



East Anglia ONE North Offshore Windfarm

Appendix 20.3 Flood Risk Assessment

Environmental Statement Volume 3

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Glossary of Acronyms

A/HMWB	Artificial or Heavily Modified Water Body
CoCP	Code of Construction Practice
CDA	Critical Drainage Area
CIA	Cumulative Impact Assessment
CIRIA	Construction Industry Research and Information Association
CMS	Construction Method Statement
DCLG	Department for Communities and Local Government
Defra	Department for Environment, Food & Rural Affairs
DMRB	Design Manual for Roads and Bridges
EA	Environment Agency
EC	European Commission
EIA	Environmental Impact Assessment
FRA	Flood Risk Assessment
FWMA	Flood and Water Management Act
GEP	Good Ecological Potential
GES	Good Ecological Status
HDD	Horizontal Directional Drilling
LFRMS	Local Flood Risk Management Strategy
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPS	National Policy Statement
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
SCDC	Suffolk Coastal District Council
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage System
WDC	Waveney District Council
WFD	Water Framework Directive

Glossary of Terminology

Applicant	East Anglia ONE North Limited.
Cable sealing end compound	A compound which allows the safe transition of cables between the overhead lines and underground cables which connect to the National Grid substation.
Cable sealing end (with circuit breaker) compound	A compound (which includes a circuit breaker) which allows the safe transition of cables between the overhead lines and underground cables which connect to the National Grid substation.
Construction consolidation sites	Compounds associated with the onshore works which may include elements such as hard standings, lay down and storage areas for construction materials and equipment, areas for vehicular parking, welfare facilities, wheel washing facilities, workshop facilities and temporary fencing or other means of enclosure.
Development area	The area comprising the onshore development area and the offshore development area (described as the 'order limits' within the Development Consent Order).
East Anglia ONE North project	The proposed project consisting of up to 67 wind turbines, up to four offshore electrical platforms, up to one construction, operation and maintenance platform, inter-array cables, platform link cables, up to one operational meteorological mast, up to two offshore export cables, fibre optic cables, landfall infrastructure, onshore cables and ducts, onshore substation, and National Grid infrastructure.
East Anglia ONE North windfarm site	The offshore area within which wind turbines and offshore platforms will be located.
European site	Sites designated for nature conservation under the Habitats Directive and Birds Directive, as defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017 and regulation 18 of the Conservation of Offshore Marine Habitats and Species Regulations 2017. These include candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas.
Evidence Plan Process	A voluntary consultation process with specialist stakeholders to agree the approach to the EIA and the information required to support HRA.
Horizontal directional drilling (HDD)	A method of cable installation where the cable is drilled beneath a feature without the need for trenching.
Jointing bay	Underground structures constructed at intervals along the onshore cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	The area (from Mean Low Water Springs) where the offshore export cables would make contact with land, and connect to the onshore cables.
Link boxes	Underground chambers within the onshore cable route housing electrical earthing links.
Mitigation areas	Areas captured within the onshore development area specifically for mitigating expected or anticipated impacts.

National electricity grid	The high voltage electricity transmission network in England and Wales owned and maintained by National Grid Electricity Transmission
National Grid infrastructure	A National Grid substation, cable sealing end compounds, cable sealing end (with circuit breaker) compound, underground cabling and National Grid overhead line realignment works to facilitate connection to the national electricity grid, all of which will be consented as part of the proposed East Anglia ONE North project Development Consent Order but will be National Grid owned assets.
National Grid overhead line realignment works	Works required to upgrade the existing electricity pylons and overhead lines (including cable sealing end compounds and cable sealing end (with circuit breaker) compound) to transport electricity from the National Grid substation to the national electricity grid.
National Grid overhead line realignment works area	The proposed area for National Grid overhead line realignment works.
National Grid substation	The substation (including all of the electrical equipment within it) necessary to connect the electricity generated by the proposed East Anglia ONE North project to the national electricity grid which will be owned by National Grid but is being consented as part of the proposed East Anglia ONE North project Development Consent Order.
National Grid substation location	The proposed location of the National Grid substation.
Natura 2000 site	A site forming part of the network of sites made up of Special Areas of Conservation and Special Protection Areas designated respectively under the Habitats Directive and Birds Directive.
Onshore cable corridor	The corridor within which the onshore cable route will be located
Onshore cable route	This is the construction swathe within the onshore cable corridor which would contain onshore cables as well as temporary ground required for construction which includes cable trenches, haul road and spoil storage areas.
Onshore cables	The cables which would bring electricity from landfall to the onshore substation. The onshore cable is comprised of up to six power cables (which may be laid directly within a trench, or laid in cable ducts or protective covers), up to two fibre optic cables and up to two distributed temperature sensing cables.
Onshore development area	The area in which the landfall, onshore cable corridor, onshore substation, landscaping and ecological mitigation areas, temporary construction facilities (such as access roads and construction consolidation sites), and the National Grid Infrastructure will be located.
Onshore infrastructure	The combined name for all of the onshore infrastructure associated with the proposed East Anglia ONE North project from landfall to the connection to the national electricity grid.
Onshore preparation works	Activities to be undertaken prior to formal commencement of onshore construction such as pre-planting of landscaping works, archaeological investigations, environmental and engineering surveys, diversion and laying of services, and highway alterations.

Onshore substation	The East Anglia ONE North substation and all of the electrical equipment within the onshore substation and connecting to the National Grid infrastructure.
Onshore substation location	The proposed location of the onshore substation for the proposed East Anglia ONE North project.
Transition Bay	Underground structures at the landfall that house the joints between the offshore export cables and the onshore cables.

20.3 Flood Risk Assessment

20.1 Introduction

20.1.1 Background

1. This Flood Risk Assessment (FRA) has been prepared to accompany the proposed East Anglia ONE North project Environmental Statement (ES) and is included as **Appendix 20.3**.
2. The overall aim of this FRA is to provide sufficient justification to regulators and other stakeholders that the proposed East Anglia ONE North project is appropriate and in line with planning and national policy requirements regarding flood risk. This FRA also aims to address specific concerns raised by key communities and stakeholders during consultation events and Expert Topic Group (ETG) meetings, discussed further in **Chapter 5 EIA Methodology** and detailed in **Appendix 20.1**.
3. The purpose of this FRA is:
 - To provide information required to support the ES in terms of flooding, supported by the application of the Sequential and, where appropriate, the Exception Test;
 - To establish whether the proposed East Anglia ONE North project is likely to be affected by current or future flooding from any source and whether it will increase flood risk elsewhere;
 - To inform potential mitigation options; and
 - To provide recommendations on potential measures required to reduce flood risk, if applicable.
4. As described in **Chapter 6 Project Description**, the Applicant is developing the proposed East Anglia ONE North project alongside a second project, the proposed East Anglia TWO project.
5. The East Anglia TWO offshore windfarm project (the proposed East Anglia TWO project) is also in the application phase. The proposed East Anglia TWO project has a separate Development Consent Order (DCO) which has been submitted at the same time as the proposed East Anglia ONE North project. The two projects share the same landfall location and onshore cable corridor and the two onshore substations are co-located, and connect into the same National Grid substation.
6. This FRA is based on a review of the impact of the onshore development area focusing on the proposed East Anglia ONE North project. However, the onshore

development area includes areas that would also be required for the proposed East Anglia TWO project. Therefore, due to the similar geographical location of the two projects and the detail of the available flood risk data then the conclusions of the assessment and proposed mitigation measures would be appropriate for the proposed East Anglia ONE North project as well as the proposed East Anglia TWO project, under both the proposed construction scenarios (see **Chapter 5 EIA Methodology** for more detail on construction scenarios and **Chapter 20 Water Resources and Flood Risk** for the assessment associated with these scenarios). For further information on cumulative impacts refer to **Appendix 20.2**.

20.1.2 Approach and Method

7. This FRA has been prepared in accordance with EN-1 Overarching National Policy Statement (NPS) for Energy, National Planning Policy Framework (NPPF) (Ministry of Housing, Communities & Local Government 2019), Planning Practice Guidance (PPG) for Flood Risk and Coastal Change (Ministry of Housing, Communities & Local Government 201), and the Environment Agency's Climate Change Allowance guidance (Environment Agency 2016).
8. The Climate Change Allowance guidance sets out the Environment Agency's recommended climate change allowances for development when considering flood risk and coastal change for planning purposes. 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 areas at highest flood risk.
9. The Environment Agency Product 4 and 8 data packages were requested to support the FRA for the proposed East Anglia ONE North project. Product 4 data was requested for key locations including strategic watercourse crossings, onshore substation(s) and the landfall. Product 4 data related to the onshore cable route and landfall was provided in August 2018. Product 8 data, related to breach hazard mapping, was not provided and the Environment Agency confirmed in their response that there was no information they could provide as they do not hold the information. This is presented in **Annex 1**. Additionally, the FRA has utilised online information / mapping which is publicly available to support the assessment of flood risk. Information related to this has informed the discussion as set out in **section 20.4**.
10. Due to the size and nature of the onshore development area, and the varying types of flood risk associated with this geographical coverage of the onshore development area, the potential sources of flood risk are considered within the following key sections of this FRA:
 - **Section 20.4.1** – Landfall;

- **Section 20.4.2** – Onshore cable route including proposed temporary access works and Construction Consolidation Sites (CCS); and
- **Section 20.4.3** – Onshore substation and National Grid infrastructure.

20.2 Baseline Environment

20.2.1 Existing Surface Water Drainage System

11. The onshore development area is largely located on rural, agricultural land where there are limited existing formal surface water drainage systems; however, there are likely to be a large number of agricultural land drains and ordinary watercourses, especially along the onshore cable route (see **Chapter 21 Land Use** for more information).
12. More formal surface water drainage systems are likely to be present in locations where the onshore development area passes in proximity to settlements or highways. These are explored in more detail in **section 20.4**.

20.2.2 Geology and Hydrogeology

13. The onshore development area is underlain by a Principal Aquifer in the Chalk bedrock. Parts of the onshore development area are also underlain by Secondary (A, B and undifferentiated) aquifers in the superficial Crag deposits. The Environment Agency's groundwater vulnerability map indicates that the onshore development area overlies a minor aquifer with high vulnerability.
14. Regionally, the principal groundwater body underlying the onshore elements of the proposed East Anglia ONE North project is the Waveney and East Suffolk Chalk and Crag. Water Framework Directive (WFD) classification data (Environment Agency 2016) demonstrate that groundwater is under pressure from abstractions of groundwater and connected surface waters for arable agricultural uses, and from diffuse source pollution from livestock farming. Saline intrusion is not considered to be an issue, as adverse effects on groundwater-dependent terrestrial ecosystems and surface water bodies are not reported.

20.2.3 Surface Hydrology

15. The Environment Agency's WFD river water body catchments are based on surface hydrological catchments and have therefore been used to delineate the boundaries of each surface water drainage catchment within the FRA. The onshore elements of the proposed East Anglia ONE North project are located within three surface water drainage catchments comprising the Hundred River, Leiston Beck and Friston Watercourse.
16. The Hundred River rises near East Green, from where it flows south towards Knodishall and Coldfair Green. From here, it flows in a south-easterly direction

towards the coast. The river flows to the south of The Meare at Thorpeness (to which it is connected via a sluice); it then flows southwards along the landward edge of the coastal dune system until it discharges to the sea via a sluice to the south of The Haven. The Hundred River catchment contains the majority of the onshore cable route. The Hundred River is designated as a Main River by the Environment Agency, from its northern tributary approximately 600m to the north-west of Peakhill Farm, and from its southern tributary at the point it crosses the railway line approximately 600m to the north-west of Westhouse Farm, all the way to its mouth at Sluice Cottage, where it discharges into the sea.

17. Leiston Beck rises near Leiston Abbey, from where it flows in an easterly direction through Sizewell Belts and Marshes. It then flows in an artificial channel along the coast in a northerly direction until it discharges into the sea at Minsmere Sluice. The southern part of the Leiston Beck catchment would contain a short section of the onshore cable route. This tributary of the Leiston Beck is designated as an Ordinary Watercourse; however, although the onshore cable route is partially located within the catchment for the Leiston Beck it is not in proximity to the watercourse itself.
18. The Friston Watercourse collects water from a catchment to the north of Friston. From Friston it flows southwards towards Firs Farm and Firs Farm Cottages. From here, it flows eastwards to the north of Black Heath Wood before turning southwards into the Alde Estuary. The tidal reach of the river is known as Ham Creek. A significant proportion of the onshore development area including the onshore substation, National Grid infrastructure and part of the onshore cable route, near Friston, is located within the catchment of the Friston Watercourse. To the north of Church Road in Friston the Friston Watercourse has no formal watercourse, and the catchment is drained by a combination of agricultural land drains and inundation of trackways until it drains into the northern extent of the Friston Watercourse as identified as Main River by the Environment Agency via a short section of culverting to pass beneath Church Road. The Friston Watercourse is designated as a Main River from Church Road to where it joins the River Alde.

20.3 Policy, Guidance and Consultation

20.3.1 National Planning Policy Framework (NPPF)

19. The NPPF Planning Practice Guidance (PPG) for Flood Risk and Coastal Change (Ministry of Housing, Communities & Local Government 2014) and Climate Change Allowance Guidance (Environment Agency 2016) provide direction on how flood risk should be considered at all stages of the planning and development process. 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

proposed East Anglia ONE North project needs to be considered along with the flood risk to the onshore development area.

20.3.2 Probability of Flooding – Flood Zones

20. **Table A20.3.1** outlines the definitions of each flood zone and associated probability, taken from Table 1 of the NPPF PPG (Ministry of Housing, Communities & Local Government 2014). The NPPF 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).

Table A20.3.1 Summary of Flood Zone Definitions

Flood zone	Probability of flooding	Return periods
1	Low	Land having a less than 1 in 1,000 annual probability of river or sea flooding.
2	Medium	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
3a	High	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.
3b	High – Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their SFRA areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

20.3.3 Local Authorities

21. The onshore development is within the administrative area of East Suffolk Council Local Planning Authority. East Suffolk Council (ESC) is the merger of Suffolk Coastal District Council (SCDC) and Waveney District Council (WDC), which became effective from 1st April 2019.
22. Any reference to SCDC and WDC within this FRA, is restricted to documents / information published prior to the creation of ESC.
23. SCC is the Lead Local Flood Authority (LLFA) covering the onshore development area. 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.

20.3.4 Preliminary Flood Risk Assessment

24. A Preliminary Flood Risk Assessment (PFRA) for Suffolk was produced by Suffolk County Council in June 2011 (Suffolk County Council 2011). It was subsequently updated in December 2017 (Suffolk County Council 2017).
25. 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. PFRAs are used to identify areas that are at risk of significant flooding. The PFRA is used to inform the LFRMS.

20.3.5 Strategic Flood Risk Management

26. Waveney District Council and Suffolk Coastal District Council jointly commissioned a review and update to their 2008 Level 1 Strategic Flood Risk Assessment (SFRA). The updated Level 1 SFRA was published in April 2018.
27. A review of information contained within the Level 1 SFRA has been carried out to inform the understanding of flood risk issues within the onshore development area.
28. A Level 2 SFRA was subsequently prepared on behalf of Waveney District Council and Suffolk Coastal District Council and published in June 2018. This assessment followed completion of the Level 1 SFRA and should be read in conjunction with this study. The purpose of the Level 2 assessment is to analyse the level of flood risk associated with allocated development sites within their study area, in accordance with the NPPF and the NPPF PPG.
29. SFRAs are high level strategic documents carried out by local planning authorities to assess the risk to an area from flooding, at present and into the future, taking into consideration the impacts of climate change and to assess the impact that land use changes and development will have on flood risk. The SFRA informs the Local Plan for development.
30. Five allocated development sites were identified for assessment in the Level 2 SFRA. These sites were allocated during the ongoing formulation of the Waveney District Council Local Plan and are all located in the Lowestoft area. As none of the five allocated development sites are within the onshore development area the Level 2 SFRA has not been considered further within this FRA.

20.3.6 Local Flood Risk Management Strategy (LFRMS)

31. Suffolk County Council produced the Suffolk Local Flood Risk Management Strategy (LFRMS) in March 2016 (Suffolk County Council 2016), which is an update to their first Local Flood Risk Management Strategy, published in February 2013. It outlines the aims and objectives of the Council as the LLFA

and provides policies based on these aims. The production of the LFRMS was overseen by the Suffolk Flood Risk Management Partnership which includes Suffolk County Council as well as District Councils, Internal Drainage Boards (IDBs), Highways England and other key organisations.

32. Critical Drainage Areas (CDAs) are defined in the Town and Country Planning (General Development Procedure) (Amendment) (No. 2) (England) Order 2006, as 'an area within Flood Zone 1 which has critical drainage problems'. Consideration of CDAs is necessary to inform key flood risk priorities. The LFRMS indicates that local authorities should identify CDAs within their SFRA. The Level 1 SFRA indicated that Suffolk Coastal District Council and Waveney District Council has no defined CDAs.

20.3.7 Catchment Flood Management Plan (CFMP)

33. 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), which are addressed later in this FRA. CFMPs consider the likely impacts of climate change, the effects of how we manage the land and how areas can be developed sustainably.
34. The onshore development area is covered by the East Suffolk CFMP which was published in December 2009 (Environment Agency 2009). The onshore development area is wholly located within sub-area 6 Suffolk Coast and Heaths which contains a large area of low-lying coastal plain. The sub-area is significantly larger than the onshore development area and is largely uninhabited with some small communities such as Knodishall, Wangford, Wrentham and Alderton. The watercourses in this sub-area are largely undefended and the fluvial flood risk to people and property is identified as being low.
35. The preferred policy for this sub-area is Policy Option 2 which is defined as areas of low to moderate flood risk where the Environment Agency can generally reduce existing flood risk management actions. However, where flood risk is more concentrated (for example in towns and villages) or where an increase in fluvial flooding would have a negative impact on an internationally designated conservation area, existing actions to manage flooding may be continued.

20.3.8 Shoreline Management Plan (SMP)

36. 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.

37. The onshore development area is covered by SMP7: Lowestoft Ness to Felixstowe Landguard Point (Suffolk Coastal District Council 2010) and is located within Sub-cell 3c and specifically within Policy Development Zone 4 – Dunwich Cliffs to Thorpeness.
38. A review of the SMP for this Policy Development Zone found that a length of the coastline is covered by the Leiston – Aldeburgh Site of Special Scientific Interest (SSSI), Sandlings Special Protection Area (SPA) and that the frontage in this area is dominated by two areas of high ground, the Dunwich and Minsmere Cliffs, to the north, and the Sizewell Cliffs and Thorpeness headland to the south. There are limited sections of man-made defences along the frontage, with defences tending to be set back behind the active shingle beach.
39. The SMP indicates that Thorpeness as a headland and nearshore feature controls the long-term behaviour of the zone and this is unlikely to change significantly over the period of the SMP.
40. Initially the frontage was divided into two management areas; however, following discussions with stakeholders the SMP concluded that it was more appropriate to treat the frontage as a whole area in terms of management. Therefore, in terms of management the zone is sub-divided into only one management area, classed as Dunwich Cliffs to Thorpeness (seven policy units).
41. As such, Policy Units MIN 13.2 Sizewell Cliffs and MIN 13.3 Thorpeness are applicable to the onshore development area. The preferred policy for both of these is No Active Intervention in Epoch 1 (up to 2025), Epoch 2 (2026 to 2055) and No Active Intervention for MIN13.2 in Epoch 3 (2055 – 2105) and Managed Realignment for MIN 13.3 in Epoch 3 (2055 – 2105).

20.3.9 Flood Risk Stakeholders and Consultation

20.3.9.1 Key Flood Risk Stakeholders

42. The onshore development area crosses multiple watercourse channels / ditches some of which are managed by the East Suffolk IDB.
43. The Environment Agency is a key flood risk stakeholder in the proposed East Anglia ONE North project, due to their roles and responsibilities related to the management of Main Rivers that the onshore development area will be required to cross over.
44. Other stakeholders and consultees include Suffolk County Council as well as key local communities.
45. Concerns raised by statutory consultees as well as local communities / residents including residual flood risk in and around Friston have been considered and

clarification provided within this FRA. These are also detailed within **Appendix 20.1**.

20.4 Definition of Flood Hazard

20.4.1 Landfall Location

20.4.1.1 Overview of Proposed Activities

46. It is proposed that up to four offshore export cables would make landfall to the north of Thorpeness in Suffolk using Horizontal Directional Drilling (HDD). The landfall location comprises transition bays and a temporary CCS. More information can be found in **Chapter 6 Project Description**.

20.4.1.2 Historic Flooding

47. The Product 4 data package has been obtained from the Environment Agency. This has been reviewed alongside the publicly available Historic Flood Map dataset, which shows the maximum extent of all individual Recorded Flood Outlines. Both the Product 4 data package and the Historic Flood Map dataset do not show historic flooding to have affected the landfall location.

48. The Level 1 SFRA Appendix 4 maps (Waveney District Council and Suffolk Coastal District Council 2018) identified locations where there were recorded flood outlines; however, none of these were within the landfall location. Within the Level 1 SFRA report a number of notable flooding incidents were highlighted within East Suffolk, specifically along the East Suffolk coastline. Although a number of incidents were reported it is not clear if any of these affected the landfall location.

49. Within the Level 1 SFRA flood incidents related to foul or surface sewers, groundwater, highways drainage, surface water and other sources were identified. Within the landfall location there were no historic flood incidents from these sources.

20.4.1.3 Flooding from Rivers

50. The landfall location is located within Flood Zone 1, as defined by the Environment Agency online Flood Map for Planning (Environment Agency undated) (**Figure 20.3.1**) and confirmed by the Product 4 data package obtained in August 2018.

51. The placement of the landfall within Flood Zone 1 ensures that a sequential, risk-based approach has been applied in determining this location. The sequential approach, which in decision-making requires the application of the Sequential Test, aims to locate any development within the lowest flood risk areas possible which helps ensure that development can be safely and sustainably delivered.

52. The Level 1 SFRA (Waveney District Council and Suffolk Coastal District Council 2018) focussed on fluvial flood risk in a number of key catchments. The landfall location would be located wholly within the Hundred River catchment. The Level 1 SFRA notes that the Hundred River is a coastal draining river which flows through the low-lying Beachfarm Marshland before entering the sea. However, the flood extent within the Level 1 SFRA also confirms that the landfall location is located within Flood Zone 1. Therefore, the landfall location is at low risk of flooding from fluvial sources.

20.4.1.4 Flooding from the Sea

53. The landfall location is located within Flood Zone 1, as defined by the Environment Agency online Flood Map for Planning (Environment Agency undated) (**Figure 20.3.1**) and confirmed by the Product 4 data package obtained in August 2018. The Environment Agency previously confirmed as part of the scoping stage that there are no formal coastal defences associated with flood prevention or coastal stability at the landfall location.
54. The Level 1 SFRA (Waveney District Council and Suffolk Coastal District Council 2018) noted that the fluvial Flood Zones within East Suffolk have been combined with the tidal Flood Zones and mapped in Figure 5, Appendix A of the document. A review of the Level 1 SFRA mapping has identified that there is a narrow band along the coastal frontage which is at risk of flooding; however, this appears to be directly adjacent to the coastal defence line and does not affect the landfall location including the landfall CCS.
55. The Level 1 SFRA indicates that tidal flooding constitutes the main form of flood risk along the coastal frontage, which comprises an exposed but defended coastline. Defences tend to comprise natural frontages of embankments, cliff and natural shingle ridges, as well as man-made defences, such as embankments and sea walls.
56. Embedded mitigation measures for the proposed East Anglia ONE North project include the location of permanent infrastructure to be set back landward at the predicted 100 year erosion line (estimated to be at least 85m from the existing cliff edge) This will decrease the potential risk of flooding resulting from cliff erosion during the design life of the proposed East Anglia ONE North project.
57. Following review of the Environment Agency Product 4 data package, the online Flood Map for Planning and Level 1 SFRA it is concluded that the landfall location is at low risk of flooding from tidal sources.

20.4.1.5 Flooding from Groundwater

58. The landfall location is underlain by a Principal Aquifer in the Chalk bedrock. Parts of the landfall location are also underlain by Secondary (A, B and undifferentiated) aquifers in the superficial Crag deposits. The Environment Agency's groundwater vulnerability map indicates that the landfall location overlies a minor aquifer with high vulnerability.
59. The Level 1 SFRA (Waveney District Council and Suffolk Coastal District Council 2018) indicated that groundwater flooding is most likely to occur in low-lying areas which are underlain by permeable rock (aquifers), particularly after periods of sustained rainfall.
60. The Level 1 SFRA notes that the British Geological Survey (BGS) Susceptibility to Groundwater Flooding map shows the majority of the SFRA study area has a designation of "Limited potential for groundwater flooding to occur", except in some concentrated areas surrounding watercourses where the designation given is "Potential for groundwater flooding to occur at surface".
61. The landfall location is located within an area shown as having a "Limited potential for groundwater flooding to occur". There are five unlicensed (private) abstractions known to the Environment Agency within or adjacent to the onshore development area and a further three observation boreholes in the area (which may also be used for abstraction) (**Figure 20.3.2**). All but one of the unlicensed abstraction points appear to be related to non-industrial abstractions, therefore any abstraction is likely to have minimal impact on local groundwater resources and therefore minimal effect on the risk of flooding from groundwater sources.
62. The effect that the landfall transition bays shall have on groundwater flows, both during construction and once operational, is likely to be minimal, due to their size, relatively shallow burial depth (e.g. 1.2m below ground level) and the above groundwater flood risk. Therefore, the landfall location is at low risk of flooding from groundwater sources.

20.4.1.6 Flooding from Surface Water

63. The Environment Agency's Long Term Flood Risk Information map (Environment Agency undated) (**Figure 20.3.3**) shows the landfall location to be in an area at very low risk of surface water flooding i.e. outside the extent of the 1 in 1,000 year surface water flooding event. As such, the landfall location is at low risk of flooding from surface water.

20.4.1.7 Flooding from Sewers

64. The Level 1 SFRA (Waveney District Council and Suffolk Coastal District Council 2018) did not report any flooding from sewers within the landfall location. The

landfall is located within existing agricultural land and it is likely that there is no foul sewer network within proximity of the landfall location. As such, there is a low risk of flooding from sewer sources.

20.4.1.8 Flooding from Reservoirs

65. The Environment Agency's Long Term Flood Risk Information map (Environment Agency undated) shows the landfall location is outside the maximum extent of flooding from reservoirs. As such, there is no risk of flooding from reservoirs.

20.4.1.9 Flooding from Canals and Other Artificial Sources

66. The landfall is located away from these sources. As such, there is no risk of flooding from canals and other artificial sources.

20.4.1.10 Summary of Flooding Sources

67. The landfall is located within Flood Zone 1, at low risk from fluvial or tidal sources. There has been no history of flooding identified as part of this FRA for the landfall location; however, this does not mean that flooding has not occurred in the past.

68. The overall risk of flooding from all sources to the landfall location is considered to be low.

20.4.2 Onshore Cable Route including Proposed Temporary Access Works and Construction Consolidation Sites

20.4.2.1 Overview of Proposed Activities

69. The onshore cable route is approximately 9km long and it will run in a northern direction from a point to the north of Thorpeness, before it turns in a generally western direction crossing a variety of agricultural land, watercourses and tracks / roads before reaching the onshore substation.

70. The onshore cable route includes up to six onshore cables and up to two fibre optic cables, jointing bays and associated distributed temperature sensing (DTS) cabling (some or all of which may be installed in ducts), a temporary haul road and a series of temporary CCS. More information can be found in **Chapter 6 Project Description**.

20.4.2.2 Watercourse Crossings

71. The onshore cable route crosses the Hundred River, a 'Main River' (as designated by the Environment Agency) and a number of ordinary watercourses and agricultural drainage channels.

72. Within this FRA, the definition of the flood hazard to the onshore cable route has been considered related to the key watercourse, the Hundred River. In addition, there is a network of smaller land drains or agricultural ditches (classed as

ordinary watercourses), not easily identifiable from mapping and which may be only seasonally wet, likely to be crossed by the onshore cable route. Flood risk associated with these ordinary watercourses tends to be associated with overland flow and surface water flood risk and therefore their potential impacts are discussed within the surface water flooding sections throughout this FRA.

20.4.2.3 Historic Flooding

73. The Product 4 data package obtained from the Environment Agency, August 2018, does not indicate any records of flooding along the onshore cable route. The Environment Agency indicate, in their Product 4 data package, that although there are no records of flooding this does not mean that it has not been subject to flooding, only that no flooding has been reported to them in this location.
74. Information contained within the Level 1 SFRA (Waveney District Council and Suffolk Coastal District Council 2018) indicates that the onshore cable route does not intersect any locations affected by historic fluvial or tidal events.
75. A review of other sources of flooding in the Level 1 SFRA and from mapping information provided by Suffolk County Council (Suffolk County Council 2018a and b) indicates that there have been reports of highway flooding in 2014, 2016 and 2017 along the onshore cable route in the vicinity of Aldringham and Knodishall Common.

20.4.2.4 Flooding from Rivers

76. The majority of the onshore cable route is located within Flood Zone 1 as defined by the Environment Agency online Flood Map for Planning (**Figure 20.3.1**) and confirmed by the Product 4 data package obtained in August 2018.
77. There is one key location, to the east of the B1122 Aldeburgh Road and south of Aldringham, where the onshore cable route intersects an area of Flood Zone 2 and 3 i.e. as it passes under the Hundred River. In this location, the Flood Zone does not follow the onshore cable route in a linear fashion; rather, the onshore cable route intersects the area of increased flood risk associated with the watercourse crossing (**Figure 20.3.1**). As such, the majority of the onshore cable route is at low risk of fluvial flooding.

20.4.2.5 Flooding from the Sea

78. The majority of the onshore cable route is located away from the coast and as such the risk associated with tidal flooding is limited to the landfall location and the extent of the onshore cable route that connects with it.
79. The Level 1 SFRA (Waveney District Council and Suffolk Coastal District Council 2018) confirmed that the fluvial Flood Zones within East Suffolk have been

combined with the tidal Flood Zones and mapped. A review of the Level 1 SFRA mapping identified that no parts of the onshore cable route are located within the areas identified as being at risk.

80. Following review of the Environment Agency Product 4 data package, the online Flood Map for Planning and Level 1 SFRA it is concluded that the onshore cable route is at low risk of flooding from tidal sources.

20.4.2.6 Flooding from Groundwater

81. The onshore cable route is underlain by a Principal Aquifer in the Chalk bedrock. Parts of the onshore cable route are also underlain by Secondary (A, B and undifferentiated) aquifers in the superficial Crag deposits. The Environment Agency's groundwater vulnerability map indicates that the onshore cable route overlies a minor aquifer with high vulnerability.
82. The Level 1 SFRA (Waveney District Council and Suffolk Coastal District Council 2018) indicated that groundwater flooding is most likely to occur in low-lying areas which are underlain by permeable rock (aquifers), particularly after periods of sustained rainfall.
83. The Level 1 SFRA notes that the BGS Susceptibility to Groundwater Flooding map shows the vast majority of the SFRA study area has a designation of "Limited potential for groundwater flooding to occur", except in some concentrated areas surrounding the watercourses where the designation given is "Potential for groundwater flooding to occur at surface".
84. The onshore cable route is located primarily within an area shown as having a "Limited potential for groundwater flooding to occur". However, around Coldfair Green and Aldringham there is an area showing an increased risk, classed as "Potential for groundwater flooding to occur at surface" and "Potential for groundwater flooding of property situated below ground level". Therefore, the onshore cable route may be at risk of flooding from groundwater in this location.
85. There are five unlicensed (private) abstractions known to the Environment Agency within or adjacent to the onshore development area and a further three observation boreholes in the area (which may also be used for abstraction) (**Figure 20.3.2**). All but one of the unlicensed abstraction points appear to be related to non-industrial abstractions, therefore any abstraction is likely to have minimal impact on local groundwater resources and therefore minimal effect on the risk of flooding from groundwater sources.
86. The effect that the onshore cable route shall have on groundwater flows both during construction and once operational is likely to be minimal as the cable duct is to be located at relatively shallow depths, in a minimally sized waterproof duct.

Embedded mitigation measures related to the construction phase of the cable excavation, as set out in **Chapter 18 Ground Conditions and Contamination**, have been incorporated in the proposed East Anglia ONE North project design to limit the impact of the onshore cable route on groundwater disturbance and to limit the impact on the hydraulic connectivity between groundwater and surface water. Therefore, the onshore cable route is at low risk of flooding from groundwater sources.

20.4.2.7 Flooding from Surface Water

87. The Environment Agency's Long Term Flood Risk Information map (Environment Agency undated) (**Figure 20.3.3**) indicates that surface water flooding within proximity of the onshore cable route is primarily related to the Hundred River and is similar to the fluvial flood extent of the watercourse.
88. In addition, there are small areas at risk of flooding from surface water within topographically low-lying areas along the onshore cable route as well as increased risk associated with existing agricultural land drains / field boundaries and ordinary watercourses. Specifically, there is a risk of surface water flooding where the onshore cable route turns northwards at Friston to connect with the onshore substation with surface water draining from the north of Little Moor Farm and also from Grove Wood, draining downhill to the north of Woodside Farm.
89. No surface water flood risk areas appear to follow the onshore cable route in a linear fashion; rather the onshore cable route intersects these areas of increased flood risk perpendicularly (**Figure 20.3.3**).
90. The Level 1 SFRA (Waveney District Council and Suffolk Coastal District Council 2018) includes details of surface water flooding which led to the development of the Leiston Surface Water Management Plan in 2016; however, the study area for this is outside the onshore development area, and therefore outside of the onshore cable route. The Level 1 SFRA indicated that no other areas in East Suffolk are covered by Surface Water Management Plans and none of the records of surface water flooding incidents appear to be related to the onshore cable route.
91. Mapping information provided by Suffolk County Council (Suffolk County Council 2018a and b) indicates that there have been a number of flooding incidents around Aldringham and Coldfair Green. These include:
 - Blocked highway drain in February 2016 along the B1353;
 - Flooded road in July 2017 along the B1122; and
 - Blocked highway drain in January 2017 along the B1069.

92. All of the above incidents are in proximity to locations where the onshore cable route would be required to pass under the highway; however, they are also at the boundary of the area identified for the onshore cable route.
93. The existing localised agricultural / land drains running alongside and / or crossing through the onshore cable route have the potential to cause flooding to the onshore cable route as well as there being a potential off-site impact as a result of the proposed East Anglia ONE North project.
94. A Surface Water and Drainage Management Plan will be developed, as secured under the requirements of the draft DCO, agreed with regulators and implemented to minimise water within the cable trench and other working areas and ensure ongoing drainage of surrounding land. Further detail is provided in the Outline Code of Construction Practice (OCoCP) submitted with this DCO application. As such, the onshore cable route is primarily at low risk of flooding from surface water. Further details related to management of surface water flood risk and drainage along the onshore cable route are considered alongside the drainage for the onshore substation and National Grid infrastructure within **section 20.7**.

20.4.2.8 Flooding from Sewers

95. The majority of the onshore cable route is contained in rural, agricultural land and as such the risk of flooding from sewers is likely to be low.
96. The risk of flooding from sewer sources increases in areas where the onshore cable route passes in proximity to urban areas such as Aldringham and Coldfair Green and / or as it crosses highway infrastructure where a formal sewer network is likely to be present; however, there are no records of historic sewer flooding affecting the onshore cable route. As such, there is a low risk of flooding from sewer sources.

20.4.2.9 Flooding from Reservoirs

97. The Environment Agency's Long Term Flood Risk Information map (Environment Agency undated) shows that the onshore cable route crosses a number of small areas within the maximum extent of flooding from reservoir sources. These extents are limited to locations within proximity of the reservoir known as The Walks, to the south east of Leiston.
98. The flood risk from reservoirs whilst significant in consequence should it occur is unlikely due to the extensive legislation that governs the maintenance and operation of these structures. As such, there is a low risk of flooding from reservoirs.

20.4.2.10 Flooding from Canals and Other Artificial Sources

99. The onshore cable route is located away from these sources. As such, there is no risk of flooding from canals and other artificial sources

20.4.2.11 Summary of Flooding Sources

100. Based on the information presented above, the onshore cable route is at low risk of flooding from all potential sources.

101. The majority of the onshore cable route is located within Flood Zone 1. Areas located within Flood Zones 2 and 3 are associated with watercourse crossings.

102. There is an increased risk of surface water flooding and flooding from sewers, as the onshore cable route passes in proximity to settlements such as Aldringham and Coldfair Green.

103. In addition, there is a risk of surface water flooding affecting the onshore cable route in the vicinity of existing smaller agricultural land drains and ordinary watercourses, specifically to the north of Friston. A Surface Water and Drainage Management Plan will be developed, as secured under the requirements of the draft DCO, agreed with regulators and implemented to minimise water within the onshore cable trench and other working areas and ensure ongoing drainage of surrounding land. Design measures, including multiple interceptor ditches, will be implemented to limit the potential risk to the onshore cable route as a result of surface water flooding. Further detail is provided in the OCoCP submitted with this DCO application.

20.4.3 Onshore Substation and National Grid Infrastructure

20.4.3.1 Overview of Proposed Activities

104. Two substations are required for the proposed East Anglia ONE North project - one is the onshore substation and the other is the National Grid substation. It is proposed that they will be sited adjacent to one another. The purpose of the onshore substation is to convert the electrical current from HVAC cables into appropriate voltage for the National Grid substation to connect into the national electricity grid.

105. The onshore substation would be located within a single compound, with maximum dimensions of 190m (width) x 190m (length). In addition to the main converter halls, the onshore substation compound would contain electrical equipment including power transformers, switchgear, reactive compensation equipment, harmonic filters, cables, lightning protection masts, control buildings, communications masts, backup generators, access, fencing and other associated equipment, structures or buildings. The station will have a compact

layout, with the majority of equipment contained in typical warehouse style buildings.

106. The onshore substation would be connected to the National Grid substation by means of up to two buried cables. These may be installed directly underground or within concrete troughs. Space will also be required for the HVAC equipment to link the onshore substation to the National Grid substation.
107. A National Grid substation and National Grid overhead line realignment works (together referred to as the National Grid infrastructure) are required to connect the onshore substation to the national electricity grid. The National Grid substation will be located to the north of the onshore substation and the modifications to the existing overhead lines will take place within the onshore development within the vicinity of the National Grid substation.
108. The National Grid substation would be located to the immediate north west of the onshore substation and running parallel to the existing overhead lines that connect Sizewell and Bramford. The maximum footprint of the National Grid substation would be up to 145m (wide) x 310m (long), or 44,950m². The maximum operational footprint of the (three) cable sealing end compounds would be 10,000m². The maximum pylon operational footprint for the (four) reconstructed / relocated pylons would be 1,600m². The maximum footprint of the permanent access road to cable sealing end compounds would be 1,850m².
109. More information related to the onshore substation and National Grid infrastructure can be found in **Chapter 6 Project Description**.

20.4.3.2 Historic Flooding

110. The Product 4 data package obtained from the Environment Agency, August 2018, does not indicate any records of flooding in the location of the onshore substation or the National Grid infrastructure. The Environment Agency indicate, in their Product 4 data package, that although there are no records of flooding this does not mean that it has not been subject to flooding, only that no flooding has been reported to them in this location.
111. Information contained within the Level 1 SFRA (Waveney District Council and Suffolk Coastal District Council 2018) does not show historic flooding to have affected the onshore substation or the National Grid infrastructure.
112. Within the Level 1 SFRA flood incidents related to foul or surface sewers, groundwater, highways drainage, surface water and other sources were identified. A review of the Level 1 SFRA indicates reports of highway drainage issues in the vicinity of Friston; however, this is outside the area identified for the onshore substation and National Grid infrastructure.

20.4.3.3 Flooding from Rivers

113. The onshore substation and National Grid infrastructure are located within Flood Zone 1, as defined by the Environment Agency online Flood Map for Planning (Environment Agency undated) (**Figure 20.3.1**) and confirmed by the Level 1 SFRA data shown on Maps 20 and 23 of the document.
114. The placement of the onshore substation and National Grid infrastructure within Flood Zone 1 ensures that a sequential, risk-based approach has been applied in determining this location. The sequential approach, which in decision-making requires the application of the Sequential Test, aims to locate any development within the lowest flood risk areas possible which helps ensure that development can be safely and sustainably delivered.
115. The Level 1 SFRA (Waveney District Council and Suffolk Coastal District Council 2018) focussed on fluvial flood risk in a number of key catchments. The onshore substation and National Grid infrastructure are primarily located in the Friston watercourse catchment, a tributary of the River Alde. The Level 1 SFRA does not cover this watercourse specifically and therefore information on flood risk from the Friston watercourse has been based on historic anecdotal information provided by the local community. The Friston Watercourse is designated as Main River by the Environment Agency south of Church Road.
116. A small area of the National Grid infrastructure, associated with modifications to the existing overhead lines, are partially located within the Hundred River catchment. The Level 1 SFRA notes that the Hundred River is a coastal draining river which flows through the low-lying Beachfarm Marshland before entering the sea. However, the flood extent within the Level 1 SFRA also confirms that this National Grid infrastructure is located within Flood Zone 1. Therefore, the onshore substation and National Grid infrastructure are at low risk of flooding from fluvial sources.

20.4.3.4 Flooding from the Sea

117. The onshore substation and National Grid infrastructure are located within Flood Zone 1, as defined by the Environment Agency online Flood Map for Planning (Environment Agency undated) (**Figure 20.3.1**) and confirmed by the Level 1 SFRA.
118. The Level 1 SFRA (Waveney District Council and Suffolk Coastal District Council 2018) confirmed that the fluvial Flood Zones within East Suffolk have been combined with the tidal Flood Zones and mapped in Figure 5, Appendix A of the document. A review of the Level 1 SFRA mapping found that the onshore substation and National Grid infrastructure are not at risk from tidal flooding. The onshore substation and National Grid infrastructure are located approximately

3km inland from the tidal River Alde and 6km inland from the coastal frontage at Thorpeness and therefore there is no risk of flooding from the sea / tidal sources.

20.4.3.5 Flooding from Groundwater

119. The onshore substation and National Grid infrastructure are underlain by a Principal Aquifer in the Chalk bedrock. Parts of the onshore substation and National Grid infrastructure are also underlain by Secondary (A, B and undifferentiated) aquifers in the superficial Crag deposits. The Environment Agency's groundwater vulnerability map indicates that the onshore substation and National Grid infrastructure overlies a minor aquifer with high vulnerability.
120. The Level 1 SFRA (Waveney District Council and Suffolk Coastal District Council 2018) indicated that groundwater flooding is most likely to occur in low-lying areas which are underlain by permeable rock (aquifers), particularly after periods of sustained rainfall.
121. The Level 1 SFRA notes that the BGS Susceptibility to Groundwater Flooding map shows the vast majority of the SFRA study area has a designation of "Limited potential for groundwater flooding to occur", except in some concentrated areas surrounding the watercourses where the designation given is "Potential for groundwater flooding to occur at surface".
122. There are five unlicensed (private) abstractions known to the Environment Agency within or adjacent to the onshore development area and a further three observation boreholes in the area (which may also be used for abstraction) (**Figure 20.3.2**). All but one of the unlicensed abstraction points appear to be related to non-industrial abstractions, therefore any abstraction is likely to have minimal impact on local groundwater resources and therefore minimal effect on the risk of flooding from groundwater sources.
123. The onshore substation and National Grid infrastructure are located within the area shown as having a "Limited potential for groundwater flooding to occur". Therefore, the onshore substation and National Grid infrastructure are at low risk of flooding from groundwater sources.

20.4.3.6 Flooding from Surface Water

124. The Environment Agency's Long Term Flood Risk Information map (Environment Agency undated) (**Figure 20.3.3**) shows the onshore development area is primarily in an area at primarily low risk of surface water flooding i.e. outside the extent of the 1 in 1,000 year surface water flooding event.
125. However, the National Grid Substation, National Grid CCS, cable sealing end compounds and permanent access road are located in an area with varying risk

- of surface water flooding. The northern and western boundary around the National Grid substation, including the cable sealing end compounds, and part of the footprint of the National Grid substation, includes areas at both high risk of surface water flooding i.e. during the 1 in 30 year event and medium risk of surface water flooding i.e. there is a risk of flooding during the 1 in 100 year event. This flood risk is associated with the drainage of surface water from the north in proximity to Little Moor Farm.
126. The onshore substation and onshore substation CCS are located in areas primarily at low risk of surface water flooding i.e. outside the extent of the 1 in 1,000-year surface water flooding event.
127. As part of the onshore substation and National Grid infrastructure a permanent access road will be built to the north-east of Moor Farm, connecting to both the onshore substation and National Grid substation. In addition, permanent access tracks to the cable sealing end compounds will be built to the north of the National Grid substation. Parts of the access roads are likely to cross areas at both high risk of surface water flooding i.e. during the 1 in 30-year event and medium risk of surface water flooding i.e. there is a risk of flooding during the 1 in 100-year event (**Figure 20.3.3**).
128. The surface water flood risk extends downstream to Friston, where there have been several reports of historical flooding, as provided by local residents. Flood incident records as recorded by the LLFA are reported as having a low priority, and are generally located along the B1121 Saxmundham Road (Suffolk County Council 2018a and b).
129. Flood risk from surface water to the onshore substation and National Grid infrastructure and off-site as a result of the proposed East Anglia ONE North project will be addressed through the development of a detailed drainage design, the beginnings of which are provided in the Outline Landscape and Ecological Management Strategy (OLEMS), as secured under the requirements of the draft DCO, and submitted with this DCO application. Existing land drains will need to be reinstated and / or connected into the formal drainage network following construction.
130. A local specialised drainage contractor will undertake surveys, locate drains, create drawings pre- and post-construction, and ensure appropriate reinstatement. The Surface Water and Drainage Management Plan will include provisions to minimise flood risk within the working area and ensure ongoing drainage of surrounding land.
131. The Surface Water and Drainage Management Plan, as secured under the requirements of the draft DCO, will include Sustainable Drainage System (SuDS)

measures. Further detail is provided in the OCoCP submitted with this DCO application.

132. Further details related to management of surface water flood risk and drainage for the onshore substation and National Grid infrastructure is considered within **section 20.7**.

20.4.3.7 Flooding from Sewers

133. The Level 1 SFRA (Waveney District Council and Suffolk Coastal District Council 2018) did not report any flooding from sewers within the onshore substation and National Grid infrastructure area.
134. The onshore substation and National Grid infrastructure are to be located on existing agricultural land. As such, there is a low risk of flooding from sewer sources.

20.4.3.8 Flooding from Reservoirs

135. The Environment Agency's Long Term Flood Risk Information map (Environment Agency undated) shows the onshore substation and National Grid infrastructure is outside the maximum extent of flooding from reservoirs. As such, there is no risk of flooding from reservoirs.

20.4.3.9 Flooding from Canals and Other Artificial Sources

136. The onshore substation and National Grid infrastructure are located away from these sources. As such, there is no risk of flooding from canals and other artificial sources.

20.4.3.10 Summary of Flooding Sources

137. The onshore substation and National Grid infrastructure are located within Flood Zone 1, at low risk from fluvial or tidal sources. There has been no history of flooding identified as part of this FRA for the onshore substation and National Grid infrastructure; however, this does not mean that flooding has not occurred in the past.
138. There is a known risk associated with surface water flooding in proximity to the onshore substation and National Grid infrastructure. A Surface Water and Drainage Management Plan will be developed, agreed with regulators and implemented to minimise water within the working areas and to ensure ongoing drainage of surrounding land.
139. A Surface Water and Drainage Management Plan will be developed, as secured under the requirements of the draft DCO, agreed with regulators and implemented to minimise the flood risk to the onshore substation and National

Grid infrastructure and downstream locations including Friston. Further detail is provided in the OCoCP submitted with this DCO application.

20.5 Flood Risk Vulnerability

20.5.1 Background to Sequential and Exception Test

140. The aim of the NPPF PPG Sequential Test is to ensure that a sequential approach is adopted to steer new development to areas with the lowest probability of flooding, i.e. Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, the local authority can consider reasonably available sites in Flood Zone 2. Only where there are no reasonably available sites for development in Flood Zone 1 or 2, should the suitability of sites in Flood Zone 3 be considered.
141. Following application of the Sequential Test, if it is not possible for the proposed East Anglia ONE North project to be located in zones with a lower probability of flooding, consistent with wider sustainability objectives, the Exception Test can be applied if appropriate.
142. For the Exception Test to be passed, the following two elements must be passed for development to be allocated or permitted:
- It must be demonstrated that the proposed East Anglia ONE North project provides wider sustainability benefits to the community that outweigh flood risk, informed by an SFRA where one has been prepared;
 - A Site-specific FRA must demonstrate that the proposed East Anglia ONE North project 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; and
 - Within each flood zone, surface water and other sources of flooding also need to be considered when applying the sequential approach to the location of the proposed East Anglia ONE North project.

20.5.2 Vulnerability Classification

143. Under the NPPF PPG Flood Risk and Coastal Change, the proposed East Anglia ONE North project is considered as 'Essential Infrastructure', which is defined as:
- Essential transport infrastructure (including mass evacuation routes), which must cross the area at risk;
 - Essential utility infrastructure which must be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood; and

- Wind turbines.

20.5.3 Application of the Sequential Test and Exception Test

144. The onshore development area is located within Flood Zones 1, 2 and 3, as defined by the Environment Agency’s online Flood Map for Planning (Environment Agency undated) (**Figure 20.3.1**). The Sequential Test has been considered in accordance with the NPPF PPG. **Table A20.3.2** shows that the ‘Essential Infrastructure’ development located within Flood Zones 1 and 2 is deemed acceptable, and that development located within Flood Zone 3 is required to pass the Exception Test.

Table A20.3.2 Flood Risk Vulnerability and Flood Zone ‘Compatibility’

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More vulnerable	Less Vulnerable	Water Compatible
1	✓	✓	✓	✓	✓
2	✓	Exception test required	✓	✓	✓
3a	Exception test required	X	Exception test required	✓	✓
3b	Exception test required	X	X	X	✓

145. Parts of the onshore development area that are located within Flood Zone 3 are required to pass the Exception Test, by demonstrating that the proposed East Anglia ONE North project provides wider sustainability benefits to the community which outweigh flood risk, and that the proposed East Anglia ONE North project will be safe for its lifetime without increasing flood risk elsewhere.
146. The proposed East Anglia ONE North project has been sequentially located wherever possible. Above ground compounds / structures are located within Flood Zone 1, and subterranean development is located primarily in Flood Zone 1, with some locations in Flood Zone 2 and 3 where it is required to pass under existing watercourses.
147. Subterranean development will only be at potential risk of flooding during the construction phase. Once operational, the flood risk will have been mitigated as the cables will be wholly located underground with no interaction with the above ground Flood Zone.

148. The temporary haul road is for access during the construction phase, as well as the CCS. Following construction, the temporary construction elements will be removed and land returned to its present state.
149. On the basis of the above, it is considered that the Exception Test is not applicable to the nature of the proposed East Anglia ONE North project.
150. The final decision regarding the application of the Sequential Test and Exception Test is for the Planning Inspectorate to confirm whether they agree that the proposed East Anglia ONE North project satisfactorily passes both tests. However, we believe that the sequential approach adopted and the wider benefits associated with the provision of renewable energy ensures that the proposed East Anglia ONE North project is in accordance with the guidance related to the Sequential and Exception Test.

20.6 Climate Change

151. The risk of flooding from potential sources will be amplified as a result of the predicted increase in rainfall associated with climate change. Given the potential sources of flooding identified in this FRA and the below ground nature of the majority of the onshore components, there are two main aspects of climate change which are likely to impact the proposed East Anglia ONE North project. These are an increase in peak river flows and an increase in the duration and intensity of rainfall events likely to increase the magnitude of surface water flooding.
152. Current guidance on climate change allowances (Environment Agency 2016, amended February 2017), states 'Essential Infrastructure' developments within Flood Zone 3 should use the 'Upper End' climate change allowance and 'Essential Infrastructure' within Flood Zone 2 should consider the 'Higher Central' and 'Upper End' allowances when considering impacts on fluvial flood risk due to climate change. If a site is located within Flood Zone 1 then guidance states that the 'Central' allowance should be used for 'Essential Infrastructure'.
153. The onshore development area is located within the Anglian River Basin District. Assuming a construction start date of 2023, the peak river flow climate change allowance would comprise an additional 20% or 35% in Flood Zone 2 and an additional 35% in Flood Zone 3 assuming 25 years of operation for the purpose of this assessment in ES. In Flood Zone 1 the peak river flow climate change allowance would comprise an additional 15% assuming 25 years of operation for the purpose of assessment in this ES; these are shown in **Table A20.3.3**.

Table A20.3.3 Peak River Flow Allowances for Anglian River Basin District (uses 1961 to 1990 baseline)

River basin district	Allowance Category	Total potential change anticipated for '2020s' (2015-2039)	Total potential change anticipated for '2050s' (2040 – 2069)	Total potential change anticipated for '2080s' (2070 – 2115)
Anglian	Upper End	25%	35%	65%
	Higher Central	15%	20%	35%
	Central	10%	15%	25%

154. The above climate change allowance related to peak river flow and fluvial flooding is only likely to be relevant to the onshore substation and National Grid infrastructure as all other elements of the proposed East Anglia ONE North project will be below ground once constructed. As the onshore substation and National Grid infrastructure are located within Flood Zone 1 it is recommended that a climate change allowance equivalent to a 15% increase in peak river flows be considered.
155. When considering surface water flood risk the guidance also predicts an increase in peak rainfall intensity of up to 20% assuming 25 years of operation (for the purpose of assessment in this ES) with construction commencing in 2023. Design of surface water management measures and the drainage system for above ground structures should include the above allowance as a minimum, to take into account the potential increase in surface water flood risk resulting from climate change.

20.7 Surface Water Drainage

20.7.1 Pre-Construction Work

156. Prior to commencement of the construction works, a number of surveys and studies will be undertaken to inform the development of the final design including ecological surveys, geotechnical investigations and drainage assessments.
157. Surface water drainage requirements will be dictated by the final Surface Water and Drainage Management Plan and will be designed to meet the requirements of the NPPF, NPS EN-1 and NPS EN-5, with runoff limited, through the use of SuDS and infiltration techniques, where feasible, which can be accommodated within the onshore development area.
158. The Surface Water and Drainage Management Plan will be developed according to the principles of the SuDS discharge hierarchy. Generally, the aim will be to

discharge surface water runoff as high up the following hierarchy of drainage options as reasonably practicable:

- 1) Into the ground (infiltration);
- 2) To a surface water body;
- 3) To a surface water sewer, highway drain or another drainage system; or
- 4) To a combined sewer.

159. The Surface Water and Drainage Management Plan will be developed, agreed with regulators, submitted to discharge a requirement of the draft DCO 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. This will assess the current and proposed runoff rates, volume of storage required and the proposed approach for discharge of water from each location.

20.7.2 Temporary Works

160. The onshore cable route is required to cross over the Hundred River and an open cut technique will be utilised to cross the watercourse. In this location, it will be necessary to ensure that flow along the watercourse is maintained and there is no increase in flood risk as a result of the temporary works.
161. A review of modelled water levels and discharge rates, provided by the Environment Agency in the Product 4 data package in August 2018, will be required to inform the location and design of temporary works. The methodology to be used for any temporary construction over the existing watercourse shall be agreed with the Environment Agency and / or East Suffolk IDB as part of the Environmental Permitting (Amendment) Regulations 2018 process.
162. During construction works there are a large number of smaller agricultural land drains and watercourses, along the onshore cable route, that may be only seasonally wet.
163. Trenched crossings will be used for these watercourse crossings. In these locations, it will be necessary to ensure that flow along the watercourse is maintained and there is no increase in flood risk as a result of the temporary works.
164. There is a risk of surface water flooding from these smaller agricultural land drains and watercourses and / or the flow routes into them being affected by the onshore cable route. Embedded mitigation measures to intercept and collect flow will be implemented along the onshore cable route to ensure there is no increase in flood risk to off-site receptors. This will typically include the temporary installation of interceptor drainage ditches parallel to the trenches and soil

storage areas to provide interception of surface water runoff and the use of pumps, pipes or flumes to remove water from the trenches during onshore cable installation.

165. Other temporary elements during the construction phase will include the provision of a temporary haul road for access along the onshore cable route and CCSs. This haul road would run between CCSs, located at various points along the route. These CCSs would be temporary site compounds providing facilities for the construction workforce and secure storage areas for materials.
166. Temporary haul road construction would most likely involve the placement of a suitable imported material (such as aggregate onto a geotextile base and / or use of temporary mats).. Following construction, the temporary haul road along the onshore cable route shall be removed and the land returned to its present state. The adoption of this design measure aims to limit the potential for an increase in the risks associated with surface water flooding.
167. CCSs would be required along the onshore cable route, to facilitate access to the route, allow storage of materials and accommodate site offices. CCSs are to be located in Flood Zone 1 and would be reinstated following the temporary works. The adoption of these design measure aims to limit the potential for fluvial flooding to affect the CCSs and to limit the potential for an increase in the risks associated with surface water flooding.

20.7.3 Post-Construction

168. Following construction of the onshore cable route there will be no permanent above ground elements along the onshore cable route. Temporary works and haul road surfacing shall be removed and would have no operational use. Existing land drains along the onshore cable route will be reinstated following construction (or rerouted if underneath permanent above-ground developments). A specialised drainage contractor will undertake surveys to locate drains and create drawings both pre- and post-construction, and ensure appropriate reinstatement. The pre-construction drainage plan will include provisions to minimise water within the working area and ensure ongoing drainage of surrounding land. As such there would be no impact on surface water drainage.
169. Surface water drainage requirements for the onshore substation and National Grid infrastructure will be dictated by the final Surface Water and Drainage Management Plan which will be designed to meet the requirements of the NPPF, NPS EN-1 and NPS EN-5. Changes in surface water runoff as a result of the increase in impermeable area from the onshore substation and National Grid infrastructure will be attenuated and discharged at a controlled rate, as outlined below, in consultation with the LLFA and Environment Agency.

170. The Surface Water and Drainage Management Plan will include details of SuDS measures to be included such as attenuation ponds which will, as a minimum, provide storage up to and including the 1 in 100-year storm event. Assuming a development lifetime of 25 years an increase in peak rainfall intensity of 20% will be included with the drainage design to accommodate increases in flow resulting from climate change.
171. Following consultation and engineering design work, attenuation ponds (as part of the SuDS) will be included at the onshore substation and National Grid substation to provide sufficient attenuation to enable discharge at greenfield runoff rates into the closest watercourse or sewer connection. The attenuation ponds will be designed to attenuate flows up to the 1 in 200 year event (i.e. better than the 1 in 100 year plus climate change allowance) and will aim to reduce the discharge rate by 20% compared with the existing runoff rate. The full specification for the attenuation ponds will be addressed post consent as part of detailed design.
172. The reduced discharge rate as a result of the construction of the surface water drainage system / SuDS measures will provide a betterment in terms of runoff from the site.
173. In addition, the Applicant intends to install further attenuation measures along the existing surface water flow routes during the detailed design phase. The Applicant has committed to providing an additional 'surface water management SuDS basin' (currently identified as concept within **Chapter 29 Landscape and Visual Impact Assessment**, and in the Outline Landscape and Ecological Management Strategy (OLEMS), as secured under the requirements of the draft DCO, to reduce flood risk for the village of Friston, in addition to the Surface Water Drainage Strategy currently proposed.
174. Confirmation of the size, volume and location of this additional 'surface water management SuDS basin' will follow establishment of an appropriate catchment hydraulic model, detailed design and identification of the final proposed East Anglia ONE North project parameters. As a result, the additional attenuation and wider catchment benefit associated with this proposed additional 'surface water management SuDS basin' is not incorporated within this appendix as it is not required for the mitigation of the proposed East Anglia ONE North project.

20.8 Flood Risk Management Measures

175. There is always a potential for there to be a residual flood risk to people and property due to the failure of systems and defences. Residual risk will remain after flood management or mitigation measures have been installed. Therefore,

the FRA has considered residual flood risk and measures to manage residual flood risk where appropriate.

20.8.1 Design Mitigation

176. The onshore development area is primarily located within Flood Zone 1, at low risk of flooding from fluvial or tidal sources, and as such the sequential approach has been used in the location of the above ground structures.
177. The onshore cable would be buried a minimum of 1.2m beneath the bed of any watercourse along the route. Therefore, any flood risk to this element of the proposed East Anglia ONE North project would comprise a residual risk of groundwater flooding to the underground cable. Cable ducts shall be designed to be resilient to groundwater ingress to ensure this potential flood risk is mitigated.
178. During construction, the onshore cable route will be bounded by drainage channels (one on each side) to intercept drainage from within the working onshore cable corridor. Additional drainage channels will be installed to intercept water from the cable trench.
179. Where water enters the trenches during installation, this would be pumped via settling tanks or ponds to remove sediment, before being discharged at a controlled rate into local ditches or drains via temporary interceptor drains. Depending upon the precise location, water from the channels will be infiltrated or discharged into the drainage network.

20.8.2 Flood Resilient and Resistant Design

180. Where small watercourses, shallower than 1.2m, are to be crossed during duct installation temporary damming and diverting of the watercourse is proposed. To ensure flood risk is not increased during this phase of work the capacity of the water pipe, or pumping system will need to be suitable to maintain the original flow volumes and velocity of each watercourse. Channels would be reinstated to pre-construction depths, as far as possible, to ensure flood risk is not increased elsewhere following development.
181. Where there is the potential for surface water flood risk to affect the onshore substation and National Grid infrastructure, measures will be incorporated to limit the risk of flooding i.e. plant and materials or finished floor levels raised above expected flood levels or protected with flood barriers or similar construction. Should there be a remaining residual risk then resilience measures should be incorporated including the use of materials on walls and floors that will dry quickly following an event and the siting of electrical cables and other utilities at a height above the expected flood depth.

20.8.3 Flood Warning and Evacuation Plan

182. 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.
183. Specific flood warning and evacuation plans should be produced, and an operational flood plan completed for the onshore cable route, specifically related to construction works at the watercourse crossing over the Hundred River where personnel or materials may be located, albeit temporarily, within Flood Zones 2 and 3.
184. All personnel working in proximity to the Hundred River should be made aware of the extent of Flood Zones 2 and 3 and any flood warnings issued for those areas should result in the relevant areas being cleared of all personnel and, where appropriate, all plant / materials.
185. A site-specific flood warning and evacuation plan should include practical steps for protecting the proposed East Anglia ONE North project, be easy to communicate and consider delegated responsibility, or whether personnel are likely to require additional support during a flood event.
186. It is anticipated that the proposed East Anglia ONE North project will require a comprehensive Flood Warning and Evacuation Plan, to be included within the Flood Management Plan as part of the DCO documentation, 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 if appropriate, turning off / isolating services and moving to safety; and
 - Safe access and egress routes.
187. During construction, contractors and management should liaise with the LLFA and the Environment Agency to ensure awareness of when heavy rainfall is due, and / or if a flood warning has been issued to allow work to stop, especially in areas in close proximity to the Hundred River. Additional precautions should be put in place and the site cleared of all personnel in this instance.

20.8.4 Access and Egress

188. The onshore substation and National Grid infrastructure have been located within Flood Zone 1 and as such any personnel accessing these compounds shall be

at low risk of flooding from rivers or the sea. The surrounding area comprises Flood Zone 1 and therefore access can be maintained for the efficient access and egress of personnel.

20.9 Conclusions

189. The landfall location is within Flood Zone 1, at low risk of flooding from fluvial or tidal sources.
190. The onshore substation and National Grid infrastructure are located within Flood Zone 1, at low risk of flooding from fluvial sources. They are sufficiently inland that they are not at risk of flooding from the sea.
191. The National Grid infrastructure is at risk of flooding from surface water; including the northern and western boundary around the National Grid substation, including the cable sealing end compounds, and part of the footprint of the National Grid substation which are at medium – high risk of surface water flooding. This flood risk is related to flow arising to the north in proximity to Little Moor Farm.
192. The onshore substation and onshore substation CCS are located in areas primarily at low risk of surface water flooding i.e. outside the extent of the 1 in 1,000-year surface water flooding event.
193. As part of the onshore substation and National Grid infrastructure a permanent access road will be built to the north-east of Moor Farm, connecting to the onshore substation, National Grid substation and permanent access tracks connecting the permanent access road to the cable sealing end compounds. Parts of the access roads are likely to cross areas at both high risk of surface water flooding i.e. during the 1 in 30-year event and medium risk of surface water flooding i.e. there is a risk of flooding during the 1 in 100-year event.
194. A Surface Water and Drainage Management Plan will be developed, agreed with regulators, submitted to discharge a requirement of the draft DCO 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. This will assess the current and proposed runoff rates, volume of storage required and the proposed approach for discharge of water from the site.
195. The Surface Water and Drainage Management Plan will include details of the SuDS measures to be included. As a minimum, it will provide storage up to and including the 1 in 100-year storm event. Assuming a development lifetime of 25 years an increase in peak rainfall intensity of 20% will be included with the drainage design to accommodate increases in flow resulting from climate change.

The attenuation ponds will be designed to provide sufficient attenuation with the aim to reduce the discharge rate by 20% compared with the existing runoff rate. The full specification for the attenuation ponds will be addressed post consent as part of detailed design.

196. The reduced discharge rate as a result of the construction of the surface water drainage system / SuDS measures will provide a betterment in terms of runoff from the site.
197. The onshore cable route will pass primarily through Flood Zone 1, with the watercourse crossing over the Hundred River located in Flood Zone 2 and 3.
198. Whilst undertaking the watercourse crossing the construction area may be at risk of flooding, as well as posing a potential risk of increased flooding elsewhere. Therefore, the design related to temporary crossing will be developed to limit this risk. Any construction work located within Flood Zone 2 or 3, or within proximity to a watercourse will undertake suitable risk assessments, including the formation of site specific evacuation routes into areas of low flood risk and the location of plant above modelled flood levels. Any temporary plant which can be removed from a site at flood risk during construction, should there be a heavy rainfall event forecast, will be relocated to Flood Zone 1 and outside of an area with a potential surface water flood risk.
199. During the construction works any temporary damming and / or re-routing of watercourses and land drains along the onshore cable route will be designed such that the original flow volumes and rates are maintained to ensure flood risk is not increased.
200. Once operational there will be no flood risk posed to the onshore cable route from fluvial, tidal, surface or sewer flooding. A residual risk of flooding from groundwater shall be mitigated through the use of suitable waterproofing of the cable duct.
201. On the basis, of the above information related to flood risk and the proposed flood risk management measures, including the adoption of appropriate SuDS within the drainage design it is concluded that flood risk to, and as a result of, East Anglia ONE North can be appropriately mitigated throughout the lifetime of the proposed East Anglia ONE North project.

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Annex 1: Environment Agency Product 4 Data Package

████████████████████
 ████████████████████

Our ref EAn/2018/93832
Date 10 August 2018

Dear ██████████

Enquiry regarding Product 4 & 8 for Knodishall & Thorpeness

Thank you for your enquiry which was received on 24 July 2018.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

The information we hold and a copy of the Flood Risk Assessment (FRA) advisory note is attached to my email.

Name	Product 4
Description	Detailed Flood Risk Assessment Map for Knodishall & Thorpeness.
Licence	Open Government Licence
Information Warnings	There are no Environment Agency flood defences protecting this area.
Information Warning - OS background mapping	<i>The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply to this background mapping. You are granted a non-exclusive, royalty free, revocable licence solely to view the Licensed Data for non-commercial purposes for the period during which the Environment Agency makes it available. You are not permitted to copy, sub-license, distribute, sell or otherwise make available the Licensed Data to third parties in any form. Third party rights to enforce the terms of this licence shall be reserved to OS.</i>
Attribution	Contains Environment Agency information © Environment Agency and/or database rights. Contains Ordnance Survey data © Crown copyright 2017 Ordnance Survey 100024198.

East Anglia Area

Ipswich Office, Icen House, Cobham Road, Ipswich, Suffolk, IP3 9JD
 Bampton Office, Bromholme Lane, Bampton, Huntingdon, PE28 4NE
 General Enquiries: 03708 506506
 Email: enquiries@environment-agency.gov.uk
 Website: <https://www.gov.uk/government/organisations/environment-agency>

We have considered your request under the provisions of the Freedom of Information Act 2000 / Environmental Information Regulations 2004 (EIR). The Act requires that we respond to requests by advising you whether or not information is held, and if so by providing you with that information.

EIR Regulation 3(2) states that information is held if it is in our possession and has been produced or received by us, or it is held by another person on our behalf at the time the request is received.

Information not held

In this case, the Product 8 Breach hazard mapping information you have requested is not held by us. Therefore we are refusing this part of your request on the grounds that there is no information we can provide.

Where a request is for environmental information, the Regulations allow us to refuse to disclose it if the exception at EIR Regulation 12(4)(a) applies. The regulation states that a public authority may refuse to disclose environmental information to the extent that it does not hold that information when an applicant's request is received.

It is not possible for us to conduct a public interest balancing test because the reason for non-disclosure is that the information is not held.

The SFRA data is held by Suffolk Coastal & Waveney DC and named Suffolk Coastal & Waveney District Strategic Flood Risk Assessment.

Coastal Modelling

We are currently undertaking a hydraulic modelling study for the following Essex, Norfolk and Suffolk Coastal areas: Wells, Cromer, Walcott, Thurne, Hickling and Coast, Great Yarmouth, Lowestoft, Kessingland (Lothingland Hundred), Blyth Estuary, Leiston, Alde & Ore Estuary, Deben Estuary, Stour & Orwell Estuary, Clacton, Colne & Blackwater Estuary, Crouch & Roach Estuary, Southend and the Thames.

You may be aware that some Local Planning Authorities have updated their Strategic Flood Risk Assessments (SFRAs) using data from this modelling study. As SFRA's are not updated regularly we agreed that they could use draft outputs as we wanted to ensure that the SFRA's were not out of date as soon as they were published. However although this information was shared with our external partners to assist them with the creation of their SFRAs the data remains unavailable for external practice until model completion. This is because we need to complete all necessary reviews. The project aims to be completed by summer 2018 and will be available for external practice then.

East Anglia Area

Ipswich Office, Icen House, Cobham Road, Ipswich, Suffolk, IP3 9JD
Brampton Office, Bromholme Lane, Brampton, Huntingdon, PE28 4NE
General Enquiries: 03708 506506

Email: enquiries@environment-agency.gov.uk

Website: <https://www.gov.uk/government/organisations/environment-agency>

Data Available Online

Many of our flood datasets are available online:

- Flood Map For Planning ([Flood Zone 2](#), [Flood Zone 3](#), [Flood Storage Areas](#), [Flood Defences](#), [Areas Benefiting from Defences](#))
- [Risk of Flooding from Rivers and Sea](#)
- [Historic Flood Map](#)
- [Current Flood Warnings](#)

Additional information

Please be aware that we now charge for planning advice provided to developers, agents and landowners. If you would like advice to inform a future planning application for this site then please complete our <https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion> and email it to our Sustainable Places team at: planning.ipswich@environment-agency.gov.uk.

They will initially provide you with a free response identifying the following:

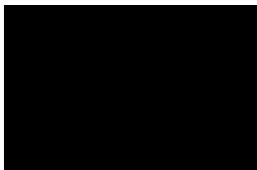
- the environmental constraints affecting the proposal;
- the environmental issues raised by the proposal;
- the information we need for the subsequent planning application to address the issues identified and demonstrate an acceptable development;
- any required environmental permits.

If you require any further information from them (for example, a meeting or the detailed review of a technical document) they will need to set up a charging agreement. Further information can be found on our [website](#).

Please note we have published revised climate change allowances, which are available online. These new allowances will need to be reflected in your Flood Risk Assessment. If you want to discuss this please call our Sustainable Places team on 0203 025 5475.

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Yours sincerely



**Customers and Engagement Officer
Environment Agency**

Team Number: 0203 0255472

East Anglia Area

Ipswich Office, Icen House, Cobham Road, Ipswich, Suffolk, IP3 9JD
Brampton Office, Bromholme Lane, Brampton, Huntingdon, PE28 4NE
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Email: enquiries@environment-agency.gov.uk

Website: <https://www.gov.uk/government/organisations/environment-agency>

Reference: EAn/2018/93832
Site Address: Knodishall & Thorpeness
Date: 09/08/2018

Included:

- Flood Map Tidal & Fluvial

Model Name and Year

- Undefended Key Outlines – Current Day
- 1D Nodes Map & Table Tidal & Fluvial

Important information to note with your Product:

Flood Risk Assessments (FRAs)

If you are obtaining this information for use within a Flood Risk Assessment (FRA) required for a planning application, please include our unaltered Product 4 data within an appendix of your FRA.

Flood Zones

Please see the attached map showing the Flood Zones (outlines) for the area of the site. Our maps show the site is located in fluvial/ tidal Flood Zone. For further information with regards to Flood Zones, please see below:

Table 1: Flood Zones

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.(Land shown in dark blue on the Flood Map)

Paragraph: 065 Reference ID: 7-065-20140306

Open Coast Modelling

For more information regarding the open coast modelled flood levels, please read the guidance regarding design sea levels on the link below:-

<https://www.gov.uk/government/publications/coastal-flood-boundary-conditions-for-uk-mainland-and-islands-design-sea-levels>

Climate Change (Tidal Only)

There is no change to the way we respond to sites affected solely by tidal flood risk as the sea level allowances are unchanged. Please use the "Table 3 sea level allowance for each epoch in millimetres (mm) per year with cumulative sea level rise for each epoch in brackets (use 2008 baseline)" found at:

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#table-3>

Climate Change (Fluvial Only)

Flood risk data requests including an allowance for climate change will be based on the 1% annual probability flood including an additional 20% increase on peak flows to account for climate change impacts, unless otherwise stated. You should refer to '[Flood risk assessments: climate change allowances](#)' to check if this allowance is still appropriate for the type of development you are proposing and its location. You may need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.

- a. The flow data for this model has been provided.

For further guidance on fluvial climate change please contact the Partnership and Strategic Overview Team at: PSOENS@environment-agency.gov.uk

Historic Flood Events

We have checked our historic flooding database and have found no record of flooding in this area. This does not mean that the site has never flooded, only that no flooding has been reported to us in this location.

Surface Water

Please be aware that in recent years, there has been an increase in flood damage caused by surface water flooding or drainage systems that have been overwhelmed. We have worked with Lead local Flood Authorities (LLFAs) to develop a map which incorporates the best local and national scale information on surface water flood risk. These maps can be viewed on our website at the following:-

<https://flood-warning-information.service.gov.uk/long-term-flood-risk/>

Reservoir Flooding

You can obtain a map which shows the extent of flooding if a reservoir was to fail and release the water that it holds. The map shows the worst case scenario. These maps can be viewed on our website at the following:-

<https://flood-warning-information.service.gov.uk/long-term-flood-risk/>

Coastal Modelling

We are currently undertaking a hydraulic modelling study for the following Essex, Norfolk and Suffolk Coastal areas: Wells, Cromer, Walcott, Thurne, Hickling and Coast, Great Yarmouth, Lowestoft, Kessingland (Lothingland Hundred), Blyth Estuary, Leiston, Alde & Ore Estuary, Deben Estuary, Stour & Orwell Estuary, Clacton, Colne & Blackwater Estuary, Crouch & Roach Estuary, Southend and the Thames.

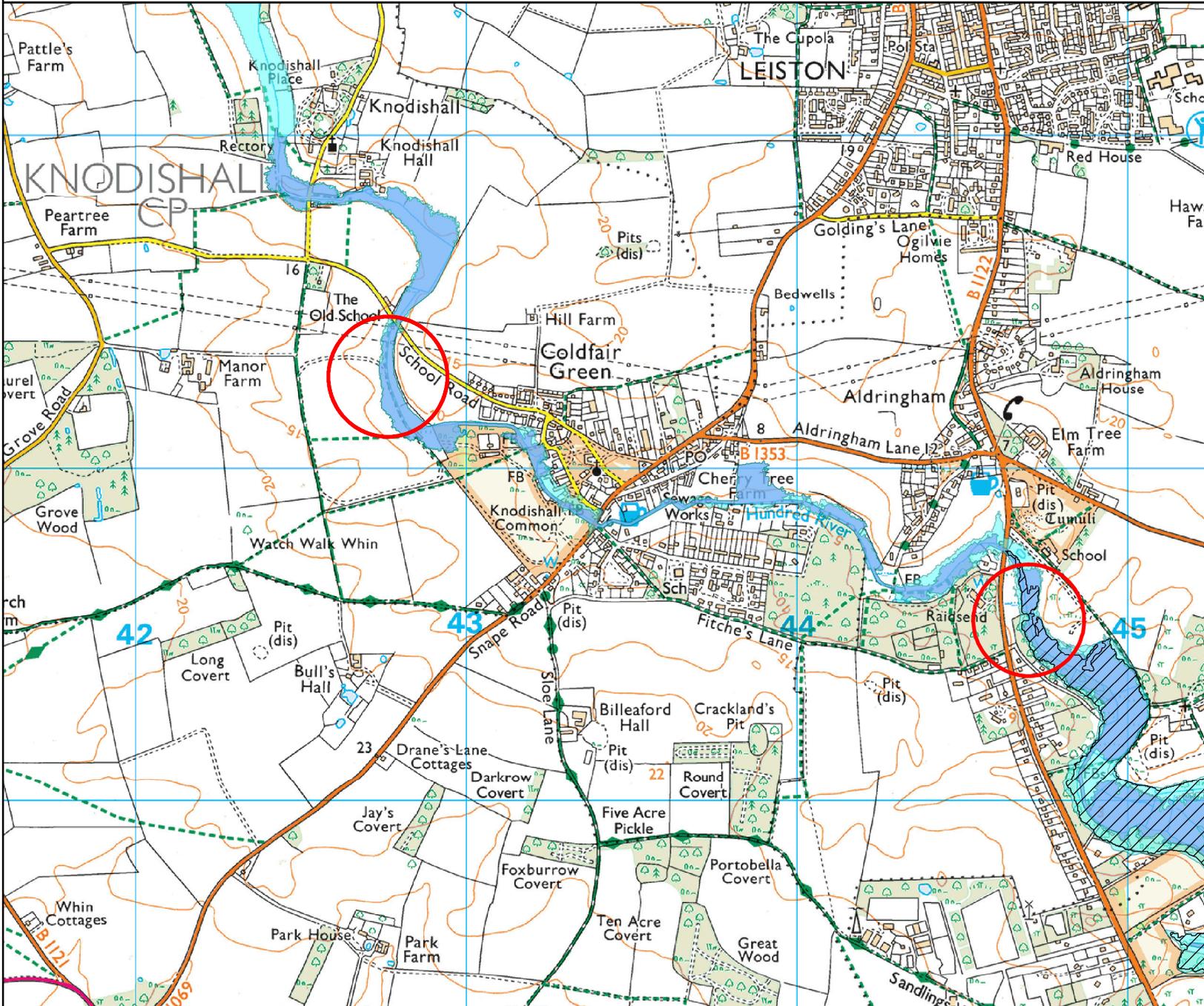
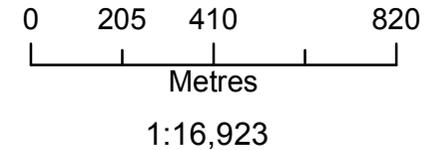
You may be aware that some Local Planning Authorities have updated their Strategic Flood Risk Assessments (SFRA's) using data from this modelling study. As SFRA's are not updated regularly we agreed that they could use draft outputs as we wanted to ensure that the SFRA's were not out of date as soon as they were published. However although this information was shared with our external partners to assist them with the creation of their SFRA's the data remains unavailable for external practice until model completion. This is because we need to complete all necessary reviews. The project aims to be completed by Late 2018 and will be available for external practice then.

Flood Map for Planning centred on Knodishall

Created 09/08/2018 - Ref: EAn/2018/93832



Environment Agency
Iceni House
Cobham Road
Ipswich
Suffolk
IP3 9JD



Legend

- Site Location
- Areas Benefiting from Defence
- Outline_Reservoir_Flood_Maps
- Flood Storage Area
- Flood Zone 3
- Flood Zone 2

Flood Map for Planning (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:
 - from the sea with a 1 in 200 or greater chance of happening each year
 - or from a river with a 1 in 100 or greater chance of happening each year.

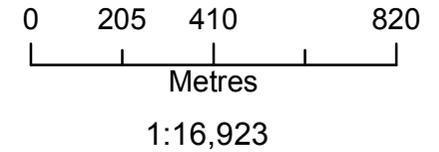
Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

Flood Map for Planning centred on Thorpeness (Tidal)

Created 09/08/2018 - Ref: EAn/2018/93832



Environment Agency
Iceni House
Cobham Road
Ipswich
Suffolk
IP3 9JD



Legend

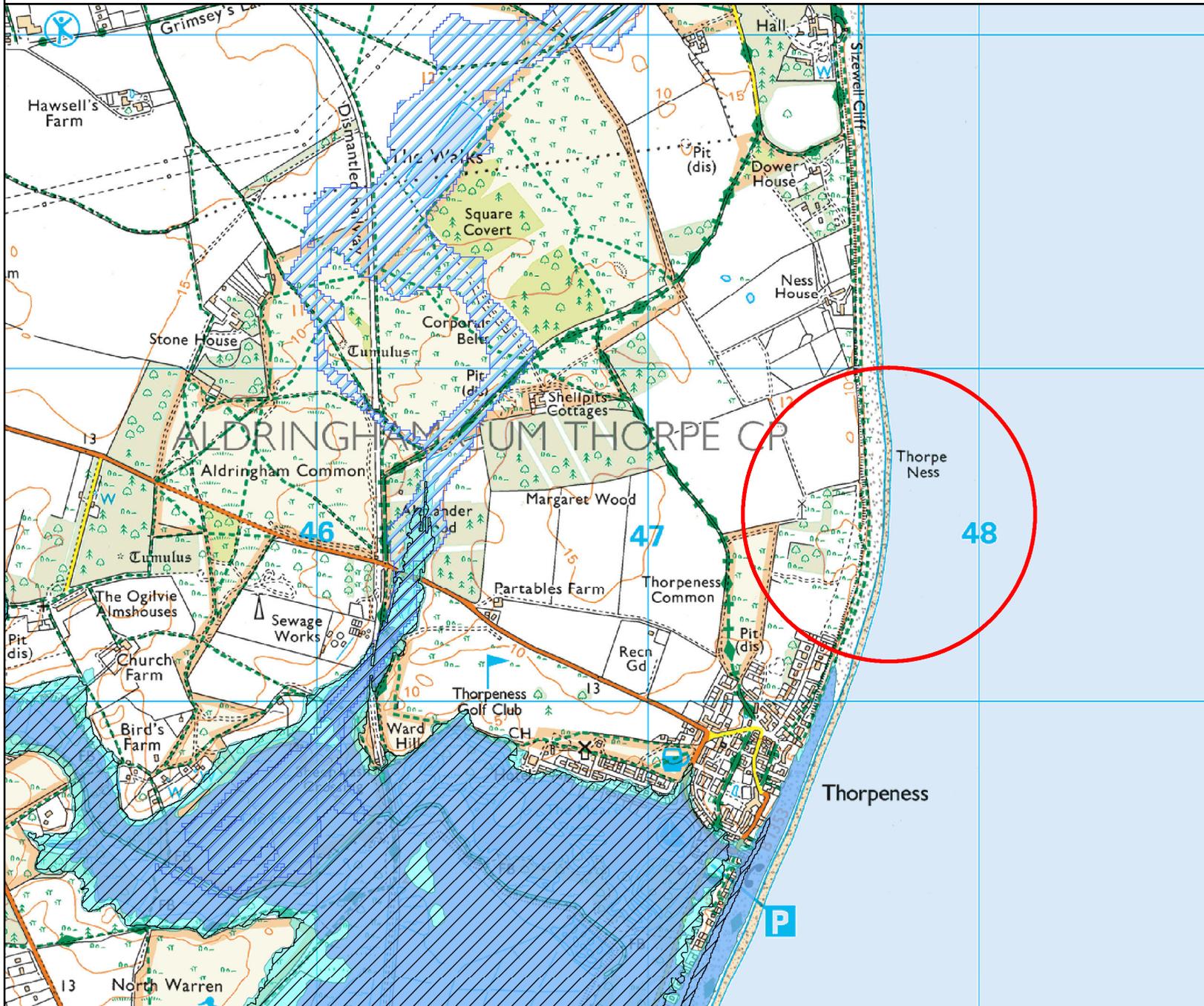
-  Site Location
-  Areas Benefiting from Defence
-  Outline_Reservoir_Flood_Maps
-  Flood Storage Area
-  Flood Zone 3
-  Flood Zone 2

Flood Map for Planning (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:

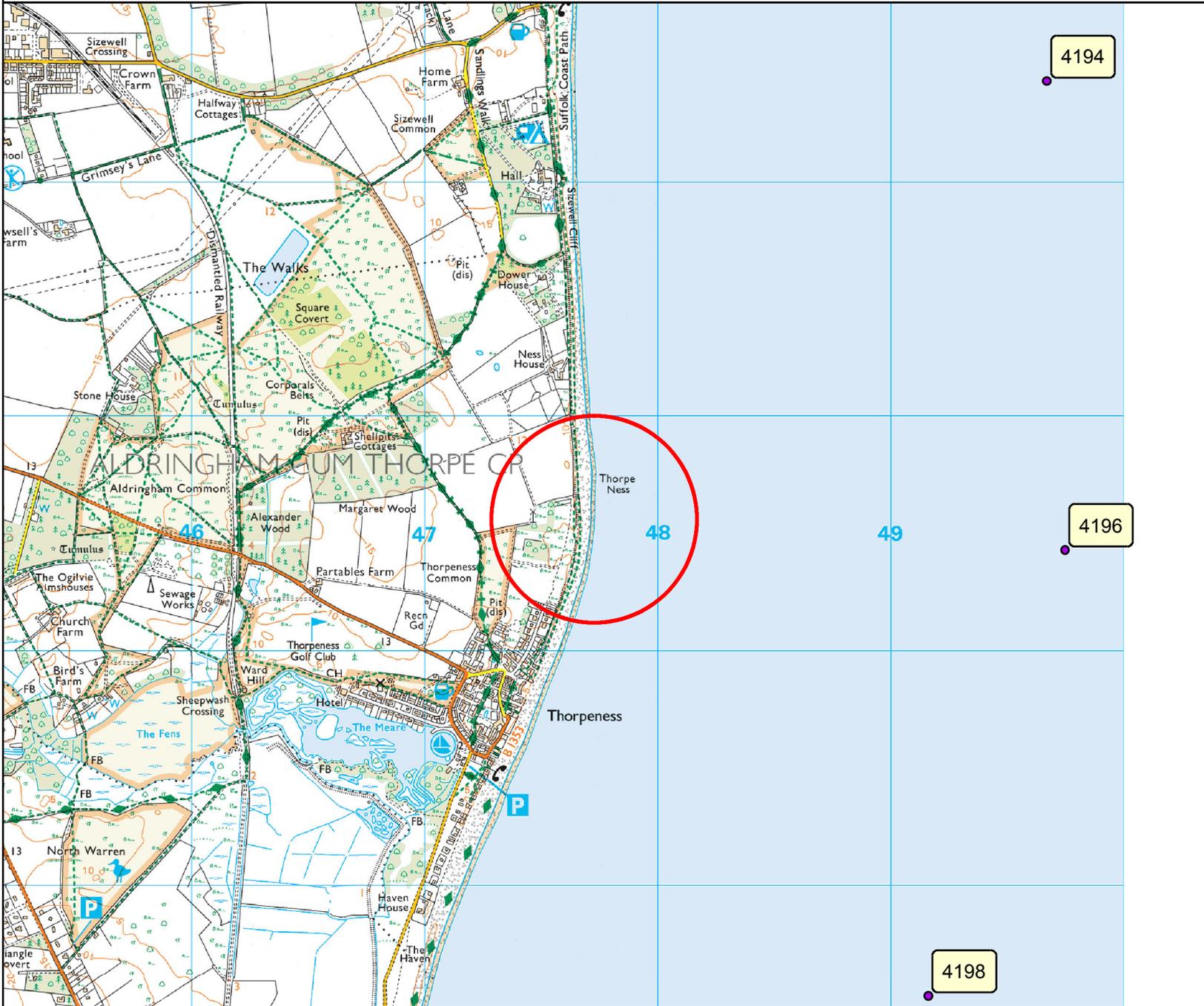
- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.



Modelled Levels Location Map centred on Thorpeness (Tidal)

Created 09/08/2018 - Ref: EAn/2018/93832

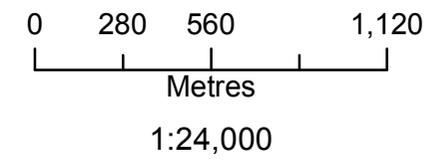


4194

4196

4198

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Cobham Road
Ipswich
Suffolk
IP3 9JD



Legend

- Flood Sea Levels
- Site Location

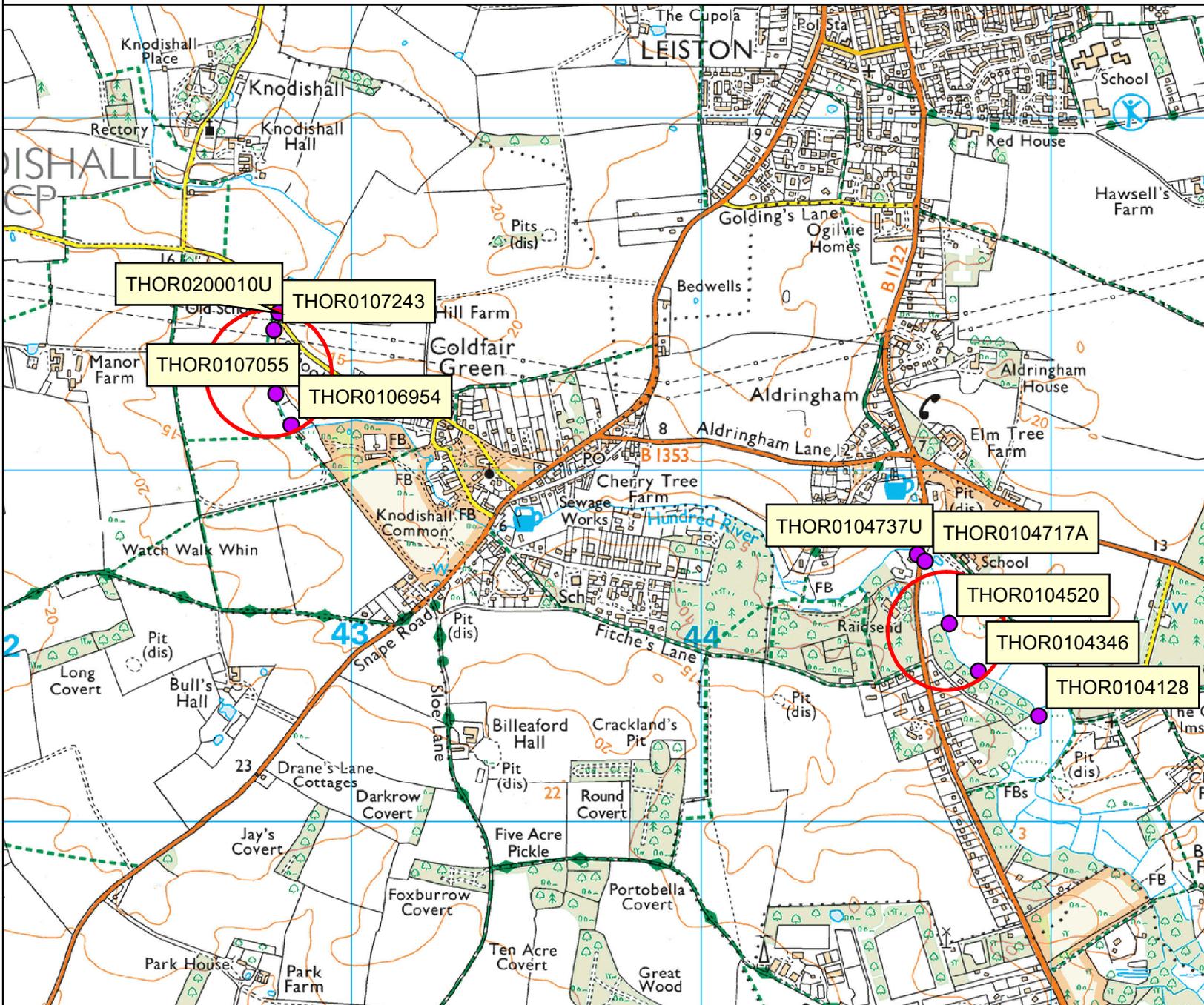
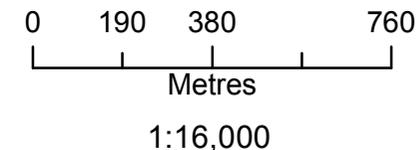
This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within the catchment. Modelled outlines take into account catchment wide defences if present.

Modelled Levels Location Map centred on Knodishall

Created 09/08/2018 - Ref: EAn/2018/93832



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Legend

- Site Location
- Model Flood Levels

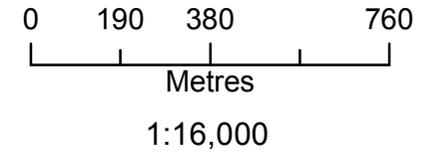
This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within the catchment. Modelled outlines take into account catchment wide defences if present.

Modelled Outlines Location Map centred on Knodishall

Created 09/08/2018 - Ref: EAn/2018/93832

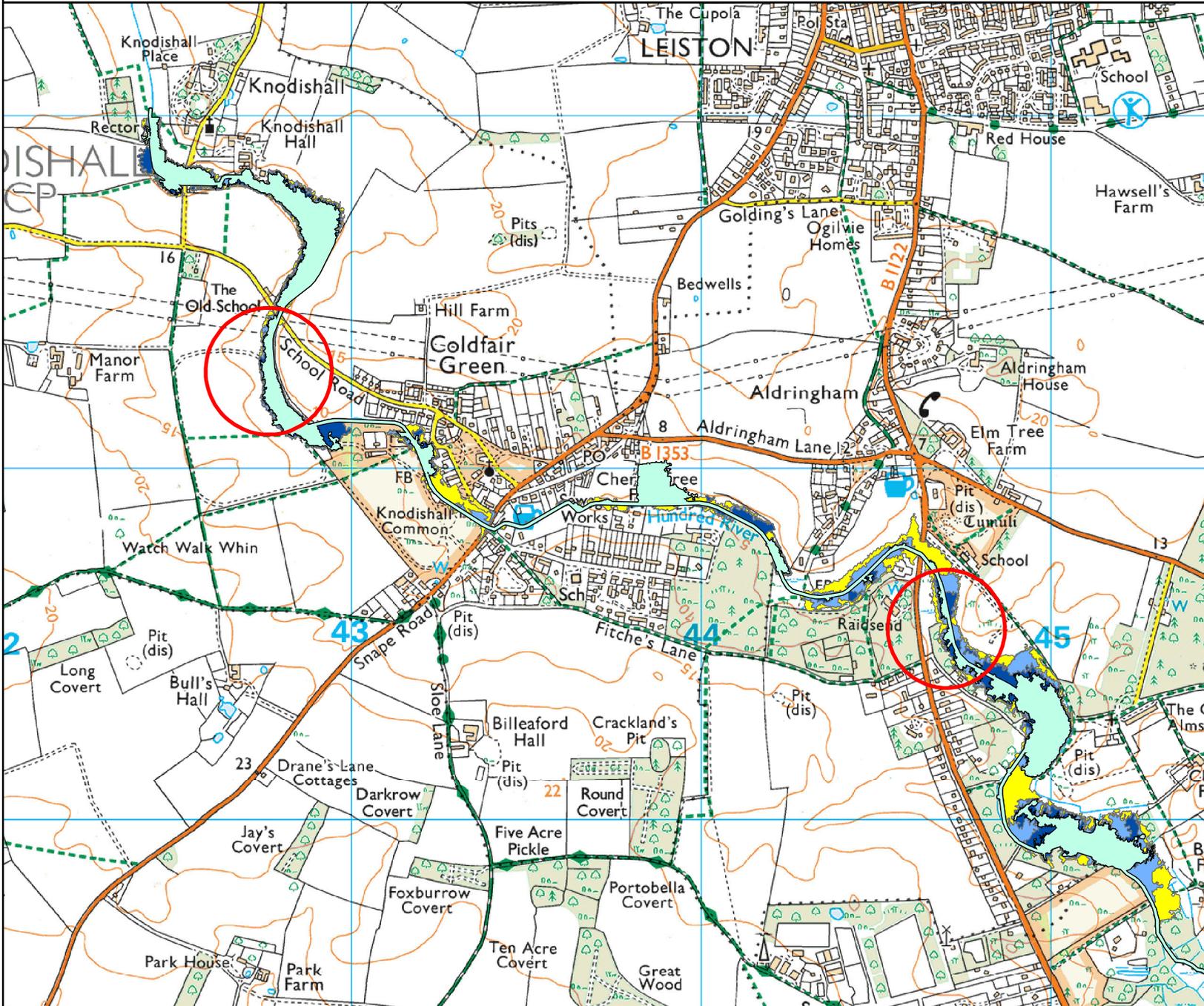


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Legend

- Site Location
- 1 in 10 (10%)
- 1 in 25 (4%)
- 1 in 100 (1%)
- 1 in 75 (1.33%)
- 1 in 1000 (0.1%)



Datasheet Reference: EAn/2018/93832
Source of information: Coastal Flood Boundary Conditions for UK Mainland & Islands
Produced By Royal Haskoning for the Environment Agency
Source of Flooding Tidal

Key
CC Climate Change
AEP Annual Exceedance Probability
mAODN Metres Above Ordnance Datum Newlyn
m³s⁻¹ Cubic Metres Per Second (Cumeecs)

Undefended (2008 Base Year)

Levels (mAODN) AEP

Node	100% (1:1)	50% (1:2)	20% (1:5)	10% (1:10)	5% (1:20)	4% (1:25)	2% (1:50)	1.33% (1:75)	1% (1:100)	0.66% (1:150)	0.5% (1:200)	0.4% (1:250)	0.33% (1:300)	0.2% (1:500)	0.1% (1:1,000)	0.01% (1:1,0000)
4194	1.99	2.13	2.31	2.45	2.60	2.65	2.79	2.89	2.95	3.06	3.13	3.19	3.22	3.35	3.53	4.18
4196	1.99	2.13	2.31	2.45	2.60	2.65	2.79	2.89	2.95	3.06	3.12	3.18	3.21	3.34	3.52	4.16
4198	2.02	2.16	2.34	2.48	2.63	2.68	2.82	2.93	2.99	3.10	3.16	3.22	3.25	3.39	3.57	4.24

Datasheet Reference: EAn/2018/93832
Source of information: East Suffolk Flood Risk Study 2006
Produced By JBA Consulting
Source of Flooding Fluvial
Flood Levels Provided In-Channel

Key
CC Climate Change
AEP Annual Exceedance Probability
mAODN Metres Above Ordnance Datum Newlyn
m³s⁻¹ Cubic Metres Per Second (Cumecs)

Undefended

Fluvial Levels (mAODN)

AEP

Node	Eastings	Northings	50% (1:2)	10% (1:10)	4% (1:25)	1.33% (1:75)	1% (1:100)	1% (1:100) +20%CC	1% (1:100) +30%CC	0.1% (1:1,000)
THOR0200010U	642795	261446	8.31	8.66	8.81	5.70	8.95	9.05	9.05	9.11
THOR0107243	642782	261397	8.20	8.43	8.49	5.70	8.56	8.64	8.64	8.68
THOR0107055	642787	261216	7.92	8.13	8.19	5.70	8.30	8.31	8.31	8.33
THOR0106954	642830	261126	7.73	8.00	8.09	5.70	8.22	8.23	8.23	8.23
THOR0104737U	644622	260759	3.12	3.48	3.63	5.67	3.84	4.07	4.07	4.19
THOR0104717A	644643	260740	3.01	3.28	3.37	5.66	3.48	3.56	3.56	3.64
THOR0104520	644712	260562	2.85	3.13	3.22	5.69	3.32	3.41	3.41	3.48
THOR0104346	644796	260427	2.79	3.06	3.15	5.68	3.26	3.36	3.36	3.42
THOR0104128	644968	260300	2.70	3.00	3.09	5.64	3.21	3.31	3.31	3.38

Undefended

Flows (m³s⁻¹)

AEP

Node	Eastings	Northings	50% (1:2)	10% (1:10)	4% (1:25)	1.33% (1:75)	1% (1:100)	1% (1:100) +20%CC	1% (1:100) +30%CC	0.1% (1:1,000)
THOR0200010U	642795	261446	2.09	3.88	4.74	5.70	5.93	7.11	7.11	8.10
THOR0107243	642782	261397	2.09	3.88	4.74	5.70	5.93	7.11	7.11	8.10
THOR0107055	642787	261216	2.10	3.88	4.74	5.70	5.92	7.11	7.11	8.10
THOR0106954	642830	261126	2.11	3.88	4.74	5.70	5.92	8.40	8.40	8.10
THOR0104737U	644622	260759	2.09	3.87	4.73	5.67	5.87	6.92	6.92	8.04
THOR0104717A	644643	260740	2.09	3.87	4.73	5.66	5.87	6.92	6.92	8.05
THOR0104520	644712	260562	2.10	3.88	4.74	5.69	5.91	6.95	6.95	8.64
THOR0104346	644796	260427	2.10	3.87	4.73	5.68	5.89	6.92	6.92	8.90
THOR0104128	644968	260300	2.10	3.90	4.70	5.64	5.85	6.87	6.87	9.87

Use of Environment Agency Information for Flood Risk Assessments

Important

The Environment Agency are keen to work with partners to enable development which is resilient to flooding for its lifetime and provides wider benefits to communities. If you have requested this information to help inform a development proposal, then we recommend engaging with us as early as possible by using the pre-application form available from our website:

<https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>

We recognise the value of early engagement in development planning decisions. This allows complex issues to be discussed, innovative solutions to be developed that both enables new development and protects existing communities. Such engagement can often avoid delays in the planning process following planning application submission, by reaching agreements up-front. We offer a charged pre-application advice service for applicants who wish to discuss a development proposal.

We can also provide a preliminary opinion for free which will identify environmental constraints related to our responsibilities including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

In preparing your planning application submission, you should refer to the Environment Agency's Flood Risk Standing Advice and the Planning Practice Guidance for information about what flood risk assessment is needed for new development in the different Flood Zones. This information can be accessed via:

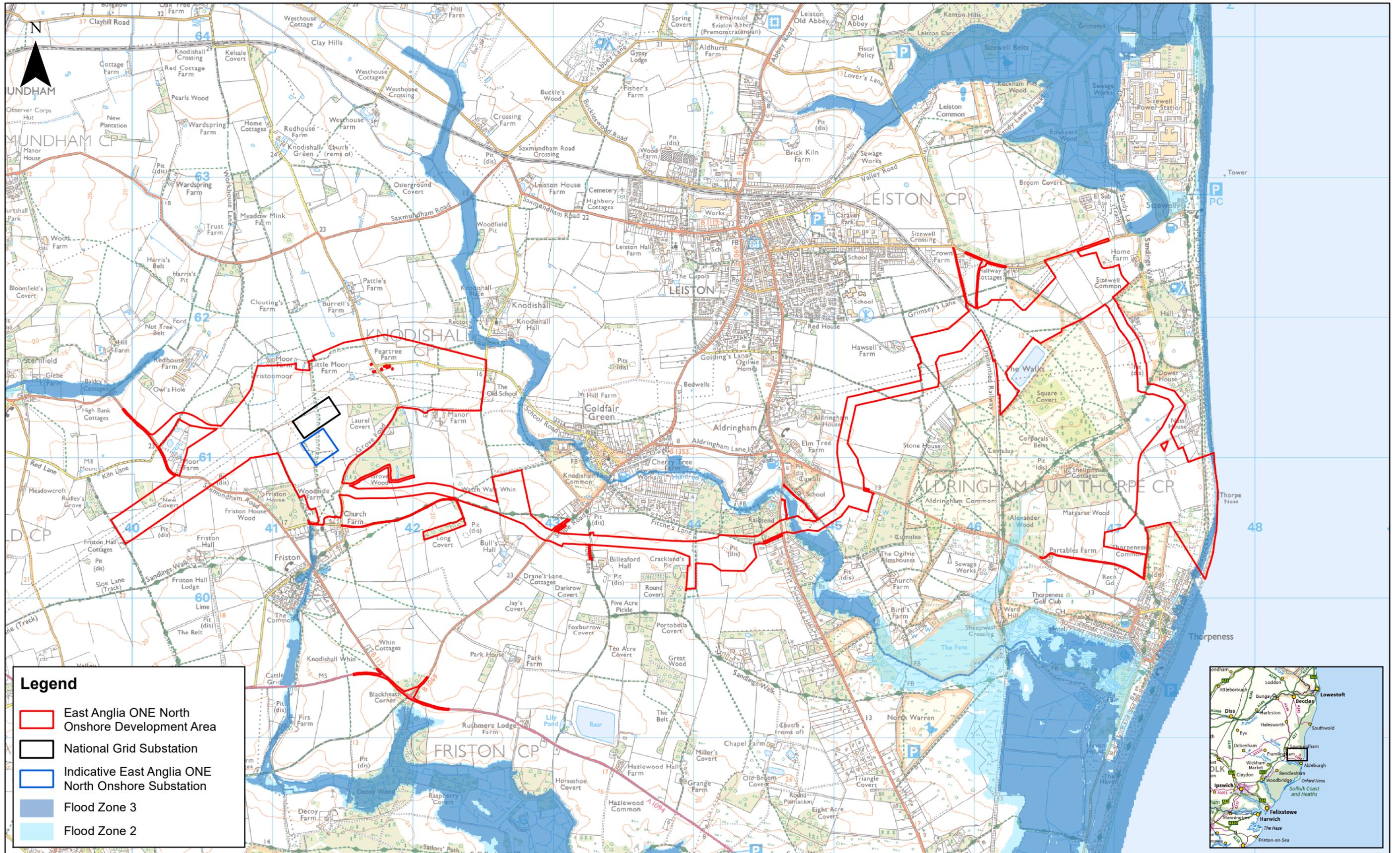
<https://www.gov.uk/flood-risk-assessment-standing-advice>
<http://planningguidance.planningportal.gov.uk/>

You should also consult the Strategic Flood Risk Assessment or other relevant materials produced by your local planning authority.

You should note that:

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk Assessment (FRA) where one is required, but does not constitute such an assessment on its own.
2. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or surface water runoff. Information produced by the local planning authority referred to above may assist here.
3. Where a planning application requires an FRA and this is not submitted or is deficient, the Environment Agency may raise an objection.

Annex 2: Supporting Figures



Legend

- East Anglia ONE North Onshore Development Area
- National Grid Substation
- Indicative East Anglia ONE North Onshore Substation
- Flood Zone 3
- Flood Zone 2



Rev	Date	By	Comment	Approved:
2	02/09/2019	FC	Second Issue.	FC
1	28/06/2019	FC	First Issue.	ID

1:25,000
Scale @ A3

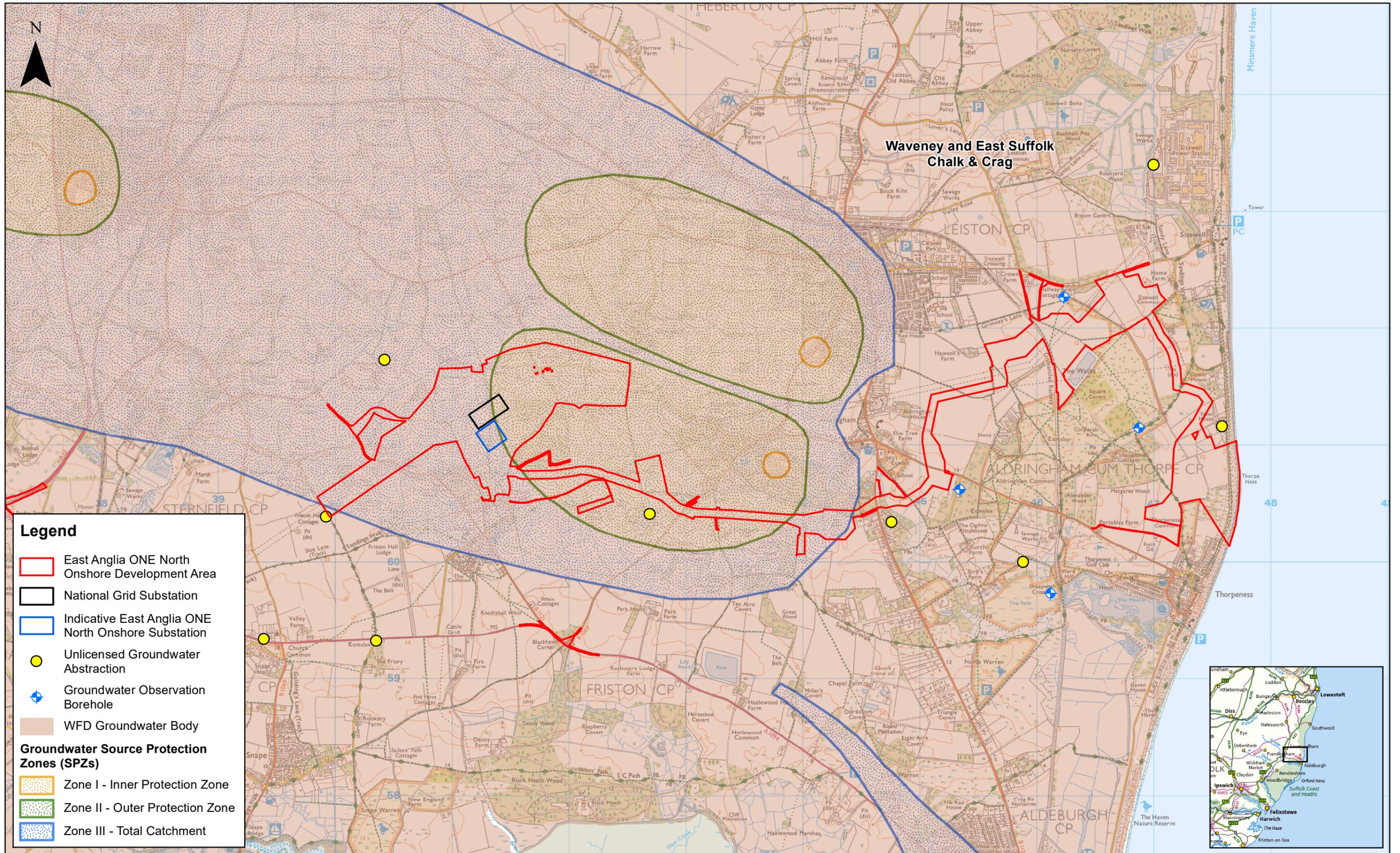
0 0.5 1 Km

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East Anglia ONE North

Environment Agency Flood Zones

Drg No	EA1N-DEV-DRG-IBR-000781	Coordinate System:	BNG
Rev	2	Datum:	OSGB36
Date	02/09/19		
Figure	20.3.1		

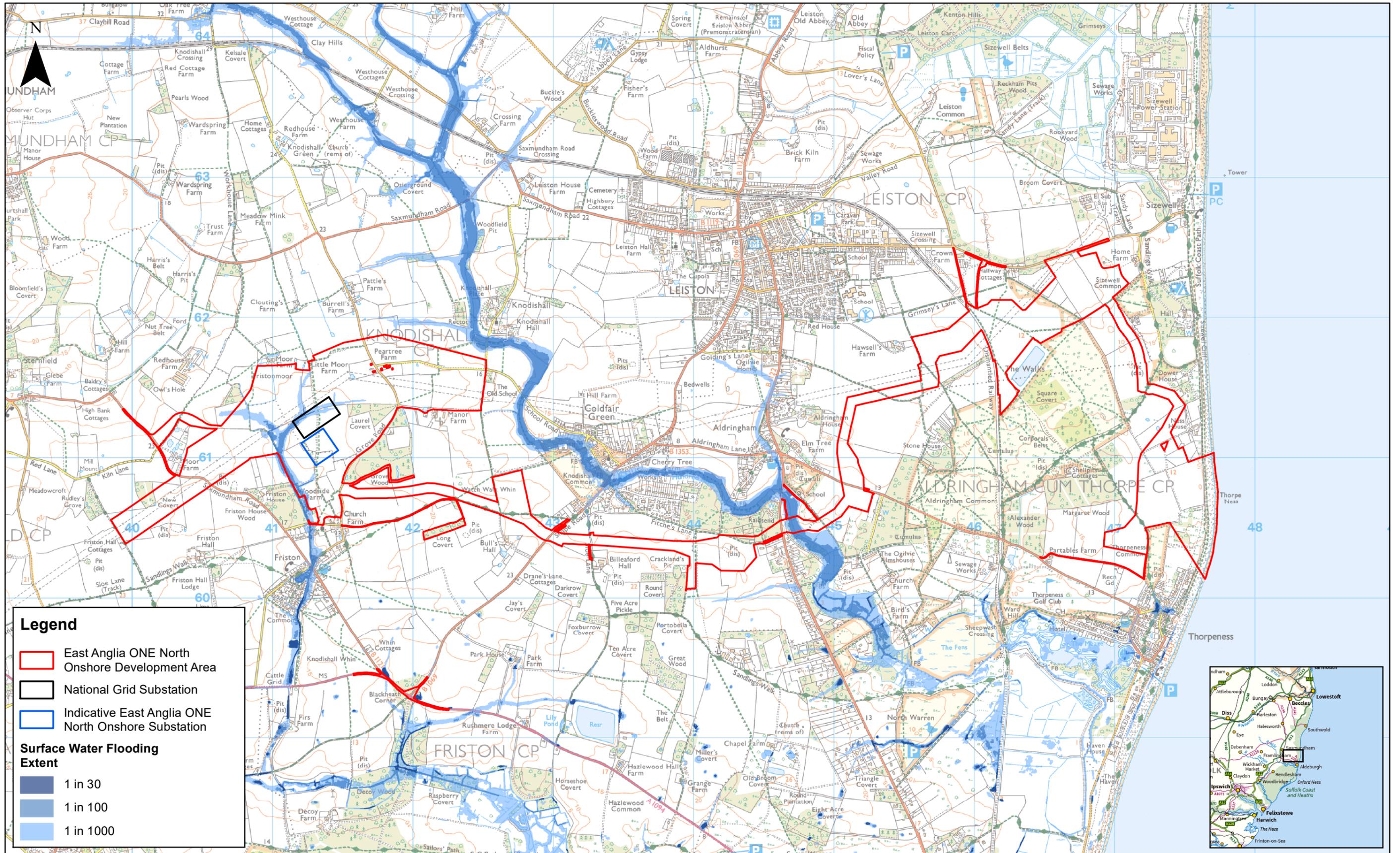


2	02/09/2019	FC	Second Issue.	Prepared:	FC
1	28/06/2019	FC	First Issue.	Checked:	ID
Rev	Date	By	Comment	Approved:	AH

1:30,000	Scale @ A3	0 0.5 1 Km
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East Anglia ONE North Groundwater Receptors

Drg No	EA1N-DEV-DRG-IBR-000782	
Rev	2	Coordinate System: BNG
Date	02/09/19	Datum: OSGB36
Figure	20.3.2	



Rev	Date	By	Comment	Approved:
2	02/09/2019	FC	Second Issue.	Prepared: FC
1	28/06/2019	FC	First Issue.	Checked: ID
				Approved: AH

1:25,000	Scale @ A3	0 0.5 1 Km
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Surface Water Flood Risk

Drg No	EA1N-DEV-DRG-IBR-000783	
Rev	2	Coordinate System: BNG
Date	02/09/19	Datum: OSGB36
Figure	20.3.3	