Geology and Hydrogeology

82. The British Geological Survey (BGS) 1:50,000 scale solid and superficial geology geological mapping has been reviewed for the onshore project area.

83. As would be expected from a linear project of this nature, the geological conditions within the onshore project area vary. However, these can be summarised as follows:

- Superficial Deposits:
  - Alluvium Clay of sedimentary clay and silt;

  - An area of no superficial geology;
  - Kesgrave Catchment Subgroup of sand and gravel; and
  - Cover sand of clay, silt, and sand.
- Bedrock Geology:
  - Thames Group Clay of clay, silt, and sand.

84. Alluvium Clay formation and Kesgrave Catchment Subgroup formations are classified as Secondary A superficial aquifers. Secondary A Aquifers are composed of permeable strata capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of baseflow to rivers.

85. Cover Sand formations are classified as Secondary B aquifers superficial aquifers. A Secondary B Aquifer comprises predominantly lower permeability strata which may in part have the ability to store and yield limited amounts of groundwater by virtue of localised features such as fissures, thin permeable horizons and weathering

86. The bedrock geology of the entire onshore project area is defined as being unproductive with relation to aquifers.

87. In addition, the northern area of the onshore cable corridor(s), close to the onshore substation zone, is shown to be within a Zone III Source Protection Zone.

88. The Department for Environment, Food & Rural Affairs' (Defra) MAGIC Map indicates that the onshore project area has been classified as having "Unproductive", "Low" and "Medium Low" groundwater vulnerability risk.

89. A Medium Low Groundwater vulnerability designation indicates that the soil may be able to transmit pollution to groundwater, which is characterised by medium leaching potential in soils and the absence of low permeability superficial deposits.

90. The study area is underlain by three WFD groundwater bodies, as follows:

- Holland Brook,
- Ramsey River; and
- Tenpenny Brook.

3.3.1 Ground Investigations

91. To aid in the understanding of flood risk and to inform the identification of potential drainage solutions for the permanent above ground infrastructure, i.e. onshore substation, a series of ground investigations will be undertaken. The ground investigation for the onshore substation will be undertaken post-DCO.

92. The results of these will be utilised to understand the potential for infiltration to be adopted, in line with the Sustainable Drainage Systems (SuDS) Hierarchy, for the operational drainage of surface water from the onshore substation and to aid in the development of the detailed design.

4 Definition of Flood Hazard

93. This section explores the risk of flooding to the key study area elements (landfall search area, onshore cable corridor(s) and onshore substation zone), as well as the temporary elements, as outlined in Section 18.2.1.3.1. As discussed in Section 1.4, the onshore cable corridor(s) has been considered in key sections based on the Water Framework Directive (WFD) Surface Water Operational Catchments (see Figure 21.1, Volume II). Where flood risk is identified, appropriate mitigation methods are discussed within Section 8.

4.1 Flood Zones

94. The PPG, through the application of the Sequential Test, aims to steer development towards areas at lowest risk of flooding (Flood Zone 1) and away from Medium and High flood risk areas (Flood Zones 2 and 3).

95. Flood Zones are informed by the extent of modelling undertaken by the Environment Agency. All designated Main Rivers, as well as some of the larger Ordinary Watercourses included in the modelling, are considered within the Flood Zone datasets.

96. It is acknowledged that there may be a flood risk associated with Ordinary Watercourses which are intercepted by the onshore cable corridor(s). However, due to the relative size and frequency of these watercourses and the associated information related to flood risk, they are considered independently from Main Rivers, as well as within the surface water flood risk section for each of the study area elements.

97. The updated PPG published in August 2022 provides guidance on how the Sequential Test should be applied for other sources of flooding. It is important to note surface water flood risk has been considered alongside the assessment of Flood Zones for all elements of the Project.

4.2 Watercourse Crossings

98. Information provided within the Crossing Schedule (see Appendix 5.1 Crossing Schedule (Volume III)) indicates that there are two Environment Agency Main Rivers that are crossed by the onshore cable corridor(s). These include two crossings over the Holland Brook, in two different locations. The first of these is behind the costal flood defences and adjacent to the North Sea frontage and the second of the crossings is over an eastern tributary of the Holland Brook, in a location to the south east of Goose Green and north of the B1035.

99. All Main Rivers will be crossed using trenchless techniques, to avoid direct interaction with these watercourses. The cable entry and exit pits will be at least 9m from the banks of the watercourse, and a minimum depth of 1.5m and maximum depth of 20m below the hard bed level.

4.3 Landfall and Onshore Cable Corridor(s) Section 1 – Holland Brook (South)

4.3.1 Overview of Proposed Activities

100. 'Landfall' refers to the area between Mean Low Water Springs (MLWS) and location at which the offshore export cables are brought ashore, and connected to the onshore export cables within transition joint bays (TJB) of the Project's onshore transmission infrastructure. High-density polyethylene (HDPE) ducts to house the cables are proposed to be installed at landfall using horizontal directional drilling (HDD).

101. Offshore export cables are then pulled through the pre-installed ducts which terminate at the transition joint bay and are jointed to onshore export cables within the landfall compound.

102. At this stage in the Project's design, a broad landfall search area has been identified between Clacton-on-Sea and Frinton-on-Sea (approximately 2km). In addition, broad onshore cable corridor(s) have been identified within which the onshore export cables will be located. These provide the connection to the onshore substation approximately 24km inland.

103. This first section of the onshore cable corridor(s) is located within the Holland Brook WFD Surface Water Operational Catchment, which runs from the landfall search area northwards for approximately 6km. Prior to submission of the Project's DCO application, a single landfall location will be identified. The temporary landfall construction compound (once a location is identified) will be 100m x 200m.

104. The onshore cable corridor(s) in this section is currently approximately 243m across, with wider sections where temporary construction compounds may be situated. Ongoing site selection and design work means that the onshore cable corridor(s) will also be refined and narrowed prior to DCO submission.

4.3.2 Historical Flooding

105. To understand the likely risk of flooding to the Project, a review of historical flood events and their frequency has been undertaken. This review aims to provide an understanding as to the context of flooding in the onshore project area, identifying areas of focus where there are likely to be flooding issues. However, it should be noted that the absence of historical flood records does not necessarily confirm that flooding has not occurred.

106. The Environment Agency Historical Flood Extent map shows that the landfall search area and this section of the onshore cable corridor(s) is located wholly outside of the historical flood extent.

107. A review of the Tendring District SFRA and the LLFA online flooding information provides no indication of historical flooding affecting the landfall search area and onshore cable corridor(s) in this location.

4.3.3 Flood Zone

108. The areas in front of and behind the coastal frontage, between the Holland Gap to Chevaux de Frise Point Coastal Defence wall, are shown to be situated within Flood Zones 2 and 3. The extent of these flood zones vary; however, they broadly follow the alignment of the Holland Brook and extend up to approximately 1km inland from the coastal frontage.

109. It is confirmed that the majority of this section, comprising the width of the landfall search area and the initial section of the onshore cable corridor(s), is situated within Flood Zone 1.

4.3.4 Flooding from Rivers

110. The Holland Brook flows into the North Sea at the coastline within this section. Given the Holland Brook's close proximity to the North Sea, the dominant source of flooding in this area is from tidal sources, as opposed to fluvial sources.

111. Therefore, there would be no fluvial risk to the onshore cable corridor(s) based on the existing flood risk, the use of trenchless techniques for installation and its location below ground once operational.

4.3.5 Flooding from the Sea

112. The entire width of the landfall search area and the initial section of the onshore cable corridor(s) is shown to be in Flood Zone 2 or 3.

113. In this location, the Flood Map for Planning indicates these areas benefit from the presence of defences. This is in the form of the Holland Gap to Chevaux de Frise Point Costal Defence wall.

114. The Standard of Protection of this flood defence is unconfirmed. However, the flood defence wall has an Effective Upstream Crest Level of 4.85m AOD at its lowest point, according to the Environment Agency online mapping layers.

115. Given that much of the southern end of this Section of the Project is shown by the Environment Agency Flood Map for Planning to benefit from the presence of flood defences, there is a residual risk of overtopping and / or breaching of these coastal frontage defences.

4.3.6 Flooding from Groundwater

116. This section of the onshore cable corridor(s), associated with the southern areas of the Holland Brook WFD catchment, is located over superficial deposits of Kesgrave Catchment Subgroup and Cover Sand, which are classified as Secondary A and Secondary B Aquifers respectively.

117. The Tendring District SFRA shows the Areas Susceptible to Groundwater Flooding (AStGWF), which is a strategic scale map showing groundwater flood areas based on a 1km square grid. The data shows the proportion of each 1km grid square where geological and hydrogeological conditions show that groundwater might emerge. It should be noted that it does not show the likelihood of groundwater flooding occurring.

118. The onshore cable corridor(s) in this section passes through three different 1km grid squares of the Tendring District SFRA AStGWF map, which classifies 25% - 50% of these areas to be at risk of groundwater emergence. The remainder of this section of the onshore cable corridor(s) passes through 1km square grids where <25% of the area is classified as being at risk of groundwater emergence.

119. Once operational, the effect that the onshore export cables will have on groundwater flows is likely to be low as the buried cable will be located at a target depth of at least 0.9m below ground (subject to localised variations such as limiting interaction to shallow or near surface groundwater). Given the depth of the onshore export cables, it is likely to be constructed within the superficial deposits. As shown previously, there are two types of superficial deposits along the route of the onshore cable corridor(s) in this section, which are classed as Secondary A and Secondary B Aquifers.

120. As the construction works require earthworks in order to place the onshore export cables, it is important to note that perched groundwater may be present below areas of the onshore cable corridor(s) and could be encountered during the below-ground engineering works.

121. There is a risk to the onshore export cables from the perched groundwater in the areas of Secondary A and Secondary B Aquifers. If perched groundwater were to be encountered, it would need to be mitigated by appropriate construction techniques and in accordance with an appropriate method statement. This will be secured within the Outline Code of Construction Practice (OCoCP), which will be produced for the ES and submitted as part of the DCO application.

122. Based on the above information there is likely to be a Very Low groundwater flood risk along the onshore cable corridor(s) and this risk will be mitigated, as outlined above.

4.3.7 Flooding from Surface Water

123. The areas where the onshore cable corridor(s) crosses the Ordinary Watercourses are identified as having a higher risk of surface water flooding. However, this is primarily limited to the width of the watercourse channel and relates to the lower lying area comprising the channel itself and the land draining into it. At this stage in the Project's design, trenchless techniques cannot be committed to at all locations, where the engineering feasibility of using such techniques needs further assessment before it can be confirmed. The list of techniques being considered at each crossing is described in Chapter 5 Project Description (Volume I), Appendix 5.1 Crossing Schedule (Volume III).

124. The onshore cable corridor(s) crosses the Holland Brook, where it is classed as an Environment Agency Main River. The Holland Brook is to be crossed at this point using trenchless techniques, in accordance with the approach to be adopted for the wider area comprising the Holland Haven Marshes SSSI. This crossing in the far south of this section of the onshore cable corridor(s) is shown on the Environment Agency's Long-Term Flood Risk Information map as being primarily at high risk of surface water flooding with areas of low and medium risk further away from the Holland Brook.

125. Both to the south close to the coastal frontage and further north along the onshore cable corridor(s), the cable route passes over numerous unnamed channels and ditches. These are not classified as being Environment Agency Main River and are likely to be small channels or ditches classed as Ordinary Watercourses, comprising tributaries into the Holland Brook. These include areas at high risk of surface water flooding which appear to connect to and flow into the Holland Brook, further south in the catchment.

126. Any surface water flood risk to the onshore cable corridor(s) will be temporary in nature and removed once construction is complete as all onshore infrastructure associated with the onshore export cables will be located below ground.

127. The land will be reinstated and existing ground levels will be maintained. Mitigation during construction is discussed in Sections 7 and 8 in relation to both surface water and Ordinary Watercourses. This will be secured within the OCoCP, which will be produced for the ES and submitted as part of the DCO application.

128. The risk of flooding from surface water is therefore considered to be Low for this section of the onshore cable corridor(s).

4.3.8 Flooding from Sewers

129. The Tendring SFRA (2009) does not include any incidents of sewer flooding, detailed by Anglian Water through their DG5 register. The DG5 database records incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding (on a 4-5 postcode digit basis).

130. The onshore cable corridor(s) is located within existing agricultural land and, therefore, it is likely that there is a limited foul sewer network within the proximity of this location. The risk of flooding from sewers is therefore considered to be Low for this section of the onshore cable corridor(s).

4.3.9 Flooding from Reservoirs

131. Reservoirs with an impounded volume greater than 25,000 cubic metres (m^3) are governed by the Reservoirs Act 1975 and are listed on a register held by the Environment Agency. The level and standard of inspection and maintenance required under the Reservoirs Act 1975 means that the risk of flooding from reservoirs is relatively low.

132. Recent changes to legislation under the Flood and Water Management Act 2010 require the Environment Agency to designate the risk of flooding from these reservoirs.

133. Flooding from reservoirs is defined based on the implications of a large uncontrolled release of water from registered reservoirs i.e. greater than 25,000m^3.

134. The Environment Agency Flood Risk from Reservoirs map shows the southern area of this section of the onshore cable corridor(s) and the landfall are at risk of flooding from a reservoir breach. This is similar to the flood extent associated with flooding from rivers. The Environment Agency mapping defines the risk of

reservoir flooding in this location as being within the maximum extent of flooding when there is also flooding from rivers. As such, these areas of potential reservoir flooding appear to be associated with the Holland Brook, in the far south of this section and located immediately to the rear of the coastal frontage.

135. However, given the regulatory requirements associated with reservoirs, the risk of reservoir failure remains Low.

4.3.10 Flooding from Canals and other Artificial Sources

136. The onshore cable corridor(s) in this section is not located near to any canals or other artificial sources, with the exception of the reservoirs discussed above. As such there is no risk of flooding from canals or other artificial sources to the landfall and this section of the onshore cable corridor(s).

4.3.11 Summary of Flooding

137. Overall, this section of the onshore cable corridor(s) is not at risk from fluvial sources, canals or other artificial sources. There is a Very Low risk of flooding associated with groundwater sources. Furthermore, there is a Low risk of flooding from sewers and reservoir sources.

138. The risk of flooding from tidal / coastal flooding is relatively Low due to the presence of the existing flood defences protecting this section. There is however a residual risk of flooding from overtopping and / or breaching of these coastal flood defences.

139. This section of the onshore cable corridor(s) passes numerous small areas of high surface water flood risk, associated with the Holland Brook and its tributaries. However, this is limited to locations where the onshore cable corridor(s) is required to pass under these watercourses or ditches.

4.4 Onshore Cable Corridor(s) Section 2 – Coastal Catchment

4.4.1 Overview of Proposed Activities

140. At this stage in the Project's design, broad onshore cable corridors have been identified within which the onshore export cables will be located. These corridors are up to 243m in width depending on the degree of engineering flexibility required prior to the completion of further EIA and engineering design studies. Multiple corridors have been retained in certain locations in order to maintain additional flexibility at this stage. Prior to submission of the Project's DCO application, these onshore cable corridors will be refined into a single onshore cable route, within which the Project's onshore export cables construction works will take place.

141. This second section of the onshore cable corridor(s) runs through the south west of the Coastal WFD Operational Catchment area for approximately 3.5km.

142. Three potential corridors have been identified, around the north of Thorpe-Le-Soken. Each of these have been assessed for potential flood risk and the results of the assessment in the FRA show that the southernmost potential corridor has the lowest flood risk.

143. The width of all three potential corridors in this section are similar, however the northernmost is the longest, whilst the southernmost is shown to be the shortest through this section.

4.4.2 Historical Flooding

144. To understand the likely risk of flooding to the Project a review of historical flood events and their frequency has been undertaken. This review aims to provide an understanding as to the context of flooding in the onshore project area, identifying areas of focus where there are likely to be flooding issues. However, it should be noted that the absence of historical flood records does not necessarily confirm that flooding has not occurred.

145. The Environment Agency Historical Flood Extent map shows that parts of both the northernmost and central routes are situated in areas which are within an Environment Agency historical flood extent.

146. The southernmost onshore cable corridor in this section is shown to be situated entirely outside of any Environment Agency Historical Flood Extent.

147. A review of the Tendring District SFRA and the LLFA online flooding information provides no indication of historical flooding affecting the onshore cable corridor(s) in this location, including all three potential options.

4.4.3 Flood Zone

148. The majority of this section, comprising the onshore cable corridor(s), is situated within Flood Zone 1. The northernmost and central options are shown to pass through areas of approximately 1km in length comprising Flood Zone 2 or 3. A greater proportion of the northernmost route passes through Flood Zone 2 or 3, than the central route option.

149. Furthermore, the southernmost option is shown to be wholly located in Flood Zone 1.

4.4.4 Flooding from Rivers

150. Given the location of this section within the coastal catchment, the dominant source of flooding is from tidal sources, more specifically from the Landermere Creek Estuary, as opposed to fluvial sources.

151. Therefore, there would be no fluvial risk to the onshore cable corridor(s) based on the existing flood risk and its location below ground once operational.

4.4.5 Flooding from the Sea

152. Parts of both the northernmost and the central corridor options are shown to be in the tidal Flood Zone 2 or 3.

153. In this location, the Flood Map for Planning indicates these areas benefit from the presence of defences. This is in the form of the Landermere Hall Coastal Defence embankment.

154. The Standard of Protection of these flood defences is unconfirmed. However, the flood defence wall has an Effective Upstream Crest Level of 4.42m AOD at its lowest point, according to the Environment Agency online mapping layers.

155. Given that much of the southern end of this Section of the Project is shown by the Environment Agency Flood Map for Planning to benefit from the presence of flood defences, there is a residual risk of overtopping and / or breaching of these coastal frontage defences.

156. There is the potential for flood risk to the northernmost and central onshore corridor options during construction. However, the risk to the onshore export cables will be mitigated by appropriate construction techniques and in accordance with an appropriate method statement.

157. This will be secured within the OCoCP. The risk of flooding to the onshore cable corridor(s) will be removed upon completion of the cable laying phase, as all infrastructure will be located underground, with the cable, joint bays and link boxes sealed from water ingress.

4.4.6 Flooding from Groundwater

158. This section of the onshore cable corridor(s), associated with the southern areas of the coastal catchment is located over superficial deposits of Alluvium including clay and silt, Kesgrave Catchment Subgroup, and Cover Sand, which are classified as Secondary A and Secondary B Aquifers respectively.

159. The Tendring District SFRA shows the AStGWF, which is a strategic scale map showing groundwater flood areas based on a 1km square grid. The data shows the proportion of each 1km grid square where geological and hydrogeological conditions show that groundwater might emerge. It should be noted that it does not show the likelihood of groundwater flooding occurring.

160. The onshore cable corridor(s) in this section passes exclusively through 1km grid squares of the Tendring District SFRA AStGWF map, where <25% of the area is classified as being at risk of groundwater emergence.

161. Once operational, the effect that the onshore export cables will have on groundwater flows is likely to be low as the buried cable will be located at a target depth of at least 0.9m below ground (subject to localised variations such as limiting interaction to shallow or near surface groundwater). Given the depth of the onshore export cables, it is likely to be constructed within the superficial deposits. As shown previously, there are three types of superficial deposits along the route of the onshore cable corridor(s) in this section, which are classed as Secondary A and Secondary B Aquifers.

162. As the construction works require earthworks in order to place the onshore export cables, it is important to note that perched groundwater may be present below areas of the onshore cable corridor(s) and could be encountered during the below-ground engineering works.

163. There is a risk to the onshore export cables from the perched groundwater in the areas of Secondary A and Secondary B Aquifers. If perched groundwater were to be encountered, it would need to be mitigated by appropriate construction techniques and in accordance with an appropriate method

statement. This will be secured within the OCoCP, which will be produced for the ES and submitted as part of the DCO application.

164. Based on the above information there is likely to be a Very Low groundwater flood risk along the onshore cable corridor(s) and this risk will be mitigated, as outlined above.

4.4.7 Flooding from Surface Water

165. The areas where the onshore cable corridor(s) crosses the Ordinary Watercourses are identified as having a higher risk of surface water flooding. However, this is primarily limited to the width of the watercourse channel and relates to the lower lying area comprising the channel itself and the land draining into it. At this stage in the Project's design, trenchless techniques cannot be committed to at all locations, where the engineering feasibility of using such techniques needs further assessment before it can be confirmed. The list of techniques being considered at each crossing is described in Chapter 5 Project Description (Volume I), Appendix 5.1 Crossing Schedule (Volume III).

166. The onshore cable corridor(s) crosses the Landermere Creek, upstream of the point where it flows into and forms its estuary, at which point it is classed as an Environment Agency Main River. All three potential routes in this section cross numerous areas of surface water flood risk which are less than 20m in width and are at medium or high risk of surface water flooding, all of which then flow into the Landermere Creek.

167. The northern and central potential routes pass through wider, more extensive areas at high risk of surface water flooding, namely where the Landermere Creek and its associated surface water flood extents are wider.

168. Up to 500m of the central and 700m of the northern routes respectively, are shown to be at risk of surface water flooding.

169. Any surface water flood risk to the onshore cable corridor(s) will be temporary in nature and removed once construction is complete as all onshore infrastructure associated with the onshore export cables will be located below ground.

170. The land will be reinstated and existing ground levels will be maintained. Mitigation during construction is discussed in Sections 7 and 8 in relation to both surface water and Ordinary Watercourses. This will be secured within the OCoCP, which will be produced for the ES and submitted as part of the DCO application.

171. The overall risk of flooding from surface water is therefore considered to be Low for this section of the onshore cable corridor(s).

4.4.8 Flooding from Sewers

172. The Tendring SFRA (2009) does not include any incidents of sewer flooding, detailed by Anglian Water through their DG5 register. The DG5 database records incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding (on a 4-5 postcode digit basis).

173. The onshore cable corridor(s) is located within existing agricultural land and, therefore, it is likely that there is a limited foul sewer network within the proximity of this location. The risk of flooding from sewers is therefore considered to be Low for this section of the onshore cable corridor(s).

4.4.9 Flooding from Reservoirs

174. The Environment Agency Flood Risk from Reservoirs map shows no areas within this section of the onshore cable corridor(s) to be at risk of flooding from reservoir sources under any situation. Therefore, there is no risk of flooding from this source.

4.4.10 Flooding from Canals and other Artificial Sources

175. The onshore cable corridor(s) in this section is not located near to any canals or other artificial sources. As such there is no risk of flooding from canals or other artificial sources to this section of the onshore cable corridor(s).

4.4.11 Summary of Flooding

176. Overall, this section of the onshore cable corridor(s) is not at risk of flooding from reservoirs, canals or other artificial sources, and is at Low risk from sewers.

177. There is no risk of fluvial flooding (from Main Rivers), as the dominant source of flooding to the areas of Flood Zones 2 and 3 through which this section of the onshore cable corridor(s) passes are tidal in nature.

178. The risk of flooding from tidal / coastal flooding is relatively Low due to the presence of the existing flood defences protecting this section. There is however a residual risk of flooding from overtopping and / or breaching of these coastal flood defences.

179. Depending on the chosen option taken forward to the DCO application, this section of the onshore cable corridor(s) passes through numerous smaller areas and one larger area (the northernmost option) of high surface water flood risk, which is associated with the Landermere Creek and its tributaries. However, this is limited to locations where the onshore cable corridor(s) is required to pass under these watercourses or ditches.

4.5 Onshore Cable Corridor(s) Section 3 – Holland Brook (North)

4.5.1 Overview of Proposed Activities

180. At this stage in the Project's design, broad onshore cable corridors have been identified within which the onshore export cables will be located. These corridors are up to 243m in width depending on the degree of engineering flexibility required prior to the completion of further EIA and engineering design studies.

181. This third section of the onshore cable corridor(s) runs north-west and then west for approximately 9km in total. This is from its re-entry point into the Holland Brook WFD Surface Water Operational Catchment, at the point where the three potential cable corridor options re-join, to the border with the Tenpenny Brook WFD Surface Water Operational Catchment.

182. At both the southern and northern side of the A120, the onshore works widen to between 600m and 1,200m to accommodate potential locations of temporary construction compounds, before curving westwards at Abbott's Hall and narrowing to approximately 200m.

4.5.2 Historical Flooding

183. To understand the likely risk of flooding to the Project a review of historical flood events and its frequency has been undertaken. This review aims to provide an understanding as to the context of flooding in the onshore project area, identifying areas of focus where there are likely to be flooding issues. However, it should be noted that the absence of historical flood records does not necessarily confirm that flooding has not occurred.

184. The Environment Agency Historical Flood Extent map shows no areas of this section are situated within an Environment Agency historical flood extent.

185. A review of the Tendring District SFRA and the LLFA online flooding information provides no indication of historical flooding affecting the onshore cable corridor(s) in this location.

4.5.3 Flood Zone

186. It is confirmed that the majority of this section of the onshore cable corridor(s) is situated within Flood Zone 1.

187. Two very small section (approximately 30m in length) of the onshore cable corridor(s) are shown to be situated within Flood Zone 2 or 3.These are where the onshore cable corridor(s) crosses the eastern tributary of the Holland Brook and where it crosses the Holland Brook itself.

4.5.4 Flooding from Rivers

188. Given the location of the onshore cable corridor(s) and the location where it crosses the Holland Brook and its tributary in this section, i.e. relatively high up in the catchment with topographic levels of approximately 20m AOD, the dominant source of flooding is from fluvial sources, as opposed to tidal sources.

189. There is limited potential for flood risk to the onshore cable corridor(s) during construction; however, the risk to the onshore export cables will be mitigated by appropriate construction techniques. The cables will be constructed at a target depth of at least 0.9m beneath the ground surface, and encased in water restrictive material, meaning the risk of flooding from fluvial sources is considered to be relatively Low.

190. Appropriate mitigation measures will be secured within the OCoCP. The risk of flooding to the onshore cable corridor(s) will be removed upon completion of the cable laying phase, as all infrastructure will be located underground, with the cable, joint bays and link boxes sealed from water ingress.

4.5.5 Flooding from the Sea

191. Given the topographic levels within this section of the onshore cable corridor(s) are approximately 10m AOD at the lowest point, the dominant source of flooding to any area within Flood Zone 2 or 3, where the cable route passes the Holland Brook, is likely to be from fluvial sources.

192. Therefore, the risk of tidal flooding to this section of the onshore cable corridor(s) is Very Low.

4.5.6 Flooding from Groundwater

193. This section of the onshore cable corridor(s), associated with the northern areas of the Holland Brook WFD catchment is located over superficial deposits of Kesgrave Catchment Subgroup, and Cover Sand, which are classified as Secondary A and Secondary B Aquifers respectively.

194. The Tendring District SFRA shows the AStGWF, which is a strategic scale map showing groundwater flood areas based on a 1km square grid. The data shows the proportion of each 1km grid square where geological and hydrogeological conditions show that groundwater might emerge. It should be noted that it does not show the likelihood of groundwater flooding occurring.

195. The onshore cable corridor(s) in this section passes exclusively through 1km grid squares of the Tendring District SFRA AStGWF map, where <25% of the area is classified as being at risk of groundwater emergence.

196. Once operational, the effect that the onshore export cables will have on groundwater flows is likely to be low as the buried cable will be located at a target depth of at least 0.9m below ground (subject to localised variations such as limiting interaction to shallow or near surface groundwater). Given the depth of the onshore export cables, it is likely to be constructed within the superficial deposits. As shown previously, there are two types of superficial deposits along the route of the onshore cable corridor(s) in this section, which are classified as Secondary A and Secondary B Aquifers.

197. As the construction works require earthworks in order to place the onshore export cables, it is important to note that perched groundwater may be present below areas of the onshore cable corridor(s) and could be encountered during the below-ground engineering works.

198. There is a risk to the onshore export cables from the perched groundwater in the areas of Secondary A and Secondary B Aquifers. If perched groundwater were to be encountered, it would need to be mitigated by appropriate construction techniques and in accordance with an appropriate method statement. This will be secured within the OCoCP, which will be produced for the ES and submitted as part of the DCO application.

199. Based on the above information there is likely to be a Very Low groundwater flood risk along the onshore cable corridor(s) and this risk will be mitigated, as outlined above.

4.5.7 Flooding from Surface Water

200. The areas where the onshore cable corridor(s) crosses the Holland Brook, its associated Ordinary Watercourses and drainage ditches are identified as having a higher risk of surface water flooding. However, this is primarily limited to the width of the watercourse channel and relates to the lower lying area comprising the channel itself and the land draining into it.

201. At this stage in the Project's design, trenchless techniques cannot be committed to at all locations, where the engineering feasibility of using such techniques needs further assessment before it can be confirmed. The list of techniques being considered at each crossing is described in Chapter 5 Project Description (Volume I), Appendix 5.1 Crossing Schedule (Volume III).

202. The onshore cable corridor(s) crosses the eastern tributary of the Holland Brook, where it is classed as an Environment Agency Main River. In this location, the Holland Brook is to be crossed using trenchless techniques.

203. This crossing location in the far south of this section of the onshore cable corridor(s) is shown on the Environment Agency's Long-Term Flood Risk Information map as being primarily at high risk of surface water flooding, with areas of low and medium risk further away from the Holland Brook.

204. In addition, the onshore cable corridor(s) passes over numerous unnamed channels and ditches. These are not classified as Environment Agency Main River and are likely to be small channels or ditches classed as Ordinary Watercourses, comprising tributaries into the Holland Brook. This includes a crossing over an Ordinary Watercourse, which appears to be the headwaters of the Holland Brook to the north of the A120. These Ordinary Watercourses also include areas at high risk of surface water flooding which appear to connect to and flow into the Holland Brook.

205. Any surface water flood risk to the onshore cable corridor(s) will be temporary in nature and removed once construction is complete as all onshore infrastructure associated with the onshore export cables will be located below ground.

206. The land will be reinstated and existing ground levels will be maintained. Mitigation during construction is discussed in Sections 7 and 8 in relation to both surface water and Ordinary Watercourses. This will be secured within the OCoCP, which will be produced for the ES and submitted as part of the DCO application.

207. The overall risk of flooding from surface water is therefore considered to be Low for this section of the onshore cable corridor(s).

4.5.8 Flooding from Sewers

208. The Tendring SFRA (2009) does not include any incidents of sewer flooding, detailed by Anglian Water through their DG5 register. The DG5 database records incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding (on a 4-5 postcode digit basis).

209. The onshore cable corridor(s) is located within existing agricultural land and, therefore, it is likely that there is a limited foul sewer network within the proximity of this location. The risk of flooding from sewers is therefore considered to be Low for this section of the onshore cable corridor(s).

4.5.9 Flooding from Reservoirs

210. The Environment Agency Flood Risk from Reservoirs map shows no areas within this section of the onshore cable corridor(s) to be at risk of flooding from reservoir sources under any situation. Therefore, there is no risk of flooding from this source.

4.5.10 Flooding from Canals and other Artificial Sources

211. The onshore cable corridor(s) in this section is not located near to any canals or other artificial sources. As such there is no risk of flooding from canals or other artificial sources to this section of the onshore cable corridor(s).

4.5.11 Summary of Flooding

212. Overall, this section of the onshore cable corridor(s) is not at risk from reservoirs, canals or other artificial sources and at Low risk from sewers.

213. The risk of flooding from fluvial flooding is relatively Low and limited to points where the onshore cable corridor(s) passes over the Holland Brook and its tributary.

214. The risk of flooding from tidal / coastal flooding is Very Low given the topographical levels in this area are no lower than 10m AOD and the dominant source of flooding to the areas in Flood Zones 2 and 3 being fluvial in nature.

215. This section of the onshore cable corridor(s) passes through numerous small areas of high surface water flood risk, associated with the Holland Brook and its tributaries. However, this is limited to locations where the onshore cable corridor(s) is required to pass under these watercourses or ditches.

4.6 Onshore Cable Corridor(s) Section 4 – Tenpenny Brook

4.6.1 Overview of Proposed Activities

216. This fourth section of the onshore cable corridor(s) runs from the northern border of the Holland Brook WFD Surface Water Operational Catchment, north-westwards for approximately 2km, through the Tenpenny Brook WFD Surface Water Operational Catchment, to the proposed onshore substation zone.

217. Upon entry to this section the onshore cable corridor(s) is approximately 200m; however, as it heads northwest the boundary widens to approximately 600m wide as it approaches the onshore substation zone.

4.6.2 Historical Flooding

218. To understand the likely risk of flooding to the Project a review of historical flood events and its frequency has been undertaken. This review aims to provide an understanding as to the context of flooding in the onshore project area, identifying areas of focus where there are likely to be flooding issues. However, it should be noted that the absence of historical flood records does not necessarily confirm that flooding has not occurred.

219. The Environment Agency Historical Flood Extent map shows no areas of this section are situated within an Environment Agency historical flood extent.

220. A review of the Tendring District SFRA and the LLFA online flooding information provides no indication of historical flooding affecting the onshore cable corridor(s) in this location.

4.6.3 Flood Zone

221. The entire onshore cable corridor(s) within this section is situated within Flood Zone 1. The onshore cable corridor(s) in the mid-part of this section is situated approximately 100m to the north of the nearest area of Flood Zones 2 and 3 associated with the Tenpenny Brook.

4.6.4 Flooding from Rivers

222. The onshore cable corridor(s) in this section is not situated within 500m of any Environment Agency Main River. Mapping indicates there are two Ordinary Watercourses comprising ditches along field boundaries to the south of Ardleigh Road. However, as previously noted, this section of the onshore cable corridor(s) is situated entirely within Flood Zone 1. Therefore, the risk of flooding from fluvial sources is considered to be Very Low.

4.6.5 Flooding from the Sea

223. The entire onshore cable corridor(s) in this section is situated within Flood Zone 1 and no lower than 20m AOD. Therefore, the risk of flooding from tidal sources is considered to be Very Low.

4.6.6 Flooding from Groundwater

224. This section of the onshore cable corridor(s), associated with the southern areas of the Tenpenny Brook WFD Surface Water Operational Catchment, is located over superficial deposits of Kesgrave Catchment Subgroup, and Cover Sand, which are classified as Secondary A and Secondary B Aquifers respectively.

225. The Tendring District SFRA shows the AStGWF, which is a strategic scale map showing groundwater flood areas based on a 1km square grid. The data shows the proportion of each 1km grid square where geological and hydrogeological conditions show that groundwater might emerge. It should be noted that it does not show the likelihood of groundwater flooding occurring.

226. The onshore cable corridor(s) in this section passes through a single 1km grid square of the Tendring District SFRA AStGWF map, which classifies 25% - 50% of the area to be at risk of groundwater emergence.

227. All the remaining squares which the onshore cable corridor(s) either partially or wholly passes through, in this section, are classified as <25% of the area being at risk of groundwater flooding.

228. Once operational, the effect that the onshore export cables will have on groundwater flows is likely to be low as the buried cable will be located at a target depth of at least 0.9m below ground (subject to localised variations such as limiting interaction to shallow or near surface groundwater). Given the depth of the onshore export cables, it is likely to be constructed within the superficial deposits. As shown previously, there are two types of superficial deposits along the route of the onshore cable corridor(s) in this section, which are classed as Secondary A and Secondary B Aquifers.

229. As the construction works require earthworks in order to place the onshore export cables, it is important to note that perched groundwater may be present below areas of the onshore cable corridor(s) and could be encountered during the below-ground engineering works.

230. There is a risk to the onshore export cables from the perched groundwater in the areas of Secondary A and Secondary B Aquifers. If perched groundwater were to be encountered, it would need to be mitigated by appropriate construction techniques and in accordance with an appropriate method statement. This will be secured within the OCoCP, which will be produced for the ES and submitted as part of the DCO application.

231. Based on the above information there is likely to be a Very Low groundwater flood risk along the onshore cable corridor(s) and any risk will be mitigated, as outlined above.

4.6.7 Flooding from Surface Water

232. In this section, the onshore cable corridor(s) passes through relatively few areas highlighted as being at risk of flooding from surface water sources. Any areas of surface water flood risk which it does pass through are relatively small and associated with Ordinary Watercourses (ditches) and hollows in the upland catchment area of the Tenpenny Brook.

233. Any surface water flood risk to the onshore cable corridor(s) will be temporary in nature and removed once construction is complete as all onshore infrastructure associated with the onshore export cables will be located below ground.

234. The land will be reinstated and existing ground levels will be maintained. Mitigation during construction is discussed in Sections 7 and 8 in relation to both surface water and Ordinary Watercourses. This will be secured within the OCoCP, which will be produced for the ES and submitted as part of the DCO application.

235. The risk of flooding from surface water is therefore considered to be Low for this section of the onshore cable corridor(s).

4.6.8 Flooding from Sewers

236. The Tendring SFRA (2009) does not include any incidents of sewer flooding, detailed by Anglian Water through their DG5 register. The DG5 database records incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding (on a 4-5 postcode digit basis).

237. The onshore cable corridor(s) is located within existing agricultural land and, therefore, it is likely that there is a limited foul sewer network within the proximity of this location. The risk of flooding from sewers is therefore considered to be Low for this section of the onshore cable corridor(s).

4.6.9 Flooding from Reservoirs

238. The Environment Agency Flood Risk from Reservoirs map shows no areas within this section of the onshore cable corridor(s) to be at risk of flooding from reservoir sources under any situation. Therefore, there is no risk of flooding from this source.

4.6.10 Flooding from Canals and other Artificial Sources

239. The onshore cable corridor(s) in this section is not located near to any canals or other artificial sources. As such there is no risk of flooding from canals or other artificial sources to this section of the onshore cable corridor(s).

4.6.11 Summary of Flooding

240. Overall, this section of the onshore cable corridor(s) is not at risk from reservoirs, canals or other artificial sources. There is a Low risk of flooding associated with groundwater sources and sewers.

241. Additionally, the risk of fluvial and tidal / coastal flooding is Very Low, since the onshore cable corridor(s) in this section is located entirely within Flood Zone 1 and more than 500m from the nearest Environment Agency Main River.

242. Furthermore, the onshore cable corridor(s) passes through relatively few areas highlighted as being at risk of flooding from surface water sources. Mapping indicates there are two Ordinary Watercourses comprising ditches along field boundaries to the south of Ardleigh Road and these appear to be associated with areas at increased risk of surface water flooding. Other areas of surface water flood risk are relatively small and associated with ditches and hollows in the upland catchment area of the Tenpenny Brook.

4.7 Landfall and Onshore Cable Corridor(s) – Construction Compounds

4.7.1 Overview of Proposed Activities

243. Temporary construction compounds are required to support the onshore cable installation. A maximum of seven compounds will be required, including one main site compound. Construction compounds would also be required at landfall (and also at the onshore substation, considered separately in Section 4.8). Indicative locations of these construction compounds have been identified

to date – these locations will be reviewed and refined, and updated in advance of the DCO application.

244. Construction compounds would be required to support the cable duct installation and cable pulling works. They would act as a hub for the onshore construction works and would house the central offices, welfare facilities, and stores as well as acting as a staging post and secure storage for equipment and component deliveries.

245. Construction compounds would be fenced and be supported by temporary lighting and security where required. Construction compounds would be established in advance of the main works and would remain in situ for the duration of construction in any one location.

246. The cable construction compounds will have a maximum dimension of 150m x 150m, with small cable construction compounds measuring 100m x 100m.

247. As noted above, there will be a maximum of seven temporary construction compounds located along the onshore cable corridor(s) (from the landfall to the onshore substation).

4.7.2 Review of Flood Risk From All Sources

248. The indicative locations currently being considered for the temporary construction compounds are located wholly in Flood Zone 1. In addition, all of the temporary construction compounds are located in areas that are at Very Low risk from surface water flooding. The location of these will be subject to review prior to the finalisation of the ES and submission of the DCO application.

249. The indicative landfall search area identified for the landfall HDD compound is partially located in tidal / coastal Flood Zone 2 or 3. In the event of a tidal flood being forecast, mitigation measures will need to be put in place to ensure that materials remain confined to the compound and portable offices, welfare facilities and storage are secured, to prevent and minimise damages from flood waters. This will be secured within the OCoCP, which will be produced for the ES and submitted as part of the DCO application.

250. In addition, the indicative search area identified for the landfall HDD compound is shown to be at risk from surface water flooding during the 3.3% AP (1 in 30 year) event. Similar to the risks associated with coastal / tidal flooding, mitigation measures will need to be put in place to ensure that materials remain confined to the compound and portable offices, welfare facilities and storage are secured, to prevent and minimise damages from flood waters. This will be secured within the OCoCP, which will be produced for the ES and submitted as part of the DCO application.

251. The landfall HDD compound and temporary construction compounds are likely to be located within existing agricultural land and, therefore, it is likely that there is a limited foul sewer network within the proximity of their locations. The risk of flooding from sewers is therefore considered to be Low for the temporary construction compounds.

252. The Environment Agency Flood Risk from Reservoirs map shows the indicative search area for the landfall HDD compound may be partially at risk of flooding from a reservoir breach, which is similar to the flood extent associated with

flooding from rivers. As such, this area of potential reservoir flooding is associated with the Holland Brook, immediately to the rear of the coastal frontage.

253. The indicative locations for the temporary construction compounds are located in areas that are not at risk of flooding from reservoir sources under any situation. Therefore, there is no risk of flooding from this source.

254. Neither the landfall HDD compound or any of the temporary construction compounds are likely to be located near to any canals or other artificial sources. As such there is no risk of flooding from canals or other artificial sources to these elements of the Project.

4.8 Onshore Substation Zone

4.8.1 Overview of Proposed Activities

255. The precise location of the onshore substation and grid connection is subject to ongoing consultation. At this stage in the Project's design, an onshore substation zone has been defined through the Project's site selection process, within which the project onshore substation will be located (as shown in Figure 5.1, Volume II).

256. The onshore substation zone is situated to the northern end of the Tenpenny Brook WFD Surface Water Operational Catchment and northwest of the onshore cable corridor(s). The onshore substation search area is approximately 700m from north to south and 600m from east to west.

257. A new construction access and onshore substation temporary construction compound (measuring approximately 250m x 150m) will be created in advance of construction. The location of this access and any operational access will be determined in advance of DCO application during the Project's ongoing design process. The construction access will be required to facilitate access for Heavy Goods Vehicles (HGVs) as well as abnormal indivisible loads (AILs) for certain elements of the onshore substation's electrical infrastructure (e.g. transformers).

258. The 400kV cables from the onshore substation to the, as yet to be determined, grid connection would typically be installed by direct burial method. This method will require a trench to be excavated between the onshore substation and the grid connection for the cables to be laid directly and jointed before being installed.

259. Once operational, a maximum of area of 267 x 300m would be required for the onshore substation. A landscaping / bunding area, operational drainage and a new permanent operational access are also anticipated to be required.

4.8.2 Historical Flooding

260. To understand the likely risk of flooding to the Project a review of historical flood events and its frequency has been undertaken. This review aims to provide an understanding as to the context of flooding in the onshore substation zone, identifying areas of focus where there are likely to be flooding issues. However,

it should be noted that the absence of historical flood records does not necessarily confirm that flooding has not occurred.

261. The Environment Agency Historical Flood Extent map shows that none of the onshore substation zone is situated within an Environment Agency historical flood extent.

262. A review of the Tendring District SFRA and the LLFA online flooding information provides no indication of historical flooding affecting the onshore substation zone in this location.

4.8.3 Flood Zone

263. The onshore substation zone is situated wholly within Flood Zone 1. It is also located over 1km from the closest extent of either Flood Zone 2 or 3, associated with the Tenpenny Brook, which is to the south of the onshore substation zone.

4.8.4 Flooding from Rivers

264. The onshore substation zone is situated within Flood Zone 1 and approximately 1km from Flood Zones 2 or 3. It is also more than 2km from the nearest Environment Agency Main River. Mapping indicates there are two Ordinary Watercourses comprising ditches along field boundaries to the south of Ardleigh Road adjacent to the onshore cable corridor(s) entry point into the onshore substation zone. However, this has already been considered in the preceding section. As such, the risk of fluvial flooding to the onshore substation zone is considered to be Very Low.

4.8.5 Flooding from the Sea

265. As noted above, the onshore substation search area is situated within Flood Zone 1, no lower than 20m AOD and over 16km inland from the nearest coastal frontage. Therefore, the risk of flooding from tidal sources is considered to be Very Low.

4.8.6 Flooding from Groundwater

266. The onshore substation zone, associated with the Tenpenny Brook WFD Surface Water Operational Catchment, is located over superficial deposits of Cover Sand, which is classified as Secondary B Aquifer.

267. The Tendring District SFRA shows the AStGWF, which is a strategic scale map showing groundwater flood areas based on a 1km square grid. The data shows the proportion of each 1km grid square where geological and hydrogeological conditions show that groundwater might emerge. It should be noted that it does not show the likelihood of groundwater flooding occurring.

268. The onshore substation zone is situated within a single 1km grid square of the Tendring District SFRA AStGWF map, of which <25% of the area is shown to be at risk of groundwater emergence.

269. As the construction works require earthworks in order to place the onshore export cables and construct the onshore substation, it is important to note that

perched groundwater may be present and could be encountered during the below-ground engineering works.

270. After grading of the site is complete, excavations would proceed with the laying of foundations, trenches and drainage. At this stage it is not known whether the foundations would be ground-bearing or piled. This would be determined by geotechnical ground investigation post-consent that would inform the detailed design. However, for the purposes of the assessment piled foundations are assumed to be required at the onshore substation.

271. Given the depth of the onshore export cables and the construction works for the onshore substation, it is likely to be constructed within the superficial deposits. As shown previously, the superficial deposits are formed of Secondary B Aquifers.

272. However, if perched groundwater were to be encountered, especially during the installation of any piled foundations, it would need to be mitigated by appropriate construction techniques and in accordance with an appropriate method statement. This will be secured within the OCoCP, which will be produced for the ES and submitted as part of the DCO application.

273. Once operational, the effect of onshore export cables leading to and in the area of the proposed onshore substation on groundwater flows is likely to be low as the buried cables will be located at a target depth of at least 0.9m below ground (subject to localised variations such as limiting interaction to shallow or near surface groundwater). Effects arising from piled foundations will be considered further at ES, when further detail regarding the onshore substation location has been determined through the project's design process. However, at this stage due to small scale of the foundations, the effect on groundwater flows is considered likely to be low.

274. Based on the above information there is a Very Low groundwater flood risk to the onshore substation zone and any risk will be mitigated, as outlined above.

4.8.7 Flooding from Surface Water

275. The onshore substation zone includes relatively few areas highlighted as being at risk of flooding from surface water sources.

276. Any areas shown to be at high or medium risk of surface water flooding are relatively localised and predominantly in the north east of the onshore substation zone and in the southern section of the onshore substation zone. The southern area at increased risk appears to be linked to the two Ordinary Watercourses comprising ditches along field boundaries to the south of Ardleigh Road.

277. Whilst the areas at increased risk are relatively isolated and small in nature, they may result in overland flow and should be considered in the placement / location of the onshore substation and any attenuation features (see Section 7.5) within the wider onshore substation zone.

278. On this basis, whilst overall the risk of flooding from surface water is considered to be Low for the onshore substation zone, there is a need to consider this flood risk in greater detail as part of the final proposed location of the onshore substation.

4.8.8 Flooding from Sewers

279. The Tendring SFRA (2009) does not include any incidents of sewer flooding, detailed by Anglian Water through their DG5 register. The DG5 database records incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding (on a 4-5 postcode digit basis).

280. The onshore substation zone is located within existing agricultural land and, therefore, it is likely that there is a limited foul sewer network within the proximity of this location. The risk of flooding from sewers is therefore considered to be Low.

4.8.9 Flooding from Reservoirs

281. The Environment Agency Flood Risk from Reservoirs map shows no areas of the onshore substation zone to be at risk of flooding from reservoir sources under any situation. Therefore, there is no risk of flooding from this source.

4.8.10 Flooding from Canals and other Artificial Sources

282. The onshore substation zone is not located near to any canals or other artificial sources and therefore there is no risk of flooding from these sources to the area.

4.8.11 Summary of Flooding

283. Overall, the onshore substation zone is not at risk from reservoirs, canals or other artificial sources, and Low risk from sewers.

284. Additionally, the risk of fluvial and tidal / coastal flooding is Very Low, since the area is located entirely within Flood Zone 1, and more than 2km from the nearest Environment Agency Main River.

285. Areas shown to be at high or medium risk of surface water flooding are relatively localised and predominantly in the north east and southern sections of the onshore substation zone. The southern area at increased risk appears to be linked to the two Ordinary Watercourses comprising ditches along field boundaries to the south of Ardleigh Road.

286. Whilst the areas at increased risk are relatively isolated and small in nature they may result in overland flow and should be considered in the placement / location of the onshore substation and any attenuation features (see Section 7.5) within the wider onshore substation zone.

5 Consideration of the Sequential Test and Exception Test

287. As noted in Section 2.2, NPPF requires the application of the Sequential Test and, where necessary, the Exception Test. Guidance on the application of the Sequential Test is provided in the Planning Practice Guidance (PPG) for Flood Risk and Coastal Change, published on 25th August 2022, which provides criteria in relation to the appropriate allocation of development types and flood risk.

288. As stated in Paragraph 23 of the PPG:

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

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

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

290. As noted in Paragraph 31 of the PPG:

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

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

292. The need for the Exception Test depends on the potential vulnerability of the development proposed, based on the Flood Risk Vulnerability Classification, and the Flood Zone within which it would be located, as summarised in Table 2.

293. NPPF provides guidance on the criteria required to pass the Exception Test, where it is necessary to demonstrate that:

- Development that has to be in a flood risk area will provide wider sustainability benefits to the community that outweigh flood risk; and
- The development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

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

295. As noted above, the NPPF and supporting PPG provides guidance on suitable development types within each Flood Zone, as identified in Table 2, which has been considered for the Project.

Table 2 Flood Risk Vulnerability and Flood Zone 'Incompatibility' Table as specified by the PPG

	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water compatible
Flood Zone 1	**Appropriate**	Appropriate	Appropriate	Appropriate	Appropriate
Flood Zone 2	**Appropriate**	Exception Test Required	Appropriate	Appropriate	Appropriate
Flood Zone 3a	**Exception Test Required†**	Not Appropriate	Exception Test Required	Appropriate	Appropriate
Flood Zone 3b (Functional Floodplain) *	**Exception Test Required***	Not Appropriate	Not Appropriate	Not Appropriate	Appropriate

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

"" In Flood Zone 3b (functional floodplain) essential infrastructure that has passed the Exception Test, and water-compatible uses, should be designed and constructed to:*

- *remain operational and safe for users in times of flood;*
- *result in no net loss of floodplain storage;*
- *not impede water flows and not increase flood risk elsewhere.*

296. In terms of the Project, and based on the guidance in both NPPF and the supporting PPG, the Project is classed as 'Essential Infrastructure' which is defined as:

- Essential transport infrastructure (including mass evacuation routes), which has to cross the area at risk.
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including infrastructure for electricity supply including generation, storage and distribution systems; including electricity generating power stations, grid and primary substations storage; and water treatment works that need to remain operational in times of flood.
- Wind turbines.
- Solar farms.

297. Development classed as 'Essential Infrastructure' is considered acceptable in Flood Zones 1 and 2, whilst development located within Flood Zone 3 is required to pass the Exception Test, as shown in Table 2.

298. Principally the works for the Project are to be located in Flood Zone 1, including the majority of the onshore cable corridor(s) and the onshore substation zone.

299. Permanent above-ground structures are to be located within Flood Zone 1. Subterranean development is also located primarily in Flood Zone 1, with some locations in Flood Zone 2 and 3 where it is required to pass under, or in proximity to, existing watercourses.

300. Due to the large-scale nature of the works, it is acknowledged that there are locations where infrastructure is required to pass through or be located in Flood

Zone 3. This relates to the onshore cable corridor(s) adjacent to the landfall location and key locations along the onshore cable corridor(s) (associated with the need to cross existing watercourses).

301. Most of the area behind the coastal frontage is shown by the Environment Agency Flood Map for Planning, to benefit from the presence of flood defences.

302. However, parts of the onshore cable corridor(s) and the landfall are the elements of the Project which need to be subject to the consideration of the Exception Test.

303. Subterranean development will only be at potential risk of flooding during the construction phase. Once operational, the flood risk to the onshore cable corridor(s) will have been removed as the transition joint bays and cables will be wholly located underground, with the former sealed through a watertight manhole cover with no interaction with the above ground Flood Zones. The only visible above ground structures will be the concrete link boxes.

304. In addition, it is proposed that the Landfall will be constructed through the use of HDD techniques. Therefore, during construction and once operational, there will be limited interaction with the above ground Flood Zones.

305. Link boxes are required in proximity to the jointing bay locations to allow the cables to be bonded to earth to maximise cable ratings. Link boxes would not be required at all jointing bay locations, but as a worst-case scenario it is assumed that they could be required at a frequency of one every 500m. The number and placement of the link boxes would be determined as part of the detailed design. However, it is anticipated that these would be located, where possible, in areas at reduced flood risk.

306. Taking into account the two parts of the Exception Test, it is concluded that the first part comprising the provision of wider sustainability benefits to the community has been passed on the basis that the Project, as a Nationally Significant Infrastructure Project (NSIP) is providing energy certainty utilising a sustainable source of energy at a national scale.

307. With regard to the second part of the Exception Test, it is necessary to consider the Project in the context of its scale and that the majority of the onshore cable corridor(s) and the onshore substation zone are not located within an area considered to be at risk of fluvial / tidal flooding.

308. It should also be noted that the proportion of the landfall and onshore cable corridor(s) situated within Flood Zone 3, is in the first section of the onshore route which benefits from the presence of flood defences, according to the Environment Agency Flood Map for Planning.

309. In addition, the majority of the onshore cable corridor(s) and the onshore substation search area are not located within an area considered to be at risk of surface water flooding.

310. Those elements that are likely to pass through areas at increased risk of flooding, i.e. Flood Zone 3 or high surface water flood risk, comprise the subterranean development which, following construction, will not be vulnerable to flood risk during its operational lifetime (30 years) and will not increase flood risk elsewhere.

311. For the subterranean development, only during construction is there the potential for a temporary increase in flood risk and this will be mitigated through the use of appropriate management measures which will be secured within the OCoCP, which will be produced for the ES and submitted as part of the DCO application.

312. With regard to the onshore substation zone, whilst there are areas at increased surface water risk, the location / layout of the onshore substation within the zone has not yet been defined as part of the Project. Therefore, it is considered that flood risk concerns can be appropriately mitigated through further assessment during the EIA process and following further investigations, studies and consultation which will inform the final location presented within the ES. If areas at increased risk of surface water flooding cannot be avoided, then the Applicant is confident that mitigation measures can be incorporated such that there is no risk, either to and from the Project and this will be presented in the FRA accompanying the ES.

313. On this basis, it is concluded that the Project has been appropriately sequentially located in accordance with the guidance set out in the PPG with regard to the application of the Sequential Test and that the sequential approach has been adopted in the location of key elements of the infrastructure, wherever possible.

314. Furthermore, those elements that require the application of the Exception Test have demonstrated that the Project provides wider sustainability benefits to the community associated with the provision of renewable energy, and that it can be designed such that it would be safe for its lifetime without increasing flood risk elsewhere.

6 Climate Change

315. In the future, the risk of flooding from all potential sources of flood risk are likely to be amplified as a result of the predicted changes associated with climate change.

316. Given the potential sources of flooding identified in this FRA and the nature of various elements of the Project, there are two main aspects of climate change which are likely to impact the Project, both in terms of flood risk to infrastructure as well as increasing the potential for there to be an off-site impact on other receptors. These factors comprise an increase in peak river flows and an increase in the duration and intensity of rainfall events, which is likely to increase the magnitude of surface water flooding.

317. Whilst storm surges and waves are likely to be larger in the future and sea levels will be higher than in the present day, this is unlikely to affect the Project as the elements of the infrastructure likely to be affected by this source of flooding will be located below-ground once operational.

6.1 Peak River Flow Allowances

318. The climate change allowance related to peak river flow and fluvial flooding is only likely to be relevant to the onshore substation, once operational, as the onshore export cables will also be located below ground once constructed.

319. Given the onshore substation zone is located within Flood Zone 1 and more than 2km from the nearest Environment Agency Main River, the increase in fluvial flooding relating to climate change is unlikely to affect the onshore substation zone, especially given the elevated nature of the intervening ground.

320. Therefore, based on the above key factors, it is concluded that the effects of climate change on fluvial flood risk will not impact either the onshore cable route or onshore substation zone and therefore this element of climate change has not been considered further within this FRA.

6.2 Peak Rainfall Allowances

321. When considering surface water flood risk, the Essex LLFA Statutory Consultee Guidance Document requires an assessment of the lifetime of the development, the vulnerability of the proposed land use and a justification related to the choice of allowance.

322. Further to the above guidance, the Environment Agency has also issued climate change allowance guidance, specifically with regard to the application of peak rainfall allowances (Environment Agency, 2022).

323. The surface water climate change allowances are determined by the predicted increase in peak rainfall intensity. These are determined by regional variations, based on management catchments, which are sub-catchments of river basin districts. The Project is located entirely within the Essex Management Catchment and therefore the allowances for this Management Catchment have been considered further within this FRA.

324. The Environment Agency guidance setting out the appropriate climate change allowances to be adopted for different development lifetimes (Environment Agency, 2022) is summarised below:

- Development with a lifetime beyond 2100:
    - This includes development proposed in applications or local plan allocations;
    - For FRAs and SFRAs assess the upper end allowances. You must do this for both the 1% and 3.3% annual exceedance probability events for the 2070s epoch (2061 to 2125);
    - Design your development so that for the upper end allowance in the 1% annual exceedance probability event; and
    - There is no increase in flood risk elsewhere your development will be safe from surface water flooding.
- Development with a lifetime of between 2061 and 2100:
    - For development with a lifetime between 2061 and 2100 take the same approach (as for a development with a lifetime beyond 2100) but use the central allowance for the 2070s epoch (2061 to 2125); and

325. As noted above, the onshore substation zone is situated in the Essex Management Catchment and Table 3 below provides a summary of the appropriate allowance relevant to this Management Catchment.

Table 3 Peak Rainfall Intensity Allowance for the Essex Management Catchment

Essex Management Catchment	Central 1 in 30 year (3.3%)	Upper end 1 in 30 year (3.3%)	Central 1 in 100 year (1%)	Upper end 1 in 100 year (1%)
2050s	20%	35%	20%	45%
2070s	20%	35%	20%	40%

326. On the basis of the above guidance, assuming 30 years of operation with commencement of operation in 2029 at the earliest, the required allowance is an increase of 20% for the 1 in 100 (1%) year event applying the central allowance. In addition, sensitivity testing should be undertaken for the 1 in 100 year plus 40% allowance for climate change.

327. The 1 in 100 year plus 20% for climate change allowance will be accommodated, as a minimum, within the drainage design by increasing peak rainfall in hydraulic calculations and providing appropriate on-site attenuation and storage, in accordance with the Essex County Council Sustainable Drainage Systems Design Guide. This will be secured within the Outline Operational Drainage Plan, which will be produced for the ES and submitted as part of the DCO application.

7 Surface Water Drainage

7.1 Onshore Infrastructure Pre-Construction Work

328. Prior to commencement of the construction works, detailed drainage surveys will be undertaken to support the development of the detailed drainage design for all elements of the onshore infrastructure.

329. The drainage infrastructure will be developed and agreed with the appropriate regulators, where relevant, and implemented to minimise water within the working areas, ensure ongoing drainage of surrounding land and that there is no increase in surface water flood risk.

330. This will assess the current and proposed runoff rates, volume of storage required and the proposed approach for discharge of water from the Project.

331. In addition, a local specialist drainage contractor will undertake surveys, locate drains, and create drawings pre- and post-construction, to ensure appropriate reinstatement. Construction drainage will include provisions to minimise flood risk within the working area and ensure ongoing drainage of surrounding land.

7.2 Landfall Location and Onshore Cable Corridor(s) Surface Water Drainage

332. The landfall and onshore cable corridor(s) will only be at risk of surface water flooding during the construction phase. However, during the construction phase and once operational, there is a risk that drainage ditches and surface water flow routes could be adversely affected should the works and the ground reinstatement not be carefully managed.

333. During construction, the Project would use trenchless crossing techniques at key watercourse crossing locations, including all Main Rivers, to avoid direct

interaction with these watercourses. The cable entry and exit pits will be at least 9m from the banks of the watercourse, and a minimum depth of 1.5m and maximum depth of 20m below the hard bed level . In these locations the use of trenchless techniques will be confirmed and agreed with the regulators to confirm there will be no impact on flood risk as all proposed elements will be located below ground.

334. However, it is possible that trenched crossings may also need to be carried out on Ordinary Watercourses crossed by the onshore cable corridor(s). This method has the potential to directly alter the hydrology of the watercourses. Trenched crossings involve installing temporary dams (composed of straw bales and ditching clay, or another suitable technique) or flumes placed at bed level upstream and downstream of the crossing point. The cable trench is then excavated in the dry area of river bed between the two dams or beneath the flume, with the river flow maintained using a temporary pump (or flume).

335. There is the potential for the installation techniques to affect the bed and banks of the watercourse, which could result in an impact on flows along the watercourse and indirectly a change in flood risk, which will need to be managed during construction.

336. At these locations, a site-specific investigation will be carried out at detailed design stage to identify the local ground and groundwater conditions, enable a site-specific risk assessment to be undertaken and to understand the potential impact of any works on flows along the watercourse and flood risk in the local area.

337. It will be necessary to install additional field drainage within onshore cable corridor(s) to ensure the existing drainage characteristics of the land are maintained and there is no increase in flood risk to on- and off-site receptors during and after construction. All temporary drainage would pass through a silt interceptor or soakaway drainage pits before being discharged into surrounding drainage.

338. The detailed methodology to be used for any temporary construction at crossing points over existing ditches and watercourses shall be agreed with the Environment Agency and LLFA, as appropriate. To manage this ahead of the main works, the Principal Contractor will develop the construction drainage in consultation with the landowner and other statutory stakeholders.

7.3 Temporary Construction Compounds Surface Water Drainage

339. The implementation of temporary construction compounds may increase surface water run off temporarily due to an increase in impermeable area during the construction phase.

340. However, prior to construction, surface water drainage would be developed by a local specialist drainage contractor and implemented to minimise water within the cable trench and ensure ongoing drainage of surrounding land. A soakaway drainage pit may be required where infiltration rate is found suitable, if no suitable outfall to a nearby by watercourse is possible.

341. The temporary construction compounds will only be at risk of surface water flooding during construction as, following completion, the compounds and any

associated temporary access tracks will be fully reinstated and would have no operational use.

7.4 Onshore Cable Corridor(s) Post-Construction

342. Following construction of the landfall and onshore export cables there will be no permanent above ground infrastructure with the exception of link boxes manhole covers (see Chapter 5 Project Description). Furthermore, all temporary construction compounds and temporary access tracks will be fully reinstated and would have no operational use.

343. Existing land drains along the onshore cable corridor(s) will be reinstated with at least the same capacity as the pre-construction channel to prevent any potential impacts on flood risk, this will be based on the information obtained during the pre-construction survey.

344. The backfilling of material, within both construction drainage channels and along the onshore cable corridor(s) itself, will prevent a conduit from forming and ensure there are no changes to the local flow rates due to permeability changes.

7.5 Onshore Substation Operational Surface Water Drainage

345. During the development of this FRA the discharge of surface water from the onshore substation during operation has been considered within the context of the surface water flood risk and the need to ensure that any drainage solutions do not result in an increase in flood risk either to or from the onshore substation.

346. Surface water drainage requirements will be designed to meet the requirements of the NPPF, NPS EN-1 and the CIRIA SuDS Manual C753 (CIRIA, 2015), with runoff limited where feasible and in accordance with best practice.

347. Drainage options will be considered within the context of the principles of the SuDS hierarchy set out in the Essex County Council SuDS Design Guide (Essex County Council , 2020) with the aim of discharging surface water runoff as high up the hierarchy as possible.

348. A summary of the SuDS hierarchy set out in the Essex County Council SuDS Design Guidance is provided as follows:

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

349. An Outline Operational Drainage Plan will provide details of the proposed surface water drainage design confirming that sufficient storage will be provided to attenuate surface water and discharge at a controlled rate during surface water events. The volume and final location of any attenuation features will be

confirmed, in accordance with the above guidance, during the development of the detailed design.

350. As further information becomes available, the operational drainage at the onshore substation will be developed in consultation with Essex County Council (as the LLFA), the Environment Agency and other stakeholders and implemented to ensure the existing runoff rates to the surrounding water environment are maintained at pre-development rates. This process will also confirm the greenfield runoff rate, proposed runoff rates, volume of storage required and the final proposed approach for discharge of water from the site.

351. This will be secured within the Outline Operational Drainage Plan, which will be produced for the ES and submitted as part of the DCO application.

352. The operational drainage at the onshore substation will consider the likely maintenance requirements of new and existing infrastructure. It is important that maintenance is also considered in the design of the drainage system to account for the requirements of undertaking maintenance work such as ease of access for personnel, vehicles or machinery.

353. A management and maintenance plan of any proposed surface water drainage infrastructure will also be agreed with relevant stakeholders then adopted for the lifetime of the development.

8 Flood Risk Mitigation Measures

354. Residual risk is the risk that remains after flood management or embedded mitigation measures have been installed. This FRA has considered residual flood risk and whether there is a need for any additional mitigation measures to manage the residual flood risk.

8.1 Onshore Design Mitigation

355. As previously noted, the onshore project area is primarily located within Flood Zone 1, i.e. outside of Flood Zones 2 and 3, in areas at Low risk of flooding from fluvial or tidal sources. In addition, the onshore project area is principally located in areas at Low risk of surface water flooding.

356. As such, the sequential approach has been adopted in regard to the location of above-ground structures with infrastructure being located in Flood Zone 1 and at low risk of surface water flooding, where possible.

357. At the landfall, where the works have the potential to affect the tidal / coastal flood risk, it is proposed to carry out the landfall works using trenchless techniques.

358. It is, however, likely that some trenched crossings will be carried out on a limited number of Ordinary Watercourses crossed by the onshore cable corridor(s).

359. At these locations, a site-specific investigation will be carried out at detailed design stage, to identify the local ground and groundwater conditions, enable a site-specific risk assessment to be undertaken and to understand the potential impact of any works on flows along the watercourse and flood risk in the local area.

360. A local specialist drainage contractor will be appointed to prepare construction surface water drainage, undertake surveys, locate drains, and create drawings pre- and post-construction, to ensure appropriate reinstatement. Construction drainage will include provisions to minimise flood risk within the working area and ensure ongoing drainage of surrounding land.

361. All Main Rivers will be crossed using trenchless techniques, which is embedded in the scheme design, to avoid direct interaction with these watercourses. The cable entry and exit pits will be at least 9m from the banks of the watercourse, and a minimum depth of 1.5m and maximum depth of 20m below the hard bed level. Although ground disturbance will occur at entry and exit points, there will be no direct impact on the watercourses themselves.

362. Following construction of the landfall and onshore export cables there will be no permanent above ground elements, except for the proposed link boxes. Drainage will also be reinstated to match the pre-construction conditions. As such there would be no impact on surface water drainage. Furthermore, all temporary construction compounds and temporary access tracks will be fully reinstated and would have no operational use.

8.2 Flood Warning and Evacuation

363. While construction work is taking place on site, site workers and users will be required to monitor local weather forecasts and ensure there is an evacuation route in place in the event that either fluvial or surface water flooding takes place during the construction stages of the development. This will be secured within the OCoCP, which will be produced for the ES and submitted as part of the DCO application.

364. Where there are Environment Agency Flood Alerts and Flood Warnings available for a location, the Principal Contractor will be required to sign up to receive the relevant flood warnings and alerts.

365. A flood warning and evacuation plan is a list of steps to be taken in case of a flood, although it can also include steps such as taking out the relevant insurance or using recommended flood mitigation products.

366. Specific flood warning and evacuation plans should be produced for the construction phase of the onshore cable corridor(s), specifically related to construction works at watercourse crossing locations where personnel or materials may be located, albeit temporarily, within Flood Zones 2 and 3.

367. All personnel should be made aware of any access routes which are located within Flood Zones 2 and 3 and any flood warnings issued for those areas should result in the relevant access routes being cleared of all project personnel and, where possible, all project plant / materials.

368. A site-specific flood warning and evacuation plan should include practical steps for protecting the proposed onshore cable route and onshore substation, be easy to communicate and consider delegated responsibility, or whether personnel are likely to require additional support during a flood event.

369. It is anticipated that development proposals will require a comprehensive flood warning and evacuation plan including the following aspects:

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

370. As noted above, the Environment Agency provide a free Flood Alert ("flooding is possible") and Flood Warning ("flooding is expected") service for fluvial flooding (rising river levels). It is recommended that the flood warning and evacuation plan considers how receipt of these flood alerts or warnings may affect their operations.

371. It should be noted that large parts of the onshore cable corridor(s) are in rural undeveloped areas that are not covered by flood warnings. Furthermore, it is important to note that Environment Agency flood alerts and warnings are not issued in response to surface water flooding.

372. As such the flood warning and evacuation plan will include independent checks (i.e. Met Office Weather Warnings) alongside any alerts or warnings issued by the Environment Agency. These checks will also account for risks outside of the flood alerts / flood warnings and will enable contractors and site managers to consider how this information will affect planned works, especially areas in close proximity to key watercourses.

373. During construction, contractors and management should liaise with Essex County Council, as the LLFA, and the Environment Agency so they are aware of any forecast related to heavy rainfall events. The potential for flooding can then be assessed to enable work to stop, especially in areas in close proximity to key watercourses, and the site cleared of all personnel in this instance.

8.3 Access and Egress

374. The onshore substation zone is located within Flood Zone 1, and as such any personnel within these areas would be at Low risk of flooding from fluvial sources.

375. There is however a potential risk of surface water flooding to the onshore substation zone associated with isolated areas of medium and high risk of surface water flooding across the site. These should be taken into account when considering the design, location and layout of the onshore substation to ensure that by sequentially locating the onshore substation any potential flood risk concerns can be appropriately mitigated.

376. Furthermore, once operational, access to the onshore substation will be occasional and transient in nature, i.e. there will be no requirement to remain on site overnight and the site can be evacuated, upon receipt of a warning of heavy rainfall, prior to flooding occurring. This ensures operators of the site would not be placed at risk during such an event.

9 Conclusions

377. The Project has been considered within the context of the guidance set out in the NPPF and the supporting PPG. All sources of flood risk to the onshore infrastructure within the onshore project area have been considered.

9.1 Landfall

378. In terms of the existing flood risk, at the landfall the onshore export cables will be required to pass under areas shown as being in Flood Zone 2 or 3, behind the Holland Gap to Chevaux de Frise Point Coastal Defence. However, they will not be at risk from flooding as they will be installed underground using trenchless techniques.

9.2 Onshore Cable Corridor(s)

379. A review of the flood risk along the onshore cable corridor(s) has been undertaken and it has been noted that the onshore cable corridor(s) will primarily cross through Flood Zone 1, with some locations in Flood Zone 2 and 3 associated with watercourse crossings.

380. In addition, the onshore cable corridor(s) will pass through some areas of increased surface water flood risk. Again these are associated with flow routes into and watercourse crossings over Ordinary Watercourses.

381. The use of trenchless techniques has been embedded in the scheme design for Main Rivers, and as such the impact on flood risk in these locations would remain Low.

382. Trenched crossings are likely to be carried out on some Ordinary Watercourses crossed by the onshore cable corridor(s). Any temporary damming and re-routeing / fluming of watercourses along the onshore cable corridor(s) will be designed such that the original flow volumes and rates are maintained to ensure flood risk is not increased.

383. These are temporary impacts as the bed and banks are to be reinstated to their original level, position, planform and profile. At these locations, a site-specific investigation will be carried out at detailed design stage, to identify the local ground and groundwater conditions, enable a site-specific risk assessment to be undertaken and to understand the potential impact of any works on flows along the watercourse and flood risk in the local area.

384. Once operational, there will be no flood risk posed to the onshore export cables from fluvial, tidal, surface or sewer flooding. A residual risk of flooding from groundwater shall be mitigated using suitable waterproofing of the cables, link boxes and joint bays.

9.3 Onshore Substation Zone

385. The onshore substation zone is located within Flood Zone 1, which represents a Low risk of flooding from fluvial sources.

386. Whilst there is a risk of surface water flooding to the wider onshore substation zone, this is relatively localised and the location / layout of the onshore

substation within the onshore substation zone has not yet been defined. Therefore, it is concluded that the onshore substation can be designed to ensure it does not increase surface water flood risk either to the Project or to off-site receptors.

387. Once operational, access to the onshore substation will be occasional and transient in nature, i.e. there will be no requirement to remain on site overnight and the site can be evacuated, upon receipt of a warning of heavy rainfall, prior to flooding occurring. This ensures operators of the site would not be placed at risk during such an event.

388. Surface water drainage requirements for the onshore substation will be subject to consideration alongside the SuDS hierarchy to meet the requirements of the relevant policy and guidance.

389. Furthermore, an Outline Operational Drainage Plan will provide details of the proposed surface water drainage design. The operational drainage at the onshore substation will be designed taking into account the greenfield runoff rate, proposed runoff rates, volume of storage required and the proposed approach for discharge of water from the site.

9.4 Summary of Flood Risk

390. This FRA has been undertaken in accordance with the methodology and criteria provided on the application of the Sequential Test and Exception Test contained within the PPG.

391. Principally the works for the Project are to be located in Flood Zone 1 and are therefore at a low risk of surface water flooding, including the majority of the onshore cable corridor(s) and the onshore substation search area.

392. Due to the large-scale nature of the works, it is acknowledged that there are locations where infrastructure is required to pass through or be located in Flood Zone 3 or areas at an increased risk of surface water flooding. This relates to the onshore cable corridor(s) adjacent to the landfall location and key locations along the onshore cable corridor(s) (associated with the need to cross existing watercourses).

393. Given the flood risk vulnerability classification of the Project, it is necessary to consider the application of the Exception Test.

394. It is concluded that the development proposals accords with the first part of the Exception Test. It provides wider sustainability benefits to the community on the basis that the Project, as an NSIP, is providing energy certainty utilising a sustainable source of energy at a national scale.

395. It is also considered that the second part of the Exception Test is complied with, as it has been demonstrated that the infrastructure will be safe for the duration of its lifetime, without increasing flood risk elsewhere.

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

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