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OFFSHORE WIND FARM

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6.8.1.1 LESSER BLACK BACKED GULL COMPENSATORY AREA FLOOD RISK ASSESSMENT (CLEAN)

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In preparation of this document Five Estuaries Wind Farm Ltd has made reasonable efforts to ensure that the content is accurate, up to date and complete for purpose.

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Annex 1.1 of Volume 6, Chapter 8: Lesser Black Backed Gull Compensatory Area Flood Risk Assessment

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Basis of Report

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Acronyms and Abbreviations

AOD	Above Ordnance Datum
AOE	Alde Ore Estuary
AEP	Annual Exceedance Probability
BGS	British Geological Survey
DCO	Development Consent Order
DEFRA	Department of Food and Rural Affairs
DTM	Digital Terrain Model
EA	Environment Agency
ES	Environmental Statement
LBBG	Lesser Black Backed Gulls
MAGIC	Multi-Agency Geographic Information for the Countryside.
NGR	National Grid Reference
NNR	National Nature Reserve
NPPF	National Planning Policy Framework
OWF	Offshore Wind Farm
SPA	Special Protection Area
SSSI	Sites of Special Scientific Interest
SuDS	Sustainable Drainage Systems
VE	Five Estuaries Offshore Wind Farm

1.0 Introduction

1. SLR Consulting Limited (SLR) has been appointed by GoBe Consultants on behalf of Five Estuaries Offshore Windfarm Ltd (the Applicant), to prepare a Flood Risk Assessment (FRA) for proposed compensatory measures associated with the Five Estuaries Offshore Wind Farm Project (VE). The proposed works are located within the Alde-Ore Estuary Special Protection Area (AOE SPA) at Orford Ness in Suffolk. This document provides an assessment of flood risk associated with the installation of predator fencing within the compensation area defined for Lesser Black Backed Gulls (LBBG). This report covers an area of land that is referred to as “the site” within this report.

2. The purpose of this assessment is to demonstrate that the development proposals can be satisfactorily accommodated without worsening flood risk for the area and without placing the development itself at risk of flooding. This FRA has been completed in accordance with guidance presented within the National Planning Policy Framework (NPPF)[1] and its associated Planning Practice Guidance (PPG)[2] on flood risk and coastal change, taking due account of current best practice documents relating to assessment of flood risk published by the British Standards Institution BS8533[3].

1.1 Context and Site Location

3. The site is currently a relatively featureless section of Orford Ness in the Alde Estuary, with no existing buildings located on it and comprising a relatively permeable surface. The site is located in the central area of the Orford Ness spit.

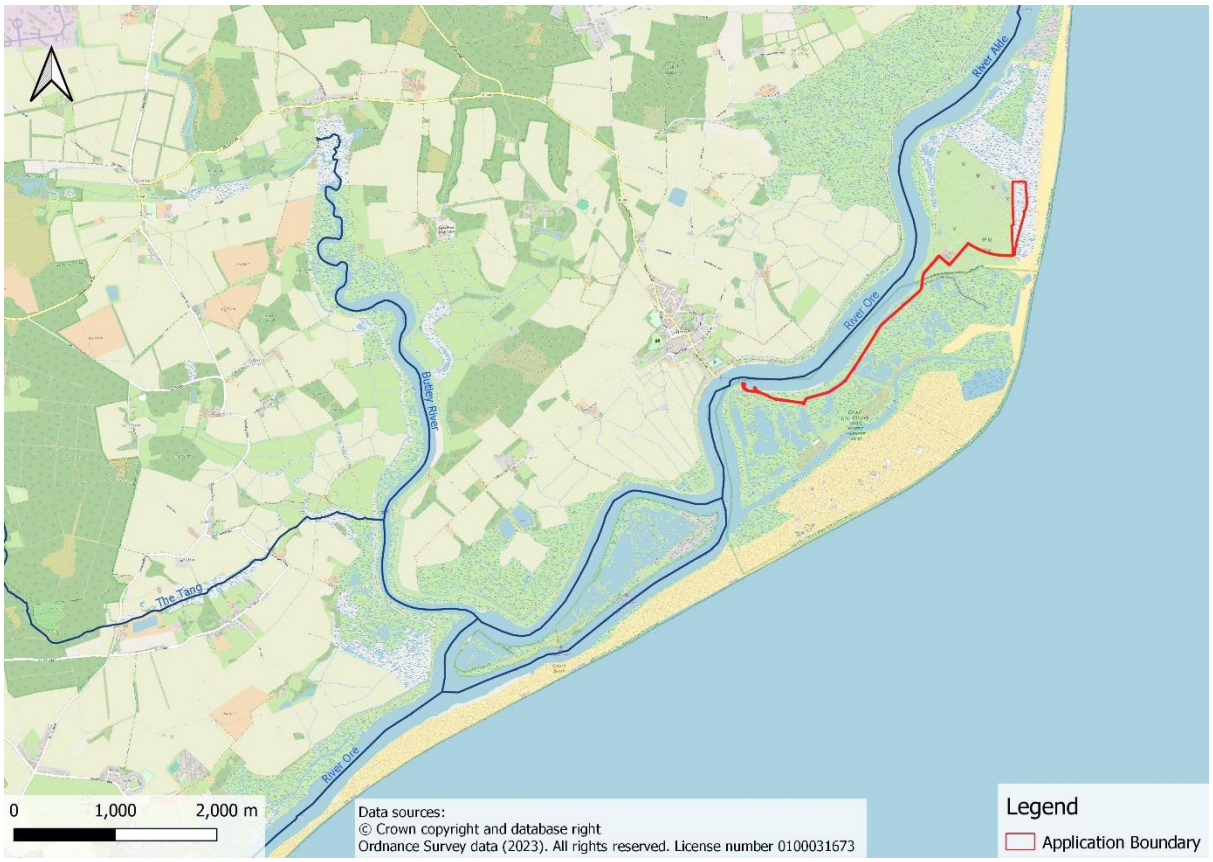
4. The site is situated within Suffolk, approximately 1km west of the village of Orford. The nearest registered postcode to the site is IP12 2BT, and the main site area (excluding the access route) is centred around grid reference (NGR) TM 45515 51140. A location plan detailing the substation works area is presented in Figure 1-1.

1 National Planning Policy Framework. National Planning Policy Framework - GOV.UK, (Published March 0212, Revised December 2023), https://www.gov.uk/government/publications/national-planning-policy-framework--2

2 Flood risk and coastal change guidance. Flood risk and coastal change - GOV.UK, (Published March 2014, Updated August 2022), https://www.gov.uk/guidance/flood-risk-and-coastal-change

3 BS8533:2017, Assessing and managing flood risk in development: Code of Practice (December 2017)

Figure 1-1 Site Location Plan



1.2 Proposed Works

5. The development proposals comprise the installation of predator proof fencing around the perimeter of a plot of land. There are no plans for any development within this fenced area.

6. The proposed predator proof fencing is to be approximately 1.8 to 2.0m high above the ground surface, with the skirt of the fencing extending up to 150mm into the ground surface, to prevent predators burrowing beneath the fence.

7. Similar height mesh fencing is already present within the proposed fencing location, acting as a security fence for the Cobra Mist site.

8. A new access onto the compensation area of the site may be required, across an existing ditch. This crossing would be either a bridge or a culvert crossing, similar to existing crossings found at Orford Ness. Any ditch crossing will be designed such that it does not alter local hydrological regimes. Any new crossing would be subject to an Ordinary Watercourse Consent application to the Lead Local Flood Authority (LLFA).

1.3 Background and Aims

9. The aim of the FRA is to assist the VE development in relation to assessment of flood risk at the LBBG compensation area. This will include assessment of the potential for the site to be impacted by flooding, the impact of the proposed works associated with establishing and operating the site, and proposed measures to be incorporated, mitigating any identified risk.

10. The report has been produced in accordance with NPPF[1] and its associated PPG[2], in addition to Overarching National Policy Statement for Energy[4] (EN-1) and National Policy Statement for Electricity Networks[5] (EN-5), taking due account of current best practice documents relating to assessment of flood risk published by the British Standards Institution BS8533[4].

2.0 Relevant Policy and Guidance

11. The compensation area will be developed in accordance with the following national legislation and relevant national and local policy and guidance.

2.1 National Policy and Guidance

- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 transposes the European Water Framework Directive (2000/60/EC) and aspects of the Groundwater Directive (2006/118/EC) into UK legislation;
- The Flood Risk Regulations 2009 transpose the EU Floods Directive (2007/60/EC) into UK legislation and sets out requirements of the Environment Agency and local authorities in preparing assessments and mapping of flood risk for each river basin district in England and Wales;
- The Flood and Water Management Act 2010 includes provisions for the management of risk in connection with flooding and sets out requirements for LLFA in preparing strategies for local flood risk management;

4 Overarching National Policy Statement for Energy (EN-1), Department for Energy Security and Net Zero, November 2023 https://assets.publishing.service.gov.uk/media/65bbfbdc709fe1000f637052/overarching-nps-for-energy-en1.pdf, accessed January 2024

5 National Policy Statement for Electricity Networks Infrastructure (EN-5), Department for Energy Security and Net Zero, November 2023, Electricity Networks National Policy Statement - EN-5 (publishing.service.gov.uk), accessed February 2024

- The Water Resources Act 1991 regulates water resources, water quality and flood defence;
- The Land Drainage Act 1991 sets out requirements for maintenance of watercourses by riparian owners;
- The National Planning Policy Framework (NPPF), prepared by the Department for Communities and Local Government was published in March 2012 and revised in December 2023. Chapter 14 of the NPPF, Meeting the challenge of climate change, flooding and coastal change, recommends a proactive strategy to mitigate and adapt to climate change and requires that flood risk, sustainability and water quality are considered;
- Flood Risk and Coastal Change Planning Practice Guidance (PPG) (2014, updated 2022) expands on policies contained in the NPPF;
- CiRIA SuDS Manual (C753, 2015) incorporates the latest research, industry practice, and guidance for design, delivery, and maintenance of SuDS;
- Preparing a Flood Risk Assessment: Standing Advice, Environment Agency, and DEFRA (2022); and
- Flood Risk Assessments: Climate Change Allowances, Environment Agency (2022).

2.2 Local Policy

- East Suffolk Local Plan, including guidance on SUDS[6];
- Suffolk Flood Risk Management Strategy[7];
- Suffolk County Council Preliminary Flood Risk Assessment[8]; and
- Suffolk Coastal and Waveney District Councils Level 1 Strategic Flood Risk Assessment (SFRA)[9].

6 East Suffolk Local Plan, East Suffolk Council, 2020, https://www.eastsuffolk.gov.uk/planning/planning-policy-and-local-plans/local-plans/ (accessed January 2024)

7 Suffolk Local Flood Risk Management Strategy, Suffolk Flood Risk Management Partnership, 2016, https://www.greensuffolk.org/flooding/flood-risk-management-strategy/ (accessed January 2024)

8 Suffolk County Council Preliminary Flood Risk Assessment, Suffolk County Council, 2011, https://www.suffolk.gov.uk/roads-and-transport/flooding-and-drainage/flood-management-in-suffolk/preliminary-flood-risk-assessment/ (accessed January 2024)

9 Suffolk Coastal and Waveney District Councils Level 1 Strategic Flood Risk Assessment, East Suffolk Councils, 2018 https://www.eastsuffolk.gov.uk/planning/planning-policy-and-local-plans/local-plans/local-plan-evidence-base/ (accessed January 2024)

2.3 Data Sources Considered

12. In assessing the flood risk to the site, the following sources have been reviewed:

- Five Estuaries Scoping Report;
- Five Estuaries Preliminary Environmental Information Report (PEIR) and associated consultee responses;
  - Mapping published on the Environment Agency website;
    - Flood Map for Planning[10];
    - Long Term Flood Risk Information[11]
      - Risk of Flooding from Rivers and Sea;
      - Risk of Flooding from Reservoirs;
      - Risk of Flooding from Surface Water; and
      - Coastal Design Sea Levels[12].
  - British Geological Survey (BGS)[13] mapping for details of superficial and bedrock geology;
  - Cranfield Soil and Agrifood Institute Soilscapes map viewer[14] for soil information;
  - Environment Agency LiDAR data from the Department for Environment, Food & Rural Affairs (DEFRA), https://environment.data.gov.uk/DefraDataDownload/?Mode=survey;
  - UK Centre for Ecology and Hydrology (CEH) Environmental Information Data Centre and UK Water Resources Portal; and
  - DEFRA's Multi-agency geographic information for the countryside (MAGIC)[15] website.

10 Environment Agency Flood Map for Planning https://flood-map-for-planning.service.gov.uk (accessed January 2024)

11 Environment Agency Long Term Flood Risk, https://www.gov.uk/check-long-term-flood-risk (accessed: January 2024)

12 Coastal Design Sea Levels - Coastal Flood Boundary Extreme Sea Levels (2018), Coastal Design Sea Levels - Coastal Flood Boundary Extreme Sea Levels (2018) - data.gov.uk (accessed March 2024)

13 British Geological Survey, Geoindex Onshore, https://geologyviewer.bgs.ac.uk/ (accessed: January 2024)

14 Soilscapes, Cranfield Soil and Agrifood Institute, Cranfield University, DEFRA, http://www.landis.org.uk/soilscapes/ (accessed: January 2024)

15 Magic Map Application, DEFRA, https://magic.defra.gov.uk/MagicMap.aspx (accessed: January 2024)

3.0 Development Compatibility

3.1 Vulnerability Classification

13. The Flood Risk and Coastal Change PPG classifies land uses into five categories;

- Essential Infrastructure
- Highly Vulnerable
- More Vulnerable
- Less Vulnerable; and,
- Water Compatible.

14. According to Annex 3 of the NPPF, the development proposal's vulnerability classification is assessed as being *water compatible*. This includes sites which are to be developed for *nature conservation and biodiversity*.

3.2 Compatibility

15. Table 3-1 below is taken from Table 2 of the PPG technical guidance[2], and compares Flood Zones with the vulnerability classification of the development proposals in order to identify whether a development is appropriate in a particular location. As this project is classed as a water compatible land use, the scheme is compatible with development in any Flood Zone.

Table 3-1 Flood Risk Vulnerability and Flood Zone 'Incompatibility'

Flood Risk Vulnerability Classification		Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	Exception Test Required	✓	✓	✓
	Zone 3a	Exception Test Required	x	Exception Test Required	✓	✓
	Zone 3b * (functional floodplain)	Exception Test Required	x	x	x	✓
Key: ✓ Exception test is not required			x Development should not be permitted			

* 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.

3.2.1 Sequential Test

16. The NPPF Flood Risk Sequential Test is used to establish whether there are any other sites at a lower flood risk that would be available for the development proposals.

17. Wherever possible, development must be directed to a site in the lowest flood risk zone. If the development is planned in a higher risk zone, flood management and mitigation measures may be required to reduce risks to an acceptable level for the specific use in question.

18. The Sequential Test requires a demonstration that the residual risk, with respect to flood management and mitigation measures, is acceptable. The potential for climate change over the life of the development must also be considered.

19. Given the site is located within Flood Zone 3b and the proposals are for a water compatible development, in accordance with the guidance in the NPPF, the proposals are considered to be appropriate in this location.

3.2.2 Exception Test

20. The compensation area is located within Flood Zone 3b and defined as water compatible development. As detailed in Table 3-1 above, development under the water compatible category is considered to be acceptable without the application of the Exception Test.

4.0 Climate Change Allowance

21. The NPPF requires that flood risk is considered over the lifetime of the development and therefore consideration needs to be given to the potential impacts of climate change.

22. In February 2016, the Environment Agency issued updated guidance on the impacts of climate change on flood risk[16] in the UK to support NPPF. This was most recently updated in May 2022 and advice sets out that peak rainfall intensity, sea level, peak river flow; offshore wind speed and extreme wave heights are all expected to increase in the future as a result of climate change. Consideration of the changes to these parameters

16 Flood risk assessments: climate change allowances - GOV.UK, (Published February 2016, Updated May 2022), https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

should use the allowances outlined below based on the anticipated lifetime of the development.

23. The climate change allowance guidance acknowledges that there is considerable uncertainty with respect to the absolute level of change that is likely to occur. As such, the document provides estimates of possible changes that reflect a range of different emission scenarios, over different epochs.

4.1 Anticipated Lifetime of Development

24. As discussed in Section 3.1, according to the NPPF, nature conservation areas such as the proposed development at the site are classified as water compatible. The site is to be designed for a 40-year design life in line with the wider VE project. It is anticipated that the site will be constructed by 2030 and will be operational up to 2070. This falls within the 2066 to 2095 epoch when considering climate change allowances for sea level rise, the 2080s epoch (2070 to 2125) for river flow, and the 2070s epoch (2061 to 2125) for peak rainfall intensity.

4.2 Sea Level Rise

25. Tidal climate change allowances are determined by the predicted increase in sea levels. These are determined by regional variations, which are based on the River Basin District under consideration.

26. The sea level rise in mm per year allowances are reproduced as Table 4-1 below for the Anglian region, with the cumulative amount for each respective epoch in brackets.

27. Climate change guidance[16] states that the predicted cumulative sea level rise for both the Higher Central and Upper End allowance should be assessed, calculated based upon the expected lifetime of the development.

28. Assuming a base year of 2018 the Higher Central cumulative sea level allowance applicable up to 2070 is 417.6mm.

29. Assuming a base year of 2018 the Upper End cumulative sea level allowance applicable up to 2070 is 537.0mm.

Table 4-1 Sea Level Allowances

Area of England	Allowance	2000 to 2035	2036 to 2065	2066 to 2095	2096 to 2125	Cumulative rise (2000 to 2125)
Anglian	Higher Central	5.8mm (203mm)	8.7mm (261mm)	11.6mm (348mm)	13.0mm (390mm)	1.20m
	Upper End	7.0mm (245mm)	11.3mm (339mm)	15.8mm (474mm)	18.1mm (543mm)	1.60m

Based on a 1981 to 2000 baseline. The total sea level rise for each epoch is in brackets

4.3 Peak River Flow

30. For peak river flow, climate change guidance[16] states that for water compatible development located in Flood Zone 3b, the Central allowance should be considered. As per Table 4-2 below, for the East Suffolk Management Catchment, in which the site is located, this equates to a 19% increase in peak flow by the 2080s (based on the proposed 40-year design life).

Table 4-2 Peak River Flow Allowances

Management Catchment	Allowance Category	2020s	2050s	2080s
East Suffolk	Central	8%	7%	**19%**
	Higher Central	13%	13%	29%
	Upper End	25%	29%	54%

4.4 Peak Rainfall Intensity

31. For peak rainfall intensity the climate change guidance[16] states that for water compatible developments with a 40-year design life, the Central allowance for the 2070's epoch for both the 3.3% Annual Exceedance Probability (AEP) (1 in 30 chance) storm event and 1% AEP (1 in 100 chance) storm event should be used. The peak rainfall allowances for the East Suffolk Management Catchment are detailed in Table 4-3 below.

32. The Environment Agency note that in some locations the allowance for the 2050s epoch is higher than that for the 2070s epoch. If so, and development has a lifetime beyond 2061, use the higher of the two allowances. The use of the Central allowance and the selection of the higher of the allowance over the two epochs means that a maximum allowance for peak rainfall intensity is 20%.

Table 4-3: Peak Rainfall Intensity Allowances

Management Catchment	Annual Exceedance Probability (%)	Allowance Category	Total potential change anticipated for the 2050s	Total potential change anticipated for the 2070s
East Suffolk	3.3	Central	20%	20%
		Upper End	40%	40%
	1.0	Central	20%	20%
		Upper End	45%	40%

5.0 Baseline Context

5.1 Local Hydrology

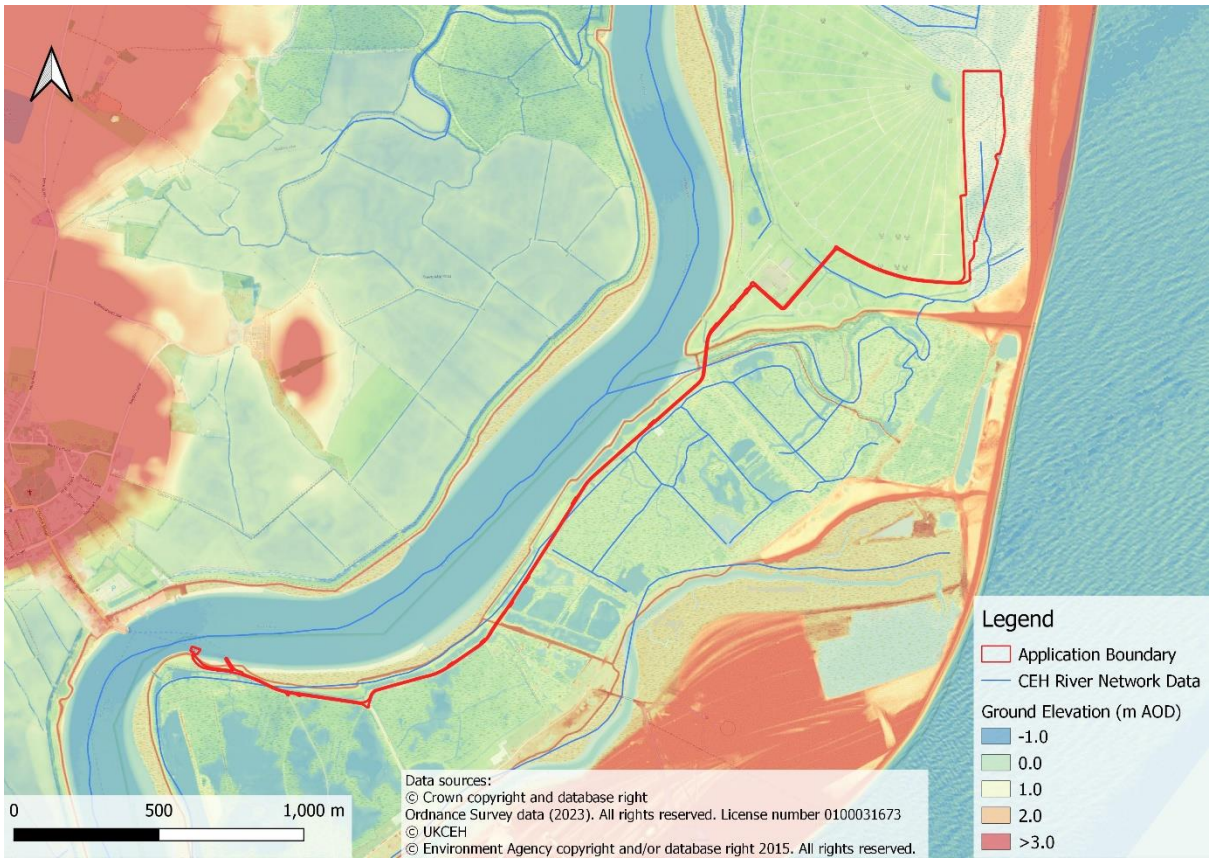
33. The site is situated on Orford Ness which is a sand spit that has formed across the mouth of the River Alde, which lies to the north of the spit. The spit channels the River Alde parallel to the coastline, becoming the River Ore along the reach adjacent to the site and the site access track. To the south of the site, the Butley River flows into the River Ore, upstream of the mouth of the River Ore into Hollesley Bay at the southern end of Orford Ness spit. The channels of the River Alde, Butley River and the River Ore can be seen in Figure 1-1.

34. According to the CEH river network data, a number of unnamed ordinary watercourses are present on Orford Ness, including channels which pass through the site and pass under the site access track. The channels appear to be interconnected with a number of surface water features present on Orford Ness and drain towards the west into the River Ore.

5.2 Site Topography

35. Ground levels within the site have been determined by reviewing the Environment Agency 2m LiDAR data. Topographic levels within the compensation area of the site range from a high of approximately 1.3m above Ordnance Datum (AOD) towards the centre of the compensation area, to a low of -0.4m AOD within some of the watercourse channels within the site. The majority of the compensation area and the access track is on flat terrain between 0.0m and 1.0m AOD, with an average ground level of approximately 0.4m AOD. The topography at the site can be seen in Figure 5-1.

Figure 5-1 Site Topography



5.3 Geological and Hydrogeological Features

5.3.1 Geology

36. According to the BGS GeoIndex[17], the site is underlain by London Clay Formation (Clay, Silt and Sand) along the access track and Red Crag Formation (Sand) below the compensation area. The bedrock geology is overlain by Tidal Flat Deposits (Clay and Silt) along the access track and the western extent of the compensation area, with Marine Beach Deposits (Sand and Gravel) present towards the eastern extent of the compensation area.

17 BGS GeoIndex: https://mapapps2.bgs.ac.uk/geoindex/home.html?_ga=2.5369018.844637358.1706180090-495629674.1706180090

5.3.2 Hydrogeology

37. The various classifications are described by the Environment Agency as follows:

- **Principal Aquifer**: layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.
- **Secondary A Aquifer**: permeable layers that can support local water supplies, and may form an important source of base flow to rivers.
- **Secondary B Aquifer**: lower permeability layers that may store and yield limited amounts of groundwater through characteristics like thin fissures and opening or eroded layers.
- **Secondary (undifferentiated)**: where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value.
- **Unproductive Strata**: strata that are largely unable to provide usable water supplies and are unlikely to have surface water and wetlands ecosystems dependent on them.

38. The Red Crag Formation bedrock is classified as Principal Aquifer while the London Clay Formation is considered to be Unproductive Strata. Within the superficial deposits the Tidal Flat Deposits which are considered to be Unproductive Strata. The Marine Beach Deposits are classified as Secondary A Aquifer.

39. According to MAGIC Mapping[15], the site is not located within any groundwater source protection zone (SPZ).

40. No significant groundwater is expected to be present along the access track due to the underlying geology comprising Unproductive Strata. The majority of the compensation area is underlain by the Red Crag Formation which is considered to be Principal Aquifer, however this is largely confined by Tidal Flat Deposits. Any shallow groundwater present at the site would be expected to be in continuity with local surface water features within Orford Ness of the adjacent estuary and coastal areas.

5.4 Existing Site Drainage

41. No formal drainage is known to be operational across the existing site. Incidental rainfall at the site is expected to infiltrate to ground locally or during extreme events may flow

overland following topographical profiles into existing surface water features or drainage channels.

6.0 Flood Risk Screening

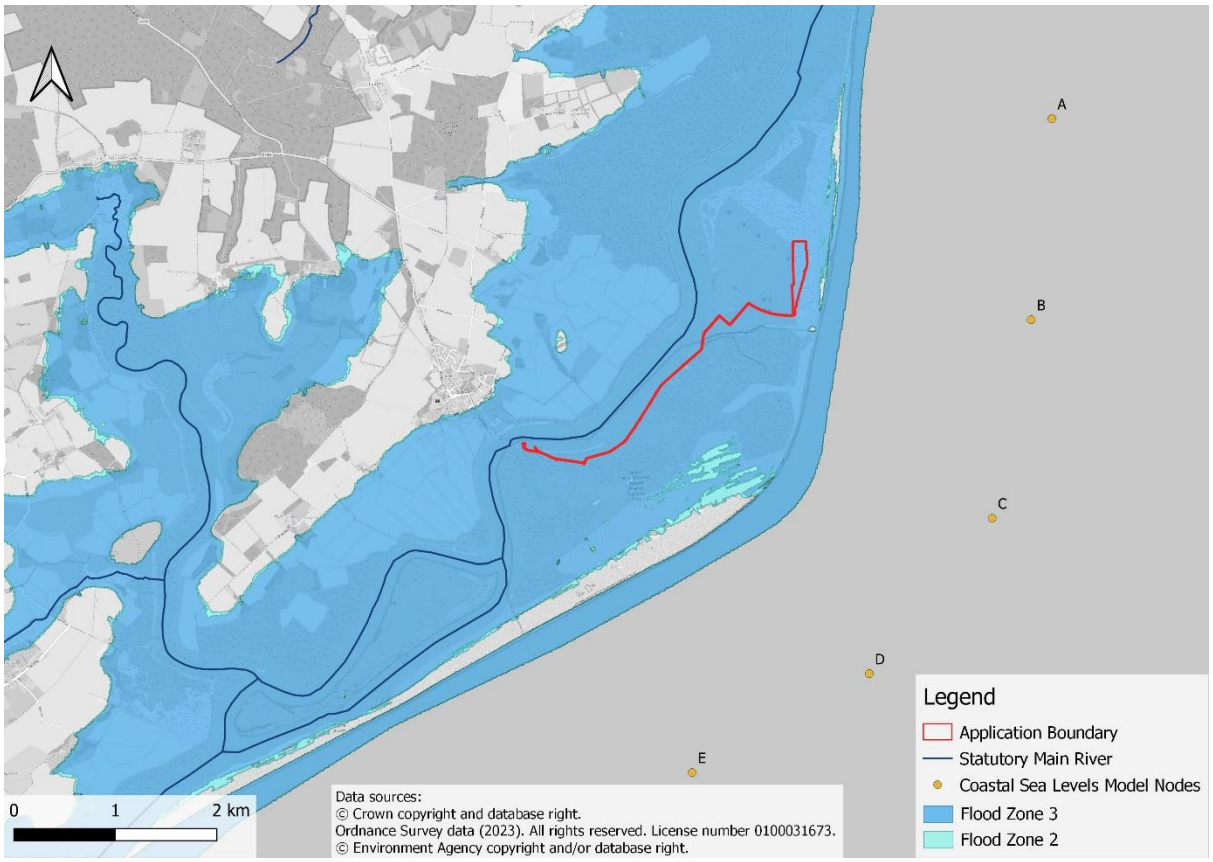
6.1 Flooding from Coastal or Tidal Sources

42. Tidal flooding results from a combination of high tides and atmospheric conditions. If low atmospheric pressure coincides with a high tide, a tidal surge may happen, which can cause significant flooding. The Environment Agency Flood Map for Planning demonstrates that the site is located within an area defined as Flood Zone 3.

43. In addition, the East Suffolk SFRA Flood Zone Mapping shows the site is situated entirely within Flood Zone 3b and is therefore a part of the functional floodplain. For reference land within the tidal Flood Zone 3b has a 1 in 20 (5.0%) or greater annual probability of sea flooding.

44. In order to determine the flood risk from tidal sources, the ground levels at the site have been compared to the information provided in the Environment Agency's Coastal Design Sea Levels dataset, which describes the extreme sea levels for a range of annual probabilities of exceedance. The Coastal Design Sea Levels dataset was prepared by the UK Coastal Flood Forecasting partnership[12], which includes the Environment Agency and other United Kingdom environmental regulatory bodies. It should be noted that the baseline year for the data set is 2018. An extract of the Environment Agency Flood Map for Planning is included at Figure 6-1.

Figure 6-1 Extract of Flood Map for Planning



6.1.1 Baseline Tidal Flood Risk

45. Comparison of the Environment Agency's Coastal Design Sea Level data for a range of model node points adjacent to the site is presented in Table 6-1. The data provides peak sea water level for the medium and low tidal flood risk scenarios which are used to define the Environment Agency Flood Zone mapping. For tidal events this data is the 1 in 200 year event (0.5% AEP) and the 1 in 1,000 year event (0.1% AEP).

Table 6-1 Environment Agency 2018 Coastal Design Sea Level Data

Node	Peak Water Level (m AOD)			
	0.5% AEP	0.1% AEP	0.5% AEP + CC	0.1% AEP + CC
A	3.26	3.62	3.80	4.16
B	3.30	3.67	3.84	4.21
C	3.34	3.72	3.88	4.26
D	3.38	3.78	3.92	4.32
E	3.49	3.90	4.03	4.44

46. The development proposals are shown to be at risk during the 0.5% AEP event, with flood depths of more than 3m across large parts of the compensation area and at greater risk of tidal flooding for the 0.1% AEP event.

6.1.2 Post Development Tidal Flood Risk

47. An allowance for climate change over the life of the proposed development has also been calculated and presented in Table 6-1. This is based on the climate change allowance for tidal events discussed in Section 4.2. The climate change allowance used is based on the Upper End cumulative sea level allowance applicable up to 2070. Comparison with topographic levels across the site indicates that the development proposals could experience flood depths of more than 3m during extreme events.

48. The development proposals are considered to be water compatible. As such, no specific mitigation measures are considered to be necessary.

49. Considering the impacts of climate change and the other factors discussed above, the assessed tidal flood risk over the development lifespan for the development proposals is considered to be high however the risk with regard to potential impact on the development proposals is considered to be very low. The risk of an increase in flood risk elsewhere is considered to be very low.

6.2 Flooding from Fluvial Sources

50. River flooding occurs when a watercourse cannot cope with the water draining into it from the surrounding land. This can happen, for example, when heavy rain falls on an already waterlogged catchment.

51. As discussed in Section 6.1, the primary source of flooding to the site is considered to be tidal flooding due to the proximity to the coast and as the River Ore to the west of the site is principally tidally influenced. All watercourses on Orford Ness drain into the River Ore or directly onto the coast and as such have a free discharge. As such, the risk of flooding from fluvial sources is considered to be very low throughout the lifetime of the development.

52. Considering the impacts of climate change and the other factors discussed above, the assessed fluvial flood risk over the development lifespan is considered to be very low.

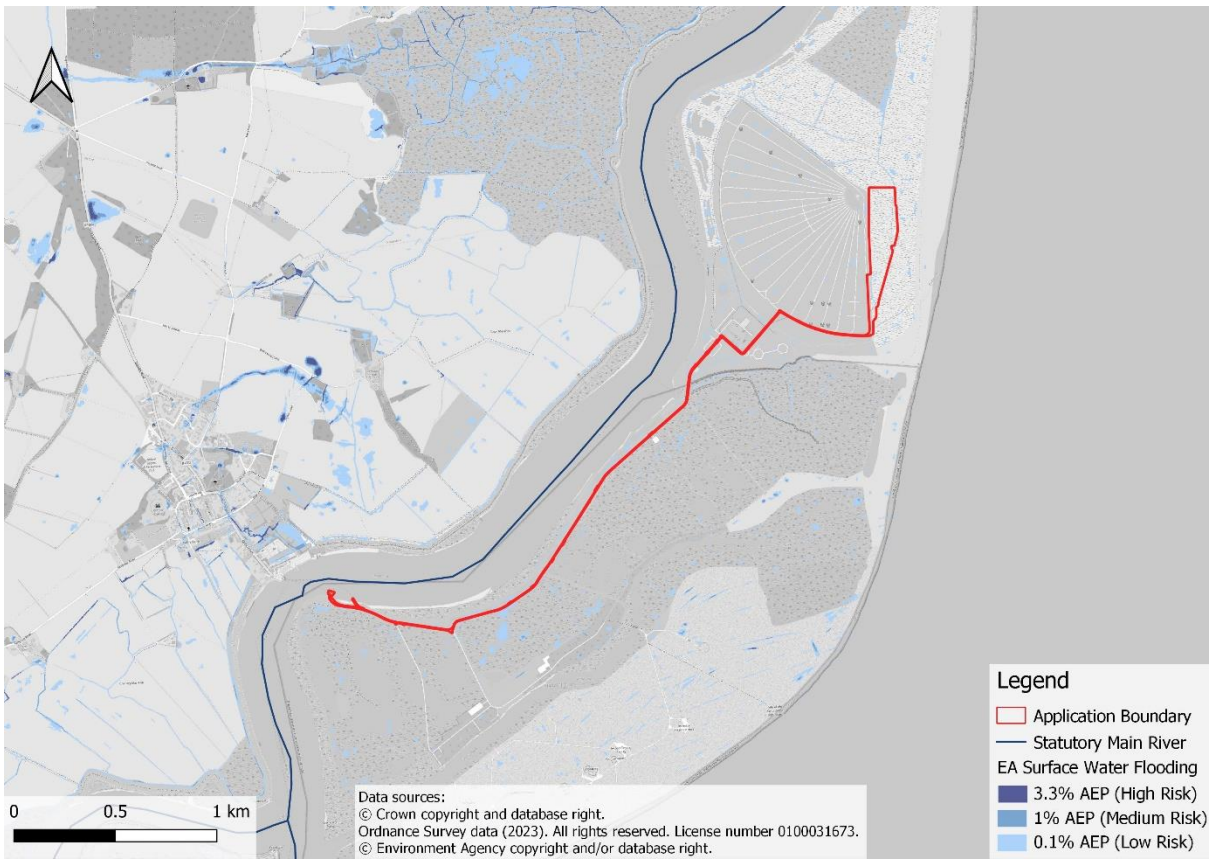
6.3 Flooding from Surface Water or Overland Flow

53. Surface water flooding occurs when heavy rainfall overwhelms the drainage capacity of the local area and flows over the surface, as such it can be difficult to predict and pinpoint. Surface water modelling has been undertaken by the Environment Agency to establish areas at risk of surface water flooding. An extract of the resulting surface water flood map is reproduced in Figure 6-2.

54. The Environment Agency defines the surface water flood risk categories as:

- Very Low: less than 0.1% AEP (1 in 1,000 chance) of flooding in any given year;
- Low: less than 1% AEP (1 in 100 chance) but greater than or equal to 0.1% AEP (1 in 1,000 chance) of flooding in any given year;
- Medium: between 1% AEP (1 in 100 chance) and 3.3% AEP (1 in 30 chance) of flooding in any given year; and
- High: greater than 3.3% AEP (1 in 30 chance) of flooding in any given year.

Figure 6-2 Extract of Environment Agency Surface Water Flood Risk Mapping



6.3.1 Baseline Surface Water Flood Risk

55. In the present-day scenario, based on the Environment Agency surface water flood risk map, the site is wholly located in an area that is not at risk of surface water flooding. As such, this means that the site would also remain unaffected up to, and including, the 0.1% AEP surface water flood event.

6.3.2 Post Development Surface Water Flood Risk

56. The current Environment Agency surface water flood risk maps do not incorporate predicted climate change allowances. However, due to the predicted increases in peak rainfall intensity, it is likely that surface water flood depths will increase over the lifetime of a development.

57. Given the nature of the site and the existing flood risk, it is considered that future climate change allowances would not negatively impact either the site or the wider area throughout the lifetime of the development.

58. As the overall surface water flood risk is very low, and the site is defined as water compatible, no mitigation measures are required.

59. Based on the assessment above, the risk of surface water flooding is considered to be very low.

6.4 Flooding from Groundwater

60. Groundwater flooding is the emergence of groundwater at the ground surface or into subsurface voids, arising as a result of abnormally high groundwater heads or flows. This can be from the introduction of an obstruction to groundwater flow or the rebound of previously depressed groundwater levels.

61. Groundwater flooding most commonly occurs in unconfined aquifers; either large aquifers from which considerable amounts of water can be discharged or in shallow permeable sediments. Flooding locations are typically near areas of natural groundwater discharge, such as river valleys and spring lines.

62. As detailed in Section 5.2, the site is generally flat with no significant topographical breaks or gradients. The geology and hydrogeology discussed in Section 5.3 indicates that no significant groundwater is expected to be present along the access track due to

the underlying geology comprising Unproductive Strata. The Red Crag Formation beneath the compensation area is expected to have groundwater at depth, however this is largely confined by Tidal Flat Deposits.

63. Any shallow groundwater present at the site would be expected to be in continuity with local surface water features within Orford Ness of the adjacent estuary and coastal areas.

64. Based on this evidence, groundwater flooding risk is considered to be very low.

6.5 Flooding from Sewers

65. Sewer flooding occurs when below ground infrastructure is overwhelmed by heavy rainfall and when blockages occur or sewer pipes fail. The likelihood of flooding depends on the presence and capacity of any local sewer system.

66. Orford Ness is not known to be served by any existing sewer system. The current risk of flooding from sewer sources is therefore considered to be very low.

67. Given the development proposals are classified as being water compatible and have no requirement for connection to any formal sewerage system, the risk of flooding from sewer sources is considered to be very low following development. No mitigation measures are required for the site.

68. The risk of flooding from sewers is therefore considered to be very low.

6.6 Flooding from Canals, Reservoirs and Artificial Sources

69. According to the EA's online mapping[11], the site does not lie within an area at risk of flooding from reservoirs.

70. The site is not within close proximity of any canals and, as such, is not at risk of flooding in the event of a canal breach.

71. The risk of flooding from canals, reservoirs and artificial sources is therefore considered to be very low.

6.7 Flooding from Infrastructure Failure

72. The site is not in an area that benefits from flood defences according to the Environment Agency Flood Map for Planning. Flood defences are present locally on the River Ore and River Alde estuaries to the west of the site, however, given the distance and orientation of these defences the removal or breaching of these defences is unlikely to have a significant impact on flood risk at the site.

73. The site is therefore not considered to be at risk of flooding from infrastructure failure, as it is located seaward of the local flood defences. No specific mitigation measures are required for the site.

6.8 Flood Risk Summary

74. A summary of the potential sources of flooding and the flood risk arising from them is presented in Table 6-2.

Table 6-2: Potential Flood Sources

Potential Flood Sources	Significant Flood Risk at Site (Y/N)
Rivers or Fluvial Flooding	N
Coastal or Tidal Flooding	Y
Surface Water or Overland Flow	N
Groundwater	N
Sewers	N
Reservoirs, Canals and Artificial Sources	N
Infrastructure Failure	N

7.0 Off Site Impacts

7.1 Impact to Flood Risk Elsewhere

75. The development proposals are classified as being water compatible, and the primary source of flooding to the site is assessed as being tidal. The location of the site, on Orford Ness, seaward of any existing flood defences is such that any works will not displace flood water or increase flood risk to others.

76. The development proposals are not predicted to impact groundwater flows, and as such will not alter the groundwater flood risk in the area.

77. There is no surface water flood risk to the site and there is no change proposed to the existing surface. As such, there will be no increase in surface water runoff as a result of the development proposals and therefore no off site increase in surface water flood risk to others.

78. Based on the above there will be no change to flood risk elsewhere as a result of the development proposals.

8.0 Mitigation Measures

8.1 Site Access / Egress

79. The development proposals are for the construction of predator proof fencing, surrounding land within the compensation area on the Orford Ness Peninsula. These works are classified as water compatible development under the NPPF.

80. It is understood that the site would only require infrequent access to strim vegetation outside of bird breeding season and for ecological surveys between April and August. The fencing is expected to be constructed outside of nesting times, however it will be important to plan construction and site maintenance/monitoring visits to avoid times when extreme tidal events may be forecast, taking into consideration flood warning notifications detailed below.

8.2 Flood Warning

81. Access to the site during construction of the predator proof fencing and during all subsequent maintenance and survey visits will need to take due consideration of weather conditions.

8.2.1 Environment Agency Flood Warning

82. The site is situated in the Environment Agency Flood Warning Area, entitled ‘The Suffolk coast from Orford Ness to Bawdsey, including Butley and Shingle Street’. It is recommended that construction workers and operators of the site sign up the

Environment Agency flood warning service[18] in order that they can receive notifications with respect to potential flooding events at the site.

83. In the case of any flood warning notification, any personnel, environmental surveyors, or anyone else present on the site, should vacate immediately. Any planned environmental surveying, maintenance or other work which involves visiting the site during the period of any flood warning, should be cancelled. This applies both during the installation of the fencing, and during the operation of the site.

8.2.2 Met Office Weather Warnings

84. The Met Office issues weather warnings up to 5 days in advance through the National Severe Weather Warning Service, when severe weather has the potential to bring impacts to the UK. It is possible to stay up to date with weather warnings through an app issued by the Met Office, or via email alerts[19].

85. Site users should monitor local weather reports and sign up for the Met Office UK weather warnings. Warnings should be monitored while on site and similar to the EA flood warning system, if a weather warning received, any staff should vacate the site immediately.

86. Prior to visiting the site contractors or surveyors should check for Met Office warnings. Should there be a future warning in place, any work which involves visiting the site during the period of the warning, should be cancelled.

9.0 Conclusion

87. SLR Consulting Limited has been appointed by GoBe Consultants on behalf of Five Estuaries Offshore Windfarm Ltd, to prepare a Flood Risk Assessment for proposed activities located at Orford Ness in Suffolk. The development proposals comprise the installation of predator proof fencing around the perimeter of a plot of land. There are no plans for any development within this fenced area.

18 Environment Agency Flood Warning Service, Home page - Sign up for flood warnings - GOV.UK (environment-agency.gov.uk)

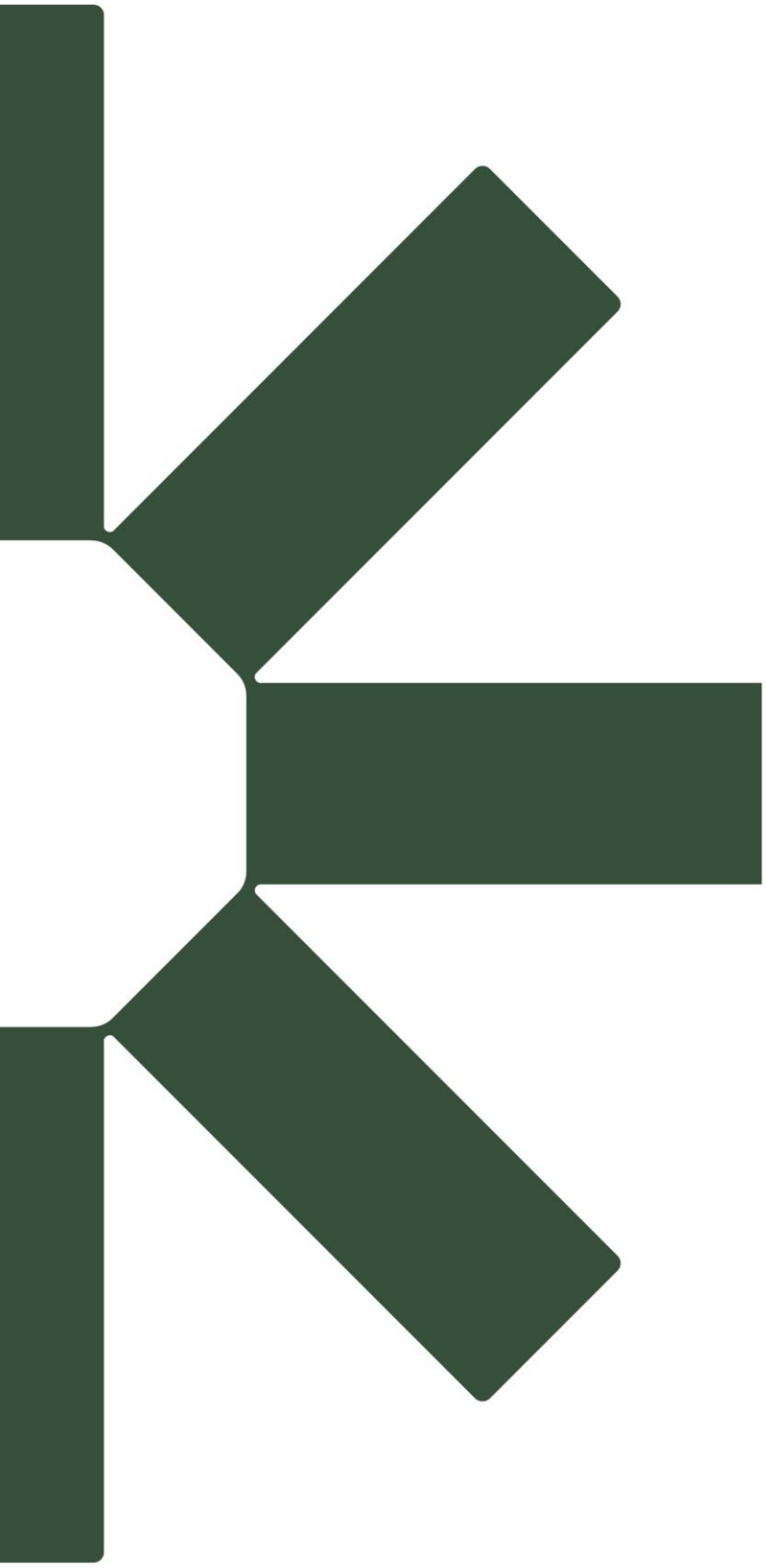
19 Met Office weather warnings guide: https://www.metoffice.gov.uk/weather/guides/warnings

88. According to NPPF vulnerability classification, the development proposals are considered to be water compatible, which includes development of nature conservation and biodiversity sites.

89. The key findings of this Flood Risk Assessment are as follows:

- The site is situated within Flood Zone 3b, which comprises land having a greater than 1 in 20 (5.0%) or greater annual probability of flooding from the sea.
- The development proposals are classified as water compatible under the guidance set out within NPPF.
- The intended lifespan for the development proposals is 40 years i.e. up to 2070. The applicable tidal climate change allowances have been considered as part of this assessment.
- Environment Agency Coastal Design Sea Levels dataset shows that the primary source of flooding to the site is tidal flooding. The site is shown to experience flood depths of over 3.0m during the 0.5% AEP tidal flood event.
- Given the proposed use, the development proposals are considered to be at low risk of flooding from tidal sources.
- Assessment of all other potential sources of flooding indicates a very low risk at the site.
- Surface water drainage for the site will not change. There will be no new impermeable surface areas added as a result of the development proposals.
- It is understood that the only access required to the site post construction will be for environmental maintenance workers to cut vegetation over the course of several days every year, and periodic monitoring of the nesting success.
- It is recommended that the operators of the site sign up to this Environment Agency Flood Warning service and use the Met Office weather warning tools. If a flood warning or weather warning is issued while the environmental surveyors, or anyone else is on the site, they should leave immediately.
- Tidal flood warnings and weather warnings can be issued in advance and therefore any construction works or site visits that may be planned to take place during the time of flood or weather warnings should be postponed.

90. In conclusion, based on the information outlined within this Flood Risk Assessment, the perceived level of flood risk to and caused by the development proposals is low and the development would be safe, without significantly increasing flood risk elsewhere over its lifetime.



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