Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions

Preliminary Environmental Information Report

Volume 3

Appendix 20.2 - Flood Risk Assessment

April 2021

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Title**:**	
Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions **Preliminary Environmental Information Report** **Appendix 20.2 Flood Risk Assessment**	
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Glossary of Acronyms

AStGWf	Areas Susceptible to Groundwater Flooding
AOD	Above Ordnance Datum
BDC	Broadland District Council
BGS	British Geological Survey
BS	British Standard
BSI	British Standards Institution
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CIA	Cumulative Impact Assessment
CFMP	Catchment Flood Management Plan
DCO	Development Consent Order
DECC	Department for Energy and Climate Change
DEFRA	Department for the Environment and Rural Affairs
DEP	Dudgeon Extension Project
DMRB	Design Manual for Roads and Bridges
DOW	Dudgeon Offshore Wind Farm
EA	Environment Agency
EC	European Commission
EIA	Environmental Impact Assessment
EPP	Evidence Plan Process
EPS	European Protected Species
EPUK	Environmental Protection United Kingdom
EQS	Environmental Quality Standards
ES	Environmental Statement
ETG	Expert Topic Group
EU	European Union
FRA	Flood Risk Assessment
GIS	Geographical Information System
HVAC	High-Voltage Alternating Current
HVDC	High-Voltage Direct Current
IDB	Internal Drainage Board
IPC	Infrastructure Planning Commission
IROPI	Imperative Reasons of Overriding Public Interest

ISO	International Standards Organisation
km	Kilometre
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
MW	Megawatts
NNDC	North Norfolk District Council
NorCC	Norwich City Council
NP	National Park
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
OS	Ordnance Survey
OWF	Offshore Wind Farm
PEIR	Preliminary Environmental Information Report
PPG	Planning Practice Guidance
PPV	Peak Particle Velocity
PRA	Preliminary Risk Assessment
SEP	Sheringham Shoal Extension Project
SFRA	Strategic Flood Risk Assessment
SNC	South Norfolk Council
SNS	Southern North Sea
SMP	Shoreline Management Plan
SoS	Secretary of State
SuDS	Sustainable Drainage Systems
TEU	Treaty of the European Union
UK	United Kingdom
UN	United Nations
WFD	Water Framework Directive
WTG	Wind Turbine Generator

Glossary of Terms

The Applicant	Equinor New Energy Limited
DCO boundary	The area subject to the application for development consent, including all permanent and temporary works for DEP and SEP. The DCO boundary will be subject to updated impact assessment and further development of mitigation proposals to inform the ES.
Dudgeon Offshore Wind Farm Extension site	The Dudgeon Offshore Wind Farm Extension offshore wind farm boundary.
The Dudgeon Offshore Wind Farm Extension Project (DEP)	The Dudgeon Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure.
Horizontal directional drilling (HDD) zones	The areas within the onshore cable route which would house HDD entry or exit points.
Jointing bays	Underground structures constructed at regular intervals along the onshore cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	The point on the coastline at which the offshore export cables are brought onshore and connected to the onshore export cables.
Onshore substation sites	Parcels of land within onshore substation zones A and B, identified as the most suitable location for development of the onshore substation. Two sites have been identified for further assessment within the PEIR.
Onshore substation zone	Parcels of land within the wider onshore substation search area identified as suitable for development of the onshore substation. Two substation zones (A and B) have been identified as having the greatest potential to accommodate the onshore substation.
PIER boundary	The area subject to survey and preliminary impact assessment to inform the PEIR, including all permanent and temporary works for DEP and SEP. The PEIR boundary will be refined down to the final DCO boundary ahead of the application for development consent
Study area	Area where potential impacts from the project could occur, as defined for each individual EIA topic.
Sheringham Shoal Offshore Wind Farm Extension site	Sheringham Shoal Offshore Wind Farm Extension offshore wind farm boundary.

The Sheringham Shoal Offshore Wind Farm Extension Project (SEP)	The Sheringham Shoal Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure.

20.2 FLOOD RISK ASSESSMENT

20.2.1 Introduction

20.2.1.1 Project Background

1. Equinor New Energy Limited (hereafter Applicant) is proposing to extend the existing operational Dudgeon and Sheringham Shoal Offshore Wind Farms named the Dudgeon Offshore Wind Farm Extension Project (hereafter DEP) and the Sheringham Shoal Offshore Wind Farm Extension Project t (hereafter SEP). DEP and SEP will include a number of offshore and onshore elements including an offshore wind farm, export cables to landfall, onshore buried cables and an onshore substation for connection to the electricity transmission network.
2. Royal HaskoningDHV was commissioned to undertake a Flood Risk Assessment (FRA) based on the Preliminary Environmental Information Report (PEIR) boundary for the DEP and SEP proposals.

20.2.1.2 Aims

3. The aim of this FRA is to provide sufficient justification to regulators and other stakeholders that DEP and SEP is appropriate and in line with planning and national policy requirements regarding flood risk.
4. The aims of this FRA are:
   - To provide information required to support the PEIR with regards to flooding, supported by the application of the Sequential Test and, where necessary, the Exception Test;
   - To establish whether DEP and SEP is likely to be affected by current or future flooding from any source and whether it will increase flood risk elsewhere;
   - To inform potential flood risk mitigation options; and
   - To provide recommendations on potential measures required to reduce flood risk, if applicable.

20.2.1.3 Methodology

5. This FRA has been prepared in accordance with the methodology and guidance set out in EN-1 Overarching National Policy Statement (NPS) for Energy (Department of Energy & Climate Change, 2011), 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, 2014), and the Environment Agency's climate change allowance guidance (Environment Agency, 2020).

6. The Environment Agency's climate change allowance guidance was updated on 17th December 2019 and 16th March 2020 (Environment Agency, 2020). There were a number of amendments including, but not limited to; updated sea level rise allowances using UKCP18 projections; additional guidance on the use of peak rainfall allowances to help design drainage systems; how to assess and design access and escape routes for less vulnerable developments and updated guidance on how to apply peak river flow allowances so the approach is the same for both Flood Zones 2 and 3. The relevance and applicability of the updated guidance has been considered within this FRA.

7. The 2020 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 (Environment Agency, 2020). The principal aim of these policies and guidance documents is to avoid inappropriate development in areas at risk of flooding and, wherever possible, to direct development away from the areas at highest flood risk. The appropriate climate change allowances have been reviewed and included within **Section 20.2.6** of this FRA.

20.2.1.3.1 Study Area

8. Flood risk varies across the study area. Therefore, to aid this assessment the PEIR boundary has been divided into three key sections within this document:

   - **Landfall area** – where the offshore export cables will connect to the onshore export cables, close to Weybourne, it will be located on land predominantly used for agriculture. The landfall location extends inland to facilitate the provision of temporary logistics compounds and access tracks.
   - **Onshore cable corridor** – is the proposed route the onshore export cables will take between the landfall location and the onshore substation. This includes associated access tracks, link boxes, joint bays and temporary logistics compounds.
   - **Onshore substation sites** – including 400kV National Grid Electricity Transmission (NGET) connection to the existing National Grid substation at Norwich Main.
   - **Temporary works** – including those relating to the onshore substation sites, access and compounds.

9. The flood risk to the landfall location, onshore cable corridor and onshore substation area are each identified independently within this FRA report.

10. Furthermore, the assessment relating to flood risk connected to the onshore cable corridor are further sub-divided into categories based on Water Framework Directive (WFD) Surface Water Operational Catchments (**Figure 20.2.1**) as outlined below:

    - Landfall area:
      - **Section 20.2.4.2:** Landfall area.
    - Onshore cable corridor:
      - **Section 20.2.4.4:** North Norfolk WFD Surface Water Operational Catchment;

- **Section 20.2.4.5:** Bure WFD Surface Water Operational Catchment;
- **Section 20.2.4.6:** Wensum WFD Surface Water Operational Catchment; and
- **Section 20.2.4.7:** Yare WFD Surface Water Operational Catchment.

- Onshore substation sites
  - **Section 20.2.4.8:** Site 1; and
  - **Section 20.2.4.9:** Site 2.

11. This FRA is structured to introduce all relevant polices and guidance for FRAs and identify the existing flood risk within the study area of DEP and SEP.
12. Following the identification of the flood risk to each element of DEP and SEP, mitigation measures related to the construction and operation of these is then discussed to ensure that there is no increase in flood risk either to, or as a result of, DEP and SEP.

20.2.2 Policy, Guidance and Consultation

20.2.2.1 Policy Guidance and Introduction

13. **Table 20.2.1** outlines all documents that are referenced in this FRA. Beneath the table, the documents and their constraints to DEP and SEP are discussed in greater detail.

Table 20.2.1: Policy or Guidance documents referenced in this FRA

Policy or Guidance Document	Author / Produced on behalf of	Year Published
National Planning Policy Framework	Ministry of Housing, Communities and Local Government	2012, updated 2019
Planning Practice Guidance (NPPF PPG) for Flood Risk and Coastal Change	Ministry of Housing, Communities & Local Government	2014
Flood risk assessments: climate change allowances guidance	Environment Agency	2016, updated in 2019 and 2020
Norfolk LLFA Statutory Consultee for Planning Guidance Document	Norfolk County Council	Version 4, March 2019
Preliminary Flood Risk Assessment (PFRA)	Norfolk County Council	2011

Policy or Guidance Document	Author / Produced on behalf of	Year Published
Strategic Flood Risk Assessment (SFRA) Level 1	Broadland District Council, Great Yarmouth Borough Council, the Borough Council of King's Lynn & West Norfolk, North Norfolk District Council, Norwick City Council, South Norfolk Council and the Broads Authority	2017
Emerging North Norfolk Local Plan 2016-2036	North Norfolk District Council	2019
Joint Core Strategy for Broadland, Norwich and South Norfolk	Broadland, Norwich and South Norfolk Council	Adopted March 2011, amendments adopted January 2014
Norfolk Local Flood Risk Management Strategy (LFRMS)	Norfolk County Council	2015
Broadland Rivers Catchment Flood Management Plan (CFMP)	Environment Agency	2009
North Norfolk Catchment Flood Management Plan (CFMP)	Environment Agency	2009
SMP6: Kelling Hard to Lowestoft Ness Shoreline Management Plan (SMP)	East Anglia Coastal Group	2012

20.2.2.2 National Planning Policy Framework

14. NPPF (Ministry of Housing, Communities and Local Government, 2019), NPPF PPG for Flood Risk and Coastal Change (Ministry of Housing, Communities and Local Government, 2014) and 'Flood risk assessments: climate change allowances guidance' (Environment Agency, 2020) provide direction on how flood risk should be considered at all stages of the planning and development process.

15. The planning system should ensure that new development is safe and not exposed unnecessarily to the risks associated with flooding. This FRA sets out the planning and wider context within which the project needs to be considered along with the flood risk to the onshore study area.

20.2.2.2.1 Probability of Flooding – Flood Zones

16. **Table 20.2.2** outlines the definitions of each flood zone and associated probability, taken from Table 1 of the NPPF PPG (Ministry of Housing, Communities and Local Government, 2014). Through the application of the Sequential Test, the NPPF PPG (Ministry of Housing, Communities and Local Government, 2014) aims to steer development towards areas at lowest risk of flooding (Flood Zone 1).

17. Where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision making should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zones 2 and 3, applying the Exception Test if required.

Table 20.2.2: 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 SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

18. The Exception Test is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while not being prohibitive to development where suitable sites at lower risk of flooding are not available.

19. The Exception Test requires developments to demonstrate that:

- The development would provide wider sustainability benefits to the community that outweigh the flood risk; and
- The development would be safe for its lifetime without increasing flood risk elsewhere and, where possible, will reduce flood risk overall.

20. Flood Zones are informed by modelling undertaken by the Environment Agency and refer to the probability of fluvial or tidal / coastal flooding, ignoring the presence of defences.

21. The extent of the modelling includes all designated Main Rivers. Any watercourse that is not classified as a Main River is referred to as an Ordinary Watercourse. This covers streams, drains, ditches and passages through which water flows that do not form the network of main rivers. Some larger Ordinary Watercourses (including Internal Drainage Board (IDB) maintained watercourses) are also included in the Environment Agency's modelling and may therefore be included within the extent of the Flood Zone datasets.

22. It is important that FRAs also identify and mitigate against risks from all identified sources of flooding. The Environment Agency provides national datasets on surface water flood risk, classified into four categories: 'Very Low', 'Low', 'Medium' and 'High' (**Table 20.2.3**).

Table 20.2.3: Summary of Surface Water Flood Risk Definitions

Probability of Flooding	Return Periods
Very Low	Land with less than 1 in 1,000 annual probability of surface water flooding (< 0.1%).
Low	Land with between 1 in 1,000 and 1 in 100 annual probability of surface water flooding (0.1% - 1%).
Medium	Land with between 1 in 100 and 1 in 30 annual probability of surface water flooding (1% - 3.3%).
High	Land with greater than 1 in 30 annual probability of surface water flooding (>3.3%).

20.2.2.3 Local Plan

23. The PEIR boundary encompasses the following Local Plans:

- The Emerging North Norfolk Local Plan 2016-2036 is currently in draft format and is expected to be finalised and adopted in June 2021.
- Joint Core Strategy for Broadland, Norwich and South Norfolk - Adopted March 2011, amendments adopted January 2014.

24. The Joint Core Strategy for Broadland, Norwich and South Norfolk was prepared to provide assistance to local developers, applicants, and Local Planning Authority officers on how to apply local and national planning policy using, amongst other evidence, the Council's Strategic Flood Risk Assessment (SFRA). It identifies spatial planning objectives and sets out, where new development in such areas is desirable for reasons of sustainability, ways to minimise the contributors to climate change and address its impact.

25. The North Norfolk Development Control Guidance Note: Development and Coastal Erosion was published in April 2009. It aims to aid decision-makers in balancing the need to preserve the sustainability of the coastal environment – and, all the while, fulfilling North Norfolk District Council's duties as a planning and coastal management authority.

26. The guidance shows how the predictions for coastal erosion, contained within the Kelling Hard to Lowestoft Ness Shoreline Management Plan (see **Section 20.2.2.8**), can be applied in decisions about new development, and it explains the different approach needed for different types of development and land use.

20.2.2.4 Preliminary Flood Risk Assessment

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

28. The PFRA provides a high level overview of the potential risk of flooding from local sources and identifies areas at flood risk which may require more detailed studies. The PFRA is used to inform the development of the Local Flood Risk Management Strategy (see **Section 20.2.2.6**).

20.2.2.5 Strategic Flood Risk Assessment

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

30. A consortium of local planning authorities comprising Broadland District Council, Great Yarmouth Borough Council, the Borough Council of King's Lynn & West Norfolk, North Norfolk District Council, Norwick City Council, South Norfolk Council and the Broads Authority produced Level 1 SFRAs in 2017.

31. An addendum to the Level 1 North Norfolk Strategic Flood Risk Assessment was subsequently published in 2018 as a result of the new Wells-next-the-Sea coastal modelling outputs.

32. The DEP and SEP study area falls entirely within the North Norfolk SFRA study area. The Level 1 SFRA informs the Local Plan for Development by delineating areas of North Norfolk that are at high risk of flooding from tidal, fluvial and surface water sources. Therefore, development sites will be required to pass the Sequential and, where necessary, Exception Tests in accordance with the NPPF.

20.2.2.6 Local Flood Risk Management Strategy

33. Norfolk County Council produced the Norfolk Local Flood Risk Management Strategy (LFRMS) in 2015 (Norfolk County Council, 2015), which outlines the aims and objectives of the Council as the LLFA and provides policies based on these aims.

34. 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 did not identify any locations within the onshore study area that are designated as CDAs.

20.2.2.7 Catchment Flood Management Plan

35. 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) (see **Section 20.2.2.8**). CFMPs consider the likely impacts of climate change, the effects of how we manage the land and how areas can be developed sustainably to establish flood risk management policies which will deliver sustainable flood risk management for the long term.

36. The onshore study area is covered by two CFMPs:

- Broadland Rivers CFMP (Environment Agency, 2009a); and
- North Norfolk CFMP (Environment Agency, 2009b).

37. The Broadland Rivers CFMP covers the majority of the onshore study area. The CFMP includes the catchment of five major rivers: the River's Ant, Bure, Wensum, Yare and Waveney. These catchments drain into a tidally dominated area of inland waterways known as the Broads and finally out to sea through the mouth of the River Yare at Great Yarmouth. The CFMP indicates that the main sources of flood risk within the onshore study area are river flooding from the River Wensum, River Yare and River Bure, tide locking, failure of pumping stations and breaching/failure of embankments.

38. The area covered by the North Norfolk CFMP includes the landfall location. It identifies the main sources of flood risk in the area are fluvial and tidal flooding from the Spring Beck as well as sudden summer storms that can result in flash flooding. The Spring Beck outfalls through coastal defences so is prone to tide locking, which could be exacerbated by sea level rise in the future by increasing the length of time the watercourse is tide locked.

20.2.2.8 Shoreline Management Plan

39. 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.

40. The onshore study area is covered within SMP6; Kelling Hard to Lowestoft Ness (Aecom, 2012). Specifically, the landfall is located within Policy Unit 6.01: Kelling Hard to Sheringham.

41. The preferred policy option for this policy unit over the next three epochs is to allow natural processes to take place i.e. allow coastal retreat through a policy of no active intervention on the open coast.

42. There is a short length of palisade at Weybourne to prevent breach of the shingle ridge. As the shingle ridge rolls back this will become exposed and local flood defence works could be implemented in a setback position to maintain facilities and reduce flood risk at this location.

20.2.2.9 Flood Risk Stakeholders and Consultation

20.2.2.9.1 Key flood risk stakeholders

43. The onshore study area is located within the authority area of Norfolk County Council.

44. Additionally, three District Councils cover the onshore study area:
    - North Norfolk District Council;
    - Broadland District Council; and
    - South Norfolk Council.
45. Norfolk County Council is the Lead Local Flood Authority (LLFA) covering the onshore study 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.
46. As the LLFA, Norfolk County Council are also responsible for consenting works that affect the flow of an Ordinary Watercourse under the terms of the Flood and Water Management Act 2010, Land Drainage Act 1991 and Water Resources Act 1991.
47. The Norfolk Rivers IDB are responsible for maintaining watercourses within a 14,985ha area, which includes parts of the onshore study area.
48. All of the watercourses that the Norfolk River IDB maintain, discharge by gravity into Environment Agency Main Rivers.
49. The Norfolk Rivers IDB is part of the larger Water Management Alliance (WMA) which consist of six IDBs (Broads IDB, East Suffolk IDB, King's Lynn IDB, Norfolk Rivers IDB, South Holland IDB and Waveney, Lower Yare and Lothingland IDB) who are responsible for maintaining key watercourses and granting Ordinary Watercourse consent within the region.
50. The onshore study area crosses multiple channels that are either within the Internal Drainage District or maintained by the Norfolk Rivers IDB.
51. The Environment Agency is also a key flood risk stakeholder in this project, due to their management of the Main Rivers that the onshore cable corridor will cross.
52. Any works, either temporary or permanent, which will alter the flow of water along a watercourse or require the erection of a culvert, bridge or modification to the channel will require consent from the corresponding relevant authorities such as the Environment Agency, LLFA or IDB.
53. As set out in the Environmental Permitting (England and Wales) Regulations 2016, a permit or exemption is required for any activities which will take place:
    - On or within 8 metres (m) of a Main River (16m, if the Main River is tidal);
    - On or within 8m of a flood defence structure or culverted main river (16m, if Main River is tidal);
    - Any activity within 16m of a sea defence structure;
    - Quarrying or excavation within 16m of any Main River, flood defence (including a remote defence) or culvert; and/or

- Activities carried out on the floodplain of a Main River, more than 8m from the riverbank, culvert or flood defence structure (or 16m, if the Main River is tidal) and planning permission has not already been obtained.

54. The key types of watercourse consent required for the DEP and SEP can be split by consenting authority as follows:

- Environment Agency:
  - **Exclusions:** Permission is not required for defined excluded activities with operations taking place within the description and conditions of the exclusion. Exclusions include, but are not limited to, when working in an emergency, if a Marine Management Organisation licence has been applied for, using ladders and scaffold towers, services crossing a river within an existing structure (Further details can be found at:

    https://www.gov.uk/government/publications/excluded-flood-risk-activities-environmental-permits/excluded-flood-risk-activities)
  - **Exemptions**: Application for a permit is not required if an activity meets the description and conditions of one of the exempt flood risk activities. Exemptions must be registered with the Environment Agency before any work can be carried out. Exemptions include, but are not limited to, electrical cable service crossing over a main river, service crossing below the bed of a main river not involving an open cut technique, temporary dewatering of a work area for no more than 4 weeks, maintaining a raised river defence or sea defence (Full details can be found at:

    https://www.gov.uk/government/publications/environmental-permitting-regulations-exempt-flood-risk-activities/exempt-flood-risk-activities-environmental-permits
  - **Standard** Rules: Application for an environmental permit Part B11 – Flood Risk Activity Standard rules application; and
  - **Bespoke**: Application for an environmental permit Part B10 – Flood Risk Activities.
- Water Management Alliance (Norfolk Rivers IDB): Application for Land Drainage Consent; and
- Norfolk County Council: Application for Consent for Works Affecting Ordinary Watercourses.

55. All Main Rivers and Ordinary Watercourses identified to be crossed by DEP and SEP will be identified as part of the watercourse crossing schedule.

56. All necessary applications for watercourse consents will be made to and agreed with the appropriate authority post-DCO consent.

20.2.2.9.2 Data collection and consultation

57. To accurately ascertain potential flood risk to the site, data from the Environment Agency, Norfolk County Council (in their role as the Lead Local Flood Authority) and North Norfolk Rivers IDB has been requested to support the FRA for DEP and SEP.

58. Information on flooding incidents, investigations and assets of relevance to the FRA was received from Norfolk County Council on 9th July 2020.

59. Data related to IDB maintained watercourses and information relevant to flood risk was provided by Norfolk Rivers IDB on 28th September 2020.

60. The Environment Agency Product 4, 5 and 8 data packages were requested, and information provided on 29th July 2020 for key locations related to strategic watercourse crossings along the onshore cable corridor, landfall location and the onshore substation search area.

61. The Environment Agency data includes:

- Product 4 data package consisting of flood zones, defences and storage areas, areas benefiting from defences, statutory main river designations, historical flood event outlines and more detailed information from computer river models (including model extent, information on one or more specific points, flood levels and flood flows);
- Product 5 data package comprising reports, including flood modelling and hydrology reports and modelling guidelines for the River Yare (2014) and Mulbarton (2014), River Wensum (2017), River Tud (2017) and River Bure (2018) - consisting of fluvial modelling reports, guidelines and technical notes; and
- Product 8 data package comprising Flood Defence Breach Hazard Map including, maximum flood depth, maximum flood velocity, maximum flood hazard from the Wells-next-the-Sea model, which was completed in 2018.

62. The information provided by the Environment Agency, Norfolk County Council and Norfolk Rivers IDB has subsequently been used to inform this FRA.

20.2.3 Baseline Environment

20.2.3.1 Existing Surface Water Drainage System

63. DEP and SEP will primarily be located on rural, agricultural land where there are limited existing formal surface water drainage systems. However, there are a large number of agricultural land drains, Ordinary Watercourses and IDB maintained watercourses, especially along the onshore cable corridor.

20.2.3.2 Geology and Hydrogeology

64. The British Geological Survey (BGS) 1:50,000 scale solid and superficial geology geological mapping has been reviewed. The geological conditions within the study area, as shown on the BGS online viewer, is as follows:

- **Superficial Deposits**
  - Marine Beach Deposits - Shingle, sand, silt and clay; beach deposits may be in the form of dunes, sheets or banks; in association with the marine environment.
  - River Terrace Deposits - Sand and gravel, locally with lenses of silt, clay or peat.

- Head Deposits - Gravel, sand and clay depending on upslope source and distance from source. Locally with lenses of silt, clay or peat and organic material.
- Alluvium - Clay, silt, sand and gravel. Normally soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel.
- Sheringham Cliffs Formation - Consists of a thick glacial sequence that contains several distinctive subdivisions varying from stratified fine-grained sands, matrix-supported diamictons, clay and sand.
- Briton's Lane Sand and Gravel Member - Horizontal, massive and low angle planar cross-bedded gravels and cobble gravels with thin seams of horizontal and rippled sand.
- Weybourne Town Till Member – A highly calcareous silt and chalk-rich matrix supported diamicton.
- Lowestoft Formation - Chalky till, together with outwash sands and gravels, silts and clays.
- Happisburgh Glacial Formation - A range of diamictons, sands and gravels, sands and laminated silts and clays.
- Bacton Green Till Member - Extensive diamicton with beds/laminae of sorted material including sand, silt and clay.

- **Bedrock Geology**
  - Wroxham Crag Formation - Interbedded gravels, sands, silts and clays.
  - Lewes Nodular Chalk, Seaford Chalk, Newhaven Chalk, Culver Chalk and Portsdown Chalk Formations - Chalk with flints.

65. The superficial Marine Beach Deposits, River Terrace Deposits, Alluvium and Briton's Lane Sand and Gravel Member are classified as Secondary A Aquifers.

66. Secondary A Aquifers are composed of permeable strata capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of baseflow to rivers.

67. The Happisburgh Glacial Formation and Bacton Green Till are classified as Secondary B Aquifers / Unproductive Strata. A Secondary B Aquifer comprises predominantly lower permeability strata which may in part have the ability to store and yield limited amounts of groundwater by virtue of localised features such as fissures, thin permeable horizons and weathering.

68. The Head Deposits, Sheringham Cliffs Formation, Weybourne Town Till Member and Lowestoft Formation are classified as Secondary Undifferentiated Aquifers. Secondary Undifferentiated Aquifers are defined by the Environment Agency as being assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

69. The Wroxham Crag Formation and White Chalk Supergroup are classified as Principal Aquifers. Aquifers with this classification are composed of geology that exhibits high permeability and / or provide a high level of water storage. They may support water supply and / or river baseflow on a strategic scale.

70. The DEFRA MAGIC Map indicates that the study area has been classified as having a 'medium to high' groundwater vulnerability risk. A high groundwater vulnerability designation indicates that the soil is easily able to transmit pollution to groundwater, which is characterised by high leaching potential in soils and the absence of low permeability superficial deposits.

71. The majority of the landfall location, onshore cable corridor and onshore substation study area is located within Source Protection Zone (SPZ) 3 with the exception of the western half of the landfall location between the village of Weybourne and the A148 (Cromer Road) and a section of the onshore cable corridor between the villages of Little Barningham and Oulton.

72. The study area is underlain by two WFD groundwater bodies:

- North Norfolk Chalk; and
- Broadland Rivers Chalk & Crag.

73. Both aquifers are designated as Principal Aquifers by the Environment Agency meaning they usually provide a high level of water storage.

20.2.3.3 Hydrology

74. The Environment Agency's WFD surface water operational 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 WFD catchment areas are shown in **Figure 20.2.1.**

75. The onshore study area is located within four surface water hydrological catchments:

- North Norfolk WFD Surface Water Operational Catchment, which covers approximately 11.7km^2 of the study area encompasses the entire landfall location and a small portion at the northern extent of the onshore cable corridor. The larger rivers rise in the south of the area and are generally small and steep in their upper reaches. In their lower reaches the geography is flatter and the rivers become wider. There are no formal flood defences in this area however there are informal flood banks along some river reaches and many of the rivers have been modified and straightened in the past. Spring Beck, classified as a Main River south of Weybourne, is located within the landfall location and flows north into the North Sea **(Figure 20.2.2)**.

- Bure WFD Surface Water Operational Catchment, within which the River Bure and the catchments of two of its tributaries within its upper reaches, Scarrow Beck and Mermaid Stream are intersected by the onshore cable corridor. The River Bure rises at Melton Constable and flows south west through the Broads to meet the sea at Great Yarmouth. Its upper reaches are steeper and suffers from sediment runoff due to historical management. The lower reaches include a range of wetland features including Hoveten Great Broad and Marshes, Woodbastwick Fens and Marshes, Bure Marshes and Norfolk Broads.
- Wensum WFD Surface Water Operational Catchment, which covers a length of approximately 20km of the onshore cable corridor. The River Wensum and two of its tributaries, the River Tud and Swannington Beck are crossed by the onshore cable corridor, along with a portion of the catchment of Blackwater Drain. The Wensum is designated along much of its length as a Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC) due to its internationally rare status as a chalk river system, including the location of the proposed crossing. It passes through Fakenham and the Pensthorpe Nature Reserve and continues in a broadly south-easterly direction through Norwich to join the River Yare at Whitlingham.
- Yare WFD Surface Water Operational Catchment, which covers approximately 14.5km of the length of the onshore cable corridor as well as the onshore substation study area. The River Yare and two of its tributaries, the River Tiffey and the Intwood Stream, are crossed by the onshore cable corridor close to the onshore substation study area. The River Yare rises south of Dereham and flows east towards Norwich with the River Tiffey being a major tributary. It is joined by the Wensum at Whitlingham and flows into Breydon Water following which it enters the sea at Great Yarmouth.

76. There are a number of Ordinary Watercourses within the sub-catchments which are crossed by the PEIR boundary. Ordinary Watercourses are all rivers, streams, ditches and drains that are not designated Main Rivers and therefore managed by the Environment Agency, instead they are the responsibility of IDBs and LLFAs.

77. Several of those water bodies crossed by the onshore cable corridor are maintained by the Norfolk Rivers IDB, as shown in **Figure 20.2.2.**

20.2.4 Definition of Flood Hazard

78. This section explores the risk of flooding to each of the three key study area elements (landfall location, onshore cable corridor and onshore substation sites), as outlined in **Section 20.2.1.3.1**. Where flood risk is identified, appropriate mitigation methods are discussed within **Section 20.2.8**.

20.2.4.1.1 Flood Zones

79. The NPPF PPG, through the application of the Sequential Test, aims to steer development towards areas at lowest risk of flooding (Flood Zone 1) and away from medium and high flood risk areas (Flood Zones 2 and 3) (**Table 20.2.2**).

80. Flood Zones are informed by the extent of modelling undertaken by the Environment Agency. All designated Main Rivers, as well as some of the larger Ordinary Watercourses (including IDB maintained watercourses) included in the modelling, are considered within the Flood Zone datasets.

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

20.2.4.1.2 Watercourse Crossings

82. Information provided within the watercourse crossing schedule (**Figure 20.2.2**) indicates that there are eight Environment Agency Main Rivers that are crossed by the PEIR boundary. These include River Glaven, Spring Beck, River Bure, River Wensum, River Yare, Intwood Stream River Tiffey and the River Tud.

83. There are 54 watercourses identified within the study area, including the Main Rivers and smaller streams and tributaries. There are 44 lakes and / or ponds located either wholly or partially within the study area.

84. The detailed methodology for all watercourse crossings, whether Environment Agency Main River, IDB maintained or other Ordinary Watercourses will be agreed with the relevant stakeholders e.g. third-party asset owners and other statutory consultees.

85. The proposed crossing methodology for all onshore crossings identified to date is provided in **Appendix 5.1 Crossing Schedule**. These will be subject to ongoing discussions with key stakeholders throughout the DCO process and further details will be agreed with the Environment Agency, IDB and / or relevant Local Authority, as relevant.

20.2.4.2 Landfall location

20.2.4.2.1 Overview of Proposed Activities

86. The approach to the cable installation at the landfall location will be to use horizontal directional drilling (HDD) techniques.

87. The offshore and onshore cables will be jointed in one or two transition joint bays onshore and each export cable will require one HDD (i.e. two in total, unless re-drilling is required).

88. The onshore transition joint bay(s) will be located underground. A pit will be dug out and will remain open until the cables are pulled through and jointed. The pit will be refilled once the transition joint bay(s) have been installed.

89. In addition, there will be a need for an onshore construction compound which will be temporary in nature and the land reinstated after completion of DEP and SEP.

20.2.4.2.2 Historical Flooding

90. Absence of historical flood records does not necessarily confirm that flooding has not occurred. The data provided by the Environment Agency shows one historical flood extent outline that affected much of the North Norfolk Coastline, occurring in 1953.

91. The East Coast of the UK was hit by a storm surge on the 31st January / 1st February 1953. As a result, areas of the North Norfolk district experienced major flooding. The Environment Agency recorded flooding at Horsey and along the coast from Decoy Wood to Weybourne due to overtopping of defences (North Norfolk SFRA, 2017).

92. The North Norfolk SFRA also identifies Weybourne to have been affected by flooding as a result of a combination of a high spring tide and low atmospheric pressure. The North Norfolk coastline suffered a tidal surge on the 5th / 6th December 2013. Water levels in some areas were higher than those experienced in the 'Great Flood of 1953' and whilst, owing to pre-planning and forewarnings, there was no loss of life or injury, significant damage was caused to both sea defences and property in towns and villages along North Norfolk's coastline. 152 houses and businesses were flooded and / or damaged as a direct result of the tidal surge, with over 200 households evacuated in Norfolk. The Environment Agency recorded flooding at Walcott, Cley-next-the-Sea, Weybourne and Wells-next-the-Sea due to overtopping of defences.

20.2.4.2.3 Flood Zones

93. The landfall location is largely within Flood Zone 1, as defined by the Environment Agency. A small part of the landfall location falls within Flood Zone 2 and 3 associated with beach / coastal areas to the north west of Weybourne and the Spring Beck, which is classified as an Environment Agency Main River (**Figure 20.2.3**).

20.2.4.2.4 Flooding from Rivers

94. The flood zones in the landfall location are largely dominated by tidal processes and therefore the risk of flooding from fluvial sources is considered to be relatively low.

95. The only identified fluvial flood zone within the landfall location is associated with the urban area (Weybourne) of the Spring Beck.

96. Modelling carried out for the Weybourne Stream (Spring Beck) to support the North Norfolk SFRA (North Norfolk District Council, 2017) provides the 1 in 25 year return period extent which has been utilised to define areas of Flood Zone 3b. The North Norfolk SFRA has provided flood risk mapping that indicates Holt Road, Church Street and Beach Road are located within the flood extents of Flood Zone 3b. This flood risk is relatively localised within Weybourne itself and does not extend to the wider area.

20.2.4.2.5 Flooding from the Sea

97. A small portion of the coastal / beach area to the north west of Weybourne has been identified as being located within Flood Zone 3 (**Figure 20.2.3**). The remaining coastal areas of the landfall location have been identified as Flood Zone 1, due to the presence of cliffs which act as a natural flood barrier.

98. The Environment Agency provided modelled Product 8 (breach) data for the Wells-next-the-Sea model, which was completed in 2018. There are 4 breach scenarios along the North Norfolk coastline which simulate a failure of the open coast dune (breach 001 and breach 003) and embankment (breach 002 and breach 004) defences.

99. The flood level associated with the 1 in 200 year breach scenario is 4.88m Above Ordnance Datum (AOD) and 5.60m AOD for the 1 in 200 year plus an allowance for climate change breach scenario. The main risk of flooding from tidal sources is primarily along Beach Road within Weybourne.

100. A small section of the beach along the frontage for the landfall location, in the vicinity of Weybourne, is identified as being in Flood Zone 3 i.e. below the cliff line (**Figure 20.2.3**). As the offshore export cables are to be brought onshore using trenchless techniques (e.g. HDD) there would be no flood risk to the cable as it makes landfall. Therefore, the landfall location is at low risk of flooding from the sea based on the existing flood risk and use of HDD for installation.

20.2.4.2.6 Flooding from Groundwater

101. The North Norfolk SFRA (North Norfolk District Council, 2017) contains limited information on the risk of flooding from groundwater sources. Isolated low-lying valley areas may be subject to local groundwater flooding; however, the details of such areas are unknown.

102. The superficial Marine Beach Deposits and Briton's Lane Sand and Gravel Member, which cover much of the landfall location, are classified as Secondary A Aquifers.

103. As part of the North Norfolk SFRA deliverables, mapping showing the Areas Susceptible to Groundwater Flooding (AStGWf) is available. The AStGWf is a strategic-scale map showing groundwater flood areas on a 1km square grid. The data was produced to provide indicative flood risk areas for Preliminary Flood Risk Assessment (PFRA) studies and to allow the authorities to determine the risk of flooding from groundwater. The data shows the proportion of each 1km grid square, where geological and hydrogeological conditions indicate that groundwater might emerge.

104. The AStGWf dataset shows that areas more susceptible to groundwater flooding are generally associated with the valleys of watercourses and along coastline areas.

105. The landfall location is generally within an area not identified to be at risk on the AStGWf mapping, however areas along the coastline are within the <25% category.

106. The LFRMS notes that groundwater can play a role in coastal erosion, as water within the rock strata can create instabilities within coastal cliffs (Norfolk County Council, 2015).

107. The landfall construction will involve below-ground works including excavation for the transition joint bays and a trenchless method of installation for the offshore export cables (such as HDD). There is therefore a risk that groundwater flooding could occur, primarily during construction; however, the effect the landfall shall have on groundwater flows once operational is likely to be minimal due to the relatively shallow depth of the construction. As such, the landfall location is at low risk of flooding from groundwater flooding.

20.2.4.2.7 Flooding from Surface Water

108. The Environment Agency's Long-Term Flood Risk Information map and (**Figure 20.2.4**) shows the landfall location to be almost entirely within an area at 'Very Low' risk of surface water flooding i.e. primarily outside the extent of the 1 in 1,000 year surface water flooding event.

109. There are four identified Ordinary Watercourses located within the landfall location. Three tributaries of the Spring Beck located south of Weybourne and the Osier Carr located on the eastern side of the landfall location.

110. At these locations, there are isolated areas at low risk (i.e. land which has a chance of flooding of between 0.1% and 1%) through to high risk (i.e. land which has a chance of flooding of greater than 3.3%) of surface water flooding.

111. The risk of surface water flooding within the landfall location is therefore considered overall to be 'Very Low' with specific areas at a higher risk of flooding associated with the land in proximity to Ordinary Watercourses.

20.2.4.2.8 Flooding from Sewers

112. The North Norfolk SFRA (North Norfolk District Council, 2017) did not report any flooding from sewers within the landfall location based on the DG5 register for North Norfolk district. The landfall is primarily located within existing agricultural land and it is likely that there is no foul sewer network within proximity of this location. As such, there is a low risk of flooding from sewer sources.

20.2.4.2.9 Flooding from Reservoirs

113. Reservoirs with an impounded volume greater than 25,000 cubic metres (m^3) are governed by the Reservoir Act 1975 and are listed on a register held by the Environment Agency. The level and standard of inspection and maintenance required under the Act means that the risk of flooding from reservoirs is relatively low. Recent changes to legislation under the Flood and Water Management Act require the Environment Agency to designate the risk of flooding from these reservoirs.

114. Flooding from reservoirs is defined based on the implications of a large uncontrolled release of water from registered reservoirs i.e. greater than 25,000m^3. The Environment Agency Flood Risk from Reservoirs map shows the landfall location is not at risk of reservoir flooding.

20.2.4.2.10 Flooding from Canals and other Artificial Sources

115. There are no canals or other artificial sources within the landfall location. Therefore, there is no risk of flooding from reservoirs, canals or other artificial sources to the landfall location.

20.2.4.2.11 Summary of Flooding Sources

116. Overall, the landfall location is not at risk from, sewers, reservoirs, canals or other artificial sources. There is a low level of flood risk associated with groundwater.

117. The risk of surface water flooding is generally low with areas at high risk generally associated with land which is immediately adjacent to Ordinary Watercourses.

118. The risk of flooding from Main Rivers is generally low with some higher risk areas within the urban area of Weybourne.

119. There is also a low risk of flooding associated with tidal / coastal flood risk on the basis that HDD is to be utilised.

20.2.4.3 Onshore cable corridor

20.2.4.3.1 Overview of Proposed Activities

120. The width of the onshore cable corridor will be 60m, increasing to 100m at trenchless crossing zones. This width accounts for the required construction footprint, including trenches, haul road, spoil storage, drainage etc.

121. The onshore export cables will be installed in trenches, either a common trench for the two projects or one trench per project.

122. Jointing bays will be used to pull the cables into the ducts and / or to join the cable lengths to each other. Link boxes are used for earthing cables and will be installed inside a protective concrete chamber.

123. The jointing bays are subsurface structures, while the link boxes will require access (for inspections) from the surface during operations and will therefore be located at or above ground level. The frequency of jointing bays and link boxes will typically be one every 500m along the cable corridor.

20.2.4.3.2 Logistics Compounds

124. Up to two main compound will be required to support the construction of the onshore export cables. This would operate as a central base for the onshore construction works and could house offices, welfare facilities, and stores, as well as acting as a staging post and secure storage for equipment and component deliveries.

125. In addition, there will be a need for a series of secondary construction compounds to be located strategically along the onshore cable corridor. These would operate as support bases for the onshore construction works as the cable work fronts pass through an area. They may house portable offices, welfare facilities, localised stores, as well as acting as staging posts for localised secure storage for equipment and component deliveries.

20.2.4.3.3 Watercourse Crossings

126. In addition, to the above elements there will be a number of locations where the onshore cable corridor crosses Main Rivers and Ordinary Watercourses.

127. All Main Rivers and IDB maintained Ordinary Watercourses will be crossed using trenchless techniques, such as HDD, to avoid direct interaction with these watercourses. The cable entry and exit pits will be at least 9m from the banks of the watercourse, and the cable will be at least 2m below the channel bed.

20.2.4.4 Onshore cable corridor Section 1 – North Norfolk WFD Surface Water Operational Catchment

20.2.4.4.1 Overview of Proposed Activities

128. For the purpose of identifying flood risk in this FRA, the onshore cable corridor is divided into four sections based upon the boundaries of the WFD Surface Water operational catchments (hereafter referred to as the WFD catchment) (**Figure 20.2.1**).

129. This first section runs from the landfall location, to the south of Bodham, in a southerly direction before crossing into the adjacent Bure WFD catchment to the east of Baconsthorpe.

20.2.4.4.2 Historical Flooding

130. Absence of historical flood record does not necessarily confirm that flooding has not occurred. Neither the Environment Agency nor the North Norfolk SFRA has any records to indicate that the onshore cable corridor within the North Norfolk WFD catchment has been previously affected by flooding from any source.

20.2.4.4.3 Flood Zones

131. The onshore cable corridor within the North Norfolk WFD catchment is located within Flood Zone 1, as defined by the Environment Agency online Flood Map for Planning (**Figure 20.2.5**).

20.2.4.4.4 Flooding from Rivers

132. As the onshore cable corridor is located in Flood Zone 1 there is no risk of fluvial flooding associated with Main Rivers in this section of the onshore cable corridor (**Figure 20.2.5**).

20.2.4.4.5 Flooding from the Sea

133. The majority of the onshore cable corridor 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 corridor that connects with it. Therefore, there is no risk of flooding from the sea in this location and the primary flood mechanisms are likely to be as a result of fluvial or surface water sources.

20.2.4.4.6 Flooding from Groundwater

134. The PEIR boundary associated with the North Norfolk WFD catchment is located over superficial deposits of Weybourne Town Till Member, which are classified as Secondary Undifferentiated Aquifers (see **Section 20.2.3.2**).

135. The North Norfolk SFRA AStGWf map shows the proportion of each 1km grid square, where geological and hydrogeological conditions indicate that groundwater might emerge. The route of the onshore cable corridor, south of Bodham and East of Baconsthorpe is generally not within an area identified to be at risk.

136. Once operational, the effect that the onshore export cables will have on groundwater flows is likely to be low as the buried cable will be located at a target depth of 1.2m below ground (subject to localised variations such as limiting interaction to shallow or near surface groundwater). Given the depth of the onshore export cables, it is likely to be constructed within the superficial deposits, and therefore will not interact with the bedrock below.

137. Furthermore, any water flowing into the trenches during the construction period will be discharged into local ditches or drains via temporary interceptor drains.

138. Based on the above information there is likely to be minimal groundwater flood risk along the onshore cable corridor and any risk will be mitigated within the design as part of the embedded mitigation measures, as outlined above.

20.2.4.4.7 Flooding from Surface Water

139. The areas where the onshore cable corridor crosses the Ordinary Watercourses are identified as having a higher risk of surface water flooding. However, this is primarily limited to the width of the watercourse channel.

140. Within the North Norfolk WFD catchment, the onshore cable corridor crosses an Ordinary Watercourse known as the Glaven. This watercourse is identified as having a primarily a 'Low' risk of surface water flooding with isolated areas of 'Medium' and 'High' risk. Further downstream the risk of flooding is classified as 'High' although this is primarily confined within the banks of the watercourse (**Figure 20.2.6**).

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

142. The land will be reinstated, and existing ground levels will be maintained. Mitigation during construction is discussed in **Section 20.2.8** in relation to both surface water and Ordinary Watercourses.

143. The risk of flooding from surface water is therefore considered to be low for this section of the onshore cable corridor.

20.2.4.4.8 Flooding from Sewers

144. Within the North Norfolk SFRA historical incidents of flooding are detailed by Anglian Water through their DG5 register. The DG5 database records incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding (on a 4-5 post code digit basis).

145. The North Norfolk SFRA did not report any flooding from sewers within this section of the onshore cable corridor based on the DG5 register for North Norfolk district.

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

20.2.4.4.9 Flooding from Reservoirs

147. Reservoirs with an impounded volume greater than 25,000m^3 are governed by the Reservoir Act 1975 and are listed on a register held by the Environment Agency.

148. Flooding from reservoirs is defined based on the implications of a large uncontrolled release of water from registered reservoirs i.e. greater than 25,000m^3. The Environment Agency Flood Risk from Reservoirs map shows this section of the onshore cable corridor is not at risk of reservoir flooding.

20.2.4.4.10 Flooding from Canals and other Artificial Sources

149. The onshore cable corridor is not located near to any canals or other artificial sources within the North Norfolk WFD catchment. As such there is no risk of flooding from these sources.

20.2.4.4.11 Summary of Flooding Sources

150. Overall, this section of the onshore cable corridor is not at risk from tidal / coastal flooding, fluvial flooding (from Main Rivers), sewers, reservoirs, canals or other artificial sources. There is a low level of flood risk associated with groundwater.

151. This section of the onshore cable corridor crosses one Ordinary Watercourse (River Glaven) within the North Norfolk WFD Catchment and the risk of surface water flooding is generally low with areas at higher risk associated with land immediately adjacent to the Ordinary Watercourses.

20.2.4.5 Onshore cable corridor Section 2 – Bure WFD Surface Water Operational Catchment

20.2.4.5.1 Overview of Proposed Activities

152. For the purpose of identifying flood risk in this FRA, the onshore cable corridor is divided into four sections based upon the boundaries of the WFD catchments (**Figure 20.2.1**).

153. This second section runs from the boundary of the North Norfolk WFD catchment (east of Baconsthorpe) for approximately 12km in a southerly direction before crossing into the adjacent Wensum WFD catchment, approximately 1km to the south west of Oulton.

20.2.4.5.2 Historical Flooding

154. Absence of historical flood record does not necessarily confirm that flooding has not occurred. Neither the Environment Agency nor the North Norfolk SFRA has any records to indicate that the onshore cable corridor within the Bure WFD catchment has been previously affected by flooding from any source.

20.2.4.5.3 Flood Zones

155. The onshore cable corridor intersects two Flood Zone 3 extents within this section (**Figure 20.2.7**):

- Approximately 400m of the onshore cable corridor to the south of Little Barningham, adjacent to Matlaske Road fall within Flood Zone 2 or Flood Zone 3. This flood extent is associated with Water_008.
- Approximately 700m stretch of the onshore cable corridor to the east of Saxthorpe, falls within Flood Zone 2 or Flood Zone 3, associated with the River Bure.

20.2.4.5.4 Flooding from Rivers

156. The onshore cable corridor crosses one Main River and three Ordinary Watercourses in this section (**Figure 20.2.1** & **Figure 20.2.7**):

- Main River
  - Bure (u/s confluence with Scarrow Beck)
- Ordinary Watercourse
  - Water_009 (Tributary of the Upper River Bure)
  - Water_010 (River Bure ditches)
  - Water_012

157. There is a fluvial flood risk associated with these watercourses. However, the risk of flooding to the onshore cable corridor will be removed upon completion of the cable laying phase, as all infrastructure will be located underground, with the cable, joint bays and link boxes sealed from water egress.

20.2.4.5.5 Flooding from the Sea

158. The majority of the onshore cable corridor 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 corridor that connects with it. Therefore, there is no risk of flooding from the sea in this location.

20.2.4.5.6 Flooding from Groundwater

159. The onshore cable corridor within the Bure WFD catchment is located over bedrock (Wroxham Crag Formation - Sand and gravel) designated as a Principal Aquifer. Principal aquifers are considered to provide a high level of water storage (**See Section 20.2.3.2**).

160. The North Norfolk SFRA AStGWf map shows the proportion of each 1km grid square, where geological and hydrogeological conditions indicate that groundwater might emerge.

161. The onshore cable corridor is located at variable risk along its route and some parts, generally associated with the valleys of watercourses, are shown to have an increased susceptibility to groundwater flooding, with a number of small 1km^2 areas showing a >=75% susceptibility to groundwater flooding.

162. The effect the onshore cable corridor shall have on groundwater flows once operational is likely to be low as the buried cable will be located at a target depth of 1.2m below ground, although this will be subject to localised variations (i.e. limiting interaction to shallow or near surface groundwater).

163. Given the depth of the onshore export cables, it is likely to be constructed within the superficial deposits, and therefore will not be within the principal chalk aquifer. No dewatering of, or discharges into, the principal aquifer are anticipated.

164. There may be some locations where HDD is proposed that may be constructed deeper than 2m to allow for the crossing of infrastructure and watercourses. At these locations, there is a potential that localised perched pockets of shallow groundwater maybe encountered.

165. Furthermore, any water flowing into the trenches during the construction period will be discharged into local ditches or drains via temporary interceptor drains.

166. Based on the above information there is a groundwater flood risk along the onshore cable corridor. However, this risk will be mitigated within the design as part of the embedded mitigation measures, as outlined above.

20.2.4.5.7 Flooding from Surface Water

167. The Environment Agency's Long-Term Flood Risk Information map and **Figure 20.2.8** shows this section to be located almost entirely in an area at 'Very Low' risk of surface water flooding i.e. primarily outside the extent of the 1 in 1,000 year surface water flooding event.

168. The areas where the onshore cable corridor crosses the Ordinary Watercourses are identified as having a higher risk of surface water flooding. However, this is primarily limited to the width of the watercourse channel.

169. Within the Bure WFD catchment, the onshore cable corridor crosses three Ordinary Watercourses. Water_008 and Water_009 (**Figure 20.2.2**) are primarily associated with a 'Low' risk of surface water flooding with smaller isolated areas of 'Medium' and 'High' risk. The areas at 'Medium' and 'High' risk are primarily confined to the channel. The Low risk scenario (i.e. 1 in 1,000 year event) could affect land immediately adjacent to the watercourses.

170. The River Bure and associated Ditches (Water_011 and Water_010, respectively) generally have a 'Low' risk of flooding which is primarily confined within the banks of the watercourses.

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

172. The land will be reinstated, and existing ground levels will be maintained. Mitigation during construction is discussed in **Section 20.2.8** in relation to both surface water and Ordinary Watercourses.

173. The risk of flooding from surface water is therefore considered overall to be low for this section of the onshore cable corridor.

20.2.4.5.8 Flooding from Sewers

174. Within the North Norfolk SFRA historical incidents of flooding are detailed by Anglian Water through their DG5 register. The DG5 database records incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding (on a 4-5 post code digit basis).

175. The North Norfolk SFRA did not report any flooding from sewers within this section of the onshore cable corridor based on the DG5 register for North Norfolk district.

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

20.2.4.5.9 Flooding from Reservoirs

177. Reservoirs with an impounded volume greater than 25,000m^3 are governed by the Reservoir Act 1975 and are listed on a register held by the Environment Agency.

178. Flooding from reservoirs is defined based on the implications of a large uncontrolled release of water from registered reservoirs i.e. greater than 25,000m^3. The Environment Agency Flood Risk from Reservoirs map shows this section of the onshore cable corridor does intersect the reservoir flooding extent.

179. This flood extent is in the vicinity of the Bure and adjacent ditches. However, based on the regulatory requirements associated with reservoirs, the risk of reservoir failure remains very low.

20.2.4.5.10 Flooding from Canals and other Artificial Sources

180. The onshore cable corridor is not located near to any canals or other artificial sources within the Bure WFD catchment. As such there is no risk of flooding from these sources.

20.2.4.5.11 Summary of Flooding Sources

181. Overall, this section of the onshore cable corridor is not at risk from tidal / coastal flooding, sewers, canals or other artificial sources.

182. There is a low level of flood risk associated with reservoir and groundwater flooding.

183. This section of the onshore cable corridor crosses the River Bure (Main River) and is partially located in Flood Zone 2 or Flood Zone 3.

184. The onshore cable corridor also crosses four Ordinary Watercourses within the Bure WFD Catchment; however, the risk of surface water flooding is generally low with areas at higher risk associated with land immediately adjacent to the Ordinary Watercourses.

20.2.4.6 Onshore cable corridor Section 3 – Wensum WFD Surface Water Operational Catchment

20.2.4.6.1 Overview of Proposed Activities

185. For the purpose of identifying flood risk in this FRA, the onshore cable corridor is divided into four sections based upon the boundaries of the WFD operational catchments (**Figure 20.2.1**).

186. This third section runs from the Bure WFD catchment (to the south west of Oulton) to an area east of Colton, where it crosses into the adjacent Yare WFD catchment.

20.2.4.6.2 Historical Flooding

187. An absence of historical flood record does not necessarily confirm that flooding has not occurred. Neither the Environment Agency nor the North Norfolk SFRA has any records to indicate that the onshore cable corridor within the Wensum WFD catchment has been previously affected by flooding from any source.

188. The LLFA provided historical flood incident records which included a record of flooding, associated with a Norfolk wide heavy rainfall and flooding event which occurred on 6th October 2019, along the A47 between Easton and Honningham.

20.2.4.6.3 Flood Zones

189. The onshore cable corridor intersects three Flood Zone 3 extents within this section (**Figure 20.2.9**):

- Approximately 220m stretch of the onshore cable corridor to the east of Swannington falls within Flood Zone 2 or Flood Zone 3. This flood extent is associated with the Trout Stream, which is classified as an Ordinary Watercourse.
- Approximately 1.1km stretch of the onshore cable corridor, between Morton on the Hill and Attlebridge, which is associated with the River Wensum, IDB maintained watercourses and multiple Ordinary Watercourses falls within Flood Zone 2 or Flood Zone 3.

- Approximately 200m wide stretch of the onshore cable corridor, east of Honningham, associated with the River Tud and its tributaries falls within Flood Zone 2 or Flood Zone 3.

20.2.4.6.4 Flooding from Rivers

190. The onshore cable corridor crosses two Main Rivers and 21 Ordinary Watercourses in this section (**Figure 20.2.2**):
    - Main River
        - River Wensum
        - River Tud
191. The vast majority of the Ordinary Watercourses within this catchment are small ditches / drains associated with the larger adjacent Main Rivers.
192. There is a fluvial flood risk associated with these watercourses. However, the risk of flooding to the onshore cable corridor will be removed upon completion of the cable laying phase, as all infrastructure will be located underground, with the cable, joint bays and link boxes sealed from water egress.

20.2.4.6.5 Flooding from the Sea

193. The majority of the onshore cable corridor 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 corridor that connects with it. Therefore, there is no risk of flooding from the sea in this location.

20.2.4.6.6 Flooding from Groundwater

194. The onshore cable corridor within the Wensum WFD catchment is located over bedrock (Wroxham Crag Formation and Chalk Super Group in the south of the catchment) designated as a Principal Aquifer. Principal aquifers are considered to provide a high level of water storage (**See Section 20.2.3.2**).
195. The North Norfolk SFRA AStGWf map shows the proportion of each 1km grid square, where geological and hydrogeological conditions indicate that groundwater might emerge.
196. The onshore cable corridor is located at variable risk along its route and some parts, generally associated with the Main Rivers and adjacent Ordinary Watercourses, are shown to have an increased susceptibility to groundwater flooding, with a number of 1km^2 areas showing a >=75% susceptibility to groundwater flooding.
197. The effect the onshore cable corridor shall have on groundwater flows once operational is likely to be low as the buried cable will be located at a target depth of 1.2m below ground, although this will be subject to localised variations (i.e. limiting interaction to shallow or near surface groundwater).
198. Given the depth of the onshore export cables, it is likely to be constructed within the superficial deposits, and therefore will not be within the principal chalk aquifer. No dewatering of, or discharges into, the principal aquifer are anticipated.

199. There may be some locations where HDD is proposed that may be constructed deeper than 2m to allow for the crossing of infrastructure and watercourses. At these locations, there is a potential that localised perched pockets of shallow groundwater maybe encountered.

200. Furthermore, any water flowing into the trenches during the construction period will be discharged into local ditches or drains via temporary interceptor drains.

201. Based on the above information there is a groundwater flood risk along the onshore cable corridor. However, this risk will be mitigated within the design as part of the embedded mitigation measures, as outlined above.

20.2.4.6.7 Flooding from Surface Water

202. The Environment Agency's Long-Term Flood Risk Information map and **Figure 20.2.10** shows this section of the onshore cable corridor to be located mostly in an area at 'Very Low' risk of surface water flooding i.e. primarily outside the extent of the 1 in 1,000 year surface water flooding event.

203. The areas where the onshore cable corridor crosses the Ordinary Watercourses are identified as having a higher risk of surface water flooding. However, this is primarily limited to the width of the watercourse channel.

204. Within the Wensum WFD catchment, the onshore cable corridor crosses multiple Ordinary Watercourses (**Figure 20.2.2**). The Ordinary Watercourses in the north of the catchment (Water_013, Water_014 and Water_015) have a primarily 'Low' risk of surface water flooding with some isolated areas of 'High' risk, however this is confined to the channel.

205. The Trout Stream is shown to have a 'Medium' and 'High' risk of flooding. The 'Medium' and 'High' risk scenarios (1 in 100 year and 1 in 30 year, respectively) extend beyond the channel and are shown to primarily impact agricultural land immediately adjacent to the watercourse.

206. The River Wensum and associated ditches / drains generally have a 'Low' risk of flooding and this is primarily confined within the banks of the watercourse.

207. Water_026 and Water_027 have primarily a 'Low' risk of surface water flooding with smaller isolated areas of 'Medium' and 'High' risk. The 'Medium' and 'High' (1 in 100 year and 1 in 30 year, respectively) scenarios are primarily confined to the channel. The flood extent for the lower occurrence scenarios (1 in 1,000 year event) could affect land immediately adjacent to the watercourse.

208. The River Tud and associated smaller tributaries, ditches and drains have been shown to have a 'Medium' and 'High' risk of flooding. The area shown to be at 'High' risk of flooding extends approximately 100m either side of the River Tud.

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

210. The land will be reinstated, and existing ground levels will be maintained. Mitigation during construction in discussed in **Section 20.2.8** in relation to both surface water and Ordinary Watercourses.

211. The risk of flooding from surface water is therefore considered to be higher within this catchment compared with other sections of the onshore cable corridor.

20.2.4.6.8 Flooding from IDB Maintained Watercourses

212. The onshore cable corridor crosses four IDB maintained watercourses in this catchment (**Figure 20.2.2**). One of these is also classified as a Main River:

- Water_017 - IDB Drain (DRN111G0103)
- Water_018 - IDB Drain (DRN111G0101)
- Water_055 - IDB Drain (DRN112G0104)
- Water_020 - IDB Drain (DRN112G0103)

213. Due to the flood risk associated with these IDB maintained watercourses where they intersect the onshore cable corridor, there is a high risk of flooding in these locations. However, this is relatively localised and limited to the location where the onshore cable corridor crosses over the IDB maintained watercourse.

214. Consultation with the North Norfolk IDB indicates that adopted IDB watercourses are subject to stricter oversight (including Byelaw 10, no works within 9m) and obstructions within any Ordinary Watercourse within the District (that does not include Main Rivers) must be consented by the IDB.

20.2.4.6.9 Flooding from Sewers

215. Within the North Norfolk SFRA historical incidents of flooding are detailed by Anglian Water through their DG5 register. The DG5 database records incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding (on a 4-5 post code digit basis).

216. The North Norfolk SFRA did not report any flooding from sewers within this section of the onshore cable corridor based on the DG5 register for North Norfolk district.

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

20.2.4.6.10 Flooding from Reservoirs

218. Reservoirs with an impounded volume greater than 25,000m^3 are governed by the Reservoir Act 1975 and are listed on a register held by the Environment Agency.

219. Flooding from reservoirs is defined based on the implications of a large uncontrolled release of water from registered reservoirs i.e. greater than 25,000m^3. The Environment Agency Flood Risk from Reservoirs map shows this section of the onshore cable corridor does intersect the reservoir flooding extent.

220. This flood extent is associated with the Main Rivers of the River Wensum, River Tud (and adjacent ditches / drains) as well as the Trout Stream. However, based on the regulatory requirements associated with reservoirs, the risk of reservoir failure remains very low.

20.2.4.6.11 Flooding from Canals and other Artificial Sources

221. The onshore cable corridor is not located near to any canals or other artificial sources within the Wensum WFD catchment. As such there is no risk of flooding from these sources.

20.2.4.6.12 Summary of Flooding Sources

222. Overall, this section of the onshore cable corridor is not at risk from tidal / coastal flooding, sewers, canals or other artificial sources.

223. There is a low level of flood risk associated with reservoir and groundwater flooding.

224. The onshore cable corridor at this section crosses two Main Rivers (the River Wensum & the River Tud) and is classified as being in Flood Zone 2 or Flood Zone 3.

225. The onshore cable corridor crosses multiple Ordinary Watercourses within the Wensum WFD catchment and the risk of surface water flooding is generally higher when compared with other sections of the onshore cable corridor.

20.2.4.7 Onshore cable corridor Section 4 – Yare WFD Surface Water Operational Catchment

20.2.4.7.1 Overview of Proposed Activities

226. For the purpose of identifying flood risk in this FRA, the onshore cable corridor is divided into four sections based upon the boundaries of the WFD operational catchments (**Figure 20.2.1**).

227. This fourth section runs from the Wensum WFD catchment (east of Colton) for approximately 14.5km in a south then easterly direction before reaching the onshore substation study area close to Norwich Main Substation.

20.2.4.7.2 Historical Flooding

228. Absence of historical flood record does not necessarily confirm that flooding has not occurred. Neither the Environment Agency nor the North Norfolk SFRA has any records to indicate that the onshore cable corridor within the Yare WFD catchment has been previously affected by flooding from any source.

229. The LLFA has provided historical flood incident records which included one record of flooding, identified as part of the South Norfolk Flood Investigation 2013 - 2016, along Marlingford Road, Easton.

20.2.4.7.3 Flood Zones

230. The onshore cable corridor intersects four Flood Zone 3 extents within this section (**Figure 20.2.11**):

- Approximately 120m stretch of the onshore cable corridor to the west of Marlingford falls within Flood Zone 2 or Flood Zone 3. This flood extent is associated with the River Yare which is classified as a Main River.
- Approximately 370m stretch of the onshore cable corridor, east of Barford, associated with the River Tiffey, is classified as Flood Zone 2 or Flood Zone 3. The River Tiffey has been classified as a Main River.

- Approximately 80m stretch of the onshore cable corridor, east of Ketteringham, associated with an Ordinary Watercourse (Water_052) has been classified as Flood Zone 2 or Flood Zone 3.
- Approximately 200m wide stretch of the onshore cable corridor, east of Swardeston, associated with the Intwood Stream, falls within Flood Zone 2 or Flood Zone 3.

20.2.4.7.4 Flooding from Rivers

231. The onshore cable corridor crosses three Main Rivers and seven Ordinary Watercourses in this section (**Figure 20.2.2**):

- Main River
  - River Yare
  - River Tiffey
  - Intwood Stream
- Ordinary Watercourses
  - Water_043 (small ditch associated with the River Yare)
  - Water_046 (Ordinary Watercourse in the upper catchment of the River Tiffey)
  - Water_047 (Ordinary Watercourse in the upper catchment of the River Yare)
  - Water_048 (small ditch)
  - Water_049 (small ditch)
  - Water_050 (Ordinary Watercourse in the upper catchment of the Intwood Stream)
  - Water_051 (small ditch)

232. There is a fluvial flood risk associated with these watercourses. However, the risk of flooding to the onshore cable corridor will be removed upon completion of the cable laying phase, as all infrastructure will be located underground, with the cable, joint bays and link boxes sealed from water egress.

20.2.4.7.5 Flooding from the Sea

233. The majority of the onshore cable corridor 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 corridor that connects with it. Therefore, there is no risk of flooding from the sea in this location.

20.2.4.7.6 Flooding from Groundwater

234. The onshore cable corridor within the Yare WFD catchment is located over bedrock (Chalk Super Group) designated as a Principal Aquifer. Principal aquifers are considered to provide a high level of water storage (**See Section 20.2.3.2**).

235. The North Norfolk SFRA AStGWf map shows the proportion of each 1km grid square, where geological and hydrogeological conditions indicate that groundwater might emerge.

236. The onshore cable corridor is located at variable risk along its route and some parts, generally associated with the Main Rivers and adjacent Ordinary Watercourses, are shown to have an increased susceptibility to groundwater flooding, with a number of 1km^2 areas showing a >=75% susceptibility to groundwater flooding.

237. The effect the onshore cable corridor shall have on groundwater flows once operational is likely to be low as the buried cable will be located at a target depth of 1.2m below ground, although this will be subject to localised variations (i.e. limiting interaction to shallow or near surface groundwater).

238. Given the depth of the onshore export cables, it is likely to be constructed within the superficial deposits, and therefore will not be within the principal chalk aquifer at depth. No dewatering of, or discharges into, the principal aquifer are anticipated.

239. There may be some locations where HDD is proposed that may be constructed deeper than 2m to allow for the crossing of infrastructure and watercourses. At these locations, there is a potential that localised perched pockets of shallow groundwater maybe encountered.

240. Furthermore, any water flowing into the trenches during the construction period will be discharged into local ditches or drains via temporary interceptor drains.

241. Based on the above information there is a groundwater flood risk along the onshore cable corridor. However, this risk will be mitigated within the design as part of the embedded mitigation measures, as outlined above.

20.2.4.7.7 Flooding from Surface Water

242. The Environment Agency's Long-Term Flood Risk Information map and **Figure 20.2.12** shows this section of the onshore cable corridor to be located primarily in an area at 'Very Low' risk of surface water flooding i.e. primarily outside the extent of the 1 in 1,000 year surface water flooding event.

243. The highest risk of surface water flooding is generally associated with land either side of the Main Rivers at the onshore cable corridor crossing points.

244. The Ordinary Watercourses within the catchment, identified in **Section 20.2.4.7.4** have a 'High' and 'Medium' risk of flooding. The flood risk, associated with the 1 in 30 year and 1 in 100 year events, extends beyond the watercourse channel and is shown to affect the agricultural land up to approximately 80m either side of the watercourse for Water_046 & Water_047.

245. The smaller ditches / drains, identified in **Section 20.2.4.7.4,** generally have a lower risk of flooding, with the 'Low' risk being confined to the channel.

246. The Yare, Tiffey and adjacent Ordinary Watercourses have primarily a 'Low' risk of surface water flooding with smaller some areas of 'Medium' and 'High' risk. The 'Medium' and 'High' (1in 100 year and 1 in 30 year, respectively) scenarios are shown to potentially affect lower land adjacent to these although these areas are mainly associated with the floodplain of the watercourses. The flood extent for the lower occurrence scenarios (1 in 1,000 year event) could affect land, up to 100m either side, of the watercourse.

247. The Intwood Stream and associated ditches that intersect the onshore cable corridor primarily have a 'High' risk of flooding associated with them.

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

249. The land will be reinstated, and existing ground levels will be maintained. Mitigation during construction in discussed in **Section 20.2.8** in relation to both surface water and Ordinary Watercourses.

250. The risk of flooding from surface water is therefore considered to be higher within this catchment compared with other sections of the onshore cable corridor.

20.2.4.7.8 Flooding from Sewers

251. Within the North Norfolk SFRA historical incidents of flooding are detailed by Anglian Water through their DG5 register. The DG5 database records incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding (on a 4-5 post code digit basis).

252. The North Norfolk SFRA did not report any flooding from sewers within this section of the onshore cable corridor based on the DG5 register for North Norfolk district.

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

20.2.4.7.9 Flooding from Reservoirs

254. Reservoirs with an impounded volume greater than 25,000m^3 are governed by the Reservoir Act 1975 and are listed on a register held by the Environment Agency.

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

256. The Environment Agency Flood Risk from Reservoirs map shows this section of the onshore cable corridor is not at risk of reservoir flooding.

20.2.4.7.10 Flooding from Canals and other Artificial Sources

257. The onshore cable corridor is not located near to any canals or other artificial sources within the Yare WFD catchment. As such there is no risk of flooding from these sources.

20.2.4.7.11 Summary of Flooding Sources

258. Overall, this section of the onshore cable corridor is not at risk from tidal / coastal flooding, sewers, reservoirs, canals or other artificial sources.

259. There is a low level of flood risk associated with groundwater flooding.

260. The onshore cable corridor crosses multiple Ordinary Watercourses within the Yare WFD Catchment, and the risk of surface water flooding is generally higher when compared with other onshore cable corridor sections.

261. The onshore cable corridor at this section crosses three Main Rivers (River Yare, River Tiffey and Intwood Stream) and is partially located in Flood Zone 2 or Flood Zone 3.

262. Additionally, for the Main Rivers, the land immediately adjacent is also shown as being at increased risk from surface water flooding.

20.2.4.8 Onshore substation– Site 1

20.2.4.8.1 Overview of Proposed Activities

263. Two sites (**Figure 20.2.13** & **Figure 20.2.16**) have been identified as potential locations for the onshore substation and these have been assessed as part of this FRA.

264. This section reviews the flood risk to the search area known as Site 1.

20.2.4.8.2 Historical Flooding

265. An absence of historical flood record does not necessarily confirm that flooding has not occurred. Neither the Environment Agency, North Norfolk SFRA or the LLFA has any records to indicate that the Site 1, or the surrounding area, has been previously affected by flooding from any source.

20.2.4.8.3 Flood Zones

266. Site 1 is located within Flood Zone 1, as defined by the Environment Agency and shown on **Figure 20.2.14**.

20.2.4.8.4 Flooding from Rivers

267. Given that Site 1 is located entirely within Flood Zone 1 the risk of flooding from this source is deemed to be Low (**Figure 20.2.14**).

268. The site is located approximately 2km to the west of the Intwood Stream and approximately 1.2km east of the River Tud.

20.2.4.8.5 Flooding from the Sea

269. Site 1 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 corridor that connects with it. Therefore, there is no risk of flooding from the sea in this location and the primary flood mechanisms are likely to be as a result of fluvial or surface water sources.

20.2.4.8.6 Flooding from Groundwater

270. Site 1 is within the Yare WFD catchment and is located over bedrock (Chalk Super Group) designated as a Principal Aquifer. Principal aquifers are considered to provide a high level of water storage (**See Section 20.2.3.2**).

271. The North Norfolk SFRA AStGWf map shows the proportion of each 1km grid square, where geological and hydrogeological conditions indicate that groundwater might emerge.

272. Site 1 is located outside of 1km^2 areas that are identified to have an increased susceptibility to groundwater flooding.

273. Based on the above information there is likely to be a low groundwater flood risk to Site 1. Any minimal risk can be mitigated within the design by limiting the use of basements within the building, sloping ground away from the key infrastructure and / or raising it up off the ground. This should minimise any potential impact should there be groundwater emergence on Site 1 both during construction and once operational.

20.2.4.8.7 Flooding from Surface Water

274. The Environment Agency's Long-Term Flood Risk Information map and **Figure 20.2.15** shows that Site 1 has a surface water flow route intersecting the north eastern quadrant of the area.

275. No Ordinary Watercourses have been identified as a potential cause of the overland flow pathway and therefore this is likely to be a result of topography and surface water runoff from the agricultural areas to the north and west.

276. Review of topographic 2m LiDAR data from the Environment Agency shows that Site 1 slopes from south to north. The highest topographic levels are located on the southern side at approximately 31.00mAOD with the lowest topographic point on the north eastern side of the site at approximately 23.50mAOD, this topographic low point coincides with the 'High' surface water flood risk area along the northern boundary of the site (**Figure 20.2.13**).

277. Based on the above analysis, it is recommended that any permanent or temporary access routes / offices / welfare and ancillary infrastructure should be located away from the area of increased surface water flood risk near the northern boundary of the site, where reasonably practical, to ensure the risk of flooding is minimised and flow conveyance is not inhibited.

278. Alteration of ground levels within the overland flow pathway should be avoided, where possible. Further information relating to ground levels should be obtained as part of more detailed site investigations, which will inform the development of appropriate mitigation measures.

279. Further mitigation will be provided by ensuring that the development does not increase surface water runoff or exacerbate the flood risk associated with the overland flow pathway.

20.2.4.8.8 Flooding from Sewers

280. Within the North Norfolk SFRA historical incidents of flooding are detailed by Anglian Water through their DG5 register. The DG5 database records incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding (on a 4-5 post code digit basis).

281. The North Norfolk SFRA did not report any flooding from sewers within Site 1 based on the DG5 register for North Norfolk district.

282. Site 1 is located within existing agricultural land and, therefore, it is likely that there is a limited foul sewer network within proximity of this location. The risk of flooding from sewers is therefore considered to be low for Site 1.

20.2.4.8.9 Flooding from Reservoirs

283. Reservoirs with an impounded volume greater than 25,000m^3 are governed by the Reservoir Act 1975 and are listed on a register held by the Environment Agency.

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

285. The Environment Agency Flood Risk from Reservoirs map shows Site 1 is not at risk of reservoir flooding.

20.2.4.8.10 Flooding from Canals and other Artificial Sources

286. Site 1 is not located near to any canals or other artificial sources. As such there is no risk of flooding from these sources.

20.2.4.8.11 Summary of Flooding Sources

287. Overall, Site 1 is not at risk from tidal / coastal flooding, river flooding, groundwater, sewers, reservoirs, canals or other artificial sources.

288. Site 1 is intersected by a surface water overland flow pathway which is identified to be at 'Medium' and 'High' risk of flooding.

20.2.4.9 Onshore substation– Site 2

20.2.4.9.1 Overview of Proposed Activities

289. Two sites (**Figure 20.2.13** & **Figure 20.2.16**) have been identified as potential locations for the onshore substation and these have been assessed as part of this FRA.

290. This section reviews the flood risk to the search area known as Site 2.

20.2.4.9.2 Historical Flooding

291. An absence of historical flood record does not necessarily confirm that flooding has not occurred. Neither the Environment Agency, North Norfolk SFRA or the LLFA has any records to indicate that Site 2, or the surrounding area, has been previously affected by flooding from any source.

20.2.4.9.3 Flood Zones

292. Site 2 is located within Flood Zone 1, as defined by the Environment Agency and shown on **Figure 20.2.17**.

20.2.4.9.4 Flooding from Rivers

293. Given that Site 2 is located entirely within Flood Zone 1 the risk of flooding from this source is deemed to be low (**Figure 20.2.17**).

294. The site is located approximately 2km to the west of the Intwood Stream and approximately 1.2km east of the River Tud.

20.2.4.9.5 Flooding from the Sea

295. Site 2 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 corridor that connects with it. Therefore, there is no risk of flooding from the sea in this location and the primary flood mechanisms are likely to be as a result of fluvial or surface water sources.

20.2.4.9.6 Flooding from Groundwater

296. Site 2 is within the Yare WFD catchment and is located over bedrock (Chalk Super Group) designated as a Principal Aquifer. Principal aquifers are considered to provide a high level of water storage (**See Section 20.2.3.2**).

297. The North Norfolk SFRA AStGWf map shows the proportion of each 1km grid square, where geological and hydrogeological conditions indicate that groundwater might emerge.

298. Site 2 is located outside of 1km^2 areas that are identified to have an increased susceptibility to groundwater flooding.

299. Based on the above information there is likely to be a relatively low groundwater flood risk to Site 2. Any minimal risk can be mitigated within the design by limiting the use of basements within the building, sloping ground away from the key infrastructure and / or raising it up off the ground. This should minimise any potential impact should there be groundwater emergence on Site 2 both during construction and once operational.

20.2.4.9.7 Flooding from Surface Water

300. The Environment Agency's Long-Term Flood Risk Information map and **Figure 20.2.18** shows that Site 2 has a surface water flow route along its northern boundary. The flood risk along this flow route is deemed to be 'Low' with some smaller isolated areas of 'Medium' and 'High' risk.

301. No Ordinary Watercourses have been identified as a potential cause of the overland flow pathway and therefore this is likely to be a result of topography and surface water runoff from the surrounding agricultural areas.

302. Review of topographic 2m LiDAR data from the Environment Agency shows that Site 2 slopes from south to north. The highest topographic levels are located on the southern side at approximately 38.00m AOD with the lowest topographic point on the north eastern side of the site at approximately 31.50m AOD, this topographic low point coincides with the 'High' and 'Low' surface water flood risk area (**Figure 20.2.16**).

303. Based on the above analysis, it is recommended that any permanent or temporary access routes / offices / welfare and ancillary infrastructure should be located towards the topographically higher southern side of the study area, where reasonably practical, to ensure the risk of flooding is minimised and flow conveyance is not inhibited.

304. Alteration of ground levels within the overland flow pathway should be avoided, where possible. Further information relating to ground levels should be obtained as part of more detailed site investigations, which will inform the development of appropriate mitigation measures.

305. Further mitigation will be provided by ensuring that the development does not increase surface water runoff or exacerbate the flood risk associated with the overland flow pathway.

20.2.4.9.8 Flooding from Sewers

306. Within the North Norfolk SFRA historical incidents of flooding are detailed by Anglian Water through their DG5 register. The DG5 database records incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding (on a 4-5 post code digit basis).

307. The North Norfolk SFRA did not report any flooding from sewers within Site 2 based on the DG5 register for North Norfolk district.

308. Site 2 is located within existing agricultural land and, therefore, it is likely that there is a limited foul sewer network within proximity of this location. The risk of flooding from sewers is therefore considered to be low for the Site 2.

20.2.4.9.9 Flooding from Reservoirs

309. Reservoirs with an impounded volume greater than 25,000m^3 are governed by the Reservoir Act 1975 and are listed on a register held by the Environment Agency.

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

311. The Environment Agency Flood Risk from Reservoirs map shows that Site 2 is not at risk of reservoir flooding.

20.2.4.9.10 Flooding from Canals and other Artificial Sources

312. Site 2 is not located near to any canals or other artificial sources. As such there is no risk of flooding from these sources.

20.2.4.9.11 Summary of Flooding Sources

313. Overall, Site 2 is not at risk from tidal / coastal flooding, river flooding, groundwater, sewers, reservoirs, canals or other artificial sources.

314. Site 2 is intersected by a surface water overland flow pathway which is identified to be at primarily 'Low' risk of flooding, with some localised areas at 'Medium' and 'High' risk of flooding.

20.2.5 Sequential and Exception Test

315. 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.

20.2.5.1.1 Vulnerability Classification

316. Under the NPPF PPG Flood Risk and Coastal Change, DEP and SEP 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.
- Wind turbines.

20.2.5.1.2 Application of the Sequential and Exception Test

317. The DEP and SEP onshore study area is located within Flood Zones 1, 2 and 3, as defined by the Environment Agency's online Flood Map for Planning. The Sequential Test has been considered in accordance with the NPPF PPG. Development classed as 'Essential Infrastructure' and located within Flood Zone 3 is required to pass the Exception Test (**Table 20.2.4**).

Table 20.2.4: Flood Risk Vulnerability Classification

Flood Zone	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	✓

318. Following application of the Sequential Test, if it is not possible for the 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.

319. 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 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 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.

320. 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 project.

321. Parts of the onshore study area located within Flood Zone 3 are required to pass the Exception Test, by demonstrating that DEP and SEP provide wider sustainability benefits to the community which outweigh flood risk, and that DEP and SEP will be safe for its lifetime without increasing flood risk elsewhere.

322. DEP and SEP have 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 cross existing watercourses.

323. 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.

324. At this stage, the access routes for temporary works and other ancillary temporary infrastructure, during the construction phase, have not been defined. However, where possible these will be within Flood Zone 1. Following construction, any temporary works will be removed and returned to their present state. On this basis, it is considered that the Exception Test is not applicable to the nature of DEP and SEP as they have been, wherever possible, sequentially laid out so as to minimise flood risk.

325. The final decision regarding the application of the Sequential Test and Exception Test is for the planning authority to confirm whether they agree that DEP and SEP satisfactorily pass both tests.

326. However, this assessment concludes that the sequential approach has been adopted, and the wider benefits associated with the provision of renewable energy ensures that DEP and SEP are in accordance with the guidance related to the Sequential and Exception Test.

20.2.6 Climate Change

327. 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, there are two main aspects of climate change which are likely to impact DEP and SEP. 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.

328. Current guidance on climate change allowances (Environment Agency, 2020), states 'Essential Infrastructure' developments within Flood Zone 2 or 3 should use the 'Upper End' climate change allowance when considering impacts on fluvial flood risk due to climate change.

329. The DEP and SEP onshore study area is located within the Anglian river basin. Assuming construction commences in the '2020s', the peak river flow climate change allowance would comprise an additional 35%, assuming 35 years of operation, as shown in **Table 20.2.5**.

Table 20.2.5: 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	H++	25%	40%	80%
	Upper End	25%	35%	65%
	Higher Central	15%	20%	35%
	Central	10%	15%	25%

330. A review of the Environment Agency modelling and the allowances for climate change included within the modelling have been summarised as follows:

- South Norfolk: The Rivers Yare, Tiffey, Tas and Tud flood extents do not increase greatly in either the 1 in 100 year event with 35% or the 1 in 100 year event with 65% climate change scenarios. Whilst flood extents may not increase significantly, climate change has the potential to increase flood levels, depths, velocities and hazard to people classification. The notable settlements where climate change extents are shown to increase, are along the River Tiffey at Barford and River Yare at Marlingford and Bawburgh.
- Broadland: The Rivers Wensum and Bure flood extents do not increase greatly in either the 1 in 100 year event with 35% or the 1 in 100 year event with 65% climate change scenarios and the extents are similar to the existing Flood Zone 2 extent. Whilst flood extents may not increase significantly, climate change has the potential to increase flood levels, depths, velocities and hazard to people classification. The notable settlements, where climate change extents are shown to increase, are along the River Wensum at Morton and Lenwade.

331. The climate change allowance related to peak river flow and fluvial flooding are only likely to be relevant to the onshore substation search area, as all other elements of DEP and SEP will be below ground once constructed.

332. Given the onshore substation sites are currently located within Flood Zone 1 and at least 1.2km from the nearest Main River, the increased fluvial flooding relating to climate change are unlikely to affect either of the options current under consideration. This is the only onshore infrastructure that will not be located below ground following construction. Therefore, the effects of climate change from fluvial sources will not impact the DEP and SEP onshore infrastructure.

333. When considering surface water flood risk, the Norfolk LLFA Statutory Consultee Guidance Document (Version 4, March 2019) requires an assessment of the lifetime of the development, the vulnerability of the proposed land use and a justification related to the choice of allowance.

334. The LLFA advise that the Upper End allowance is required for all new development. Assuming 35 years of operation the required allowance is an increase of 20% (**Table 20.2.6**). This allowance should be accommodated for within the drainage design by either increasing peak rainfall in hydraulic calculations or by increasing on-site storage, in accordance with the Norfolk LLFA Statutory Consultee Guidance Document (Version 4, March 2019).

Table 20.2.6: Peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

Applies across al of England	Total potential change anticipated for '2020s' (2015 – 2039)	Total potential change anticipated for '2050s' (2040 – 2069)	Total potential change anticipated for '2080s' (2070 – 2115)
Upper End	10%	20%	40%

Applies across al of England	Total potential change anticipated for '2020s' (2015 – 2039)	Total potential change anticipated for '2050s' (2040 – 2069)	Total potential change anticipated for '2080s' (2070 – 2115)
Central	5%	10%	20%

335. This FRA recommends that the design of surface water management measures and the drainage system for above ground structures (i.e. the onshore substation) should include the Upper End (20%) allowance as a minimum, to take into account the potential increase in surface water flood risk resulting from climate change.

336. The effect of climate change on groundwater flooding problems, and those watercourses where groundwater has a large influence on winter flood flows, is more uncertain. Milder wetter winters may increase the frequency of groundwater flooding incidents in areas that are already susceptible, but warmer drier summers may counteract this effect by drawing down groundwater levels to a greater extent during the summer months.

20.2.7 Surface Water Drainage

20.2.7.1.1 Onshore Infrastructure Pre-Construction Work

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

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

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

340. Norfolk LLFA Statutory Consultee Guidance Document (Version 4, March 2019) notes that the Environment Agency has classified the majority of Norfolk's main river channels and surface waterbodies as having a high sensitivity rating e.g. SSSI or salmonid fish stretches. This assessment is based on the species and habitats found in these systems with the rating given as an indication of the surface water bodies susceptibility to change. The sensitivity of these watercourses is likely to extend to all of the connecting tributaries and Ordinary Watercourses which flow into these river channels and surface waterbodies.

341. Additionally, Norfolk has many principal aquifers and groundwater drinking water source protection zones which would also be classed as a 'sensitive' protective resource. An applicant would have to consider if there is a significant amount of secondary superficial aquifer above the principal aquifer to provide protection and not be classed as 'sensitive'.

342. A specialised drainage contractor will undertake surveys, locate drains, create drawings pre- and post-construction, to ensure appropriate reinstatement. Construction drainage will include provisions to minimise flood risk within the working area and ensure ongoing drainage of surrounding land.

20.2.7.1.2 Landfall location and onshore cable corridor surface water drainage

343. The landfall location and onshore cable corridor will only be at risk of surface water flooding during construction. However, there is risk that drainage ditches and surface water flow routes could be adversely affected should the ground reinstatement not be carefully managed.

344. DEP and SEP would use trenchless crossing techniques at key watercourse crossing locations, including all Main Rivers and IDB maintained Ordinary Watercourses. In these locations the HDD will be confirmed and agreed with the regulators to ensure they are located a sufficient distance below the bed of the channel and therefore, there will be no impact on flood risk as all proposed elements will be located below ground.

345. It is, however, likely that trenched crossings will be carried out on Ordinary Watercourses crossed by the onshore cable corridor. This method has the potential to directly alter the geomorphology, hydrology and physical habitat value of the watercourses. Trenched crossings involve installing temporary dams (composed of sand bags, straw bales and ditching clay, or another suitable technique) upstream and downstream of the crossing point. The cable trench is then excavated in the dry area of river bed between the two dams with the river flow maintained using a temporary pump or flume.

346. This installation technique would affect the bed and banks of the watercourse and could result in an impact on flows along the watercourse, which will need to be managed during construction.

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

348. It will be necessary to install additional field drainage parallel to the cable trenches along the onshore cable corridor to ensure the existing drainage characteristics of the land are maintained and there is no increase in flood risk to on and off-site receptors during and after construction. All temporary drainage would pass through a silt interceptor before being discharged.

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

20.2.7.1.3 Onshore cable corridor Post-Construction

350. Following construction of the landfall and onshore export cables there will be no permanent above ground elements. Additionally, it is proposed that drainage will be reinstated to match the existing baseline condition. As such there would be no impact on surface water drainage. Furthermore, all temporary logistics compounds and temporary access tracks will be fully reinstated and would have no operational use.

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

20.2.7.1.4 Onshore Substation surface water drainage

352. Surface water drainage requirements will be designed to meet the requirements of the NPPF, NPS EN-1, NPS EN-5, and the CIRIA SuDS Manual C753 (CIRIA, 2015) with runoff limited where feasible, through the use of infiltration techniques which should be accommodated, where possible within the area of the development.

353. The drainage 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:

    i) into the ground (infiltration);
    ii) to a surface water body;
    iii) to a surface water sewer, highway drain or another drainage system; or
    iv) to a combined sewer.

354. The final impermeable areas of the onshore substation are not yet defined; however sufficient storage will be provided to attenuate surface water and discharge at a controlled rate during surface water events. The volume and location of the attenuation will be developed in accordance with the above guidance.

355. Any infiltration or storage device should be located away from identified overland flow pathways, where possible. The exact position will be confirmed during detailed design, post-consent. As a result, there will be no displacement of flood water as a result of any attenuation or storage features.

356. Norfolk LLFA Statutory Consultee Guidance Document (Version 4, March 2019) sets out that for greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event (100% AEP) and the 1 in 100 year rainfall event (1% AEP) should never exceed the peak greenfield runoff rate for the same event.

357. The scope for using infiltration may be reduced where soils have poor infiltration capacity, where groundwater levels are high, there is a groundwater source protection zone constraint (particularly Source Protection Zone 1), there is ground contamination where infiltration would mobilise pollutants or where ground conditions present particular risks of subsidence from voids and instability in the underlying geology.

358. 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.

359. Operational drainage at the onshore substation will be developed in consultation with the LLFA, Environment Agency and other stakeholders and implemented to ensure the existing runoff rates to the surrounding water environment are maintained at pre-development rates. This process will also define the greenfield runoff rate, proposed runoff rates, volume of storage required and the proposed approach for discharge of water from the site.

360. The Norfolk LLFA Statutory Consultee Guidance Document (Version 4, March 2019) requires the management and maintenance of SuDS to appropriately account for the construction, operation, and maintenance requirements of all components of the drainage system (surface and sub-surface).

361. The operational drainage at the substation would consider the likely maintenance requirements of new and existing infrastructure. It is important that maintenance is also considered in the design of the drainage system and the development site to account for the requirements of undertaking maintenance work such as ease of access for personnel, vehicles or machinery. A management and maintenance plan of any proposed surface water drainage infrastructure will need to be agreed with relevant stakeholders then adopted for the lifetime of the development.

20.2.8 Flood Risk Mitigation Measures

362. 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, this FRA has considered residual flood risk and measures to manage residual flood risk where appropriate.

20.2.8.1.1 Design Mitigation

363. The onshore study area is primarily located within Flood Zone 1, i.e. outside of Flood Zones 2 and 3, in areas at low risk of flooding from fluvial or tidal sources. The sequential approach has been adopted in regard to the location of above ground structures with infrastructure being located in Flood Zone 1, where possible.

364. At the landfall location, where the works have the potential to affect the tidal / coastal flood risk, DEP and SEP proposes carrying out the landfall works using HDD or other trenchless techniques.

365. It is, however, likely that trenched crossings will be carried out on Ordinary Watercourses crossed by the onshore cable corridor.

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

367. During construction, the onshore cable corridor will be designed such that it will be bounded by parallel drainage channels (one on each side) to intercept drainage within the working width. Additional drainage channels will be installed to intercept water from the cable trench. This will be 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.

368. Trenchless crossings have been embedded in the scheme design for crossing Main Rivers. The cable will be installed at least 2m below the water body and, although ground disturbance will occur at entry and exit points, there will be no direct impact on the Main Rivers.

369. Where temporary or permanent access tracks are required to cross an existing watercourse there is an increased risk of flooding (i.e. partially crossing the Flood Zone 3 extent). In this location the design will include appropriately sized crossings over the watercourse and retain existing ground elevations, wherever possible, to ensure continued floodplain capacity and / or flow conveyance.

370. Following construction of the landfall and onshore export cables there will be no permanent above ground elements with the exception of above ground link boxes if required. Additionally, it is proposed that drainage will be reinstated to match the existing baseline condition. As such there would be no impact on surface water drainage. Furthermore, all temporary logistics compounds and temporary access tracks will be fully reinstated and would have no operational use.

371. The onshore substation should be designed such that the key infrastructure is located away from the surface water overland flow routes, towards the topographically higher southern side of the search areas, where possible, as identified in **Section 20.2.4.8.7** & **20.2.4.9.7**. Altering of ground levels within the overland flow pathway will be avoided, where possible.

372. Existing land drains along the onshore cable corridor will need to be reinstated with at least the same capacity as the pre-construction channel to prevent impacts on flood risk identified during the pre-construction survey.

373. There is the potential for the construction of the onshore substation and associated infrastructure to result in the addition of low permeability surfacing, increasing the rate of surface water runoff from the site without appropriate mitigation.

374. The operational drainage will therefore be developed and agreed in consultation with the LLFA, Environment Agency and other stakeholders and implemented to ensure the existing runoff rates to the surrounding water environment are maintained at pre-development rates. This will assess the greenfield runoff rate, proposed runoff rates, volume of storage required and the proposed approach for discharge of water from the site.

20.2.8.1.2 Flood Warning and Evacuation

375. 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.

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

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

378. A site-specific flood warning and evacuation plan should include practical steps for protecting DEP and SEP, be easy to communicate and consider delegated responsibility, or whether personnel are likely to require additional support during a flood event.

379. It is anticipated that DEP and SEP will require a comprehensive flood warning and evacuation plan including the following aspects:

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

380. The Environment Agency provide a free flood alert ("flooding is possible") and warning ("flooding is expected") service for fluvial flooding (rising river levels). It is recommended that the flood warning and evacuation plan considers how receipt of these flood alerts or warnings may affect their operations.

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

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

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

20.2.8.1.3 Access and Egress

384. The onshore substation sites are located within Flood Zone 1, and as such any personnel within these areas would be at low risk of flooding from rivers or the sea.

385. The location of temporary and / or any permanent access tracks are not yet defined. However, once operational, these and access to the onshore substation will be transient in nature i.e. there will be no requirement to remain on site overnight and the site can be evacuated, upon receipt of a warning of heavy rainfall, prior to flooding occurring.

20.2.9 Conclusions

386. The landfall location is primarily located within Flood Zone 1, at low risk of flooding from fluvial or tidal sources.

387. At the landfall location, the cables may be required to cross Flood Zones 2 and 3 around the urban area of Weybourne and coastal frontage, as they come onshore. However, as the cables comprise below ground infrastructure they will not be at risk from flooding as they will be installed using HDD, or other trenchless techniques.

388. The onshore cable corridor will primarily cross through Flood Zone 1, with some locations in Flood Zone 2 and 3, primarily associated with watercourse crossings.

389. The use of HDD, or other trenchless techniques, has been embedded in the scheme design for Main Rivers and IDB maintained watercourses and as such the impact on flood risk in these locations would remain low.

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

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

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

393. Both of the potential onshore substation sites are located within Flood Zone 1, which represents a low risk of flooding from fluvial sources.

394. The onshore substation and ancillary elements should be designed such that the key infrastructure is located away from the surface water overland flow routes, towards the topographically higher southern side of the search areas, where possible. Altering of ground levels within the overland flow pathway should be avoided, where possible.

395. Surface water drainage requirements will be designed to meet the requirements of the relevant policy and guidance to ensure the existing runoff rates to the surrounding water environment are maintained at pre-development rates.

396. The operational drainage at the substation will be designed taking into account the greenfield runoff rate, proposed runoff rates, volume of storage required and the proposed approach for discharge of water from the site.

397. On the basis of the flood risk identified both to and from DEP and SEP it is considered that the proposed development is appropriate in terms of flood risk and is in accordance with the National Planning Policy Framework.

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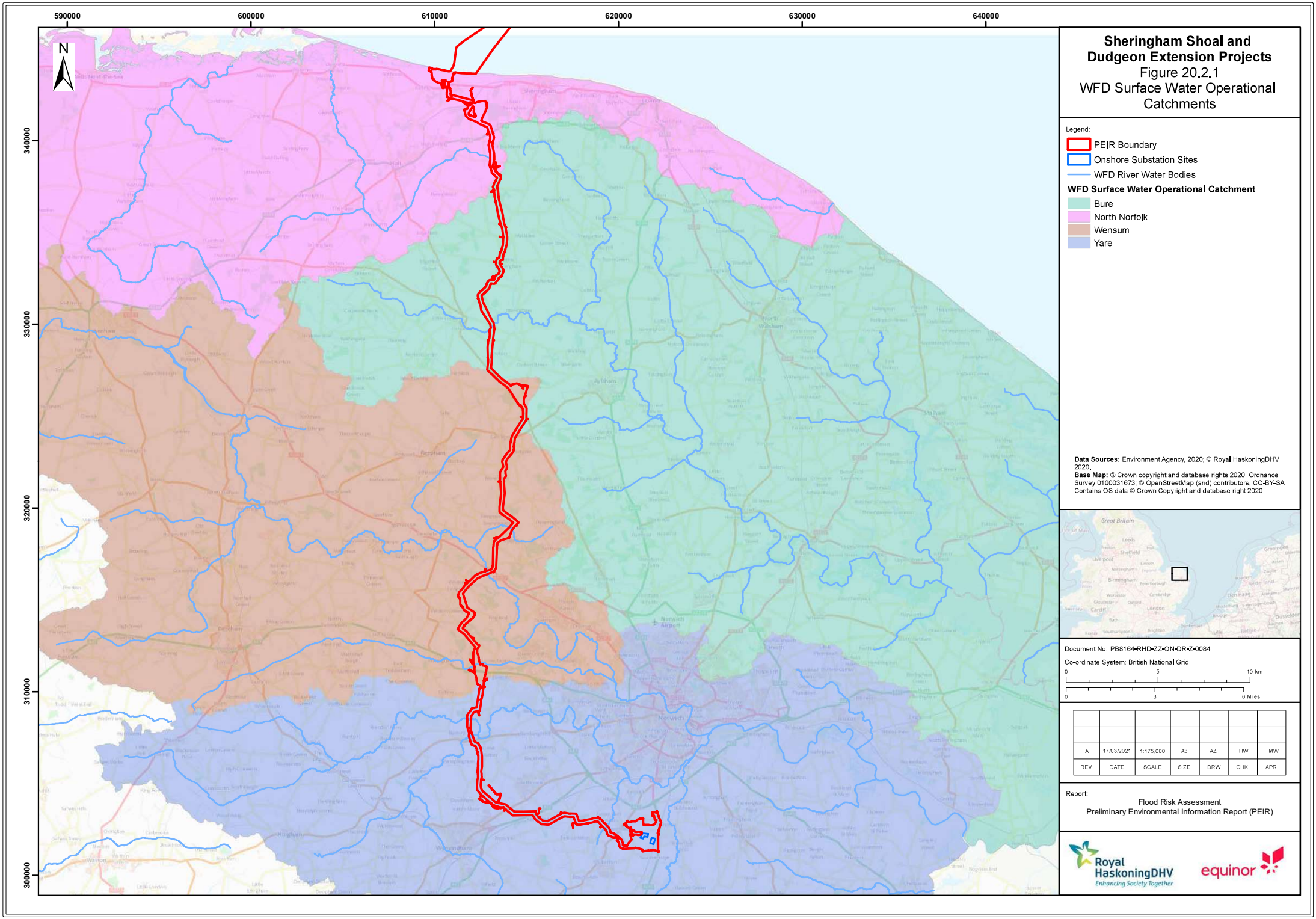
Figures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Sheringham Shoal and Dudgeon Extension Projects
Figure 20.2.1
WFD Surface Water Operational Catchments
Legend:
PEIR Boundary
Onshore Substation Sites
WFD River Water Bodies
WFD Surface Water Operational Catchment
Bure
North Norfolk
Wensum
Yare
Data Sources: Environment Agency, 2020; © Royal HaskoningDHV 2020.
Base Map: © Crown copyright and database rights 2020, Ordnance Survey 0100031673; © OpenStreetMap (and) contributors, CC-BY-SA
Contains OS data © Crown Copyright and database right 2020
Great Britain
Document No: PB8164-RHD-ZZ-ON-DR-Z-0084
Co-ordinate System: British National Grid
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5
10 km
0
3
6 Miles
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Flood Risk Assessment
Preliminary Environmental Information Report (PEIR)
Royal HaskoningDHV
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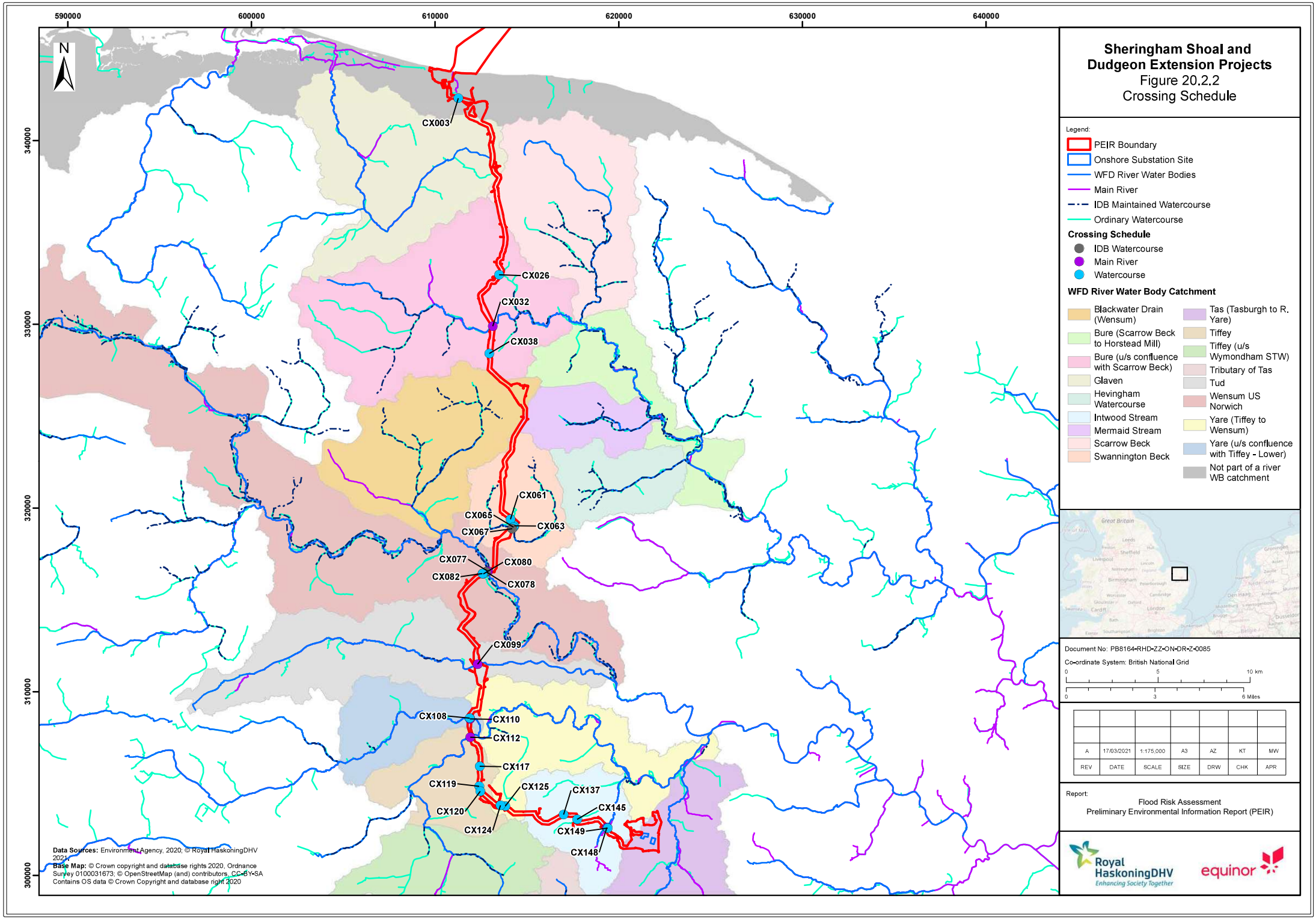

Sheringham Shoal and Dudgeon Extension Projects

Figure 20.2.2
Crossing Schedule

Legend:

- PEIR Boundary
- Onshore Substation Site
- WFD River Water Bodies
- Main River
- IDB Maintained Watercourse
- Ordinary Watercourse

Crossing Schedule

- IDB Watercourse
- Main River
- Watercourse

WFD River Water Body Catchment

- Blackwater Drain (Wensum)
- Bure (Scarrow Beck to Horstead Mill)
- Bure (u/s confluence with Scarrow Beck)
- Glaven
- Hevingham Watercourse
- Intwood Stream
- Mermaid Stream
- Scarrow Beck
- Swannington Beck
- Tas (Tasburgh to R. Yare)
- Tiffey
- Tiffey (u/s Wymondham STW)
- Tributary of Tas
- Tud
- Wensum US Norwich
- Yare (Tiffey to Wensum)
- Yare (u/s confluence with Tiffey - Lower)
- Not part of a river WB catchment

Document No: PB8164-RHD-ZZ-ON-DR-Z-0085

Co-ordinate System: British National Grid

0 5 10 km

0 3 6 Miles

A	17/03/2021	1:175,000	A3	AZ	KT	MW
REV	DATE	SCALE	SIZE	DRW	CHK	APR

Report:

Flood Risk Assessment
Preliminary Environmental Information Report (PEIR)

Royal HaskoningDHV
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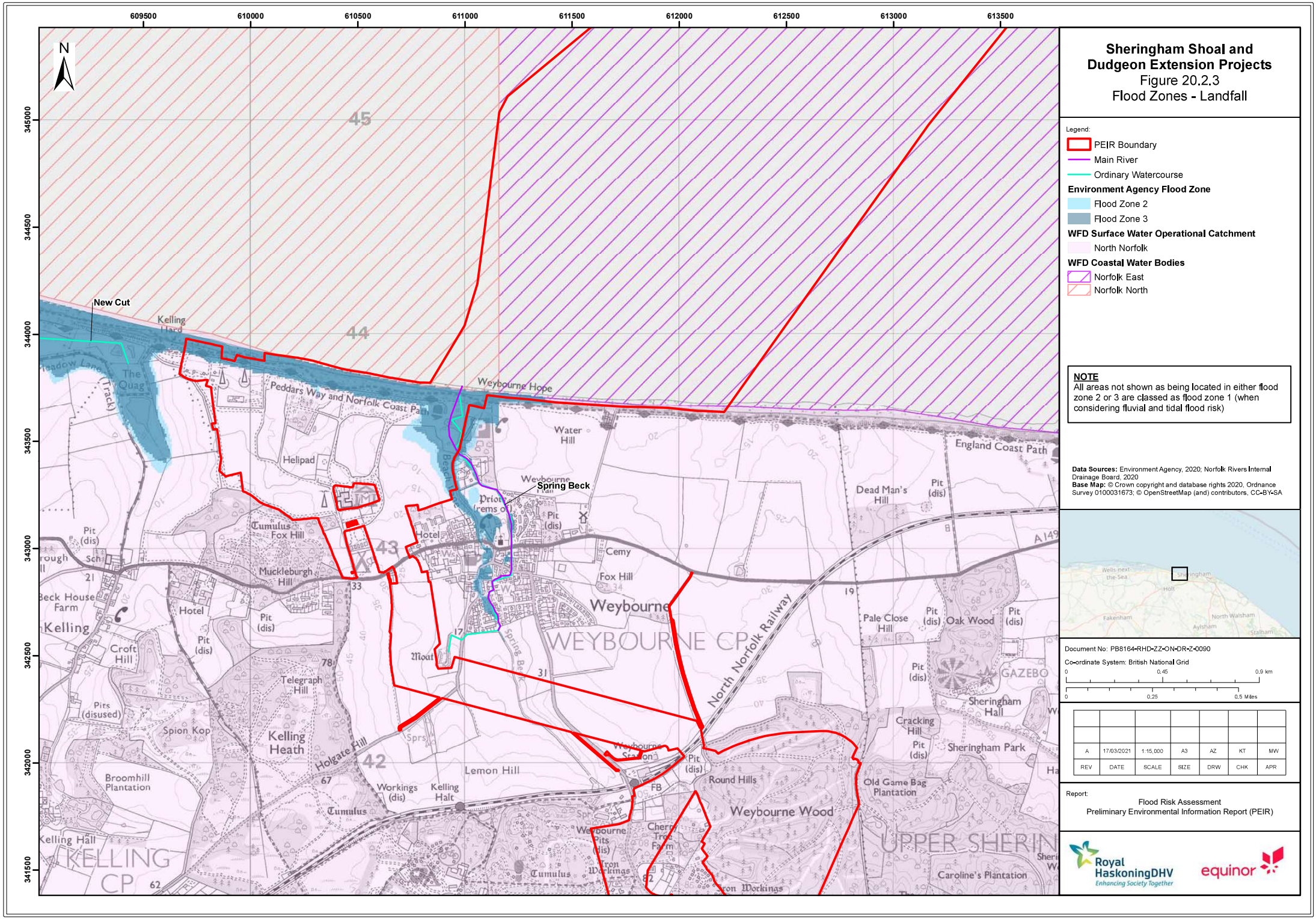

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Figure 20.2.3

Flood Zones - Landfall

Legend:

- PEIR Boundary
- Main River
- Ordinary Watercourse

Environment Agency Flood Zone

- Flood Zone 2
- Flood Zone 3

WFD Surface Water Operational Catchment

- North Norfolk

WFD Coastal Water Bodies

- Norfolk East
- Norfolk North

NOTE

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

Data Sources: Environment Agency, 2020; Norfolk Rivers Internal Drainage Board, 2020

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Document No: PB8164-RHD-ZZ-ON-DR-Z-0090

Co-ordinate System: British National Grid

0 0.45 0.9 km

0 0.25 0.5 Miles

A	17/03/2021	1:15,000	A3	AZ	KT	MW
REV	DATE	SCALE	SIZE	DRW	CHK	APR

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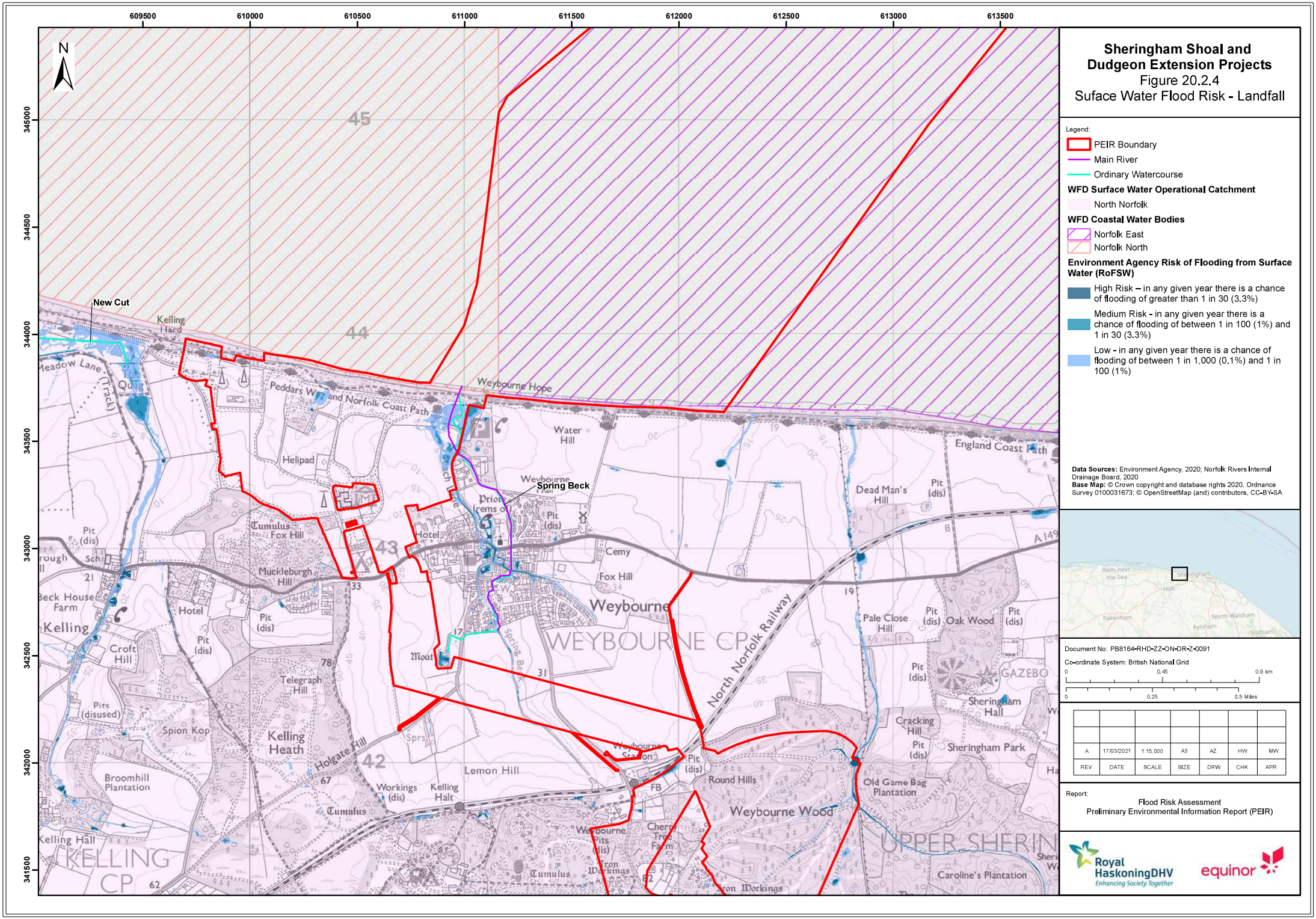

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Figure 20.2.4

Suface Water Flood Risk - Landfall

Legend:

- PEIR Boundary
- Main River
- Ordinary Watercourse

WFD Surface Water Operational Catchment

- North Norfolk

WFD Coastal Water Bodies

- Norfolk East
- Norfolk North

Environment Agency Risk of Flooding from Surface Water (RoFSW)

- High Risk – in any given year there is a chance of flooding of greater than 1 in 30 (3.3%)
- Medium Risk - in any given year there is a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%)
- Low - in any given year there is a chance of flooding of between 1 in 1,000 (0.1%) and 1 in 100 (1%)

Data Sources: Environment Agency, 2020; Norfolk Rivers Internal Drainage Board, 2020

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Document No: PB8164-RHD-ZZ-ON-DR-Z-0091

Co-ordinate System: British National Grid

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0 0.25 0.5 Miles

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REV	DATE	SCALE	SIZE	DRW	CHK	APR

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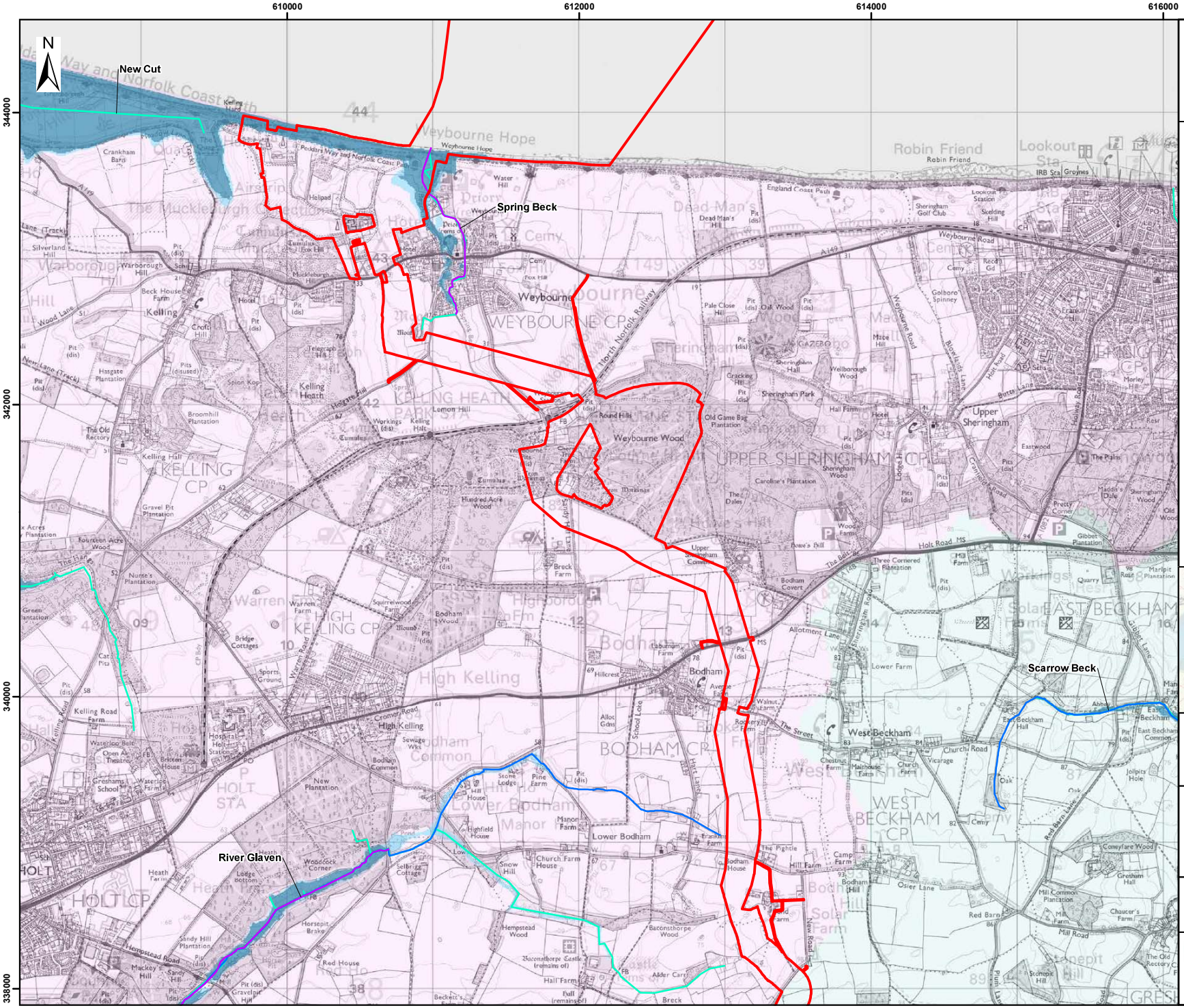

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Figure 20.2.5

Flood Zones - North Norfolk

Legend:

- PEIR Boundary
- WFD River Water Bodies
- Main River
- Ordinary Watercourse

Environment Agency Flood Zone

- Flood Zone 2
- Flood Zone 3

WFD Surface Water Operational Catchment

- Bure
- North Norfolk

NOTE

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

Data Sources: Environment Agency, 2020; Norfolk Rivers Internal Drainage Board, 2020

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Document No: PB8164-RHD-ZZ-ON-DR-Z-0086

Co-ordinate System: British National Grid

0 0.75 1.5 km

0 0.4 0.8 Miles

A	17/03/2021	1:25,000	A3	AZ	KT	MW
REV	DATE	SCALE	SIZE	DRW	CHK	APR

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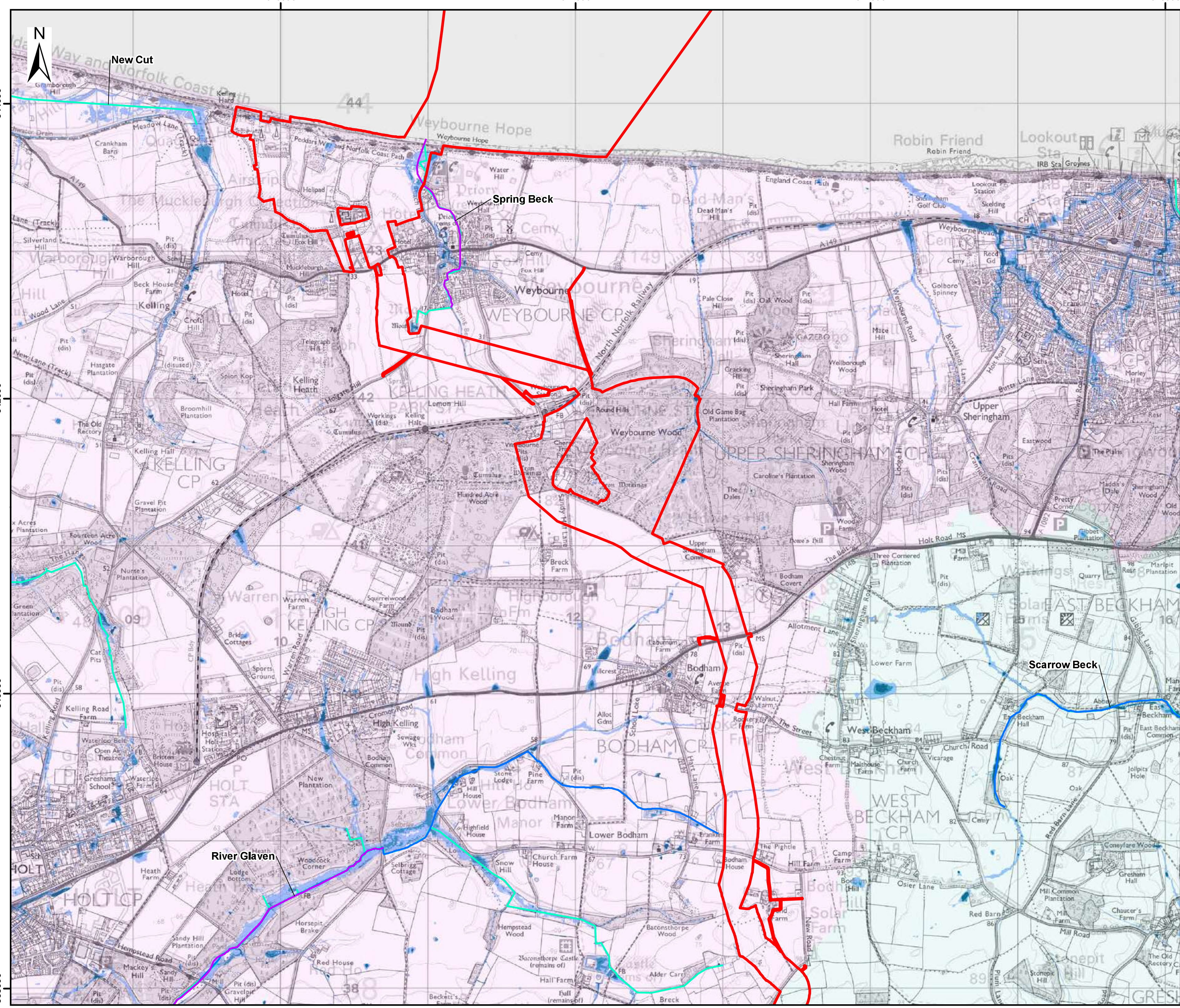

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Figure 20.2.6

Surface Water Flood Risk - North Norfolk

Legend:

- PEIR Boundary
- WFD River Water Bodies
- Main River
- Ordinary Watercourse

WFD Surface Water Operational Catchment

- Bure
- North Norfolk

Environment Agency Risk of Flooding from Surface Water (RoFSW)

- High Risk – in any given year there is a chance of flooding of greater than 1 in 30 (3.3%)
- Medium Risk - in any given year there is a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%)
- Low - in any given year there is a chance of flooding of between 1 in 1,000 (0.1%) and 1 in 100 (1%)

Data Sources: Environment Agency, 2020; Norfolk Rivers Internal Drainage Board, 2020

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Document No: PB8164-RHD-ZZ-ON-DR-Z-0087

Co-ordinate System: British National Grid

0 0.75 1.5 km

0 0.4 0.8 Miles

REV	DATE	SCALE	SIZE	DRW	CHK	APR
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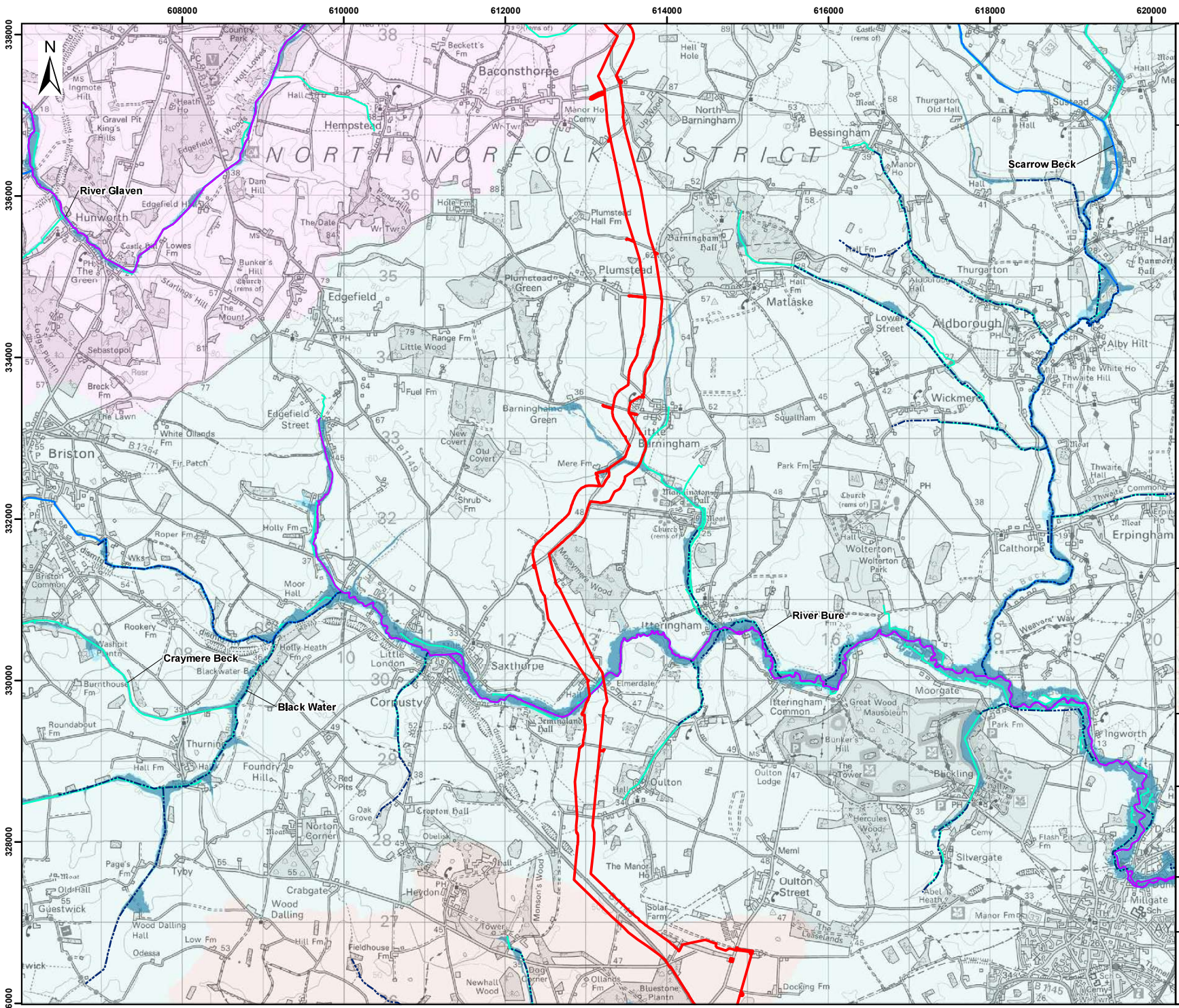

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Figure 20.2.7
Flood Zones - Bure

Legend:

- PEIR Boundary
- WFD River Water Bodies
- Main River
- IDB Maintained Watercourse
- Ordinary Watercourse

Environment Agency Flood Zone

- Flood Zone 2
- Flood Zone 3

WFD Surface Water Operational Catchment

- Bure
- North Norfolk
- Wensum

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

Data Sources: Environment Agency, 2020; Norfolk Rivers Internal Drainage Board, 2020
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Co-ordinate System: British National Grid

0 1 2 km
0 0.75 1.5 Miles

REV	DATE	SCALE	SIZE	DRW	CHK	APR
A	17/03/2021	1:45,000	A3	AZ	KT	MW

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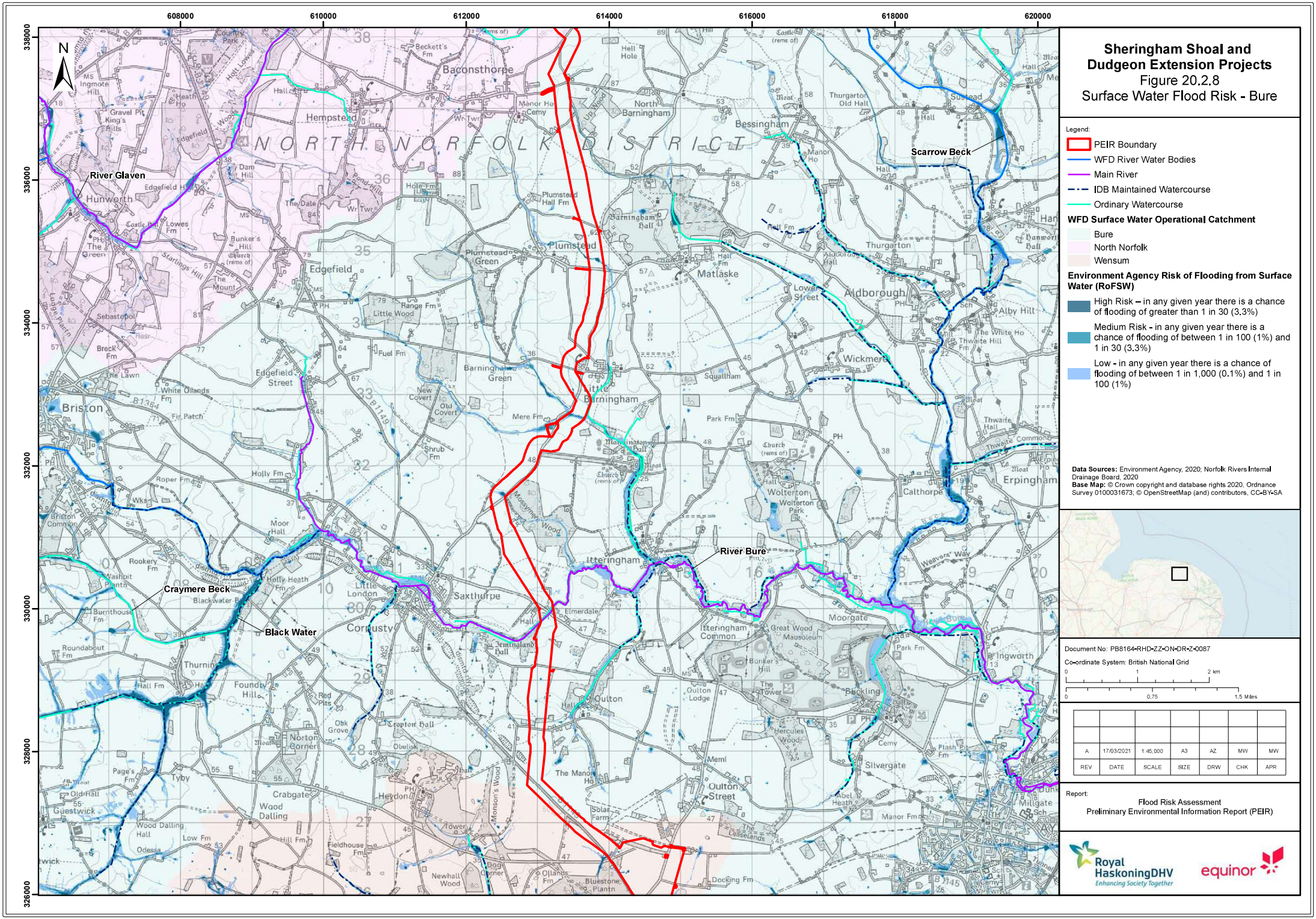

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Figure 20.2.8

Surface Water Flood Risk - Bure

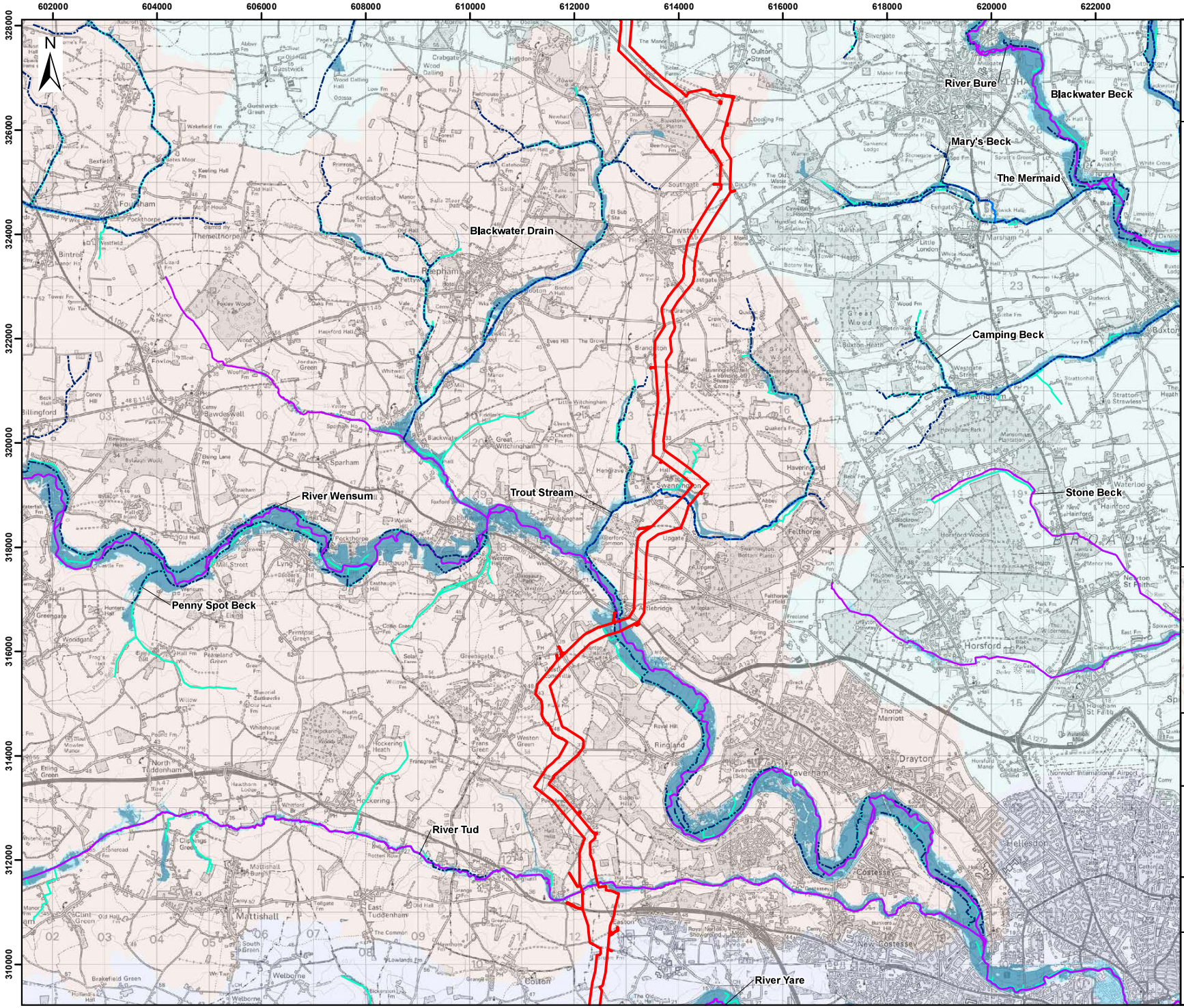

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Figure 20.2.9

Flood Zones - Wensum

Legend:

- PEIR Boundary
- WFD River Water Bodies
- Main River
- IDB Maintained Watercourse
- Ordinary Watercourse

Environment Agency Flood Zone

- Flood Zone 2
- Flood Zone 3

WFD Surface Water Operational Catchment

- Bure
- Wensum
- Yare

NOTE

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

Data Sources: Environment Agency, 2020; Norfolk Rivers Internal Drainage Board, 2020

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Co-ordinate System: British National Grid

0 2 4 km

0 1 2 Miles

A	17/03/2021	1:70,000	A3	AZ	KT	MW
REV	DATE	SCALE	SIZE	DRW	CHK	APR

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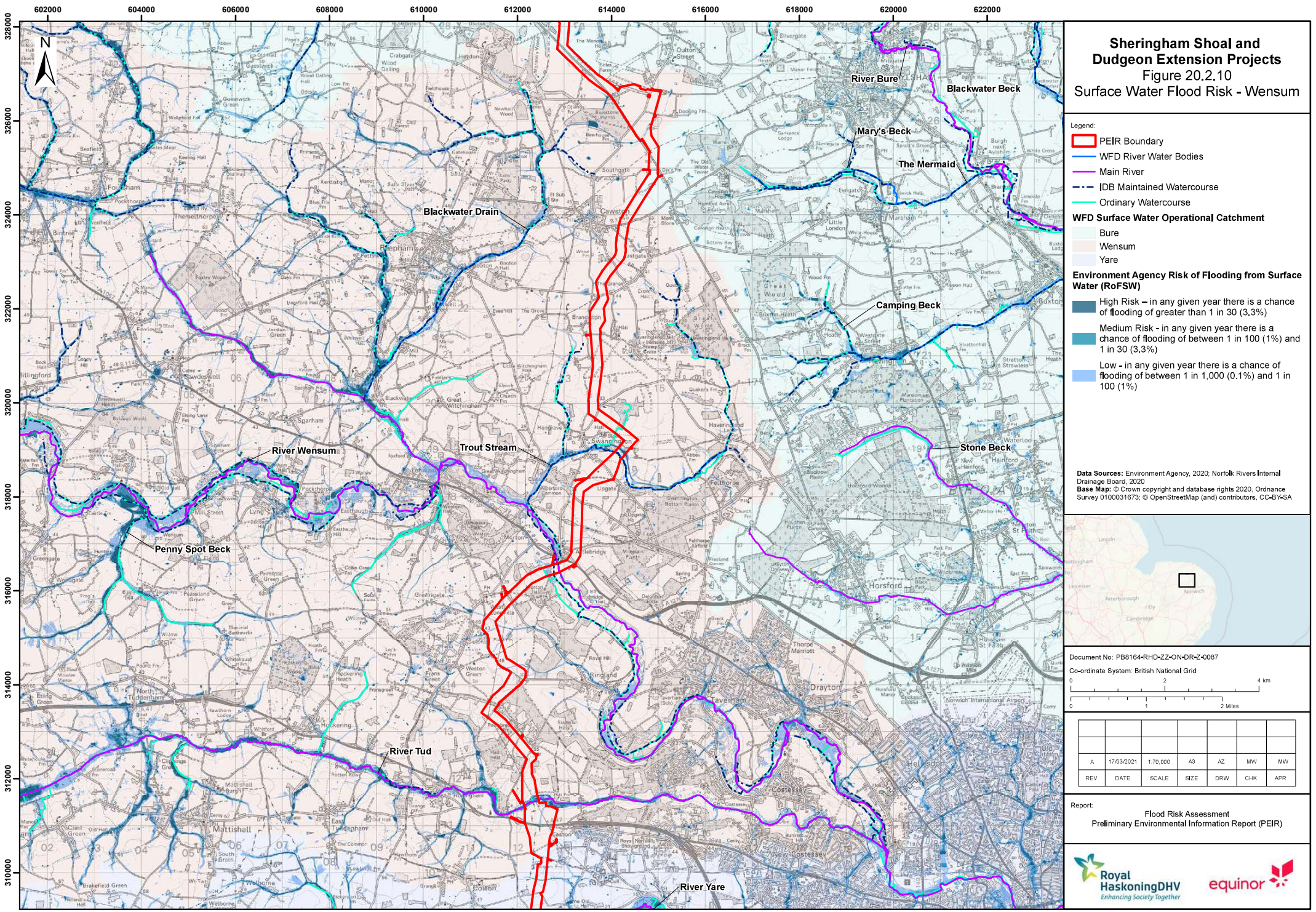

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Figure 20.2.10

Surface Water Flood Risk - Wensum

Legend:

- PEIR Boundary
- WFD River Water Bodies
- Main River
- IDB Maintained Watercourse
- Ordinary Watercourse

WFD Surface Water Operational Catchment

- Bure
- Wensum
- Yare

Environment Agency Risk of Flooding from Surface Water (RoFSW)

- High Risk – in any given year there is a chance of flooding of greater than 1 in 30 (3.3%)
- Medium Risk - in any given year there is a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%)
- Low - in any given year there is a chance of flooding of between 1 in 1,000 (0.1%) and 1 in 100 (1%)

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Co-ordinate System: British National Grid

0 2 4 km

0 1 2 Miles

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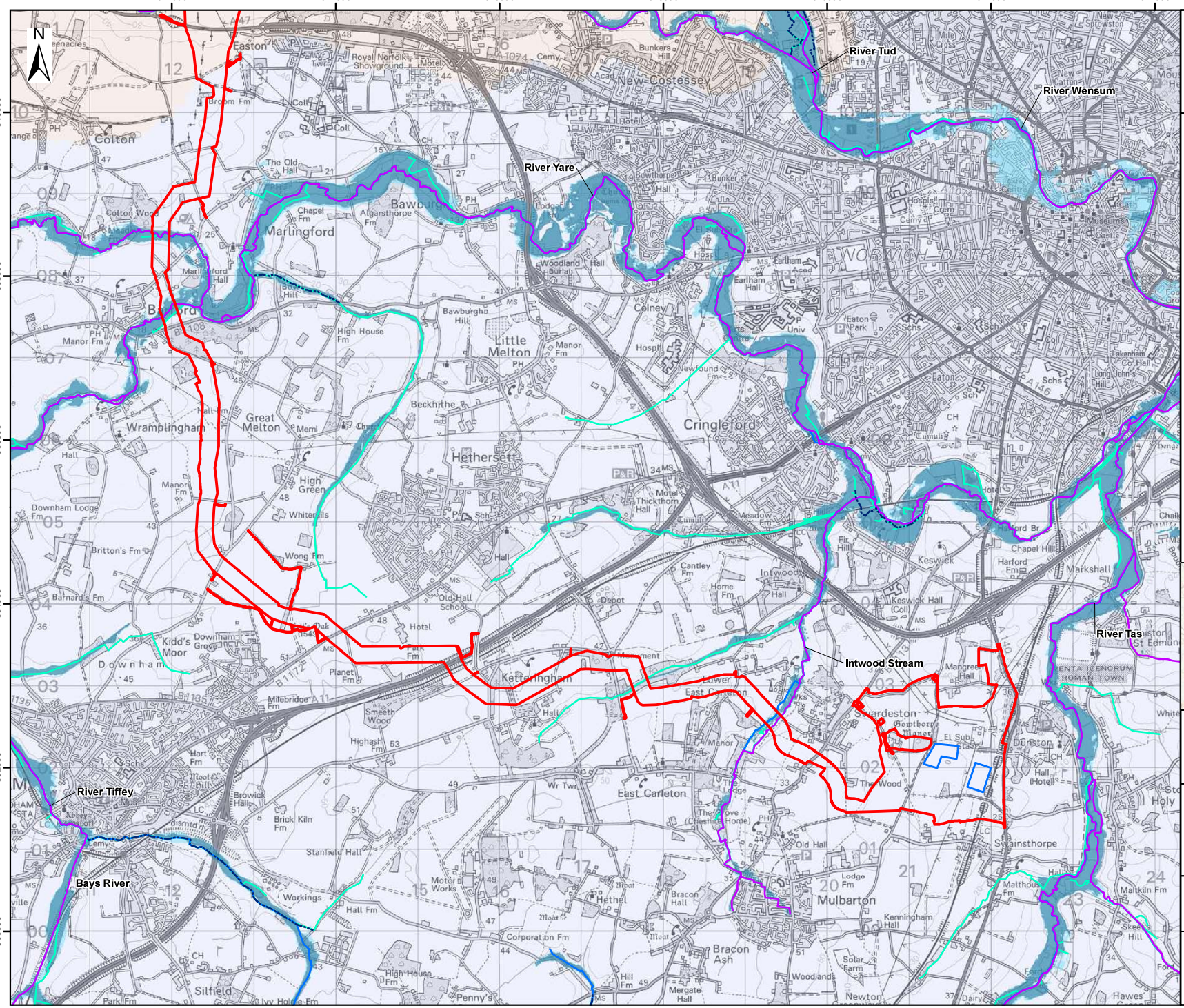

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Figure 20.2.11
Flood Zones - Yare

Legend:

- PEIR Boundary
- Onshore Substation Site
- WFD River Water Bodies
- Main River
- IDB Maintained Watercourse
- Ordinary Watercourse

Environment Agency Flood Zone

- Flood Zone 2
- Flood Zone 3

WFD Surface Water Operational Catchment

- Wensum
- Yare

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

Data Sources: Environment Agency, 2020; Norfolk Rivers Internal Drainage Board, 2020
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Co-ordinate System: British National Grid

0 1 2 km
0 0.75 1.5 Miles

A	17/03/2021	1:45,000	A3	AZ	KT	MW
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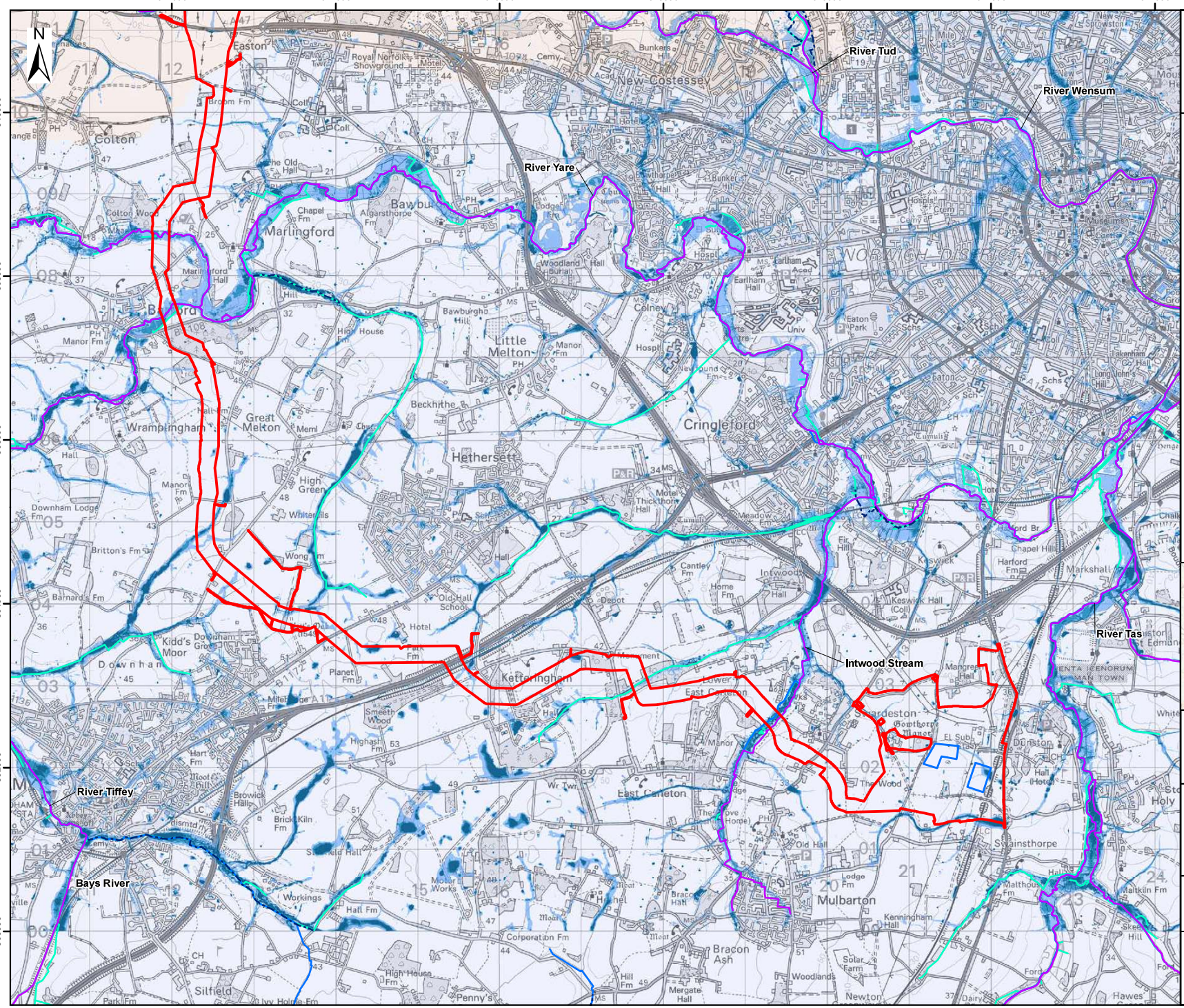

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Figure 20.2.12

Surface Water Flood Risk - Yare

Legend:

- PEIR Boundary
- Onshore Substation Site
- WFD River Water Bodies
- Main River
- IDB Maintained Watercourse
- Ordinary Watercourse

WFD Surface Water Operational Catchment

- Wensum
- Yare

Environment Agency Risk of Flooding from Surface Water (RoFSW)

- High Risk – in any given year there is a chance of flooding of greater than 1 in 30 (3.3%)
- Medium Risk - in any given year there is a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%)
- Low - in any given year there is a chance of flooding of between 1 in 1,000 (0.1%) and 1 in 100 (1%)

Data Sources: Environment Agency, 2020; Norfolk Rivers Internal Drainage Board, 2020

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Co-ordinate System: British National Grid

0 1 2 km

0 0.75 1.5 Miles

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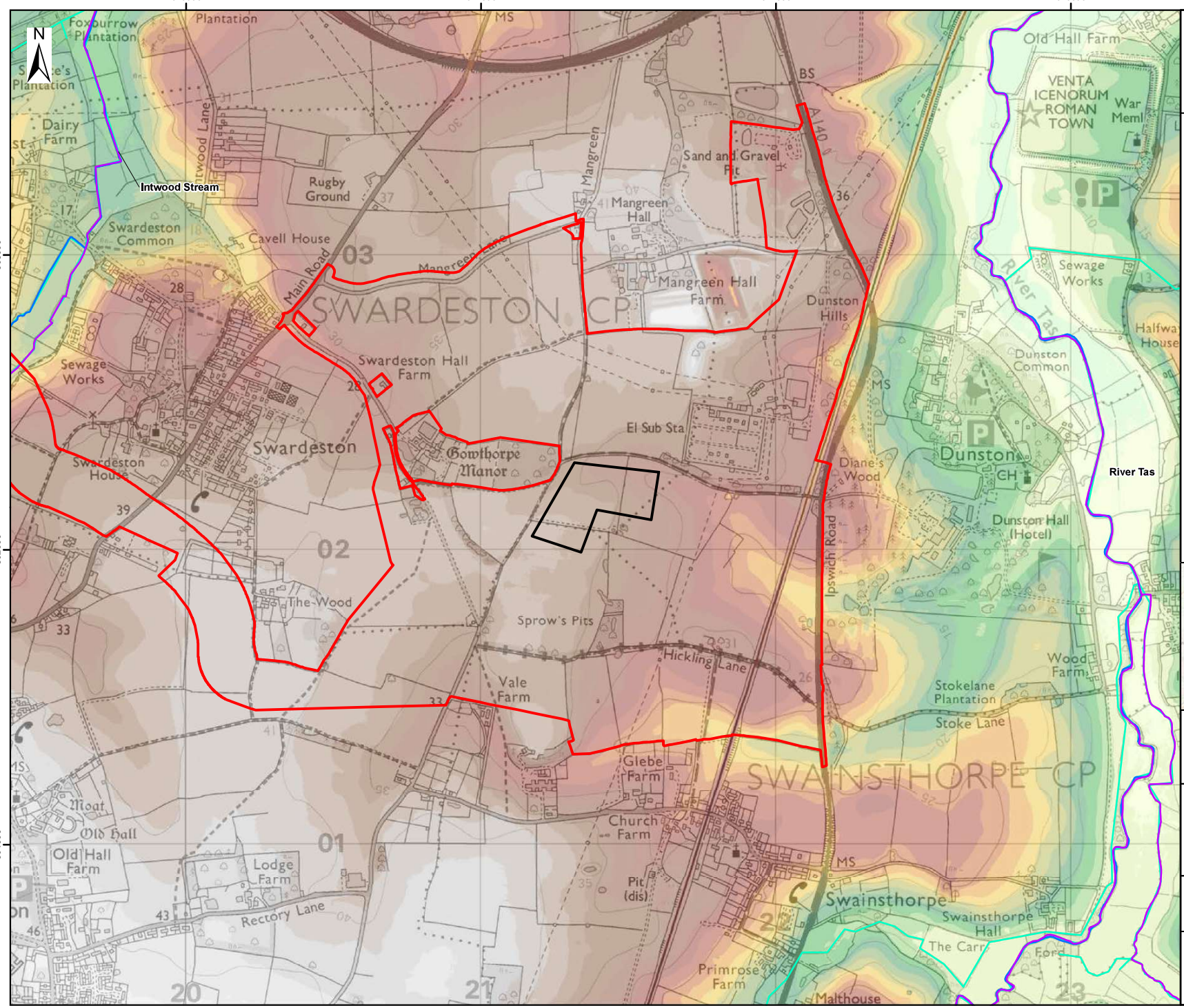

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Figure 20.2.13
Onshore Substation Option 1 - Topography

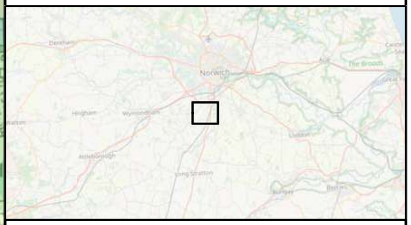
Legend:

- PEIR Boundary
- Onshore Substation Site Option 1
- WFD River Water Bodies
- Main River
- Ordinary Watercourse

Digital Terrain Model (DTM)
1m Resolution (Environment Agency, 2020)

2.1 - 4	26.1 - 28
4.1 - 6	28.1 - 30
6.1 - 8	30.1 - 32
8.1 - 10	32.1 - 34
10.1 - 12	34.1 - 36
12.1 - 14	36.1 - 38
14.1 - 16	38.1 - 40
16.1 - 18	40.1 - 42
18.1 - 20	42.1 - 44
20.1 - 22	44.1 - 46
22.1 - 24	46.1 - 48
24.1 - 26	

Data Sources: Environment Agency, 2020; Norfolk Rivers Internal Drainage Board, 2020
Base Map: © Crown copyright and database rights 2020, Ordnance Survey 0100031673; © OpenStreetMap (and) contributors, CC-BY-SA



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0 400 800 Yards

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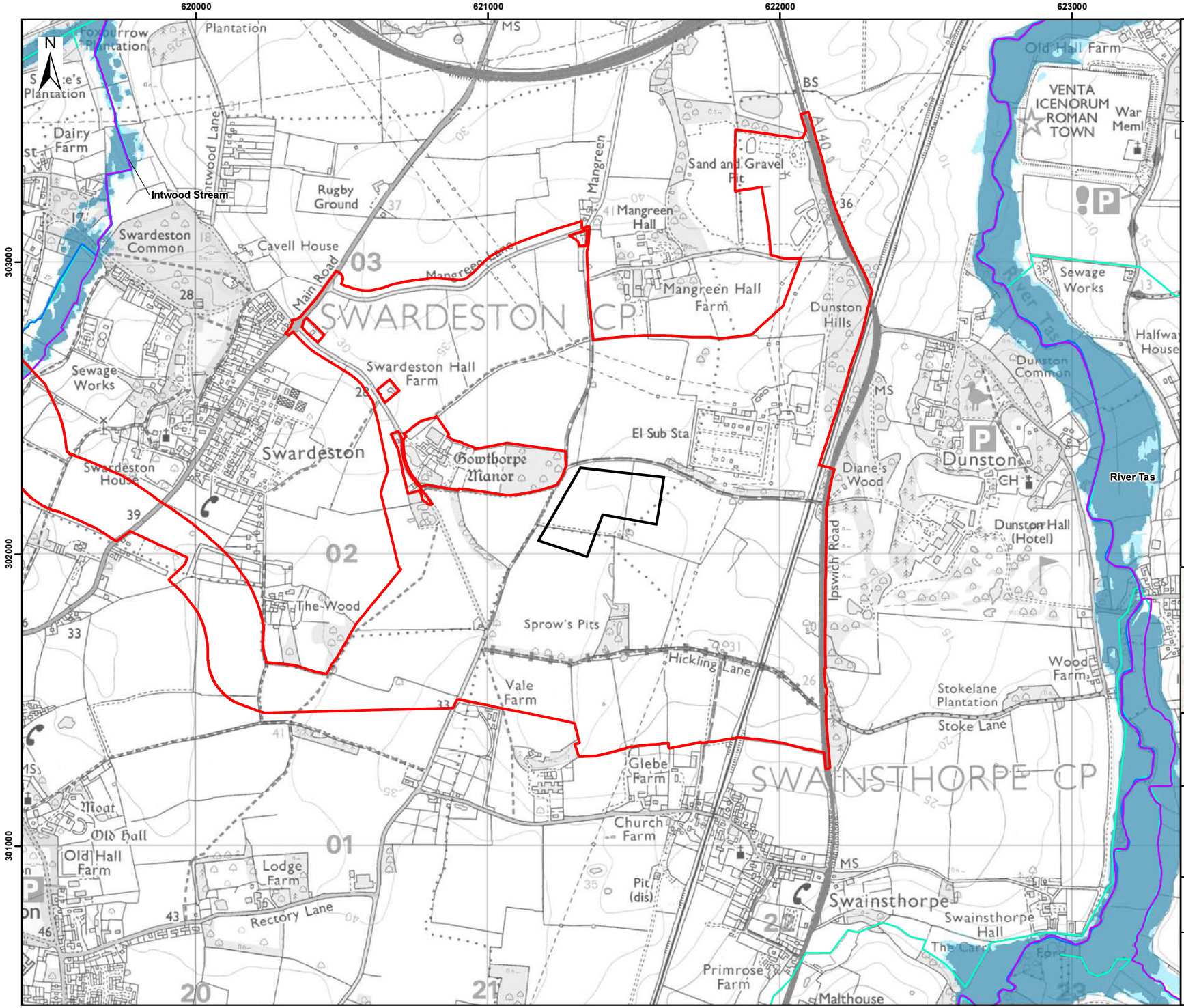

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Figure 20.2.14
Onshore Substation Option 1 - Flood Zones

Legend:

- PEIR Boundary
- Onshore Substation Site Option 1
- WFD River Water Bodies
- Main River
- Ordinary Watercourse

Environment Agency Flood Zone

- Flood Zone 2
- Flood Zone 3

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

Data Sources: Environment Agency, 2020; Norfolk Rivers Internal Drainage Board, 2020
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Co-ordinate System: British National Grid

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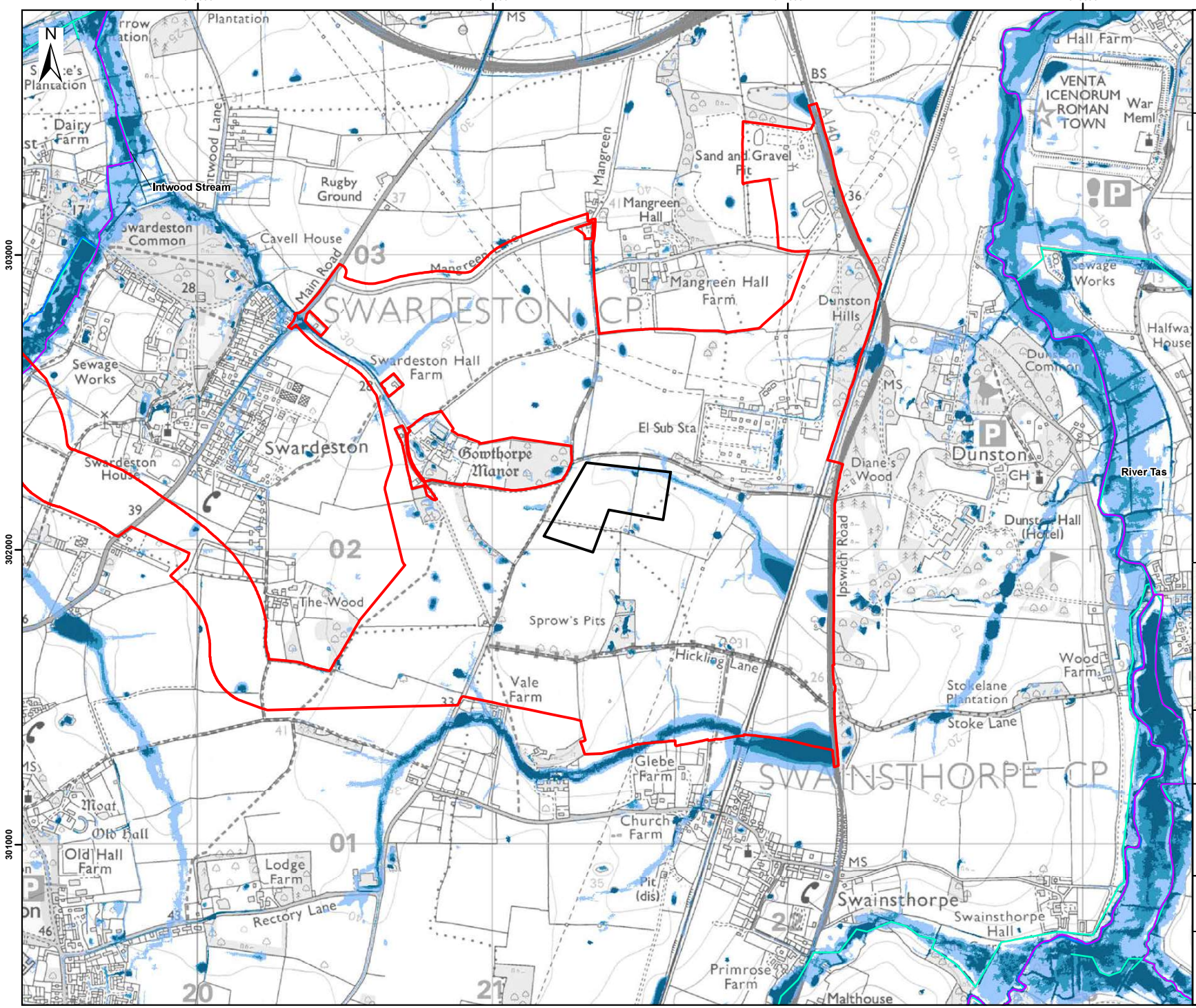

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Figure 20.2.15

Onshore Substation Option 1 - Surface Water Flood Risk

Legend:

- PEIR Boundary
- Onshore Substation Site Option 1
- WFD River Water Bodies
- Main River
- Ordinary Watercourse

Environment Agency Risk of Flooding from Surface Water (RoFSW)

- High Risk – in any given year there is a chance of flooding of greater than 1 in 30 (3.3%)
- Medium Risk - in any given year there is a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%)
- Low - in any given year there is a chance of flooding of between 1 in 1,000 (0.1%) and 1 in 100 (1%)

Data Sources: Environment Agency, 2020; Norfolk Rivers Internal Drainage Board, 2020

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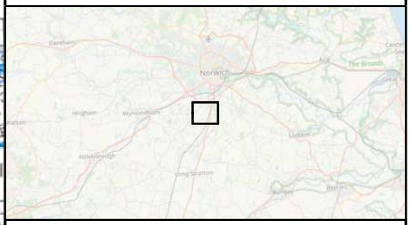

Document No: PB8164-RHD-ZZ-ON-DR-Z-0093

Co-ordinate System: British National Grid

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0 400 800 Yards

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REV	DATE	SCALE	SIZE	DRW	CHK	APR

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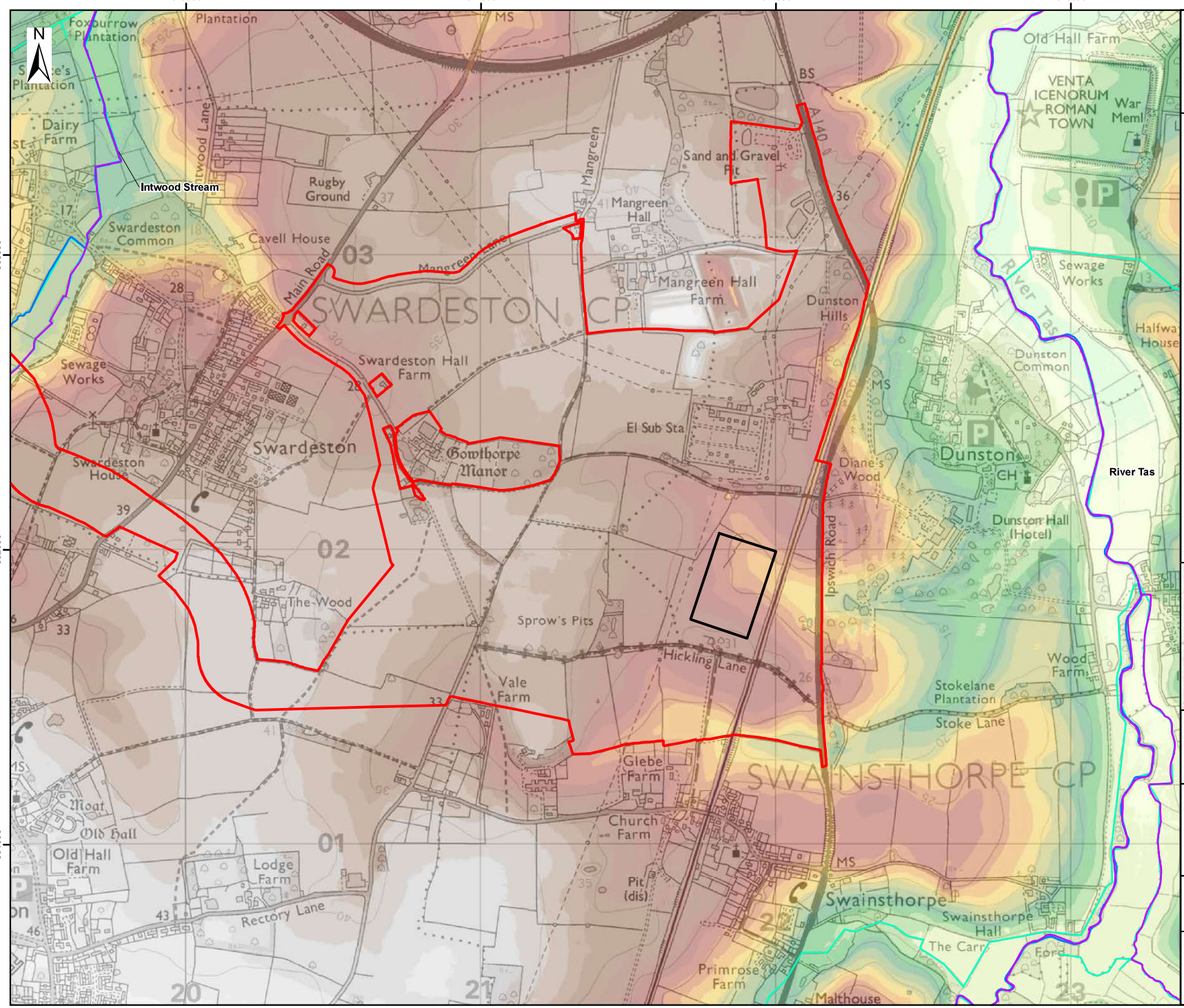

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Figure 20.2.16
Onshore Substation Option 2 - Topography

Legend:

- PEIR Boundary
- Onshore Substation Site Option 2
- WFD River Water Bodies
- Main River
- Ordinary Watercourse

Digital Terrain Model (DTM)
1m Resolution (Environment Agency, 2020)

2.1 - 4	26.1 - 28
4.1 - 6	28.1 - 30
6.1 - 8	30.1 - 32
8.1 - 10	32.1 - 34
10.1 - 12	34.1 - 36
12.1 - 14	36.1 - 38
14.1 - 16	38.1 - 40
16.1 - 18	40.1 - 42
18.1 - 20	42.1 - 44
20.1 - 22	44.1 - 46
22.1 - 24	46.1 - 48
24.1 - 26	

Data Sources: Environment Agency, 2020; Norfolk Rivers Internal Drainage Board, 2020
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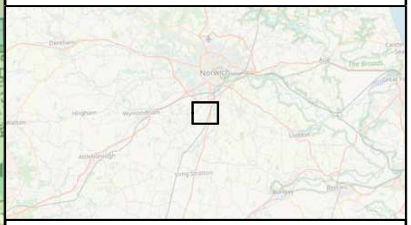

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Co-ordinate System: British National Grid

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REV	DATE	SCALE	SIZE	DRW	CHK	APR

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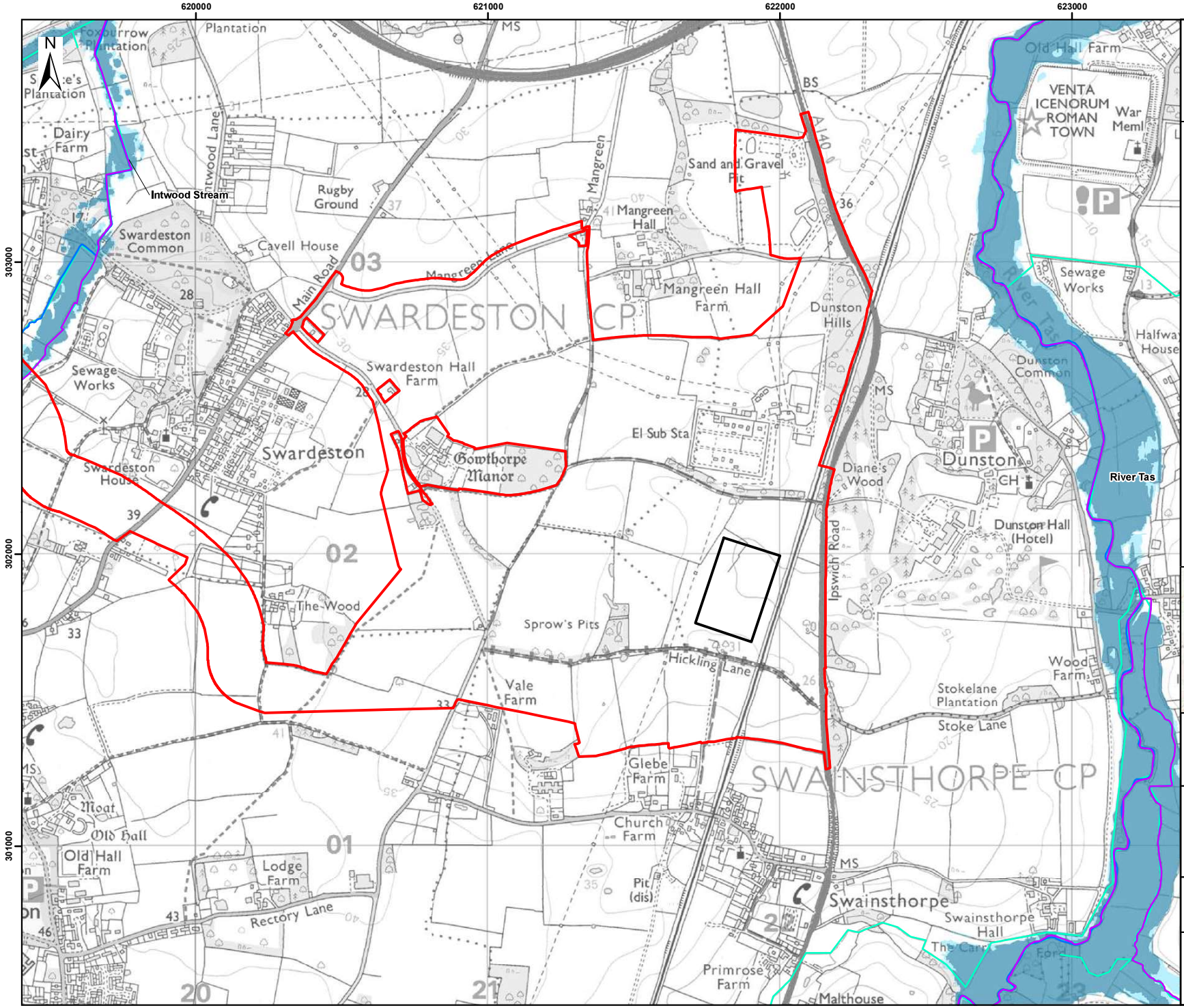

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Figure 20.2.17
Onshore Substation Option 2 - Flood Zones

Legend:

- PEIR Boundary
- Onshore Substation Site Option 2
- WFD River Water Bodies
- Main River
- Ordinary Watercourse

Environment Agency Flood Zone

- Flood Zone 2
- Flood Zone 3

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

Data Sources: Environment Agency, 2020; Norfolk Rivers Internal Drainage Board, 2020
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Co-ordinate System: British National Grid

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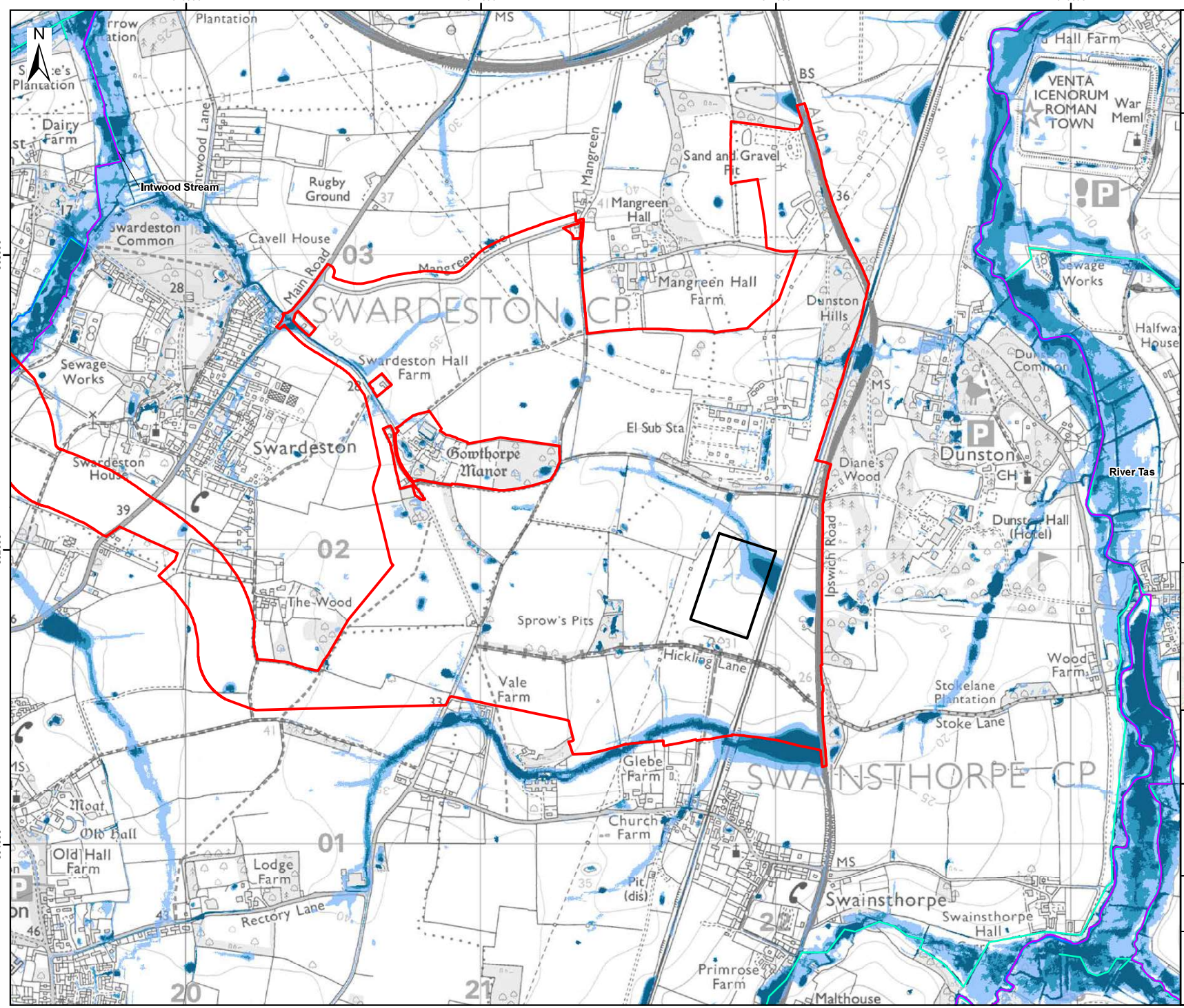

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Figure 20.2.18
Onshore Substation Option 2 - Surface Water Flood Risk

Legend:

- PEIR Boundary
- Onshore Substation Site Option 2
- WFD River Water Bodies
- Main River
- Ordinary Watercourse

Environment Agency Risk of Flooding from Surface Water (RoFSW)

- High Risk – in any given year there is a chance of flooding of greater than 1 in 30 (3.3%)
- Medium Risk - in any given year there is a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%)
- Low - in any given year there is a chance of flooding of between 1 in 1,000 (0.1%) and 1 in 100 (1%)

Data Sources: Environment Agency, 2020; Norfolk Rivers Internal Drainage Board, 2020
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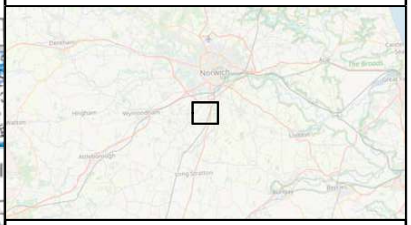

Document No: PB8164-RHD-ZZ-ON-DR-Z-0095

Co-ordinate System: British National Grid

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