WHITE CROSS

White Cross Offshore Wind Farm ES Addendum

Appendix G: Hydrogeological Risk Assessment

Document Code:	FLO-WHI-REP--0017	
Contractor Document Number:	PC2978-RHD-ZZ-XX-RP-Z-0779	
Version Number:	00	
Date:	Issue Date 27/06/2024	
Prepared by:	PO	*Electronic Signature*
Checked by:	CB	*Electronic Signature*
Owned by:	PT	*Electronic Signature*
Approved by Client :	OG	*Electronic Signature*

Version Number	Reason for Issue / Major Changes	Date of Change
00	For Issue	27/06/2024

Table of Contents

Table of Tables

Appendices

Glossary of Acronyms

Acronym	Definition
AOD	Above Ordnance Datum
bgl	Below ground level
BGS	British Geological Survey
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CEMP	Construction Environmental Management Plan
Defra	Department for Environment, Food and Rural Affairs
ECoW	Environmental Clerk of Works
EIA	Environmental Impact Assessment
ES	Environmental Statement
EQS	Environmental Quality Standard
GI	Ground Investigation
HDD	Horizontal Direct Drilling
IDB	Internal Drainage Board
km	Kilometre
km^2	Square kilometre
LLFA	Environment Agency, Lead Local Flood Authority
m	Metre
MLWS	Mean Low Water Springs
MW	Megawatts
MYA	Million years ago
ORS	Old Red Sandstone
OWL	Offshore Wind Ltd
PAH	Polycyclic Aromatic Hydrocarbons
RHDHV	Royal HaskoningDHV
SAC	Special Area of Conservation
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
TJB	Transition Joint Bay
UK	United Kingdom

Glossary of Terminology

Defined Term	Description
Depression Cone	Occurs in an aquifer when groundwater is pumped from a well. In an unconfined aquifer (water table), this is an actual depression of the water levels.
Designated Sites	Nature sites and areas of countryside can be 'designated', which means they have special status as protected areas because of their natural and cultural importance. Protection means that these places: have clear boundaries. have people and laws to make sure that the nature and wildlife are not harmed or destroyed.
Landfall	Where the offshore export cables come ashore.
Link boxes	Underground chambers or above ground cabinets next to the cable trench housing electrical earthing links.
Mean low water springs	The average tidal height throughout a year of two successive low waters during those periods of 24 hours when the range of the tide is at its greatest.
Mitigation	Mitigation measures have been proposed where the assessment identifies that an aspect of the development is likely to give rise to significant environmental impacts, and discussed with the relevant authorities and stakeholders in order to avoid, prevent or reduce impacts to acceptable levels. For the purposes of the EIA, two types of mitigation are defined: • Embedded mitigation: consisting of mitigation measures that are identified and adopted as part of the evolution of the project design, and form part of the project design that is assessed in the EIA. • Additional mitigation: consisting of mitigation measures that are identified during the EIA process specifically to reduce or eliminate any predicted significant impacts. Additional mitigation is therefore subsequently adopted by OWL as the EIA process progresses.
Offshore Export Cables	The cables which bring electricity from the Offshore Substation Platform or the inter-array cables junction box to the Landfall.
Offshore Infrastructure	All of the offshore infrastructure including wind turbine generators, substructures, mooring lines, seabed anchors, Offshore Substation Platform and all cable types (export and inter-array). This encompasses the infrastructure that is the focus of this application and Environmental Statement and the parts of the project consented under Section 36 of the Electricity Act and the Marine and Coastal Access Act 2009.
Onshore Development Area	The onshore area above MLWS including the underground onshore export cables connecting to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland. The onshore development area will form part of a separate Planning application to the Local Planning Authority under the Town and Country Planning Act 1990.
Onshore Export Cables	The cables which bring electricity from MLWS at the Landfall to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland.

Defined Term	Description
Onshore Infrastructure	The combined name for all infrastructure associated with the Project from MLWS at the Landfall to the NG grid connection point at East Yelland. The onshore infrastructure will form part of a separate Planning application to the Local Planning Authority (LPA) under the Town and Country Planning Act 1990.
the Onshore Project	The Onshore Project for the onshore TCPA application includes all elements onshore of MLWS. This includes the infrastructure associated with the offshore export cable (from MLWS), landfall, onshore export cable and associated infrastructure and new onshore substation (if required).
Source Protection Zone 1	This zone is 50 day travel time of pollutant within groundwater to source with a 50 metres default minimum radius.
Source Protection Zone 2	This zone is 400 day travel time of pollutant within groundwater to source. This has a 250 or 500 metres minimum radius around the source depending on the amount of water taken.
Source Protection Zone 3	This is the area around a supply source within which all the groundwater ends up at the abstraction point. This is the point from where the water is taken. This could extend some distance from the source point.
Source Protection Zone 4	This zone is where local groundwater conditions require additional protection.
White Cross Offshore Wind Limited	White Cross Offshore Wind Ltd (WCOWL) is a joint venture between Cobra Instalaciones Servicios, S.A., and Flotation Energy Ltd.
the Project	the Project is a proposed floating offshore windfarm called White Cross located in the Celtic Sea with a capacity of up to 100MW. It encompasses the project as a whole, i.e. all onshore and offshore infrastructure and activities associated with the Project.
White Cross Offshore Windfarm	100MW capacity offshore windfarm including associated onshore and offshore infrastructure.
White Cross Onshore Substation	A new substation built specifically for the White Cross project. It is required to ensure electrical power produced by the offshore windfarm is compliant with NG electrical requirements at the grid connection point at East Yelland.

1. Introduction

1.1 Project Overview

1. White Cross Offshore Windfarm ('the Project') is a proposed offshore windfarm located in the Celtic Sea with a capacity of up to 100MW. This document presents the hydrogeological risks of the Project and relevant mitigation measures. Specifically it considers impacts landward of Mean Low Water Springs (MLWS) during its construction, and operation and maintenance phases on hydrogeological processes and character.

2. The components of the White Cross Offshore Windfarm Project seaward of Mean High Water Springs (MHWS) ('the Offshore Project') are subject to a separate application for consent under Section 36 of the Electricity Act 1989 and for Marine Licences under the Marine and Coastal Access Act 2009. These applications are supported by a separate ES covering all potential impacts seaward of MHWS.

3. The Onshore Project comprises the following key infrastructure requiring planning permission under the Town and Country Planning Act 1990 (TCPA 1990). Above MHWS at Landfall, the Offshore Export Cable will be connected to the Onshore Export Cable via a Transition Joint Bay located in Saunton Sands Car Park. The Onshore Export Cable travels approximately 8km at its maximum inland to a high voltage alternating current onshore substation. This will include a crossing below the Taw Estuary via trenchless technology. A new White Cross Onshore Substation will be constructed to accommodate the connection of the Offshore Project to the existing East Yelland substation and Grid Connection Point.

1.2 Structure of this Hydrogeological Risk Assessment

4. **Table 1** describes the content of each section of the Hydrogeological Risk Assessment.

Table 1 Structure of Hydrogeological Risk Assessment

Section		Description
1	Introduction	Provides an overview of the Project and the purpose of this report.
2	Description of Project	Summarises the proposed trenchless technique approach, identifies trenchless locations and excavation locations where further risk assessment is required.
3	Hydrogeological Risk Assessment	Describes the findings of the risk assessment for each trenchless/cable excavation location and any appropriate or precautionary mitigations.

2. Description of Project

2.1 Programme

5. The anticipated construction start for the Project is 2027. Realistic worst-case for construction of the onshore components of the Project will take 16 months. The operational phase of the Offshore Project, including the WTG, will last for 25 years, however for some elements of the Onshore Project, including the Onshore Substation, a longer design life of 50 years has been used. The decommissioning phase is anticipated to last up to 18 months.

2.2 Use of Trenchless Techniques

6. As described in **Chapter 5: Project Description** of the **Onshore Environmental Statement (ES)**, two major trenchless crossings are required within the Onshore Development Area to navigate underneath the Braunton Burrows Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI) and the Taw-Torridge Estuary SSSI. A third trenchless crossing is required at Sandy Lane / American Road, which is close to (located between) Braunton Burrows SAC/SSSI and the Greenaways and Freshmarsh, Braunton SSSI. As such, potential risks upon hydrogeological receptors arising from drilling activities have been identified (see **Section 3**). Potential risks upon hydrogeological receptors were also assessed within **Chapter 12: Ground Conditions and Contamination** of the **Onshore ES**. No onshore piling works are proposed as part of the Project along the cable corridor.

7. Where major trenchless crossings are located, a hydrogeological risk assessment has been completed in general accordance with the recommended approach in the Environment Agency (EA) and Department for Environment, Food & Rural Affairs (Defra) 'Groundwater protection guides covering: pollution prevention, requirements, permissions, risk assessments and controls (previously covered in GP3)', 2017 and the 'Groundwater position statement' which is presently under review, 2017. These are required to characterise the hydrogeological baseline, identify site-specific hydrogeological risks, and propose site-specific control measures to be implemented. All control and mitigation measures will be further detailed in the Final Construction Environmental Management Plan (CEMP) (an outline version is provided as part of the **Further Environmental Information** submission). Excavations are to be designed where possible to minimise the disturbance of groundwater and the use of best available techniques (BAT), in accordance with the Energy Network Association Guidance 'Resilience to flooding of Grid and Primary Substations', 2018. Applying an appropriate design approach for trenchless crossing techniques, in locations where there is a risk of migration into an aquifer, will enable a sufficient thickness of impermeable material to be

maintained. Therefore, this will prevent migration of contaminants into the aquifer(s) beneath.

2.3 Identification of requirements for Hydrogeological Risk Assessments

8. After analysis of all locations of trenchless crossings, three locations have been identified as having the potential to impact on groundwater and/or designated sites. These locations are listed in **Table 2** with grid references provided.

Table 2 trenchless crossing locations

Site ref. No.	HDD ID	Location	Trenchless entry point		Trenchless exit point	
			Easting	Northing	Easting	Northing
1	**RDX1**	Braunton Burrows / Golf Course	244885	137589	246144	137266
2	**RDX2**	Sandy Lane / American Road	246318	135125	246379	135048
3	**RVX1**	River Taw	247603	132093	246925	133083

9. Braunton Marshes (Site 4) has also been assessed where dewatering is likely to be required for open cut trenching.

10. There are no groundwater Source Protection Zones (SPZ1, SPZ2, SPZ3 and SPZ4) within 1km of the Onshore Export Cable Corridor including the analysed trenchless crossings.

11. There are two known active non potable groundwater abstraction supplies:

- Within the Onshore Export Cable Corridor at Saunton Golf Club there are boreholes utilised for non potable purposes.
- Off site located 350m to the east at land known as Braunton Great Field (spring fed excavation).

3. Hydrogeological Risk Assessment

3.1 Approach

3.1.1 Risk Assessment Method

12. The approach used in this assessment has been completed in accordance with the recommended approach in the Environment Agency and Defra '*Groundwater protection guides covering: requirements, permissions, risk assessments and controls (previously covered in GP3)*', 2017 and the *'Groundwater position statement'* which is presently under review, 2017.

13. The risk ratings applied within each Conceptual Site Model are described in **Table 3**.

Table 3 Risk Ratings

Risk	Description
High	• Contaminants very likely to represent an unacceptable risk to identified receptors. • Site probably not suitable for current/future use. • Enforcement action possible. • Urgent action required. • All mitigation measures for dewatering should be applied urgently to eliminate or reduce the risk.
Medium	• Contaminants likely to represent an unacceptable risk to identified receptors. • Site probably not suitable for current/future use. • Action required in the medium term. • Mitigation measures for dewatering should be applied to eliminate or reduce the risks and if it remains increased, a control measure should be developed to limit and manage the effects of hazards.
Low	• Contaminants may be present but unlikely to create unacceptable risk to identified receptors. • Site probably suitable for current/future use. • Action unlikely to be needed whilst site remains in current use. • Risk level for dewatering is acceptable if all control measures are in place.
Negligible	• If contamination sources are present, they are considered to be minor in nature and extent • Site suitable for current/future use • No further action required. • No measures needed for dewatering.

3.1.2 Sources of Information

14. The following documents and data sources have been consulted in the preparation of this review:

- BGS Geology Viewer (BGS © UKRI, 2024). Access online: https://geologyviewer.bgs.ac.uk/?_ga=2.113156292.1980550315.1708826036-1140089097.1708826036 (accessed on 26/02/2024).
- BGS online Geology of Britain Viewer (BGS, 2023), Hydrogeological map of England and Wales. Access online: https://largeimages.bgs.ac.uk/iip/hydromaps.html?id=england-wales.jp2 (accessed on 26/02/2024).
- BGS The Physical Properties of major aquifers in England and Wales (Environment Agency, 1997).
- HDD Hydrofracture Assessment – Feasibility Stage (Waterman Infrastructure & Environment Limited, 2023).
- Magic Maps website (Defra, 2023), Groundwater Vulnerability Map and Aquifer Designation Map. Access on: Magic Map Application (defra.gov.uk) (accessed on 26/02/2024).
- Principal aquifers in England and Wales. Access online: https://www2.bgs.ac.uk/groundwater/shaleGas/aquifersAndShales/maps/aquifers/home.html (accessed on 26/02/2024).
- **Chapter 12: Ground Conditions and Contamination** of the **Onshore Project ES.**
- **Appendix 12.A: Geo-Environmental Desk Top Study and Preliminary Risk Assessment** of the **Onshore Project ES.**
- **ES Addendum Appendix T: Geotechnical Interpretative Report** (Waterman Infrastructure & Environment Limited, 2024). This report:
    - Provides a description of the site and its surroundings;
    - Summarises the Ground Investigation (GI) field work and laboratory testing undertaken; Present a summary of ground conditions and ground models;
    - Presents characteristic material values;
    - Presents an updated Geotechnical Risk Register; and
    - Provides a preliminary engineering assessment discussing the impacts, if any, that the findings of the GI have on feasibility stage designs / for consideration in FEED.
- **ES Addendum Appendix T Annex 1: Onshore Ground Investigation Factual Report** (Raeburn Drilling & Geotechnical Limited trading as Igne, 2023) informs **Appendix T.** The Factual Report provides technical information on the ground conditions for design and construction of the proposed works and the environmental chemical conditions of the Site.

- Resilience to flooding of Grid and Primary Substations (Energy Network Association Guidance, 2018).
- Tide Times webpage consisting of tide times in the UK vary around the coast depending on the position of the moon, sun and various other influences. Access online: https://www.tidetimes.org.uk/ (accessed on 17/05/2024).
- West, T.R. Geology applied to engineering (Prentice Hall, 1995).

3.1.3 Data Limitations

15. The ground conditions reported relate only to the borehole location at each site and do not necessarily guarantee a continuation of the ground conditions throughout the non-inspected areas of the Onshore Development Area. It is considered that such exploratory holes usually provide a reasonable indication as to the general ground conditions, however these cannot be determined with complete certainty.

16. The detailed consideration of hydrogeological constraints presented in this report is based on high level review of published information sources and recommended approach in the Environment Agency (EA) and Department for Environment, Food & Rural Affairs (Defra) 'Groundwater protection guides covering: requirements, permissions, risk assessments and controls (previously covered in GP3)' 2017 only.

3.2 Site 1: RDX1-Braunton Burrows / Golf Course

3.2.1 Construction Activity

17. The installation of the Onshore Export Cable underneath the Saunton Golf Club and Braunton Burrows SAC will be undertaken using a trenchless technique to avoid direct impacts to the SAC and disruption to the golf course. This area is shown in Sections 1 and 2 in **Annex 1 White Cross Offshore Windfarm Sections**.

18. The choice of a trenchless crossing of the Saunton Golf Club was the result of a site selection process, considering environmental and technical constraints. The site selection process is described in **Chapter 4: Site Selection and Assessment of Alternatives** of the **Onshore ES**.

19. There will be a temporary construction compound at the entry point of the trenchless crossing which will be located within Saunton Sands Car Park, with access to the trenchless entry from the B3231 through the carpark. The exit point will be located within the Onshore Development Area to the east of the crossing, with access via the main construction access from the B3231. The drill rig will be located within the carpark, with the direction of drilling being from west to east. When the works associated with the Landfall and Golf Course

trenchless crossing are completed, the area will be reinstated and the areas within the carpark returned to the operator.

20. The length of the trenchless crossing within this section is approximately 1300m and given the restricted working area within the trenchless entry compound at Saunton Sands Car Park, it will be necessary to pull the HDPE duct from the east side of the golf course to the west, with the full length of the HDPE duct being fabricated along the right of way to the east side of the golf course.

21. The crossing site runs underneath the Braunton Burrows SAC and SSSI, however both launch pits and the reception pit for the golf course crossing are located outside of the SSSI and SAC boundary. Braunton Burrows SAC and SSSI is characterised by an extensive system of coastal sand dunes and flooded slacks, grassland and scrub.

22. The landform within the trenchless crossing under Saunton Golf Club, is characterized by hilly terrain with ordinates reaching about 10m Above Ordnance Datum (AOD) within Saunton Sands Car Park, which is surrounded by hills reaching 25m AOD. The central part of the crossing is characterized by hills with ordinates ranging from 11 to 23m AOD. The trenchless exit point is located on a cultivated field at an ordinate of 13m AOD.

3.2.2 Ground Investigation

23. The area directly where a trenchless crossing is proposed was investigated with three boreholes: BH03, BH04 and BH05. A 50mm diameter perforated standpipe was installed in BH05 to a depth of 10m Below ground level (bgl) for groundwater monitoring purposes. A groundwater level was also taken from BH1 which is located on the cross-section line, in a westerly direction. Groundwater level measurements which were obtained during the GI and monitoring undertaken post GI are summarised in **Table 4**. The Conceptual Site Model (CSM) containing GI locations for this Site is presented in **Annex 2 Site 1: Conceptual Site Model RDX 1-Braunton Burrows / Golf Course**.

24. Summary of Geochemical Laboratory Testing conducted for the purpose of this project is described in **Appendix T: Onshore Ground Investigation Interpretative Report Annex 1: Onshore Ground Investigation Factual Report** (Raeburn Drilling & Geotechnical Limited trading as Igne, 2023) of the **ES Addendum**.

Table 4 Site 1: Groundwater level measurements

Borehole No.	Surveyed Level (m OD)	Date	Depth to Water (m)	Depth (mOD)
BH1	13.19	11/09/23	8.84	4.35
		12/09/23	8.86	4.33
		13/09/23	8.87	4.32
		14/09/23	8.87	4.32
		15/09/23	8.86	4.33
		18/09/23	8.87	4.32
		19/09/23	8.86	4.33
		20/09/23	8.85	4.34
		21/09/23	8.80	4.39
		27/09/23	8.86	4.33
		28/09/23	8.86	4.33
		29/09/23	8.85	4.34
		10/10/23	8.81	4.38
		25/10/23	8.86	4.33
		08/11/23	8.75	4.44
		19/03/24	8.03	5.16
BH5	12.12	21/09/23	1.64	10.48
		27/09/23	1.66	10.46
		28/09/23	1.65	10.47
		29/09/23	1.66	10.46
		10/10/23	1.61	10.51
		25/10/23	1.42	10.70
		08/11/23	1.15	10.97
		19/03/24	0.38	11.74

3.2.3 Geology

25. During the drilling of boreholes as part of the onshore GI, the geology was ascertained to a maximum depth of 20.00m bgl. The geological profile in all boreholes is made of topsoil and Quaternary, Devonian and Carboniferous natural soils/rocks. A summary of the geology encountered during the GI is presented as **Table 5**. The information was obtained from **Appendix T: Onshore Ground Investigation Interpretative Report**.

26. Actual ground conditions found during the GI works supports the publicly available BGS information.

27. According to the bedrock and superficial geology maps of Great Britain, there are three geological formations present within the area of Site 1:

- Pilton Mudstone Formation, which is a sedimentary bedrock formed between 372.2 Million years ago (MYA) and 346.7 MYA during the Devonian and Carboniferous periods.
- Blown Sand, which is a sedimentary superficial deposit formed between 2.588 MYA and the present day during the Quaternary period.
- Tidal Flat Deposits - Clay, silt and sand, which is a sedimentary superficial deposit formed between 11,800 years ago and the present day during the Quaternary period.

Table 5 Site 1: Ground Summary

Stratum	Depth to base of stratum (mbgl)	Elevation to base of stratum (m AOD)	Typical Description
Made Ground – Topsoil (BH05 only)	0.40 (BH05)	11.72 (BH05)	Brown sandy silty topsoil with roots and rootlets. Sand is fine and medium.
Made Ground (BH03 only)	0.60 (BH03)	8.27 (BH03)	Greyish brown very sandy silty fine to coarse angular and subangular Gravel of various lithologies including broken stone, siltstone and mudstone with cobbles. Sand is fine to coarse. Cobbles are angular and subangular of broken stone and mudstone.
Blown Sand	1.20 (BH04) – 7.20 (BH03 & BH05)	1.67 (BH03) – 12.66 (BH04)	Loose to dense brown locally slightly gravelly silty fine and medium Sand with shell fragments. Gravel is fine subangular and subrounded of various lithologies including siltstone, mudstone and sandstone. Brown slightly gravelly silty to very silty fine to coarse Sand with pockets of brown slightly gravelly sandy silt. Gravel is fine to coarse subangular and subrounded of various lithologies including siltstone, mudstone and sandstone. Loose brownish grey and greyish brown very silty fine and medium Sand with very thin dark grey loamy bands. Strong organic odour.
Tidal Flat Deposits (BH04 & BH05 only)	12.00 (BH04) – 12.30 (BH05)	11.22 (BH05) –	Medium dense mottled orange brown and brown very sandy very clayey fine to coarse angular to subrounded Gravel of siltstone and

Stratum	Depth to base of stratum (mbgl)	Elevation to base of stratum (m AOD)	Typical Description
		11.56 (BH04)	mudstone. Locally passing to slightly gravelly slightly sandy silt. Medium dense to dense orange brown slightly gravelly slightly sandy Silt. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of various lithologies including siltstone, mudstone and sandstone. Reddish brown gravelly silty to very silty fine to coarse Sand with cobbles. Gravel is fine to coarse subangular to rounded of various lithologies including siltstone, mudstone and sandstone. Cobbles are subrounded of siltstone.
Pilton Mudstone Formation (Weathered)	8.70 (BH03) – 14.80 (BH04)	-1.08 (BH05) – 0.17 (BH03)	Grey Mudstone recovered as slightly sandy very clayey fine to coarse angular gravel. Sand is fine to coarse. Locally passing to slightly sandy gravelly clay. Grey sandy very clayey fine to coarse angular to subrounded Gravel of siltstone and mudstone with cobbles. Sand is fine to coarse. Cobbles are subangular of siltstone and mudstone. Grey sandy silty fine to coarse angular Gravel of weathered mudstone with local bands of gravelly silt. Sand is fine to coarse. Mottled dark brown and grey slightly gravelly slightly sandy Clay of intermediate plasticity. Sand is fine to coarse. Gravel is fine and medium angular and subangular of mudstone. (Suspected Tidal Flat Deposits interbedded within weathered layer). Grey Mudstone recovered as sandy silty fine to coarse angular gravel with cobbles. Sand is fine to coarse. Cobbles are angular. Grey Siltstone recovered as thinly laminated slightly gravelly slightly sandy silt. Sand is fine to coarse. Gravel is fine to coarse angular and subangular.
Pilton Mudstone Formation	>20 (BH03, BH04 & BH05)	Not proven	Weak to Medium Strong thinly laminated light grey Siltstone interbedded with fine grained light grey sandstone. Rare to occasional

Stratum	Depth to base of stratum (mbgl)	Elevation to base of stratum (m AOD)	Typical Description
			calcite veining. Partially weathered evident as orange brown staining on fracture surface. Moderately weak thinly laminated grey Siltstone with mudstone bands. Distinctly weathered evident as an orange brown staining on fracture surfaces and gravelly clay infilling of fractures.

28. No geotechnical testing was undertaken on samples of Topsoil or the Made Ground in the vicinity of Braunton Burrows / Gold Course crossing.

29. One Particle Size Distribution (PSD) test was undertaken on samples of the Blown Sand. The PSD results indicate the sampled Blown Sand Deposits to be composed predominantly of Gravel sized fractions (46.2%) with secondary components of Sand (28.7%) and Silt (19%) and a minor component of Clay (6.1%). From these results, it can be concluded that the layer has good water permeability. The Uniformity Coefficient for this formation was determined to be 517.2 (BH04 1.2m bgl).

30. Three Particle Size Distribution tests were undertaken on samples of the Tidal Flat Deposits. The PSD results indicate the sampled Tidal Flat Deposits to be composed predominantly of Gravel (48.1%) sized fractions with secondary components of Sand (21.7%) and Silt (23.3%) and a minor component of Clay (6.7%). From these results, it can be concluded that the layer has good water permeability. The Uniformity Coefficient for this formation is ranging from 126.7 (BH04 7.2m bgl) to 676.1 (BH04 4.2m bgl) for samples taken from gravels.

31. Pilton Mudstone Formation has not been tested for water permeability, however mudstone is a clay-rich rock, with distinct mineralogical layering on the sub-millimeter scale so therefore is likely to have a very low natural permeability. The Uniformity Coefficient for this formation has not been determined.

3.2.4 Hydrogeology

32. During the drilling of the boreholes, groundwater strikes were impossible to determine due to the use of water flush during their advancement. The groundwater table was measured during the intrusive investigation in trial pits which were excavated up to 2.50m bgl depth, and in the boreholes designated as monitoring wells which were installed with a nominal 50mm diameter perforated standpipe. A total of six of the boreholes (BH01, BH05, BH09, BH14,

BH15 and BH17) were designated for such purpose, details of which are given on the relevant records. Two of which, BH01 and BH05 are located within Site 1. No trial pits were excavated in Site 1. After installation, groundwater level readings were taken in the instruments during the GI and during a post GI monitoring period.

33. These observations may not give an accurate indication of groundwater conditions, for the following reasons:

- The trial pit or borehole is rarely left standing at the relevant depth for sufficient time for the water level to reach equilibrium.
- A permeable stratum may have been sealed off by the borehole casing during the advancement of the hole.
- There may be seasonal, tidal or other effects within the Site.

34. No groundwater strike observations were recorded in BH03, BH04 and BH05 during their advancement due to the use of water flush. A 50mm diameter perforated standpipe was installed in BH05 to a depth of 10m bgl for monitoring purposes. The average measurement of groundwater table in BH05 in the monitored time period 21/09/2023-8/11/2023 is 1.54m bgl (10.58m AOD). Groundwater monitoring was conducted again, once in March 2024 and the groundwater table was encountered at 0.38m bgl (11.74m AOD). The difference of level is 1.16m.

35. Groundwater level measurements during monitoring period are presented in **Table 4**.

36. Groundwater in borehole BH1, occurs relatively deep due to the hilly terrain in this location (Saunton Sands Car Park). Data collected in March presents a higher groundwater table than that observed over the winter period which may also be representative of Aquifer recharge. Frequent and abundant rainfall may have caused the groundwater table to rise. The catchment area within which the Site 1 is located is generally considered to be a freshwater river catchment without tidal influence, although tidal influence cannot be ruled out.

37. According to the Hydrogeological map of England and Wales, the Site lies within an area of concealed aquifers, aquifers of limited potential and regions without significant groundwater, represented by Quaternary coastal and fluviatile alluvium – mainly silty clays with subordinate sand, gravel and peat in valleys, estuaries and sheltered coastal environments. Sands and gravels in these deposits may provide supplies of uncertain quality, with the risk of saline contamination in coastal areas.

38. General groundwater flow direction of the shallow groundwater aquifer connected with superficial deposits was not possible to assess due to the small

scale of the hydrogeological map (1:625 000). Presumed groundwater flow direction is to the west and was correlated from the groundwater table data from BHs and TPs located further on the cross sections to assess groundwater levels within the Site, however it may vary from actual direction.

39. The superficial deposits (Blown Sand and Tidal Flats Deposits) are classified as a Secondary A Aquifer, which comprises permeable layers that can support local water supplies and may form an important source of base flow to rivers, and Secondary (undifferentiated) Aquifer, which is an aquifer where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the superficial deposit type . These have only a minor value. The vulnerability of these aquifers for superficial contamination is assessed as medium-high.

40. The bedrock (Pilton Mudstone Formation) is classified as a Secondary A Aquifer, which comprises of permeable layers that can support local water supplies and may form an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

41. According to the webpage 'Principal aquifers in England and Wales', the Site 1 is located outside of any of the 11 principal aquifers in England and Wales as designated by the Environment Agency.

42. There are no groundwater Source Protection Zones recorded within 1km of the cable corridor. However, the Geotechnical Interpretative Report provides details of two active groundwater abstractions within the Site. The abstractions are derived from two boreholes at Saunton Golf Club and relate to the abstraction of fresh water from an unspecified source (described as 'Groundwater – Fresh') for the purposes of spray irrigation.

43. During the construction phase, the trenchless crossings would reach beneath the groundwater level to a certain extent. However, this would involve the use of drilling techniques that would not interfere with the flow of groundwater and instead establish a sealed duct path.

44. Dewatering for the execution of a given trenchless crossing will be of a temporary nature that will last for a few days at most and may be needed only at trenchless crossing exit point where the water table stabilizes at ~1.5m bgl. Therefore, with appropriate mitigation measures, it should not adversely affect nearby designated sites, as it will be on a very localised scale. An example of mitigation measures that can also be used for dewatering of this particular trenchless technique exit point is described in more detail in **Section 3.5.6**.

3.2.5 Hydrology

45. Infrastructure associated with the Site 1 lies mostly within Environment Agency's Taw Estuary operational catchment. Taw Estuary (GB108050020000) is a freshwater river catchment without tidal influence. It is drained by Sir Arthur's Pill (Main River) and Ordinary Watercourses. Total catchment area is 15.964km^2. The majority of the Taw Estuary (Sir Arthur's Pill catchment) is characterised by flat pastures interspersed with numerous slow-flowing freshwater channels (Ordinary Watercourses) that make up Braunton Marsh (south of the Site 1). This area was formerly inter-tidal marshland prior to embanking works in the 19th century.

46. A small part of Site 1 (Saunton Sands Car Park) lies within coastal catchment of Braunton Burrows which comprises of small area of land between MLWS and the western watershed of the Taw Estuary (Sir Arthur's Pill catchment). There is only one short (~350m) watercourse in this catchment. It flows from the steep hillside above Saunton Sands Car Park and is then culverted below the car park, until it discharges onto the beach. In addition, the extent of the small sand aquifer that underlies Braunton Burrows is uncertain.

47. The entire system is protected from sea water inundation during tidal floods from the south by the Inner Bank, a sea defence that runs adjacent to the Toll Road, and one way flap valves installed on the Great Sluice structure. It is understood that the Great Sluice is controlled by Braunton Marsh Internal Drainage Board (IDB) but maintained by the Environment Agency.

48. Ordinary Watercourses near Saunton Golf Course: An area characterized by several short, straight, incised channels. Their artificial form and location (set within arable farmland) suggests they are regularly maintained (by dredging/desilting). Channels are typically 1-1.5m and densely overgrown with riparian vegetation. There is no evidence of bedforms. One channel at the southern end of Saunton golf course flows through woodland and appears to have a more natural form.

49. Channels are located in a radius of 2km south-east and two ponds located approximately 500m north of the Site 1.

3.2.6 Conceptual Site Model

50. A summary of the CSM is outlined below and describes the potential sources, potential contaminant migration pathways and potentially exposed receptors associated with the Project. All mitigations listed here will be outlined further in the construction phase final CEMP. A schematic cross section illustrating the CSM is presented in **Annex 2 Site 1: Conceptual Site Model RDX 1-Braunton Burrows / Golf Course.** The pollutant linkages are described in more detail in

Table 3. The risk ratings applied in **Table 6** are defined in **Table 3**. The key components of the conceptual model are discussed in more detail below.

51. **Annex 2 Site 1: Conceptual Site Model RDX 1-Braunton Burrows / Golf Course** illustrates that the drilling level will be conducted in all the geological layers of this cross section and do not extend beneath the siltstone layer which is a low porosity material as well as mudstone. Unlike the overlying permeable sands and gravels, silt is considered to be a low permeability material. Although there is likely to be leakage through the permeable deposits, it is thought that the layer of mudstone will afford some protection to the bedrock aquifer beneath. This conclusion also applies to excavations for entry/exit pits.

52. Given that there will be no excavation/drilling through the vertical depth of the siltstone layer, the direct contamination of groundwater in the bedrock aquifer (Pilton Mudstone Formation) is not a consideration. Any risk to the underlying bedrock aquifers will be from contaminants transported through the lower permeability material (a low porosity layer) which overlies them. The risk can only apply to the shallow aquifer (superficial deposits), which is the shallowest layer of soils where groundwater occurs, through which the trenchless crossing passes. Water from this level is used for agricultural purposes such as irrigating plants, cooling machinery, cattle farming, etc.

53. Based on the groundwater level data from the GI (groundwater occurred in natural soils as an unconfined water table), it is likely that dewatering of groundwater within the superficial deposits will be required during the construction works (especially within the trenchless exit point). Given that this activity is only temporary in duration and unlikely to comprise significant volumes of water, there is unlikely to be a significant impact to the Pilton Mudstone bedrock aquifer, comprising of mudstone overlying siltstone, considering that these are of marginal importance (Secondary A Aquifer).

54. Monitoring will be in place during dewatering to ensure no adverse impacts on surface water flows or downstream surface water abstractions and dewatering will be subject to permitting through the Environment Agency's permitting regime.

55. No contaminants of concern were observed in gathered samples of superficial or Made Ground deposits. Therefore, there is not considered to be a risk to groundwater during the operation of cable ducts in the area which is additionally located outside of the Source Protection Zone 1 and 2.

56. Localised and marginal exceedances of EQS criteria (0.0063 µg/l) for PAH (Fluoranthene with concentration of 0.02 µg/l) have been recorded within the groundwater at the Site (BH05). The concentrations recorded are not considered

to represent a significant risk to identified surface water receptors, especially when factors such as attenuation and dilution are taken into consideration.

57. On the basis of the laboratory data available, risks of leaching of contamination and migration in Controlled Waters are assessed as low and consequently there is no requirement for further assessment or remedial measures.

Table 6 Summary of Conceptual Model for Site 1: RDX 1-Braunton Burrows / Golf Course crossing

Source	Pathway	Receptor	Risk rating	Mitigation proposed	Risk rating following mitigation
Fuel or oil spills from machinery on site	Excavation for entry/exit pits; trenchless crossing bores; surface runoff	Surface water. Groundwater in superficial aquifers (Secondary A and Secondary undifferentiated Aquifers). Groundwater in bedrock aquifer (Secondary A). Saunton Golf Club Borehole No. 1.	High	No refuelling within footprint of excavations. No storage of any potentially contaminative within footprint of excavations. Spill kits and plant nappies will be made available on Site. No welfare facilities on within footprint of excavations. In circumstances of inclement weather, the areas of work would be evaluated by the Environmental Clerk of Works (ECoW) with the Site Manager, and construction would either be suspended, or the ground protected by a trackway system.	Low
Sediment fines	Excavation and earthworks for entry/exit pits; trenchless crossing bores; surface runoff	Surface water. Groundwater in superficial aquifers (Secondary A and Secondary undifferentiated Aquifers). Groundwater in bedrock aquifer (Secondary A).	Low	Prevent silt generation through use of silt trapping. Contain and treat silty water on site – such as by using silt fences at the toe of the stockpiles and at the low end of the excavation and let the water trickle out from the lower end of the silt fence through the grass. Divert silty water into non-sensitive areas away from watercourses to allow dispersal and diffuse drainage, this will be done by either pumping through siltbuster unit or by forming grass channels to direct the water away from sensitive receptors. Exact methodology will be refined in the final CEMP (which will be a planning condition).	Negligible

Source	Pathway	Receptor	Risk rating	Mitigation proposed	Risk rating following mitigation
Contaminated surface water	Over-pumping in the excavations	Surface water. Groundwater in superficial aquifers (Secondary A and Secondary undifferentiated Aquifers). Groundwater in bedrock aquifer (Secondary A). Saunton Golf Club Borehole No. 1.	Medium	Discharge locations for temporary discharges during construction will be agreed with the Environment Agency, Lead Local Flood Authority (LLFA) and IDB, and discharge is at a controlled rate in accordance with the approved discharge rate. The Contractor will undertake consultation with the Environment Agency prior to any dewatering activities occurring within all locations of trenchless crossings covered by this document to determine the appropriate disposal option for these arisings.	Low
Contaminated groundwater from superficial aquifer	Creation of new pathways for contamination as a result of excavations and Trenchless drilling	Groundwater in bedrock aquifer (Secondary A). Saunton Golf Club Borehole No. 1.	Medium	No discharge to ground of any water abstracted from the excavations during construction activities. Water is to be discharged via settlement lagoons.	Low

Source	Pathway	Receptor	Risk rating	Mitigation proposed	Risk rating following mitigation
Drilling fluid breakout	Trenchless crossing drilling	Groundwater in superficial aquifers (Secondary A and Secondary undifferentiated Aquifers). Groundwater in bedrock aquifer (Secondary A).	High	Monitoring of drilling fluids parameters for the required ground conditions and to quickly identify and limit any losses which may indicate a breakout. Measures to remove the released bentonite if a significant volume of material is contained – for example pumped back to the bentonite lagoon within the trenchless crossing compound, or pumped to the interceptor drains, or pumped to the mobile settling tanks that will be used for managing sediment traps. All of the mitigation measures will be included in a final Bentonite Management Plan (**Outline Bentonite Management Plan** (WHX001-FLO-CON-ENV-PLN-0012) is provided as part of the **Further Environmental Information** submission).	Medium

Source	Pathway	Receptor	Risk rating	Mitigation proposed	Risk rating following mitigation
Dewatering	Area outlined by the extent of the depression cone around excavations and earthworks for entry/exit pits.	Surface water. Groundwater in superficial aquifers (Secondary A and Secondary undifferentiated Aquifers). Flora and Fauna. Barunton SAC/SSSI Saunton Golf Club Borehole No. 1.	Medium	Use groundwater monitoring during dewatering to ensure no adverse impacts on surface water flows or downstream surface water abstractions. Divert pumped water to surface water, including surface watercourses. Irrigate adjacent Designated Sites by absorption wells, irrigation systems or infiltration ditches. It is usually sufficient to carry out the discharge of drainage water within the depression cone. Use principle of closing water circuits and the concept of compensation measures. Works and measures will be undertaken under an EA permit and thus will be agreed with the Environment Agency during the permit application process.	Low

58. Additionally, **Appendix S: Hydrofracture Assessment Report** of the **ES Addendum** (Waterman Infrastructure & Environment Limited, 2023) demonstrates that there is no significant risk of frac-out along the bore profile with the exception of the final stages of the bore where the profile begins to rise resulting in loss of cover. This is unavoidable but the effects can be easily controlled/mitigated by putting appropriate site measures in place such as sandbagging and/or casing in line with general trenchless crossing working methodologies, to reduce and contain any hydrofracture. All drill fluids used will be self-flocculating, environmentally inert and CEFAS approved.

3.2.7 Summary

59. No contaminants of concern were observed in gathered samples of superficial or Made Ground deposits. Therefore, there is not considered to be a risk to groundwater during the operation of cable ducts in the area which is additionally located outside of the Source Protection Zone 1 and 2.

60. With the exception of organic odours recorded in several boreholes which are considered to be associated with the presence of vegetation and/or peat within natural soils, no visual or olfactory evidence of contamination was recorded within the soils along the proposed cable route. These observations generally align with the results of the chemical testing undertaken, suggesting an absence of significant contamination.

61. Localised and marginal exceedances of EQS criteria (0.0063 µg/l) for PAH (Fluoranthene with concentration of 0.02 µg/l) have been recorded within the groundwater at the Site (BH05). The concentrations recorded are not considered to represent a significant risk to identified surface water receptors, especially when factors such as attenuation and dilution are taken into consideration.

62. Monitoring will be in place during dewatering to ensure no derogation of surface water flows or downstream surface water abstractions.

63. **Appendix S: Hydrofracture Assessment Report** demonstrates that there is no significant risk of frac-out along the bore profiles with the exception of the final stages of the bore where the profile begins to rise resulting in loss of cover.

3.3 Site 2: RDX2-Sandy Lane / American Road

3.3.1 Construction Activity

64. Throughout Sections 3 and 4 (**Annex 1 White Cross Offshore Windfarm Sections**) of the Onshore Export Cable Corridor, the cable installation method will be mainly open-cut trenching with small sections of trenchless techniques for main watercourses, road, and sensitive habitat crossings.

65. Section 3 runs southeast and then south from the eastern edge of Saunton Golf Club through arable fields and crossing 11 field boundaries and drainage ditches before extending to the field to the north of Sandy Lane Car Park. Section 4 passes south extending from the east of Sandy Lane Car Park to the Taw Estuary Crossing.

66. Activities at Site 2 relate to the location at which the Onshore Export Cable Corridor will cross from Section 3 to the pastural fields to the east of Sandy Lane Car Park. This will be undertaken using trenchless technology to avoid disturbance to vegetation on the boundaries of Braunton Burrows SAC and Greenaways and Freshmarsh, Braunton SSSI, and disruption/closure of the road.

67. The proposed technique for the crossing in this location, as identified in the Constructability Technical Note of **Appendix T: Onshore Ground Investigation Interpretative Report** of the **Onshore ES**, will be a direct pipe technique using a Piperam to install ducts directly without the need for a drilling rig. The ducts will be installed a minimum of 2m below the bottom of the road (at its lowest point).

68. The terrain within the trenchless crossing under Sandy Lane/American Road, is characterized by flat terrain with ordinates of about 7-8m AOD. The land is used for agricultural purposes and as meadows.

3.3.2 Ground Investigations

69. The area was investigated with exploratory boreholes BH08 and BH09 & TP07 and TP08. A 50mm diameter perforated standpipe was installed in BH09 to a depth of 10m bgl for groundwater monitoring purposes. Groundwater level was also monitored in two trial pits during the intrusive GI, TP07 and TP08. Groundwater level measurements which were obtained during the GI and monitoring undertaken post GI are summarised in **Table 7**. A CSM containing GI locations for this Site is presented in **Annex 3 Site 2: Conceptual Site Model RDX2-Sandy Lane / American Road**.

70. Summary of Geochemical Laboratory Testing conducted for the purpose of this project is described in **Appendix T: Onshore Ground Investigation Interpretative Report Annex 1: Onshore Ground Investigation Factual Report** (Raeburn Drilling & Geotechnical Limited trading as Igne, 2023) of the **ES Addendum**.

Table 7 Site 2: Groundwater level measurements

Borehole No.	Surveyed Level (m OD)	Date	Depth to Water (m)	Depth (mOD)
BH9	6.03	11/09/23	0.15	5.88
		12/09/23	0.15	5.88
		13/09/23	0.18	5.85
		14/09/23	0.15	5.88
		15/09/23	0.12	5.91
		18/09/23	0.10	5.93
		19/09/23	0.10	5.93
		20/09/23	0.10	5.93
		21/09/23	0.10	5.93
		27/09/23	0.10	5.93
		28/09/23	0.10	5.93
		29/09/23	0.10	5.93
		10/10/23	0.15	5.88
		25/10/23	0.00	6.03
		08/11/23	0.00	6.03
		25/03/24	-0.16	6.19
TP07	8.15	14/09/23	1.40	6.75
TP08	5.20	15/09/23	1.60	3.60

3.3.3 Geology

71. During the drilling of Boreholes for the onshore GI, the geology was assessed to a maximum depth of 10.20m bgl. The geological profile in all boreholes is made of topsoil and Quaternary, Devonian and Carboniferous natural soils/rocks. A summary of the geology encountered during the GI is presented as **Table 8**. The information was obtained from the GI reports.

72. Actual ground conditions found during the GI works supports the publicly available BGS information, additionally Blown Sand deposit was encountered in BH08.

73. According to the bedrock and superficial geology maps of Great Britain, there are two geological formations present within the Site:

- Pilton Mudstone Formation which is a sedimentary bedrock formed between 372.2 MYA and 346.7 MYA during the Devonian and Carboniferous periods

- Tidal Flat Deposits – Clay, silt and sand which is a sedimentary superficial deposit formed between 11.8 thousand years ago and the present during the Quaternary period.

Table 8 Site 2: Ground Summary

Stratum	Depth to base of stratum (mbgl)	Elevation to base of stratum (m AOD)	Typical Description
Blown Sand (BH08 only)	6.8 (BH08)	1.14 (BH08)	Very loose to loose brownish grey silty fine and medium Sand.
Tidal Flat Deposits	>10.2 (BH08 & BH09)	Not proven	Medium dense to dense brownish grey slightly gravelly sandy Silt with pockets of sandy clay. Sand is fine to coarse. Gravel is fine and medium subangular and subrounded of various lithologies including sandstone, siltstone and mudstone. Very loose to loose grey silty fine and medium Sand with pockets of dark brown pseudofibrous peat and traces of vegetation. Organic odour. Mottled brown and grey slightly gravelly sandy Clay of low plasticity. Sand is fine to coarse. Gravel is fine and medium subangular and subrounded of various lithologies including siltstone, mudstone and sandstone. Mottled brown and grey very sandy clayey fine to coarse subangular and subrounded Gravel of various lithologies including sandstone, siltstone and mudstone. Sand is fine to coarse. Dense brown slightly silty fine to coarse Sand and fine to coarse angular to rounded Gravel of various lithologies including siltstone, sandstone and quartzite with cobbles. Cobbles are subrounded and rounded of siltstone.
Pilton Mudstone Formation	Not proven	Not proven	Mudstone / Siltstone (Not Proven).

74. Blown Sand was encountered in BH08 only, down to a maximum depth 6.8m bgl. The typical description of the Blown Sand was: Very loose to loose brownish grey silty fine and medium SAND. No PSD tests of Blown Sand were undertaken. The Uniformity Coefficient for this formation has not been determined.

75. Two PSD tests were undertaken on samples of the Tidal Flat Deposits. The PSD results indicate the sampled Tidal Flat Deposits to be extremely variable with primary components of Gravel (28.6%), Sand (32.3%) and Silt (41.4%) and secondary components of Cobbles (10%) and Clay (12.2%). From these results, it can be concluded that the layer has good water permeability. The Uniformity Coefficient for this formation was determined to be 118.8 (BH09 7.0m bgl).

3.3.4 Hydrogeology

76. During the drilling of the boreholes, groundwater strikes were impossible to determine due to the use of water flush during their advancement. The groundwater table was measured during the intrusive investigation in trial pits which were excavated up to 2.50m bgl depth, and in the boreholes designated as monitoring wells with a nominal 50mm diameter perforated standpipe. A total of six of the boreholes (Nos. BH01, BH05, BH09, BH14, BH15 and BH17) were designated for such purpose, details of which are given on the relevant records. One of which, BH09 is located within Site 2. Two trial pits, TP07 and TP08, were excavated in Site 2. After installation, groundwater level readings were taken in the instruments during the GI and during a post GI monitoring period.

77. These observations may not give an accurate indication of groundwater conditions, for the following reasons:

- The trial pit or borehole is rarely left standing at the relevant depth for sufficient time for the water level to reach equilibrium.
- A permeable stratum may have been sealed off by the borehole casing during the advancement of the hole.
- It may have been necessary to add water flush to the borehole to facilitate progress.
- There may be seasonal, tidal or other effects within the Site.

78. The average measurement of groundwater table in BH09 in the monitoring period 11/09/2023-08/11/2023 is 0.11m bgl (5.92m AOD). Groundwater monitoring was conducted again, once in March 2024 and groundwater table was encountered at -0.16m bgl (11.74m AOD). The difference of level is 0.27m. In addition to measurement of groundwater table in boreholes during the monitoring period, a groundwater table was also measured in trial pits during the GI located nearby the trenchless location. In this case, groundwater was encountered at a depth of 1.40m bgl (6.75m AOD) in TP07 and at a depth of 1.60m bgl (3.60m AOD) in TP08. Trial pits were not included in continuous groundwater monitoring. Groundwater was measured in them only once after excavation.

79. Groundwater level measurements during monitoring period are presented in **Table 7.**

80. The March data presents a higher groundwater table than that observed in winter. Frequent and abundant rainfall may have caused the groundwater table to rise. The level of groundwater above the ground surface in BH09 may be due to poor protection of the standpipe in which the measurements were taken. As a result of poor protection, precipitation may have entered the standpipe. It is worth mentioning that the aquifer is characterized by slower water flow compared to surface water. Another reason for the elevated groundwater level in the standpipe may be the reduced permeability of surface formations caused by plants/different structure of soil surface which may cause temporarily increased hydrostatic pressure. The catchment area within which the Site 2 is located is generally considered to be a freshwater river catchment without tidal influence, although tidal influence cannot be ruled out.

81. According to the Hydrogeological map of England and Wales, the Site lies within an area of concealed aquifers, aquifers of limited potential and regions without significant groundwater, represented by Quaternary coastal and fluviatile alluvium – mainly silty clays with subordinate sand, gravel and peat in valleys, estuaries and sheltered coastal environments. Sands and gravels in these deposits may provide supplies of uncertain quality, with the risk of saline contamination in coastal areas.

82. General groundwater flow direction of the shallow groundwater aquifer connected with superficial deposits was not possible to assess due to the small scale of the hydrogeological map (1:625 000). Presumed groundwater flow direction is to the south-east and was correlated from groundwater table data from BHs and TPs located further afield assess groundwater levels within the Site, however it may vary from actual direction.

83. The superficial deposits (Blown Sand and Tidal Flat Deposits) are classified as Secondary (undifferentiated) Aquifer which is an aquifer where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value. The vulnerability of this aquifer for superficial contamination is assessed as medium.

84. The bedrock (Pilton Mudstone Formation) is classified as a Secondary A Aquifer, which comprises of permeable layers that can support local water supplies and may form an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

85. According to the webpage 'Principal aquifers in England and Wales', the Site is located outside of 11 principal aquifers in England and Wales designated by The Environment Agency.

3.3.5 Hydrology

86. Infrastructure associated with the Site 2 lies within Environment Agency's Taw Estuary operational catchment.. Taw Estuary (GB108050020000) is a freshwater river catchment without tidal influence. It is drained by Sir Arthur's Pill (Main River) and Ordinary Watercourses. Total catchment area is 15.964km^2.

87. The majority of the Taw Estuary (Sir Arthur's Pill catchment) is characterised by flat pastures interspersed with numerous slow-flowing freshwater channels (Ordinary Watercourses) that make up Braunton Marsh. This area was formerly inter-tidal marshland prior to embanking works in the 19th century.

88. Sir Arthur's Pill flows around the western side of Braunton Marsh and then in an easterly direction, before being joined by Boundary Drain. The lower course of Sir Arthur's Pill discharges to a channel at the edge of Horsey Island via a control structure (i.e. the Great Sluice). The Horsey Island channel then discharges to the River Caen and wider Taw-Torridge estuary.

89. Boundary Drain divides from Sir Arthur's Pill immediately west of Braunton Great Field and follows a southerly and then north-easterly direction around the perimeter of Braunton Marsh.

90. It is understood that the Boundary Drain carries some of the water diverted off Sir Arthur's Pill, via a sluice gate control, around to land along the western and eastern boundary extents of the Marshes as well as draining the same land during wetter periods and following significant rainfall events when runoff from the land is increased.

91. Sir Arthur's Pill at Sandy Lane and near America Road Car Park is ~2-3 m wide at bank top and similar at bank base. The channel is much less incised at these locations and there is no evidence of recent desilting/dredging. Near America Road car park the channel has a gently sinuous planform (as it follows a pre-drainage paleochannel), and the channel is flanked by a ~5 m wide marshy margin. Bank full depth is ~1.5 m.

92. Boundary Drain, Sir Arthur's Pill and River Caen Pill are located respectively approx. 150m, 500m and 2,000m east of the Site 2.

3.3.6 Braunton Marshes Dewatering

93. Dewatering processes for the purpose of the trenchless crossing will take place in close proximity of Braunton Burrows SAC and SSSI and Greenaways and Freshmarsh, Braunton SSSI. The designated sites located within the vicinity are summarised in **Table 9.** To determine the impact of trenchless crossings on designated sites, the following calculations were made.

Table 9 Designated sites

Designated Site	Designated features	Distance from entry point (m)	Distance from exit point (m)
Braunton Burrows SAC	2120 "Shifting dunes along the shoreline with Ammophila arenaria (""white dunes"")"; 2130 "Fixed coastal dunes with herbaceous vegetation (""grey dunes"")"; 2170 Dunes with Salix repens ssp. Argentea (Salicion arenariae); 2190 Humid dune slacks; 1140mudflats and sandflats not covered by seawater at low tide; 1395 Petalwort.	27.6	36.3
Braunton Burrows SSSI	Braunton Burrows is one of the largest dune systems in Britain, about 5km long north-south and 1km wide, with lime-rich dune sup to 30m high, and an extensive system of variably-flooded slacks, grassland and scrub, inland of a wide sandy foreshore. There is thus a variety of habitats for many flowering and lower plants, and for many birds and invertebrates. Several species are nationally rare or vulnerable. There are also important features of geological interest.	27.6	36.3
Greenaways and Freshmarsh, Braunton SSSI	This site is of special interest for its herb-rich marshy grasslands and also the rich water-plant communities occurring in the drainage ditches. These habitats are of particular importance as they now have a very restricted distribution in Devon. The site occupies the northern fringe of Braunton Marsh, the land being generally flat and low-lying with a high water table. The soils are derived from marine alluvium with a peaty surface horizon in places.	29.4	38.6

3.3.6.1 Depression cone of Entry Point:

94. The groundwater level measured in TP07 which is located upstream of Entry Point was taken as the reference level and was encountered at a depth of 1.40m bgl. Cable depth was assumed to be 2m, and the depth of the groundwater table lowering was assumed to be 0.5m below the bottom of the cable trench.

$$R = 575s\sqrt{kH} = 575 \times 1.1\sqrt{0.00223 \times 6.75} = 24.54\ [m]$$

$$s = H - ho = 6.75 - 5.65 = 1.1\ [m]$$

k – filtration coefficient [m/h]

H – height of the static water table [m]

ho – height of the dynamic water table in the well [m]

s = H – ho depression of the water table [m]

R – radius of the depression cone [m]

3.3.6.2 Depression cone of Exit Point:

95. The average measurement of groundwater table in BH09 in monitored time period 11/09/2023-08/11/2023 is 0.11m bgl (5.92m AOD). Cable depth was assumed to be 2m, and the depth of the groundwater table lowering was assumed to be 0.5m below the bottom of cable trench.

$$R = 575s\sqrt{kH} = 575 \times 2.39\sqrt{0.00223 \times 2.39} = 100.33\ [m]$$

$$s = H - ho = 5.92 - 3.53 = 2.39\ [m]$$

96. The filtration coefficient of 2.23×10^{-3} [m/s] was assumed for the layer of medium sands occurring within this area (West, T.R., 1995), however this is a worst case scenario and according to the borehole logs, the superficial layer in BH07 includes silty fine to medium sands which may be characterised by lower permeability and, therefore, a smaller depression cone during dewatering. A filtration coefficient was not determined in the **Appendix T Annex 1** (Raeburn Drilling & Geotechnical Limited trading as Igne, 2023).

97. The depression cones were calculated for a single well located at the entry and exit points of this particular trenchless crossing, these parameters are only schematic and will vary depending on the adopted dewatering parameters, which should be included in the Dewatering Design such.

98. Taking into account the calculated depression cones, the first one formed during the dewatering of the trenchless crossing entry point will not extend into the adjacent designated sites, however the second one formed for the trenchless crossing exit point will extend into adjacent SAC and both SSSIs.

99. It should be noted that the depressions caused by drainage are sometimes smaller than the seasonal fluctuations of the water table. The size of the depression cone radius is influenced by both natural conditions and the lowering of the water table and pumping time. Working in trenches below the groundwater level requires continuous dewatering in order to work in overland conditions, but also to ensure safety for both the excavation work, the crew and the equipment or any installations. Water from the depression cone received by

the drainage system is mostly diverted to surface water, including surface watercourses.

100. A significantly negative impact of depression cones on the environment is the depletion of groundwater intakes located within their boundaries. This results in a lowering of the water table and consequently an increase in the height of water extraction and an increase in the energy consumption of the water intake or the need to modernise it. In addition, a change in hydrological conditions as a result of a lowering of the groundwater table can cause the water supply to the root zone of plants to disappear. As a further consequence, this may result in a temporary transformation of habitats towards the disappearance of flora and fauna of hydrogenic habitats (organisms occurring in local depressions of land, peat bogs, river valleys and surface waters), usually leading to a decrease in their natural and mostly economic value.

101. The impact of dewatering, if required, on designated sites leads to the need for a system to protect them, e.g. by irrigating them (in this case, it is suggested that absorption wells, irrigation systems or infiltration ditches, for example, be constructed). As a mitigation measure, it is usually sufficient to carry out the discharge of drainage water within the depression cone. The above measures are part of the principle of closing water circuits and the concept of compensation measures. However, a possible impact of the depression cone on designated area is identified and an assessment of the impact of the Project on these areas has therefore been undertaken in **Appendix A: Response to Natural England Annex 2: Hydrogeology Technical Note** of this **ES Addendum**.

102. It should be noted that the greatest depressions of the water table form immediately adjacent to the pit. In the peripheral part of the depression cone, these depressions are not significant (the depression curve is similar to a logarithmic scale) and, in this case, can range up to several centimeters, as the trenchless crossing exit point is not located directly next to the designated sites, but is approximately 40m from the nearest point of the abovementioned sites.

103. Dewatering for the execution of a given trenchless crossing will be of a temporary nature that will last for a few days at most. Therefore, with appropriate mitigation measures, they should not adversely affect nearby protected areas even at a very localised scale.

104. Additionally, **Section 1.3** of **Appendix 5.A: Braunton Burrows and Taw Estuary Crossing Method Statement** of the **Onshore ES** describes rationale for the use of trenchless crossing underneath the Braunton Burrows and the Taw Estuary and ensures that potential impacts on designated sites and the wider estuarine and riverine environment are avoided as part of the Project's embedded mitigation. This point should be also applied to the Sandy Lane /

American Road crossing. It is also advised to avoid the direct disturbance of surface drainage patterns and surface flows of the surface water catchment which is linked to its associated flood risk.

105. As outlined in **Chapter 5: Project Description Table 5.3: Onshore cable parameters**, depth of cable trench varies from 1.6m bgl to 1.9m bgl.

3.3.7 Conceptual Site Model

106. A summary of the CSM is outlined below and describes the potential sources, potential contaminant migration pathways and potentially exposed receptors associated with the Project. A schematic cross section illustrating the CSM is presented in **Annex 3 Site 2: Conceptual Site Model RDX2-Sandy Lane / American Road**. The pollutant linkages are described in more detail in **Table 3**. The risk ratings applied in **Table 10** are defined in **Table 3**. The key components of the conceptual model are discussed in more detail below.

Table 10 Summary of Conceptual Model for Site 2: RDX2-Sandy Lane / American Road crossing

Source	Pathway	Receptor	Risk rating	Mitigation proposed	Risk rating following mitigation
Fuel or oil spills from machinery on site	Excavation for entry/exit pits; surface runoff	Surface water. Groundwater in superficial aquifers (Secondary undifferentiated Aquifer). Groundwater in bedrock aquifer (Secondary A Aquifer). Braunton Burrows SAC/SSSI Greenaways and Freshmarsh, Braunton SSSI.	High	No refuelling within footprint of excavations. No storage of any potentially contaminative within footprint of excavations. Spill kits and plant nappies will be made available on Site. No welfare facilities within footprint of excavations. In circumstances of inclement weather, the areas of work would be evaluated by the Environmental Clerk of Works (EcoW) with the Site Manager, and construction would either be suspended, or the ground protected by a trackway system.	Low
Sediment fines	Excavation and earthworks for entry/exit pits; surface runoff	Surface water. Groundwater in superficial aquifers (Secondary undifferentiated Aquifer). Groundwater in bedrock aquifer (Secondary A Aquifer). Braunton Burrows SAC/SSSI	Low	Prevent silt generation through use of silt trapping. Contain and treat silty water on site – such as by using silt fences at the toe of the stockpiles and at the low end of the excavation and let the water trickle out from the lower end of the silt fence through the grass. Divert silty water into non-sensitive areas away from watercourses to allow dispersal and diffuse drainage, this will be done by either pumping through siltbuster unit or by forming grass channels to direct the water away from sensitive	Negligible

Source	Pathway	Receptor	Risk rating	Mitigation proposed	Risk rating following mitigation
		Greenaways and Freshmarsh, Braunton SSSI.		receptors. Exact methodology will be refined in the final CEMP.	
Contaminated surface water	Over-pumping in the excavations	Surface water. Groundwater in superficial aquifers (Secondary undifferentiated Aquifer). Groundwater in bedrock aquifer (Secondary A Aquifer). Braunton Burrows SAC/SSSI Greenaways and Freshmarsh, Braunton SSSI.	Medium	Discharge locations for temporary discharges during construction will be agreed with the Environment Agency, LLFA and IDB, and discharge is at a controlled rate in accordance with the approved discharge rate. The Contractor will undertake consultation with the Environment Agency prior to any dewatering activities occurring within all locations of trenchless crossings covered by this document to determine the appropriate disposal option for these arisings.	Low
Contaminated groundwater from superficial aquifer	Creation of new pathways for contamination as a result of excavations	Groundwater in bedrock aquifer (Secondary A Aquifer). Braunton Burrows SAC/SSSI Greenaways and Freshmarsh, Braunton SSSI.	Low	No discharge to ground of any water abstracted from the excavations during construction activities. Water is to be discharged via settlement lagoons.	Negligible

Source	Pathway	Receptor	Risk rating	Mitigation proposed	Risk rating following mitigation
Drilling fluid breakout	Trenchless crossing drilling	Groundwater in superficial aquifers (Secondary undifferentiated Aquifer). Groundwater in bedrock aquifer (Secondary A Aquifer). Braunton Burrows SAC/SSSI Greenaways and Freshmarsh, Braunton SSSI.	Medium	Monitoring of drilling fluids parameters for the required ground conditions and to quickly identify and limit any losses which may indicate a breakout. Measures to remove the released bentonite if a significant volume of material is contained – for example pumped back to the bentonite lagoon within the trenchless crossing compound, or pumped to the interceptor drains, or pumped to the mobile settling tanks that will be used for managing sediment traps. All of the mitigation measures will be included in a final Bentonite Management Plan (**Outline Bentonite Management Plan** (WHX001-FLO-CON-ENV-PLN-0012) is provided as part of the **Further Environmental Information** submission).	Low

Source	Pathway	Receptor	Risk rating	Mitigation proposed	Risk rating following mitigation
Dewatering	Area outlined by the extent of the depression cone around excavations and earthworks for entry/exit pits.	Surface water. Groundwater in superficial aquifers (Secondary A and Secondary undifferentiated Aquifers). Flora and Fauna. Braunton Burrows SAC/SSSI Greenaways and Freshmarsh, Braunton SSSI.	High	Use groundwater monitoring during dewatering to ensure no adverse impacts on surface water flows or downstream surface water abstractions. Divert pumped water to surface water, including surface watercourses. Irrigate adjacent Designated Sites by absorption wells, irrigation systems or infiltration ditches. It is usually sufficient to carry out the discharge of drainage water within the depression cone. Use principle of closing water circuits and the concept of compensation measures. Works and measures will be undertaken under an EA permit and thus will be agreed with the Environment Agency during the permit application process.	Medium

107. **Annex 3 Site 2: Conceptual Site Model RDX2-Sandy Lane / American Road** illustrates that the drilling level will not reach clay, silt and gravel layers and will be conducted only in the sand layer. Sand is a non-cohesive material with high permeability, however underlying silts and clays are a cohesive material with lower permeability than the overlying sands. It is worth noting that the silt layer does not extend over the entire profile. Although there is likely to be leakage through the deposits, it is thought that this layer will afford some protection to the bedrock Secondary A Aquifer beneath. This conclusion also applies to excavations for entry/exit pits. Geological profile was investigated to 10m bgl.

108. Given that there will be no excavation/drilling through the underlain layers, the direct contamination of groundwater in the concealed aquifers is not a consideration. Any risk to the underlying concealed aquifers will be from contaminant transport through the lower permeability material which overlies it. The risk can only apply to the shallow aquifer, which is the shallowest layer of soils where groundwater occurs, through which the trenchless crossing passes. Water from this level is used for domestic purposes such as irrigating plants, cooling machinery, cattle farming, etc.

109. Based on the groundwater level data from the monitoring campaign (groundwater occurred in natural soils as an unconfined water table) and it is likely that dewatering of groundwater within the superficial deposits will be required during the construction works. Given that this activity is only temporary in duration and unlikely to comprise significant volumes of water, there is unlikely to be a significant impact to the aquifers beneath considering that these are of marginal importance.

110. Monitoring will be in place during dewatering to ensure no adverse impacts on surface water flows or downstream surface water abstractions and dewatering will be subject to permitting through the Environment Agency's permitting regime.

111. No contaminants of concern were observed in gathered samples of superficial or Made Ground deposits. Therefore, there is not considered to be a risk to groundwater during the operation of cable ducts in the area which is additionally located outside of the Source Protection Zone 1 and 2.

112. With the exception of organic odours recorded in BH09 which are considered to be associated with the presence of vegetation and/or peat within natural soils, no visual or olfactory evidence of contamination was recorded within the soils along the proposed cable route. These observations generally align with the results of the chemical testing undertaken, suggesting an absence of significant contamination.

113. No exceedances of EQS criteria have been recorded within the groundwater at the Site.

114. This minor trenchless crossing Site was not covered by **Appendix S: Hydrofracture Assessment Report**.

3.3.8 Summary

115. No contaminants of concern were observed in gathered samples of superficial or Made Ground deposits. Therefore, there is not considered to be a risk to groundwater during the operation of cable ducts in the area which is additionally located outside of the Source Protection Zone 1 and 2.

116. No exceedances of EQS criteria have been recorded within the groundwater at the Site.

117. Monitoring will be in place during dewatering to ensure no derogation of surface water flows or downstream surface water abstractions.

118. Dewatering for the execution of a given trenchless crossing will be of a temporary nature that will last for a few days at most. Therefore, with appropriate mitigation measures, they should not adversely affect nearby protected areas, even at a very localised scale.

119. This Site was not covered by the **Appendix S: Hydrofracture Assessment Report**.

3.4 Site 3: RVX1-River Taw

3.4.1 Construction Activity

120. Site 3 is the location of the Taw Estuary Crossing and extends from the northern edge to the southern edge of the River Taw (see Section 5 in **Annex 1 White Cross Offshore Windfarm Sections**). The methodology to install the Onshore Export Cable underneath the River Taw is a trenchless technique which is expected to be Horizontal Directional Drill (HDD) or Direct Pipe. A temporary construction compound will be required at the entry point of this crossing on the south side to facilitate the trenchless solution. The exit point, on the north side, will have a fenced working area but no construction compound. Both the entry point compound and exit point working area will be back a minimum of 16m from the sea defences.

121. The use of a trenchless technique will avoid any direct impacts on the River Taw and Taw-Torridge Estuary SSSI.

122. The trenchless technique is drilled from a temporary construction compound located on the south side of the Taw Estuary outside of the Taw-Torridge Estuary

SSSI. It will exit at a second temporary construction compound to on the north side of the Taw Estuary, west of the Crow Beach House (the White House). This compound will be outside of the Braunton Burrows SAC, Braunton Burrows SSSI, and the Taw- Torridge Estuary SSSI.

123. The length of the trenchless technique will be approximately 1300 m from the entry point to the exit point. The stringing out of the HDPE ducting to be used for trenchless crossing will undertaken on the north side of the Taw Estuary.

124. When the works associated with the Taw Estuary crossing are completed the area will be reinstated to minimise disruption.

125. The landforms within the trenchless crossing under the Taw River, are characterized by flat terrain on both banks of the river with ordinates of about 4m AOD. The land is undeveloped and used as grassland/pasture.

3.4.2 Ground Investigations

126. The area was investigated with exploratory boreholes BH14 and BH15 & TP13 to TP14. A 50mm diameter perforated standpipe was installed in BH14 and BH15 to a depth of 10m bgl for groundwater monitoring purposes. Groundwater level was also monitored in two trial pits: TP13 and TP14. Groundwater level measurements which were obtained during the GI and monitoring undertaken post GI are summarised in **Table 11**. A CSM containing GI locations for this Site is presented in **Annex 4**.

127. Summary of Geochemical Laboratory Testing conducted for the purpose of this project is described in **Appendix T: Onshore Ground Investigation Interpretative Report Annex 1: Onshore Ground Investigation Factual Report** (Raeburn Drilling & Geotechnical Limited trading as Igne, 2023) of the **ES Addendum**.

Table 11 Site 3: Groundwater level measurements

Borehole No.	Surveyed Level (m OD)	Date	Depth to Water (m)	Depth (mOD)
BH14	3.76	18/09/23	0.77	2.99
		19/09/23	0.78	2.98
		20/09/23	0.78	2.98
		21/09/23	0.75	3.01
		27/09/23	0.95	2.81
		28/09/23	0.96	2.80
		29/09/23	0.96	2.80
		10/10/23	0.95	2.81
		08/11/23	0.35	3.41
		19/03/24	0.81	2.95
BH15	3.95	21/09/23	0.59	3.36
		27/09/23	0.96	2.99
		28/09/23	0.96	2.99
		29/09/23	0.96	2.99
		10/10/23	0.91	3.04
		25/10/23	0.65	3.30
		08/11/23	0.65	3.30
		19/03/24	0.45	3.50
TP13	3.36	19/09/23	0.90	2.46
TP14	4.23	19/09/23	2.20	2.03

3.4.3 Geology

128. During the drilling of Boreholes for the onshore GI, the geology was assessed to a maximum depth of 20.20m bgl. The geological profile in all boreholes is made of topsoil and Quaternary and Carboniferous natural soils. The area was investigated through two boreholes: BH14 and BH15. A summary of the geology encountered during the GI is presented as **Table 12 Site 3: Ground Summary**. The information was obtained from the GI reports.

129. Actual ground conditions found during the GI works supports the publicly available BGS information.

130. According to the bedrock and superficial geology maps of Great Britain, there are two geological formations present within the Site:

- Ashton Mudstone Member and Crackington Formation - Mudstone and siltstone. Sedimentary bedrock formed between 329 MYA and 318 MYA during the Carboniferous period.
- Tidal Flat Deposits - Clay, silt and sand which is a sedimentary superficial deposit formed between 11.8 thousand years ago and the present during the Quaternary period.

Table 12 Site 3: Ground Summary

Stratum	Depth to base of stratum (mbgl)	Elevation to base of stratum (m AOD)	Typical Description
Made Ground – Topsoil (BH14 only)	0.30 (BH14)	3.46 (BH14)	Dark brown sandy Topsoil with rootlets. Sand is fine to coarse.
Tidal Flat Deposits (BH14 only)	4.20 (BH14)	-0.44 (BH14)	Brown slightly silty to silty fine to coarse Sand. Very loose brown slightly gravelly to gravelly sandy Silt. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of various lithologies including sandstone, mudstone and siltstone. Greyish brown clayey fine to coarse Sand and fine to coarse subangular to rounded Gravel of various lithologies including sandstone, mudstone and siltstone.
Ashton Mudstone Member and Crackington Formation (Weathered)	4.20 (BH15) – 7.90 (BH14)	-4.14 (BH14) – 0.26 (BH15)	Grey and dark grey Mudstone recovered as sandy to very sandy very clayey fine to coarse angular and subangular gravel. Sand is fine to coarse. Grey Mudstone recovered as locally thinly laminated slightly gravelly slightly sandy silt. Sand is fine to coarse. Gravel is fine and medium angular. Very weak, locally weak and moderately weak dark grey Mudstone. Distinctly weathered and recovered almost entirely as angular gravel and gravelly clay.
Ashton Mudstone Member and Crackington Formation	>20 (BH15)	Not Proven	Weak and moderately weak, locally medium strong light grey Siltstone with calcite veins. Recovered as non-intact. Very weak and weak, locally moderately weak dark grey Mudstone with rare calcite veining. Locally partially weathered evident as a reduction in strength. Very weak and weak, locally medium strong light grey Siltstone with calcite veins. Locally

Stratum	Depth to base of stratum (mbgl)	Elevation to base of stratum (m AOD)	Typical Description
			distinctly weathered evident as a reduction in strength. Stratum is highly fractured throughout. Medium strong and strong, locally weak light grey Siltstone with occasional to frequent calcite veins. Partially weathered evident as an orange brown staining. Locally distinctly weathered evident as a significant reduction in strength to gravelly clay in places. Stratum is highly fractured throughout.

131. No geotechnical testing was undertaken on samples of topsoil.

132. One PSD test was undertaken on samples of the Tidal Flat Deposits. The PSD result indicates that sampled Tidal Flat Deposits have a primary component of Gravel (52%), secondary component of Sand (19.9%) and Silt (18.9%) and minor component of Clay (9.2%). Such composition of a non-cohesive soil may indicate about higher permeability. The Uniformity Coefficient for this formation was determined to be 1913.0 (BH14 4.2m bgl).

133. Alluvium was encountered in BH15 only, up to a maximum depth of 3.8m bgl. The alluvium was typically described as: mottled greyish brown and orange brown slightly gravelly slightly sandy Silt. Brownish grey silty fine to coarse Sand and fine to coarse angular and subangular Gravel of siltstone and mudstone. Water permeability of this layer has not been tested.

134. Ashton Mudstone Member and Crackington Formation is represented by siltstones and mudstones which are mostly weathered locally recovered as non-cohesive gravel which may pose a higher permeability. The Uniformity Coefficient for this formation has not been determined.

3.4.4 Hydrogeology

135. During the drilling of the boreholes, groundwater strikes were impossible to determine due to the use of water flush during their advancement. The groundwater table was measured during the intrusive investigation in trial pits which were excavated up to 2.50m bgl depth, and in the boreholes designated as monitoring wells which were installed with a nominal 50mm diameter perforated standpipe. A total of six of the boreholes (Nos. BH01, BH05, BH09, BH14, BH15 and BH17) were designated for such purpose, details of which are given on the relevant records. Two of which, BH14 and BH15 are located within Site 3. Two trial pits, TP13 and TP14, were excavated in Site 3. After installation,

groundwater level readings were taken in the instruments during the GI and during a post GI monitoring period.

136. These observations may not give an accurate indication of groundwater conditions, for the following reasons:

- The trial pit or borehole is rarely left standing at the relevant depth for sufficient time for the water level to reach equilibrium.
- A permeable stratum may have been sealed off by the borehole casing during the advancement of the hole.
- It may have been necessary to add water to the borehole to facilitate progress.
- There may be seasonal, tidal or other effects within the Site.

137. The average measurement of groundwater table in BH14 in the monitored time period 18/09/2023-08/11/2023 is 0.81m bgl (2.95m AOD) and in BH15 in the monitored time period 21/09/2023-08/11/2023 is 0.81m bgl (3.14m AOD). Water monitoring was conducted again, once in March 2024 and the groundwater table was encountered at 0.81m bgl (2.95m AOD) in BH14 and at 0.45m bgl (3.50m AOD) in BH15. In addition to measurement of groundwater table in boreholes, a groundwater table was also measured in trial pits located nearby investigated trenchless crossings. In this case, groundwater was encountered at a depth of 0.90m bgl (2.46m AOD) in TP13 and at a depth of 2.20m bgl (2.03m AOD) in TP14. Trial pits were not included in continuous groundwater monitoring. Groundwater was measured in them only once after excavation.

138. Groundwater level measurements during monitoring period are presented in **Table 13**.

139. According to the Tide Times webpage, the nearest tidal registration station is in the village of Appledore, located approx. 2.5km south-west of the River Taw crossing. The largest differences in elevation between the tides recorded in September were recorded at the beginning and end of the month and amounted to about -0.3m AOD for low sea level and 8.5m AOD for high sea level. In the middle of the month, the variations were smaller and amounted to about 2m AOD for low tide and 5m AOD for high tide. In October, the tides reached similar values. In November, the biggest differences in height between the tides were recorded at the beginning and end of the month and amounted to about 0.5m AOD for low sea level and 7m AOD for high level. In the middle of the month, the variations were smaller and amounted to about 1m AOD for low tide and 7m for high tide.

140. Comparing the results from groundwater monitoring with tidal heights, a limited influence of tides on groundwater can be assumed, which fluctuated around 3m AOD throughout the monitoring period.

141. According to the Hydrogeological map of England and Wales, the Site lies within an area of 2 regions:

- Concealed aquifers, aquifers of limited potential, regions without significant groundwater, represented by Quaternary coastal and fluviatile alluvium – mainly silty clays with subordinate sand, gravel and peat in valleys, estuaries and sheltered coastal environments. Sands and gravels in these deposits may provide supplies of uncertain quality, with the risk of saline contamination in coastal areas.
- Region underlain by impermeable rocks, generally without groundwater except at shallow depth: represented by Culm Measures: SW England. Intensely folded and faulted greywacke sequence of shales and sandstones with some water in weathered zones.

142. General groundwater flow direction of the shallow groundwater aquifer connected with superficial deposits was not possible to assess due to the small scale of the hydrogeological map (1:625 000).

143. The superficial deposits (Tidal Flats Deposits) are classified as a Secondary A Aquifer which comprises permeable layers that can support local water supplies, and may form an important source of base flow to rivers and Secondary (undifferentiated) Aquifer, which is an aquifer where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value. The vulnerability of this aquifer for superficial contamination is assessed as medium-high.

144. The bedrock (Ashton Mudstone Member and Crackington Formation) is classified as a Secondary A Aquifer, which comprises of permeable layers that can support local water supplies and may form an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

145. According to the webpage 'Principal aquifers in England and Wales', the Onshore Development Area is located outside of 11 principal aquifers in England and Wales designated by The Environment Agency.

3.4.5 Hydrology

146. Infrastructure associated with the Site 3 lies within two surface water catchments, which are part of the Environment Agency's Taw and North Devon operational catchment. These are:

- Taw Estuary (GB108050020000) – north of Taw River. This is a freshwater river catchment without tidal influence. It is drained by Sir Arthur's Pill (Main River) and Ordinary Watercourses. To avoid confusion with the tidal estuary of the River Taw, this catchment is hereafter

referred to as the 'Taw Estuary (Sir Arthur's Pill catchment)'. Total catchment area is 15.964km^2.

- Taw/Torridge (GB540805015500) – south of Taw River. Estuarine waters of the River Taw and River Torridge that receive inflows from large areas of Torridge, Mid, West and North Devon. Total catchment area is 14.436 km^2.

147. The majority of the Taw Estuary (Sir Arthur's Pill catchment) is characterised by flat pastures interspersed with numerous slow-flowing freshwater channels (Ordinary Watercourses) that make up Braunton Marsh. This area was formerly inter-tidal marshland prior to embanking works in the 19th century.

148. Sir Arthur's Pill flows around the western side of Braunton Marsh and then in an easterly direction, before being joined by Boundary Drain. The lower course of Sir Arthur's Pill discharges to a channel at the edge of Horsey Island via a control structure (i.e. the Great Sluice). The Horsey Island channel then discharges to the River Caen and wider Taw-Torridge estuary.

149. The tidal River Taw widens appreciably downstream of Barnstaple (typically 400-850m wide). Below Appledore the Taw estuary is joined by the Torridge estuary and the combined water discharge to Barnstaple Bay. The usual range of the River Taw at Barnstaple tide gauge is approximately 4m.

150. The Onshore Export Cable Corridor within Site 3 also crosses an area of onshore coastal catchment which is a land at Instow Barton Marsh (i.e. land south of the tidal estuary near the existing East Yelland substation) – hereafter referred to as 'coastal catchment (Instow Barton Marsh)'.

151. The main area of onshore coastal catchment that will be affected by the Onshore Project is Instow Barton Marsh, adjacent to the existing East Yelland substation. This area of land is characterised by a series of short, straight, artificial drains.

152. The majority of drains flow to a small lake immediately north of the proposed White Cross Onshore Substation, which discharges to the estuary via a control structure. There is also a culvert below a coastal embankment (flood defence) that takes higher flows to the foreshore.

153. The Onshore Export Cable will be routed below the River Taw bed. There is a Boundary Drain located adjacent to the trenchless crossing exit point.

3.4.6 Conceptual Site Model

154. A summary of the CSM is outlined below and describes the potential sources, potential contaminant migration pathways and potentially exposed receptors associated with the Project. A schematic cross section illustrating the CSM is presented in **Annex 4 Site 3: Conceptual Site Model RVX1-River Taw**. The

pollutant linkages are described in more detail in **Table 3 Risk Ratings**. The risk ratings applied in **Table 13** are defined in **Table 3**. The key components of the conceptual model are discussed in more detail below.

155. **Annex 4** illustrates that the drilling level will be almost entirely in the bedrock, barring the sections near the entry and exit points. The rock in which the trenchless crossing will be made is mudstone in the initial stage and final stage in the siltstone. The bore path will not extend beneath the siltstone layer, remaining within it until it surfaces near the exit. This is a low porosity material as well as mudstones, which is resistant to water absorption, unlike the overlying permeable sands and gravels. Silt is considered as a low permeability material, although there is likely to be leakage through the permeable deposits, it is thought that the layer of siltstone will afford some protection to the aquifer beneath. This conclusion also applies to excavations for entry/exit pits.

Table 13 Summary of Conceptual Model for Site 3: RVX1-River Taw crossing

Source	Pathway	Receptor	Risk rating	Mitigation proposed	Risk rating following mitigation
Fuel or oil spills from machinery on site	Excavation for entry/exit pits; trenchless crossing bores; surface runoff	Surface water. Groundwater in superficial aquifer (Secondary A and Secondary undifferentiated Aquifers). Groundwater in bedrock aquifer (Secondary A Aquifer). Taw-Torridge Estuary SSSI.	High	No refuelling within footprint of excavations. No storage of any potentially contaminative within footprint of excavations. Spill kits and plant nappies will be made available on Site. No welfare facilities on within footprint of excavations. In circumstances of inclement weather, the areas of work would be evaluated by the Environmental Clerk of Works (ECoW) with the Site Manager, and construction would either be suspended, or the ground protected by a trackway system.	Low
Sediment fines	Excavation and earthworks for entry/exit pits; trenchless crossing bores; surface runoff	Surface water. Groundwater in superficial aquifer (Secondary A and Secondary undifferentiated Aquifers). Groundwater in bedrock aquifer (Secondary A Aquifer).	Low	Prevent silt generation through use of silt trapping. Contain and treat silty water on site – such as by using silt fences at the toe of the stockpiles and at the low end of the excavation and let the water trickle out from the lower end of the silt fence through the grass. Divert silty water into non-sensitive areas away from watercourses to allow dispersal and diffuse drainage, this will be done by either pumping through siltbuster unit or by forming grass channels to direct the water	Negligible

Source	Pathway	Receptor	Risk rating	Mitigation proposed	Risk rating following mitigation
		Taw-Torridge Estuary SSSI.		away from sensitive receptors. Exact methodology will be refined in the final CEMP.	
Contaminated surface water	Over-pumping in the excavations	Surface water. Groundwater in superficial aquifer (Secondary A and Secondary undifferentiated Aquifers). Groundwater in bedrock aquifer (Secondary A Aquifer). Taw-Torridge Estuary SSSI.	Medium	Discharge locations for temporary discharges during construction will be agreed with the Environment Agency, LLFA and IDB, and discharge is at a controlled rate in accordance with the approved discharge rate. The Contractor will undertake consultation with the Environment Agency prior to any dewatering activities occurring within all locations of trenchless crossings covered by this document to determine the appropriate disposal option for these arisings.	Low
Contaminated groundwater from superficial aquifer	Creation of new pathways for contamination as a result of excavations and trenchless crossing drilling	Groundwater in bedrock aquifer (Secondary A Aquifer). Taw-Torridge Estuary SSSI.	Medium	No discharge to ground of any water abstracted from the excavations during construction activities. Water is to be discharged via settlement lagoons.	Low

Source	Pathway	Receptor	Risk rating	Mitigation proposed	Risk rating following mitigation
Drilling fluid breakout	Trenchless crossing drilling	Groundwater in superficial aquifer (Secondary A and Secondary undifferentiated Aquifers). Groundwater in bedrock aquifer (Secondary A Aquifer). Taw-Torridge Estuary SSSI.	Medium	Monitoring of drilling fluids parameters for the required ground conditions and to quickly identify and limit any losses which may indicate a breakout. Measures to remove the released bentonite if a significant volume of material is contained – for example pumped back to the bentonite lagoon within the trenchless crossing compound, or pumped to the interceptor drains, or pumped to the mobile settling tanks that will be used for managing sediment traps. All of the mitigation measures will be included in a final Bentonite Management Plan (**Outline Bentonite Management Plan** (WHX001-FLO-CON-ENV-PLN-0012) is provided as part of the **Further Environmental Information** submission).	Low

Source	Pathway	Receptor	Risk rating	Mitigation proposed	Risk rating following mitigation
Dewatering	Area outlined by the extent of the depression cone around excavations and earthworks for entry/exit pits.	Surface water. Groundwater in superficial aquifer (Secondary A and Secondary undifferentiated Aquifers). Flora and Fauna. Taw-Torridge Estuary SSSI.	Medium	Use groundwater monitoring during dewatering to ensure no adverse impacts on surface water flows or downstream surface water abstractions. Divert pumped water to surface water, including surface watercourses. Irrigate adjacent Designated Sites by absorption wells, irrigation systems or infiltration ditches. It is usually sufficient to carry out the discharge of drainage water within the depression cone. Use principle of closing water circuits and the concept of compensation measures. Works and measures will be undertaken under an EA permit and thus will be agreed with the Environment Agency during the permit application process.	Low

156. Given that there will be drilling through the mudstone layer, the direct contamination of groundwater in the bedrock aquifer might be a consideration. Any risk to the underlying bedrock aquifer will be from contaminants transport through the lower permeability material which overlies them and where low porosity layer will not occur. Water from this level is used for domestic purposes such as irrigating plants, cooling machinery, cattle farming, etc.

157. Based on the groundwater level data from the GI (groundwater occurred in natural soils as an unconfined water table) and it is likely that dewatering of groundwater within the superficial deposits will be required during the construction works. Given that this activity is only temporary in duration and unlikely to comprise significant volumes of water, there is unlikely to be a significant impact to the aquifers beneath considering that these are of marginal importance.

158. Monitoring will be in place during dewatering to ensure no adverse impacts on surface water flows or downstream surface water abstractions and dewatering will be subject to permitting through the Environment Agency's permitting regime.

159. No contaminants of concern were observed in gathered samples of superficial or Made Ground deposits. Therefore, there is not considered to be a risk to groundwater during the operation of cable ducts in the area which is additionally located outside of the Source Protection Zone 1 and 2.

160. Localised and marginal exceedances of EQS criteria (8.6 µg/l) for Nickel (concentration of 15 µg/l) have been recorded within the groundwater at the Site (BH15). The concentrations recorded are not considered to represent a significant risk to identified surface water receptors, especially when factors such as attenuation and dilution are taken into consideration.

161. Additionally, **Appendix S: Hydrofracture Assessment Report** (Waterman Infrastructure & Environment Limited, 2023) of the **ES Addendum** demonstrates that there is no significant risk of frac-out along the bore profile with the exception of the final stages of the bore where the profile begins to rise resulting in loss of cover. This is unavoidable but the effects can be easily controlled/mitigated onshore by putting appropriate site measures in place such as sandbagging and/or casing in line with general trenchless crossing working methodologies, to reduce and contain any hydrofracture. All drill fluids used should also be self-flocculating, environmentally inert and CEFAS approved.

3.4.7 Summary

162. No contaminants of concern were observed in gathered samples of superficial or Made Ground deposits for the cable ducts laid underground during their operational phase, therefore, there is not considered to be a risk to groundwater during the operation of cable ducts.

163. Localised and marginal exceedances of EQS criteria (8.6 µg/l) for Nickel (concentration of 15 µg/l) have been recorded within the groundwater at the Site (BH15). The concentrations recorded are not considered to represent a significant risk to identified surface water receptors, especially when factors such as attenuation and dilution are taken into consideration.

164. Monitoring will be in place during dewatering to ensure no derogation of surface water flows or downstream surface water abstractions.

165. **Appendix S: Hydrofracture Assessment Report** demonstrates that there is no significant risk of frac-out along the bore profiles with the exception of the final stages of the bore where the profile begins to rise resulting in loss of cover

3.5 Site 4: Braunton Marshes

3.5.1 Construction Activity

166. Throughout Section 4 (Annex 1 White Cross Offshore Windfarm Sections) of the cable corridor, the cable installation method will be mainly open-cut trenching with small sections of trenchless techniques for main watercourses (2m below the bed of watercourse), road, and sensitive habitat crossings.

167. Braunton Marshes, are characterised by their landscape of flat pastures interspersed with numerous slow-flowing freshwater channels, and are inhabited by abundant wildlife. It has been used in this way since the enclosure of the Marsh in 1811.

168. Drainage system of Braunton Marsh operates by means of gravity, with the subtle gradients of the clay-lined water channels directing water around the marshes. Water exits the Marshes via the Great Sluice at Horsey Island. Some water enters the system via the River Caen, predominantly during the Summer.

3.5.2 Ground Investigations

169. The area was investigated with exploratory boreholes BH09 to BH14 & TP08 to TP13. A 50mm diameter perforated standpipe was installed in BH09 and BH14 to a depth of 10m bgl for groundwater monitoring purposes. Groundwater level was also monitored in six trial pits, TP08 to TP13. Groundwater level measurements which were obtained during the GI and monitoring undertaken

post GI are summarised in **Table 14**. A CSM containing GI locations for this Site is presented in **Annex 5: Conceptual Site Model Braunton Marshes**.

170. Summary of Geochemical Laboratory Testing conducted for the purpose of this project is described in **Appendix T: Onshore Ground Investigation Interpretative Report Annex 1: Onshore Ground Investigation Factual Report** (Raeburn Drilling & Geotechnical Limited trading as Igne, 2023) of the **ES Addendum**.

Table 14 Site 4: Groundwater level measurements

Borehole No.	Surveyed Level (m OD)	Date	Depth to Water (m)	Depth (mOD)
BH9	6.03	11/09/23	0.15	5.88
		12/09/23	0.15	5.88
		13/09/23	0.18	5.85
		14/09/23	0.15	5.88
		15/09/23	0.12	5.91
		18/09/23	0.10	5.93
		19/09/23	0.10	5.93
		20/09/23	0.10	5.93
		21/09/23	0.10	5.93
		27/09/23	0.10	5.93
		28/09/23	0.10	5.93
		29/09/23	0.10	5.93
		10/10/23	0.15	5.88
		25/10/23	0.00	6.03
		08/11/23	0.00	6.03
		25/03/24	-0.16	6.19
BH14	3.76	18/09/23	0.77	2.99
		19/09/23	0.78	2.98
		20/09/23	0.78	2.98
		21/09/23	0.75	3.01
		27/09/23	0.95	2.81
		28/09/23	0.96	2.80
		29/09/23	0.96	2.80
		10/10/23	0.95	2.81
		08/11/23	0.35	3.41

Borehole No.	Surveyed Level (m OD)	Date	Depth to Water (m)	Depth (mOD)
		19/03/24	0.81	2.95
TP08	5.20	15/09/23	1.60	3.60
TP09	3.92	15/09/23	1.00	2.92
TP10	4.16	15/09/23	1.20	2.96
TP11	4.09	15/09/23	0.90	3.19
TP12	4.32	18/09/23	1.00	3.32
TP13	3.36	19/09/23	0.90	2.46

3.5.3 Geology

171. During the drilling of Boreholes for the onshore GI, the geology was assessed to a maximum depth of 17.80m bgl. The geological profile in all boreholes is made of topsoil and Quaternary, Devonian and Carboniferous natural soils/rocks. The area was investigated through six boreholes: BH09 to BH14 and six trial pits TP08 to TP13. A summary of the geology encountered during the GI is presented as **Table 15**. The information was obtained from the GI reports.

172. Actual ground conditions found during the GI works supports the publically available BGS information.

173. According to the bedrock and superficial geology maps of Great Britain, there are three geological formations present within the Onshore Export Cable Corridor Section 4:

- Pilton Mudstone Formation which is a sedimentary bedrock formed between 372.2 MYA and 346.7 MYA during the Devonian and Carboniferous periods.
- Ashton Mudstone Member and Crackington Formation - Mudstone and siltstone. Sedimentary bedrock formed between 329 MYA and 318 MYA during the Carboniferous period.
- Tidal Flat Deposits – Clay, silt and sand which is a sedimentary superficial deposit formed between 11.8 thousand years ago and the present during the Quaternary period.

Table 15 Site 4: Ground Summary

Stratum	Depth to base of stratum (mbgl)	Elevation to base of stratum (m AOD)	Typical Description
Made Ground - Topsoil	0.15 (TP10) – 0.40 (BH13)	2.93 (BH13) – 5.00 (TP08)	Dark brown sandy Topsoil with rootlets. Sand is fine to coarse.
Tidal Flat Deposits	1.70 (TP10, not proven) – 5.70 (BH10)	-1.87 (BH13) – 3.40 (TP08, not proven)	Firm, locally soft mottled orange-brown and brown slightly gravelly slightly sandy Silt with traces of vegetation. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of various lithologies including siltstone, mudstone and sandstone. Very loose to loose grey silty fine and medium Sand with pockets of dark brown pseudofibrous peat and traces of vegetation. Organic odour. Grey very silty fine and medium Sand with frequent shell fragments. Very soft dark brownish grey slightly sandy silty Clay of low plasticity with traces of vegetation. Sand is fine and medium. Dark brown gravelly sandy pseudofibrous Peat with frequent decomposing vegetation and pockets of brown sand. Sand is fine to coarse. Gravel is fine subrounded of sandstone. Strong organic odour. Brownish grey very silty fine to coarse Sand with frequent pockets of soft brownish grey silt and shells. Firm mottled orange brown and grey slightly gravelly slightly sandy Silt with low cobble content and traces of vegetation.
Ashton Mudstone Member and Crackington Formation	>17.8 (BH14)	Not Proven	Very weak, locally weak and moderately weak dark grey Mudstone. Distinctly weathered and recovered almost entirely as angular gravel and gravelly clay. Weak and moderately weak, locally medium strong light grey Siltstone with calcite veins. Very weak and weak, locally moderately weak dark grey Mudstone with rare calcite veining. Locally partially weathered evident as a reduction in strength. Stratum is highly fractured throughout.

Stratum	Depth to base of stratum (mbgl)	Elevation to base of stratum (m AOD)	Typical Description
			Medium strong and strong, locally weak light grey Siltstone with occasional calcite veins. Partially weathered evident as an orangebrown staining. Locally distinctly weathered evident as a significant reduction in strength to gravelly clay in places. Stratum is highly fractured throughout.
Pilton Mudstone Formation	>7.20 (BH10 & BH12)	Not Proven	Grey Mudstone recovered as sandy clayey fine to coarse angular gravel. Sand is fine to coarse. Mottled dark grey and brown Mudstone recovered as thinly laminated slightly gravelly slightly sandy clay. Sand is fine to coarse. Gravel is fine to coarse angular.

174. No Geotechnical Testing on samples of Topsoil were undertaken.

175. Ten PSD and seven Atterberg Limit Tests were undertaken on samples of the Tidal Flat Deposits. 1 No. test returned a non-plastic designation, 3 No. returned a low plasticity clay designation, 3 No. returned a high plasticity clay designation, and the remaining 1 No. returned a very high silt. The PSD results indicate the sampled Tidal Flat Deposits to be extremely variable with primary components of Sand (32.1%) and Silt (34.2%), secondary components of Gravel (18.1%) and Clay (21.6%) and a minor component of Cobbles (4.2%). From these results, it can be concluded that non-cohesive soils are characterized by good water permeability, while cohesive soils in a plastic state can occur as an insulating layer with low water permeability. These assumptions are not confirmed by water permeability tests. The Uniformity Coefficient for this formation is ranging from 2.4 (BH10 2.3m bgl) for sample taken from sand to 6111.1 (BH13 4.2m bgl) for sample taken from gravel.

176. Ashton Mudstone Member and Crackington Formation by weak mudstones and siltstones, locally medium strong and strong. Partially weathered evident as an orange-brown staining. Locally distinctly weathered evident as a significant reduction in strength to gravelly clay in places. Stratum is highly fractured throughout which may indicate about higher permeability. The Uniformity Coefficient for this formation has not been determined.

3.5.4 Hydrogeology

177. During the drilling of the boreholes, groundwater strikes were impossible to determine due to the use of water flush during their advancement. The groundwater table was measured during the intrusive investigation in trial pits which were excavated up to 2.50m bgl depth, and in the boreholes designated as monitoring wells which were installed with a nominal 50mm diameter perforated standpipe. A total of six of the boreholes (BH01, BH05, BH09, BH14, BH15 and BH17) were designated for such purpose, details of which are given on the relevant records. Two of which, BH09 and BH14, are located within Site 4. Six trial pits, TP08 to TP13, were excavated in Site 4. After installation, groundwater level readings were taken in the instruments during the GI and during a post GI monitoring period.

178. These observations may not give an accurate indication of groundwater conditions, for the following reasons:

- The trial pit or borehole is rarely left standing at the relevant depth for sufficient time for the water level to reach equilibrium.
- A permeable stratum may have been sealed off by the borehole casing during the advancement of the hole.
- It may have been necessary to add water to the borehole to facilitate progress.
- There may be seasonal, tidal or other effects within the Site.

179. The average measurement of groundwater table in BH09 in the monitored time period 11/09/2023-08/11/2023 is 0.11m bgl (5.92m AOD) and in BH14 in the monitored time period 18/09/2023-08/11/2023 is 0.81m bgl (2.95m AOD). Water monitoring was conducted again, once in March 2024 and groundwater table was encountered at -0.16m bgl (11.74m AOD) in BH09 and at 0.81m bgl (2.95m AOD) in BH14. The difference of levels in BH09 is 0.27m while in BH14 it remained the same as in the earlier monitoring campaign. A noticeable difference in BH14 occurred in the measurement on 8/11/23 where the groundwater table was measured at a depth of 0.35m bgl (3.41m AOD). In addition to measurement of groundwater table in boreholes, a groundwater table was also measured in trial pits located along investigated Onshore Export Cable Corridor Section 4. In this case, groundwater was encountered at a depths of: 1.60m bgl (3.60m AOD) in TP08, 1.00m bgl (2.92m AOD) in TP09, 1.20m bgl (2.96m AOD) in TP10, 0.90m bgl (3.19m AOD) in TP11, 1.00m bgl (3.32m AOD) in TP12 and 0.90m bgl (2.46m AOD) in TP13. Trial pits were not included in continuous groundwater monitoring. Groundwater was measured in them only once after excavation.

180. Groundwater level measurements during monitoring period are presented **in Table 14.**

181. The March data presents a higher groundwater table than that observed in winter in BH09, while in BH14 it remained the same as the average of the previous monitoring company. Frequent and abundant rainfall may have caused the groundwater table to rise. The level of groundwater above the ground surface in BH09 may be due to poor protection of the standpipe in which the measurements were taken. As a result of poor protection, precipitation may have entered the standpipe. It is worth mentioning that the aquifer is characterized by slower water flow compared to surface water. Another reason for the elevated groundwater level in the standpipe may be the reduced permeability of surface formations caused by plants/different structure of soil surface which may cause temporarily increased hydrostatic pressure. The catchment area within which Site 4 is located is generally considered to be a freshwater river catchment without tidal influence, although tidal influence cannot be ruled out.

182. According to the Hydrogeological map of England and Wales, the Site lies within an area of 3 regions:

- Locally important aquifers represented by Carboniferous Limestone and Basal Conglomerate including Yoredale Series which feature a massive, well-fissured karstic limestones giving large supplies (up to 175l/s) from resurgences in Mendip and South Wales. Borehole yields are variable up to 40l/s. Yoredale Series are represented by rhythmic limestones, sandstones and shales, rarely yield up to 40l/s by fissure flow.
- Concealed aquifers, aquifers of limited potential, regions without significant groundwater, represented by Quaternary coastal and fluviatile alluvium – mainly silty clays with subordinate sand, gravel and peat in valleys, estuaries and sheltered coastal environments. Sands and gravels in these deposits may provide supplies of uncertain quality, with the risk of saline contamination in coastal areas.
- Region underlain by impermeable rocks, generally without groundwater except at shallow depth represented by Devonian Old Red Sandstone (ORS) of SW England. Folded marine shales with thin limestones in SW. ORS comprises sandstones, marls and conglomerates and has yielded a small supplies from sandstones of lower division in Welsh borders.

183. General groundwater flow direction of the shallow groundwater aquifer connected with superficial deposits was not possible to assess due to the small scale of the hydrogeological map (1:625 000). Presumed groundwater flow direction is to the south-east and was correlated from groundwater table data from BHs and TPs located further afield to assess groundwater levels within Section 4 of the Onshore Export Cable Corridor, however it may vary from actual direction. Furthermore, the boreholes were arranged along the trenchless profile line and not spread throughout the whole Braunton Marshes area.

184. The superficial deposits (Tidal Flat Deposits) are classified as Secondary (undifferentiated) Aquifer which is an aquifer where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value. The vulnerability of this aquifer for superficial contamination is assessed as medium.

185. The bedrock (Pilton Mudstone Formation and Crackington Formation) is classified as a Secondary A Aquifer, which comprises of permeable layers that can support local water supplies and may form an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

186. According to the webpage 'Principal aquifers in England and Wales', the Onshore Development Area is located outside of 11 principal aquifers in England and Wales designated by The Environment Agency.

3.5.5 Hydrology

187. Infrastructure associated with the Site 4 lies within Environment Agency's Taw Estuary operational catchment.. Taw Estuary (GB108050020000) is a freshwater river catchment without tidal influence. It is drained by Sir Arthur's Pill (Main River) and Ordinary Watercourses. Total catchment area is 15.964km^2.

188. The majority of the Taw Estuary (Sir Arthur's Pill catchment) is characterised by flat pastures interspersed with numerous slow-flowing freshwater channels (Ordinary Watercourses) that make up Braunton Marsh. This area was formerly inter-tidal marshland prior to embanking works in the 19th century.

189. Sir Arthur's Pill flows around the western side of Braunton Marsh and then in an easterly direction, before being joined by Boundary Drain. The lower course of Sir Arthur's Pill discharges to a channel at the edge of Horsey Island via a control structure (i.e. the Great Sluice). The Horsey Island channel then discharges to the River Caen and wider Taw-Torridge estuary.

190. Boundary Drain divides from Sir Arthur's Pill (an EA Main River) immediately west of Braunton Great Field and follows a southerly and then north-easterly direction around the perimeter of Braunton Marsh.

191. It is understood that the Boundary Drain carries some of the water diverted off Sir Arthur's Pill, via a sluice gate control, around to land along the western and eastern boundary extents of the Marshes as well as draining the same land during wetter periods and following significant rainfall events when runoff from the land is increased.

192. Inner Marsh Pill flows off Sir Arthur's Pill in an easterly direction through the centre of Braunton Marsh before joining Boundary Drain. The centre of Braunton

Marsh is crossed by several straight, engineered channels that connect to the above-named watercourses.

193. The Braunton Marsh is now an extensive network of drainage ditches, field drains and ordinary watercourses with one Main River, Sir Arthur's Pill, flowing north to south before discharging into the River Taw estuary via the Great Sluice structure.

194. Consultation with Braunton Marsh IDB indicated that during an average winter season Braunton Marsh are, as expected, generally saturated and waterlogged. The ground is extremely soft in places and standing or pooling water is extensive throughout the system.

195. Flooding on Braunton Marsh is seasonal, occurring mostly in the winter season following periods of sustained rainfall and higher water levels across the drainage ditch network.

196. Sir Arthur's Pill at Sandy Lane and near America Road Car Park is ~2-3 m wide at bank top and similar at bank base. The channel is much less incised at these locations and there is no evidence of recent desilting/dredging. Near America Road car park the channel has a gently sinuous planform (as it follows a pre-drainage paleochannel), and the channel is flanked by a ~5 m wide marshy margin. Bank full depth is ~1.5 m.

197. At its downstream reach, where it forms a confluence with Boundary Drain, Sir Arthur's Pill has a wider channel (~3-4 m at bank top and similar at bank base). The channel is also noticeably deeper (the channel bed could not be seen despite low water levels). Where Boundary Drain joins Sir Arthur's Pill, the channel is flanked by a ~15-20 m wide marshy zone – LiDAR data indicates this marshy area forms the limits of a pre-drainage intertidal channel.

198. Designed Onshore Export Cable Corridor Section 4 (**Annex 1 White Cross Offshore Windfarm Sections**) passes through the Boundary Drain in the initial phase and several trenches as getting closer to the RVX1-River Taw trenchless Exit Point. River Caen is located approximately 2,000m east of the Onshore Export Cable Corridor Section 4.

3.5.6 Dewatering

199. To ensure safe working conditions, certain areas along the onshore export cable corridor may require dewatering depending upon ground conditions and water levels. Pipes will be sunk to a depth dictated by the ground conditions and water pumped out in advance of excavation to temporarily lower the surrounding groundwater level. The groundwater produced will be pumped to an adjacent watercourse downstream of the Project and outline pipes will be installed to prevent scouring and disturbance of the watercourse bed. The watercourse will

be monitored for sediment disturbance and rate of flow with additional mitigation measures being put in place if required.

200. For the removal of water in the trench or localised ponding on the right of way, the Site Foreman will be notified of the land area agreed as suitable to pump the water on to. Where any further locations are required as the work continues, these will be directed through the Agricultural Liaison Officer and agreed with the landowners and IDB.

201. Where surrounding land is not available for discharging water, then excess water will pass through a filtration system, such as temporary settlement lagoons, with straw bales and silt netting filtration and then into a watercourse.

202. A water management scheme may also be installed which is formed from a number of lined lagoons with interconnecting spill ways in order to manage any groundwater encountered during the dewatering or run off. This water would need testing for contaminants prior to discharge into any adjacent watercourses, if a permit is obtainable from the relevant authorities during the construction phase.

203. The direction of flow at the location where the Onshore Export Cable Corridor Section 4 begins in relation to the Greenaways and Freshwater Marsh Braunton SSSI is 'downstream'. Given a negligible localised scale of change to upflow and downflow there is no effect expected on hydrogeology within the Greenaways and Freshwater Marsh Braunton SSSI or into the Braunton Burrows SSSI and SAC boundary. It is noted that at the closest point to both SSSIs, the route would be trenchless and deeper than a trenched route.

204. Across the Braunton Marshes, whilst this is the point whereby the ducting is located below the groundwater, again this arises due to proximity to the nearby surface water drains which keeps water levels high. The perpendicular location to groundwater flow, only partial obstruction, and limited upflow and downflow changes which are localised would not be expected to lead to any long-term changes to hydrogeology that would be noticeable above the existing conditions.

205. South-east of Sandy Lane Car Park the trenched sections are expected to commence approximately 40m outside the boundary of both the Greenaways and Freshwater Marsh Braunton SSSI and the Braunton Burrows SSSI and SAC. The trenches would be constructed in 100m sections (and thus moving away from the SSSIs), and where groundwater levels are higher than 1.2m bgl, dewatering would be required. The dewatering would entail pumping out inflowing water as they are excavating and laying the ducting. Then it would cease whilst they are infilling the excavated material. The dewatering would cause a temporary and localised draw down of the groundwater level. However, given the short duration of the work , any drawdown would be extremely short-

term in nature. Given the surface water management this drawdown would be rapidly refreshed by the existing water management structures and activities. Further this draw down whilst localised would be moving away from the designated sites as construction commenced southwards. In the case of the Greenaways and Freshwater Marsh Braunton SSSI the movement would be away from the site but for the Braunton Burrows SSSI and SAC there would be little or no expected change due to the intervening Boundary Drain between any works and the site. The localised draw down is not expected to result in noticeable change in the hydrogeology of the Greenaways and Freshwater Marsh Braunton SSSI due to the temporary nature and the distance from the nearest point, as well as the variable nature of the groundwater changes in the area, and their influence by the existing water level management structures and operations.

206. One potential activity on the surface water drains is where trenching will occur through the drain without trenchless techniques. The disruption to drainage (and thus hydrogeology) would be immeasurable as continuous passage of water would be provided through diversion and pumping or other measures detailed in the ES.

207. Taking into account the calculated depression cones from **Section 3.3.4**, it was proven that the first one formed during the dewatering of the trenchless entry point will not extend into the adjacent designated sites, however the second one formed for trenchless exit point will extend into adjacent SAC and both SSSIs. However, conditions such as depth to the water table were worst then than these occurring along designed Onshore Export Cable Corridor Section 4. These depths are greater than for BH09 for which the extent of the depression cone was calculated and therefore the depression cone for drainage will be smaller further downstream of Onshore Export Cable Corridor Section 4.

208. It should be noted that the depressions caused by drainage are sometimes smaller than the seasonal fluctuations of the water table. The size of the depression cone radius is influenced by both natural conditions and the lowering of the water table and pumping time. Working in trenches below the groundwater level requires continuous dewatering in order to work in overland conditions, but also to ensure safety for both the excavation work, the crew and the equipment or any installations. Water from the depression cone received by the drainage system is mostly diverted to surface water, including surface watercourses.

209. It is also advised to avoid the direct disturbance of surface drainage patterns and surface flows of the surface water catchment which is linked to its associated flood risk.

210. The reconnection of land drains cut by the cable trench, that are not being replaced by an easement or header drain will be carried out as part of the backfill operation. After the installation of the cable the backfill will be compacted in layers up to the underside of the severed drains which are to be permanently reinstated by cross connection. The replacement drain will extend into the virgin/undisturbed ground on each side of the trench width for a minimum of 1m measured at right angles to the trench. The undisturbed ground will be excavated by hand and a good connection formed to the existing drain. The cable trench backfill will then be compacted up to the subsoil surface level.

211. All drainage reconnections across the trench will be carried out in accordance with the requirements of the land drainage specification.

212. Post-construction agricultural drainage will be reinstated including the replacement of any drains that were damaged during the construction process.

213. Where minor watercourses such as open ditches or drains, are to be crossed, the approach will be open cut trenching combined with temporary damming and diverting of the watercourse. The suitability of this method would be agreed at detailed design.

214. As outlined in **Chapter 5: Project Description, Table 5.3: Onshore cable parameters**, depth of cable trench varies from 1.6m bgl to 1.9m bgl.

3.5.7 Conceptual Site Model

215. A summary of the CSM is outlined below and describes the potential sources, potential contaminant migration pathways and potentially exposed receptors associated with the Project. A schematic cross section illustrating the CSM is presented in **Annex 5 Site 4: Conceptual Site Model Braunton Marshes**. The pollutant linkages are described in more detail in **Table 3.** The risk ratings applied in **Table 16** are defined in **Table 3**. The key components of the conceptual model are discussed in more detail below.

216. **Annex 5 Conceptual Site Model Braunton Marshes** illustrates that the trenching works will not reach Tidal Flat superficial deposits (Secondary (undifferentiated) Aquifer) clay, gravel, siltstone, mudstone layers and will be conducted only in the sand layer, locally crossing silt and clay (occurs locally in BH12) layers. Sand is a non-cohesive material with high permeability, however underlying silts and clays are a cohesive material with lower permeability than the overlying sands. It is worth noting that the silt layer does not extend over the entire profile (NW part of planned trenching). Although there is likely to be leakage through the deposits, it is thought that this layer will afford some protection to the Secondary A bedrock aquifer beneath (Pilton Mudstone Formation and Crackington Formation). This conclusion applies to the whole

length of excavations for cable/ducts. Geological profile was investigated to 17.80m bgl.

217. Given that there will be no excavation through the underlain layers, the direct contamination of groundwater in the concealed aquifersORSis not a consideration. Any risk to the underlying aquifers will be from contaminant transport through the lower permeability material which overlies it. The risk can only apply to the shallow aquifer, which is the shallowest layer of soils where groundwater occurs, through which onshore cable passes. Water from this level is used for domestic purposes such as irrigating plants, cooling machinery, cattle farming, etc.

218. Based on the groundwater level data from the ground investigation (groundwater occurred in natural soils as an unconfined water table) it is likely that dewatering of groundwater within the superficial deposits will be required during the construction works. Given that this activity is only temporary in duration and unlikely to comprise significant volumes of water, there is unlikely to be a significant impact to the aquifers beneath considering that these are of marginal importance.

219. Monitoring will be in place during dewatering to ensure no adverse impacts on surface water flows or downstream surface water abstractions and dewatering will be subject to permitting through the Environment Agency's permitting regime.

Table 16 Summary of Conceptual Model for Site 4: Braunton Marshes crossing

Source	Pathway	Receptor	Risk rating	Mitigation proposed	Risk rating following mitigation
Fuel or oil spills from machinery on site	Excavation and earthworks for cable/duct; surface runoff	Surface water. Groundwater in superficial aquifer (Secondary undifferentiated Aquifer). Groundwater in bedrock aquifer (Secondary A Aquifer). Braunton Burrows SAC/SSSI. Greenaways and Freshmarsh, Braunton SSSI. Taw-Torridge Estuary SSSI.	High	No refuelling within footprint of excavations. No storage of any potentially contaminative within footprint of excavations. Spill kits and plant nappies will be made available on Site. No welfare facilities on within footprint of excavations. In circumstances of inclement weather, the areas of work would be evaluated by the Environmental Clerk of Works (EcoW) with the Site Manager, and construction would either be suspended, or the ground protected by a trackway system.	Low
Sediment fines	Excavation and earthworks for cable/duct; surface runoff	Surface water. Groundwater in superficial aquifer (Secondary undifferentiated Aquifer). Groundwater in bedrock aquifer	Low	Prevent silt generation through use of silt trapping. Contain and treat silty water on site – such as by using silt fences at the toe of the stockpiles and at the low end of the excavation and let the water trickle out from the lower end of the silt fence through the grass. Divert silty water into non-sensitive areas away from watercourses to allow dispersal and diffuse	Negligible

Source	Pathway	Receptor	Risk rating	Mitigation proposed	Risk rating following mitigation
		(Secondary A Aquifer). Braunton Burrows SAC/SSSI. Greenaways and Freshmarsh, Braunton SSSI. Taw-Torridge Estuary SSSI.		drainage, this will be done by either pumping through siltbuster unit or by forming grass channels to direct the water away from sensitive receptors. Exact methodology will be refined in the final CEMP.	
Contaminated surface water	Over-pumping in the excavations	Surface water. Groundwater in superficial aquifer (Secondary undifferentiated Aquifer). Groundwater in bedrock aquifer (Secondary A Aquifer). Braunton Burrows SAC/SSSI. Greenaways and Freshmarsh, Braunton SSSI. Taw-Torridge Estuary SSSI.	Medium	Discharge locations for temporary discharges during construction will be agreed with the Environment Agency, LLFA and IDB, and discharge is at a controlled rate in accordance with the approved discharge rate. The Contractor will undertake consultation with the Environment Agency prior to any dewatering activities occurring within the Onshore Development Area covered by this document to determine the appropriate disposal option for these arisings.	Low

Source	Pathway	Receptor	Risk rating	Mitigation proposed	Risk rating following mitigation
Contaminated groundwater from superficial aquifer	Creation of new pathways for contamination as a result of excavations	Groundwater in bedrock aquifer (Secondary A Aquifer). Braunton Burrows SAC/SSSI. Greenaways and Freshmarsh, Braunton SSSI. Taw-Torridge Estuary SSSI.	Low	No discharge to ground of any water abstracted from the excavations during construction activities. Water is to be discharged via settlement lagoons.	Negligible
Dewatering	Area outlined by the extent of the depression cone around excavations and earthworks for entry/exit pits.	Surface water. Groundwater in superficial aquifer (Secondary undifferentiated Aquifer). Flora and Fauna. Braunton Burrows SAC/SSSI. Greenaways and Freshmarsh, Braunton SSSI. Taw-Torridge Estuary SSSI.	Medium	Use groundwater monitoring during dewatering to ensure no adverse impacts on surface water flows or downstream surface water abstractions. Divert pumped water to surface water, including surface watercourses. Irrigate adjacent Designated Sites by absorption wells, irrigation systems or infiltration ditches. It is usually sufficient to carry out the discharge of drainage water within the depression cone. Use principle of closing water circuits and the concept of compensation measures. Works and measures will be undertaken under an EA permit and thus will be agreed with the Environment Agency during the permit application process.	Low

220. No contaminants of concern were observed in gathered samples of superficial or Made Ground deposits. Therefore, there is not considered to be a risk to groundwater during the operation of cable ducts in the area which is additionally located outside of the Source Protection Zone 1 and 2.

221. With the exception of organic odours recorded in BH09 and BH10 which are considered to be associated with the presence of vegetation and/or peat within natural soils, no visual or olfactory evidence of contamination was recorded within the soils along the proposed cable route. These observations generally align with the results of the chemical testing undertaken, suggesting an absence of significant contamination.

222. No exceedances of EQS criteria have been recorded within the groundwater at the Site.

223. This Site was not covered by the **Appendix S: Hydrofracture Assessment Report**.

3.5.8 Summary

224. No contaminants of concern were observed in gathered samples of superficial or Made Ground deposits for the cable ducts laid underground during their operational phase, therefore, there is not considered to be a risk to groundwater during the operation of cable ducts.

225. No exceedances of EQS criteria have been recorded within the groundwater at the Site.

226. Monitoring will be in place during dewatering to ensure no derogation of surface water flows or downstream surface water abstractions.

227. Dewatering for the execution of a given trenched area will be of a temporary nature that will last for a few days at most. Therefore, with appropriate mitigation measures, they should not adversely affect nearby protected areas, even at a very localised scale.

228. This Site was not covered by the **Appendix S: Hydrofracture Assessment Report** of the **ES Addendum**.

4. Summary and Conclusions

229. The objective of this document was to assess the hydrogeological risks of the Project. Specifically, it considers impacts landward of MLWS during its construction, and operation and maintenance phases on hydrogeological processes and character.

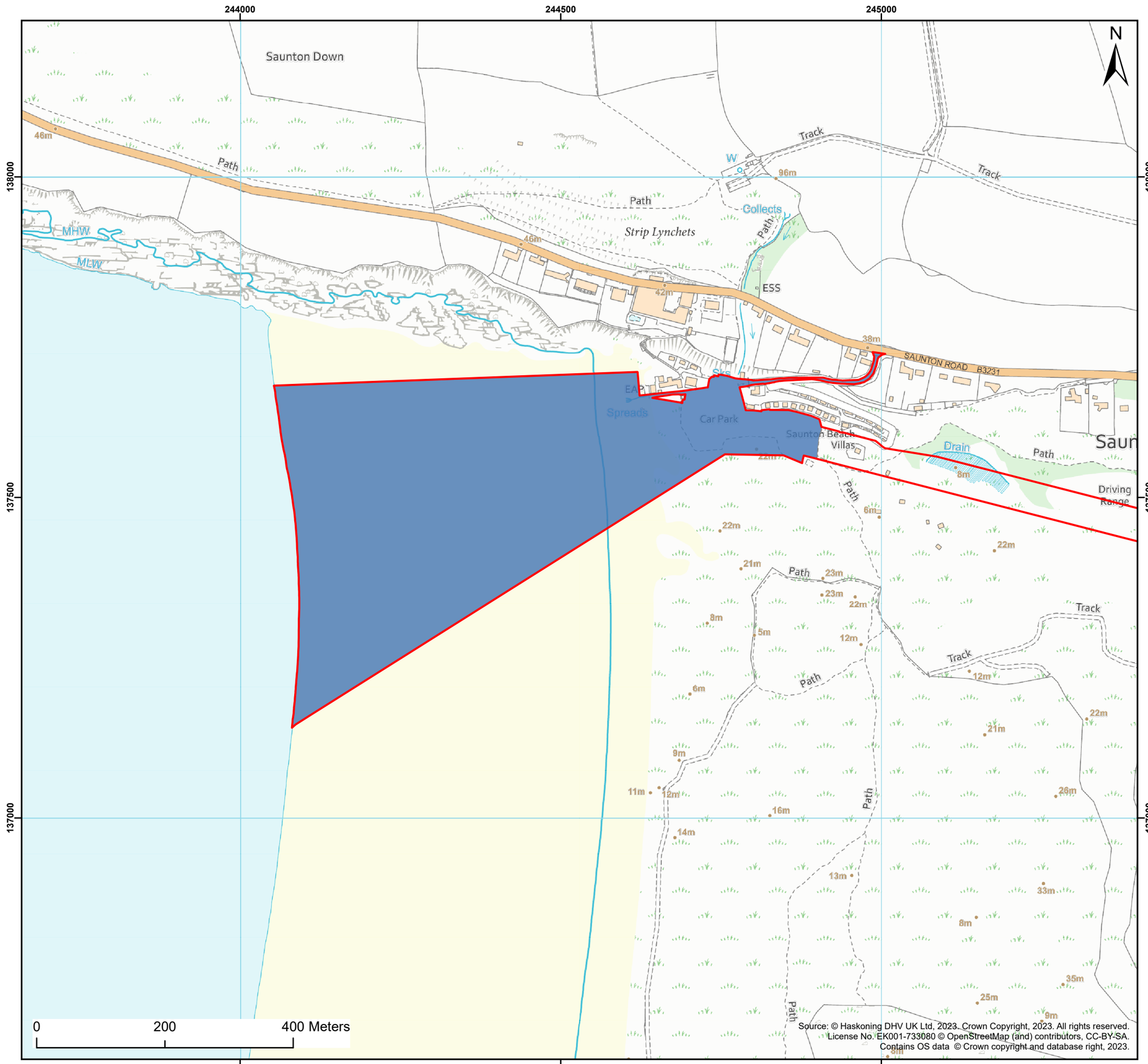
230. No contaminants of concern were observed in gathered samples of superficial or Made Ground deposits for the cable ducts laid underground during their operational phase, therefore, there is not considered to be a risk to groundwater during the operation of cable ducts within all of the analysed areas.

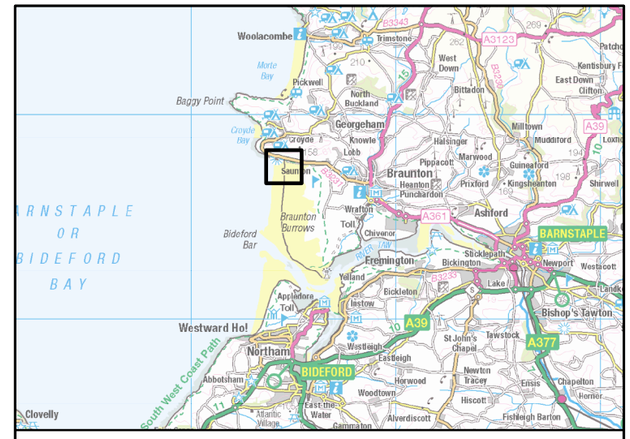
231. Localised and marginal exceedances of EQS criteria for Nickel and PAH (Fluoranthene) have been recorded within the groundwater at the Site 1 (BH05) and Site 3 (BH15) respectively. The concentrations recorded are not considered to represent a significant risk to identified surface water receptors, especially when factors such as attenuation and dilution are taken into consideration.

232. Monitoring will be in place during dewatering to ensure no derogation of surface water flows or downstream surface water abstractions.

233. Dewatering for the execution of trenchless / trenched area will be of a temporary nature that will last for a few days at most. Therefore, with appropriate mitigation measures, they will not adversely affect nearby protected areas, even at a very localised scale. As a mitigation measure, it is consider that it will be sufficient to carry out the discharge of drainage water within the depression cone as a part of the principle of closing water circuits and the concept of compensation measures.

234. Sites 1 and 3 have been covered by **Appendix S: Hydrofracture Assessment Report** which demonstrates that there is no significant risk of frac-out along the bore profiles with the exception of the final stages of the bore where the profile begins to rise resulting in loss of cover. This is unavoidable but the effects can be easily controlled/mitigated onshore by putting appropriate site measures in place such as sandbagging and/or casing in line with general trenchless working methodologies, to reduce and contain any hydrofracture. All drill fluids used will also be self-flocculating, environmentally inert and CEFAS approved.





Legend:

Onshore Development Area

Onshore Export Cable Corridor Section

Section 1

Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm

Title: Onshore Project Section 1

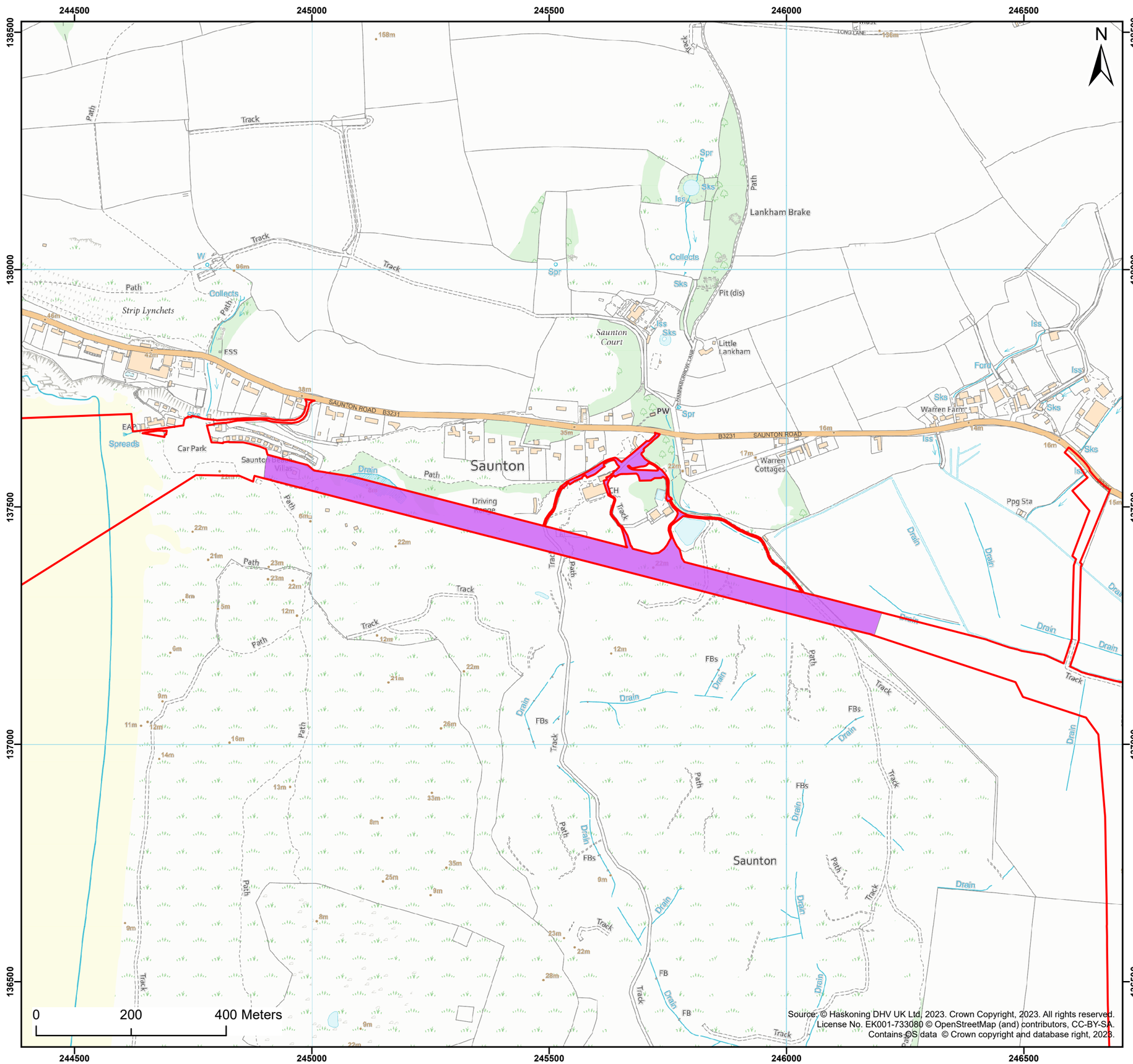
App:	Drawing No:
1.2	PC2978-RHD-ZZ-XX-DR-Z-0726

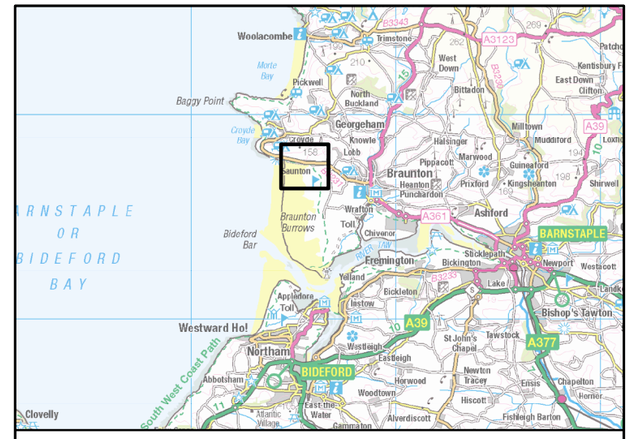
Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	26/02/2024	MT	PO	A3	1:6 000

Co-ordinate system: British National Grid

WHITE CROSS

Royal HaskoningDHV
Enhancing Society Together





Legend:

- Onshore Development Area

Onshore Export Cable Corridor Section

- Section 2

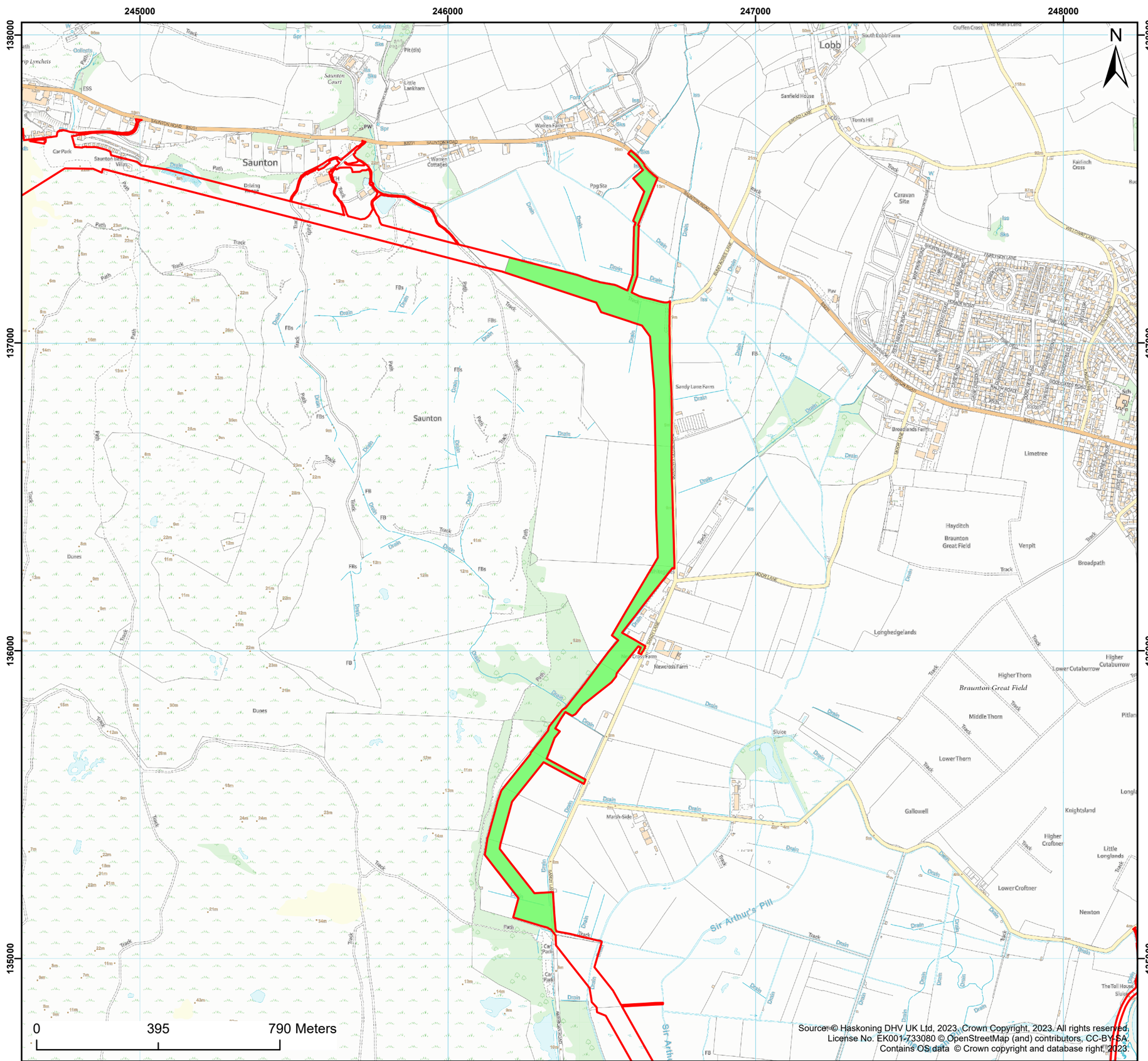
Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm
Title: Onshore Project Section 2	
App: 1.3	Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0727

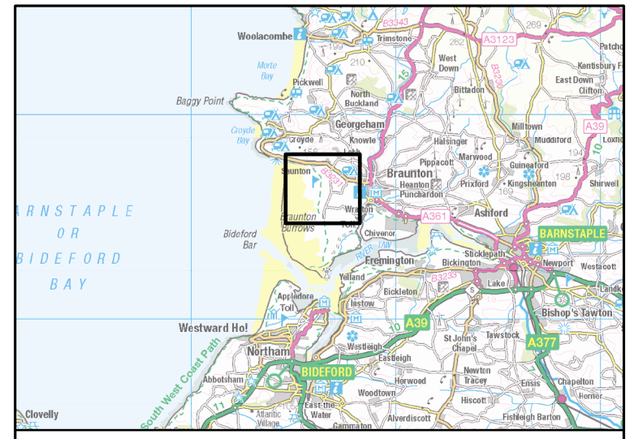
Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	26/02/2024	MT	PO	A3	1:8 000

Co-ordinate system: British National Grid

WHITE CROSS

Royal HaskoningDHV
Enhancing Society Together





Legend:

Onshore Development Area

Onshore Export Cable Corridor Section

Section 3

Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm

Title: Onshore Project Section 3

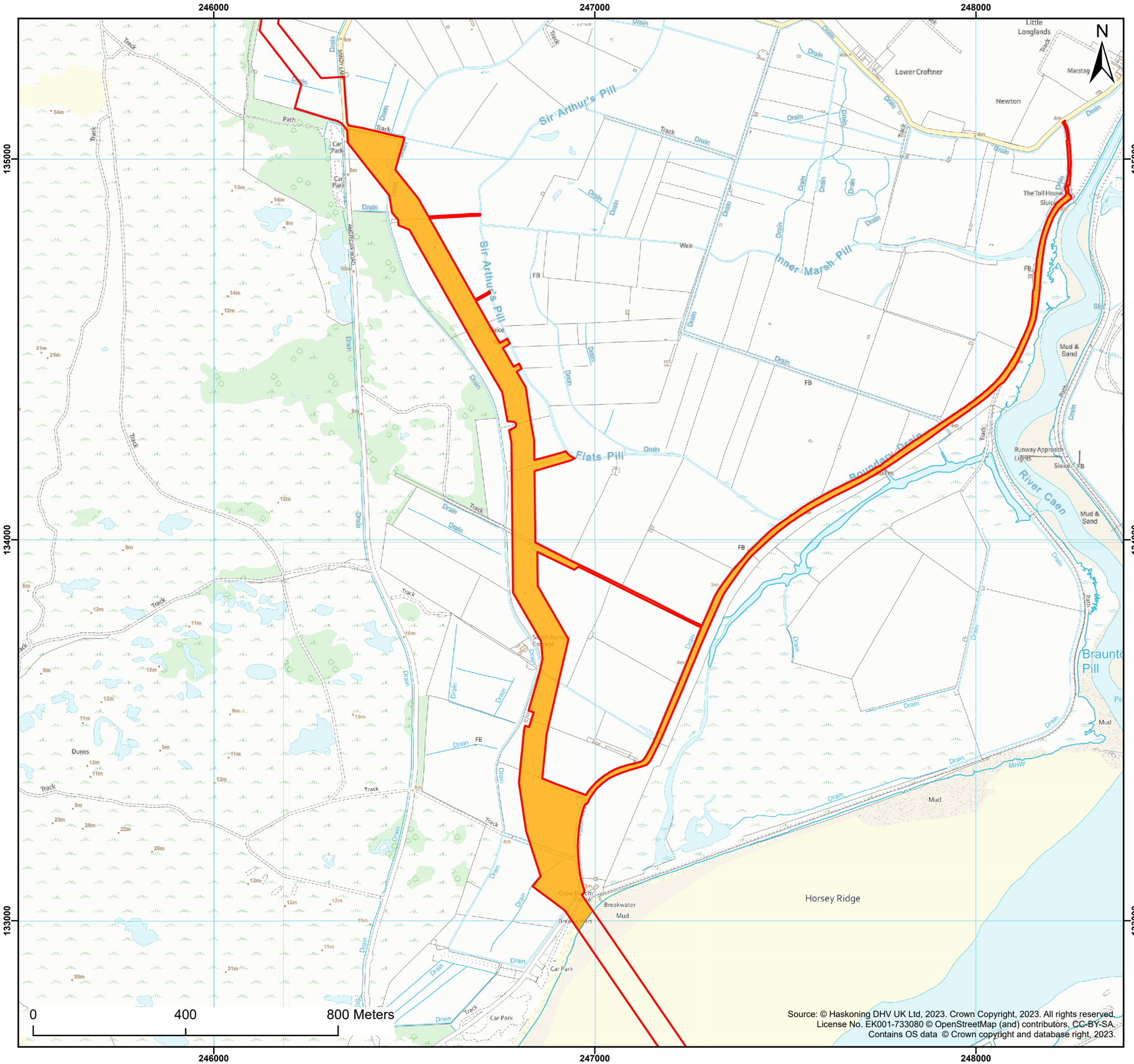
App:	Drawing No:
1.4	PC2978-RHD-ZZ-XX-DR-Z-0728

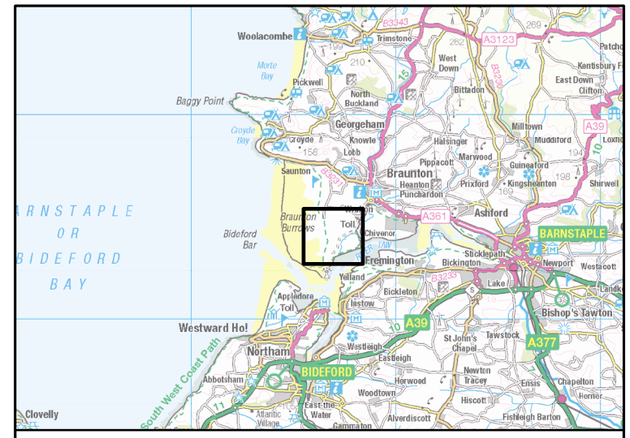
Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	26/02/2024	MT	PO	A3	1:12 500

Co-ordinate system: British National Grid

WHITE CROSS

Royal HaskoningDHV
Enhancing Society Together





Legend:

Onshore Development Area

Onshore Export Cable Corridor Section

Section 4

Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm

Title: Onshore Project Section 4

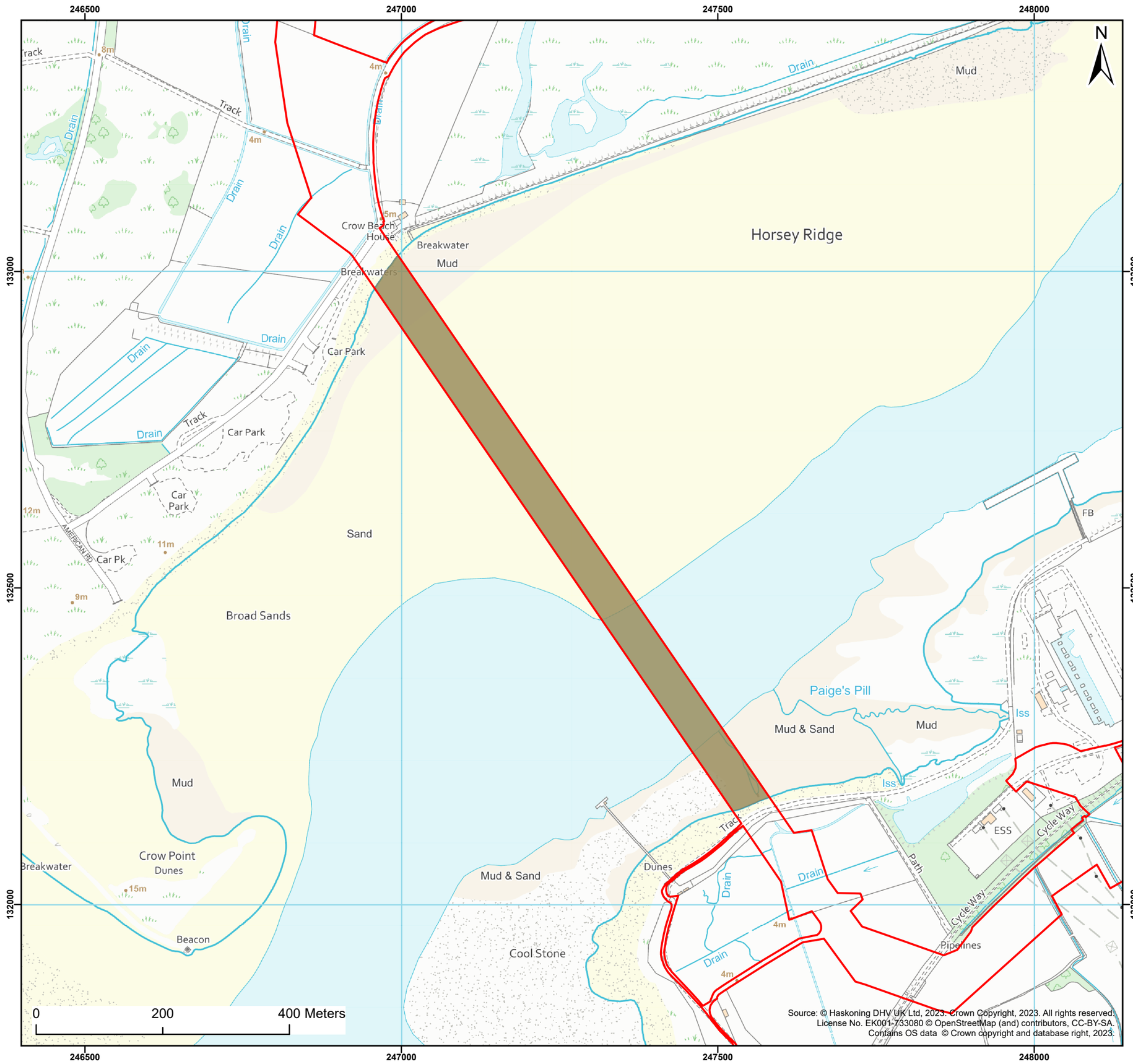
App:	Drawing No:
1.5	PC2978-RHD-ZZ-XX-DR-Z-0729

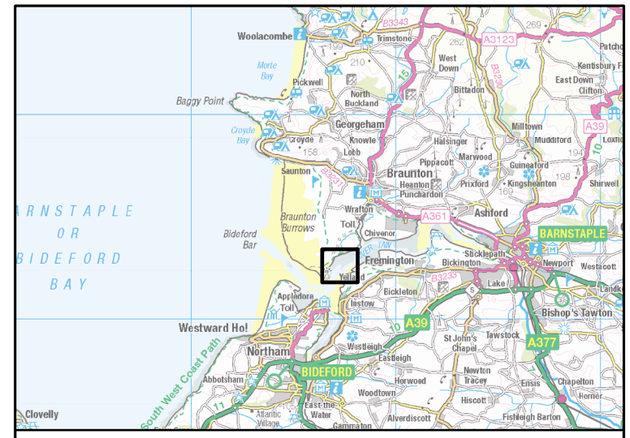
Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	26/02/2024	MT	PO	A3	1:10 000

Co-ordinate system: British National Grid

WHITE CROSS

Royal HaskoningDHV
Enhancing Society Together





Legend:

- Onshore Development Area

Onshore Export Cable Corridor Section

- Section 5

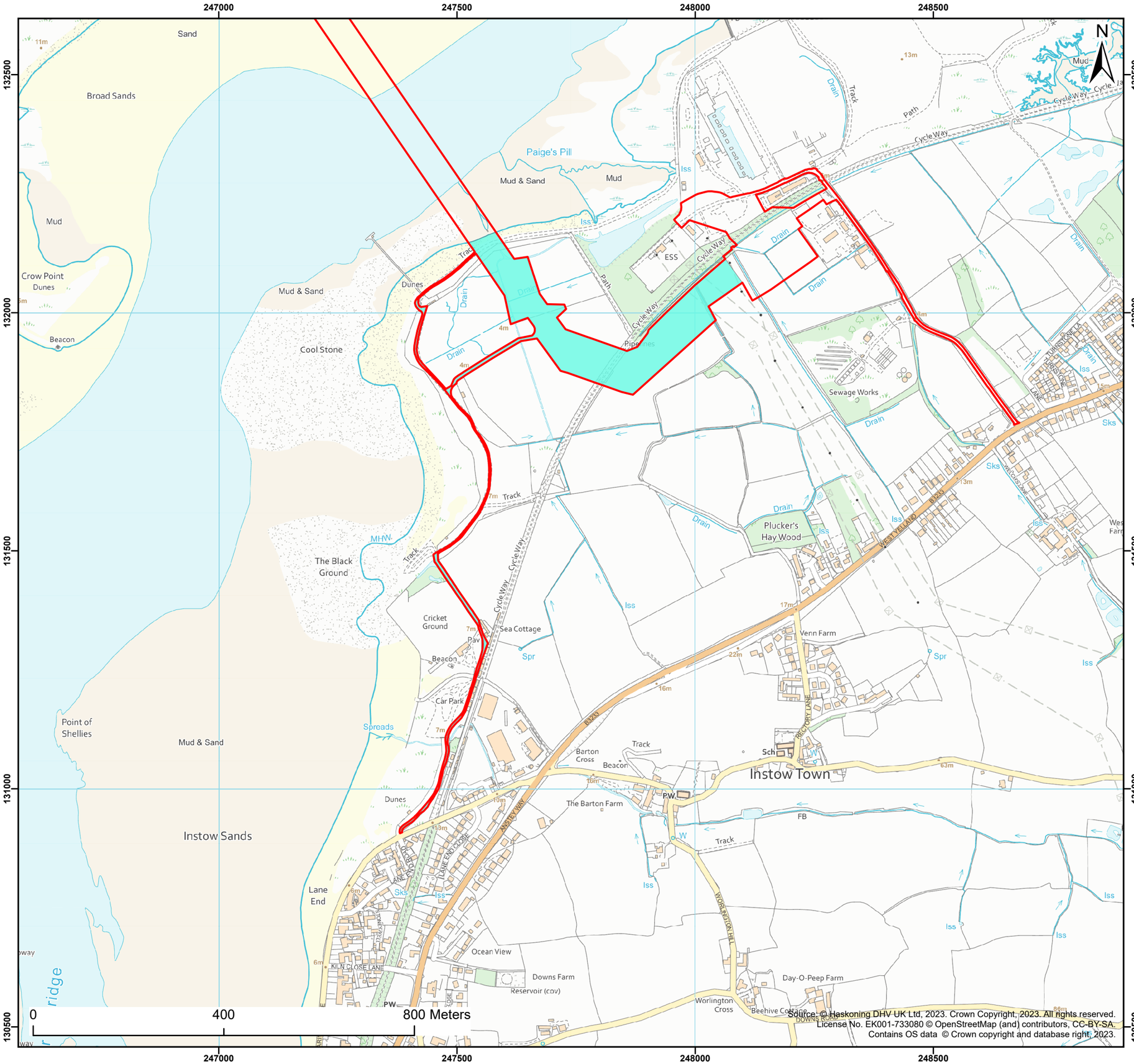
Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm
Title: Onshore Project Section 5	
App: 1.6	Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0730

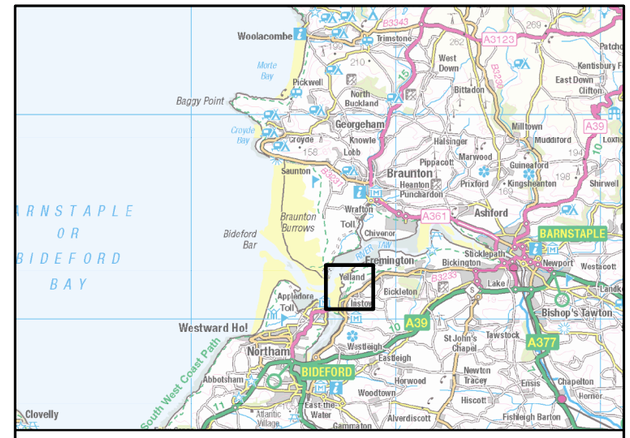
Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	26/02/2024	MT	PO	A3	1:6 000

Co-ordinate system: British National Grid

WHITE CROSS

Royal HaskoningDHV
Enhancing Society Together





Legend:

Onshore Development Area

Onshore Export Cable Corridor Section

Section 6

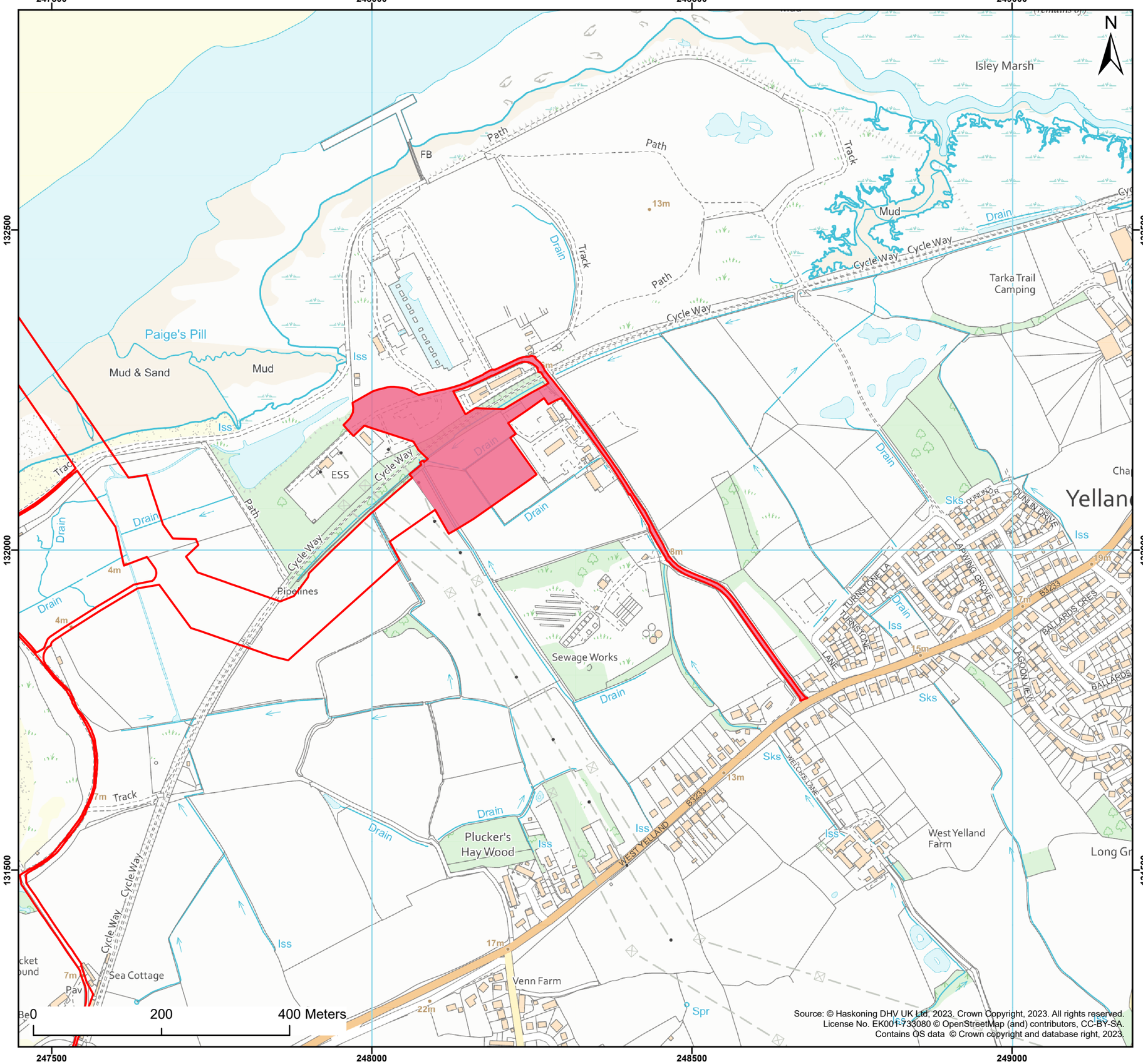
Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm
Title: Onshore Project Section 6	
App: 1.7	Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0731

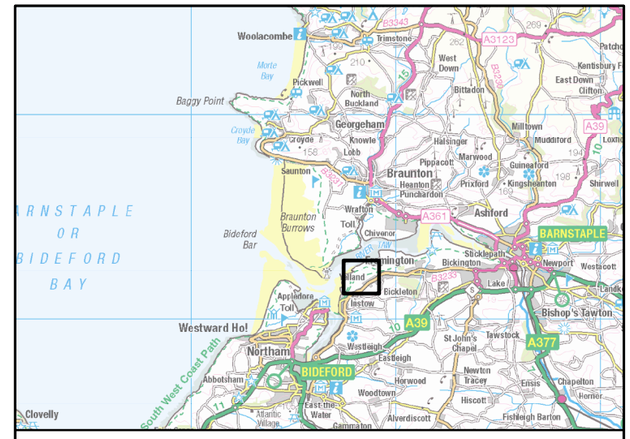
Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	26/02/2024	MT	PO	A3	1:8 000

Co-ordinate system: British National Grid

WHITE CROSS

Royal HaskoningDHV
Enhancing Society Together





Legend:

Onshore Development Area

Onshore Export Cable Corridor Section

Section 7

Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm

Title: Onshore Project Section 7

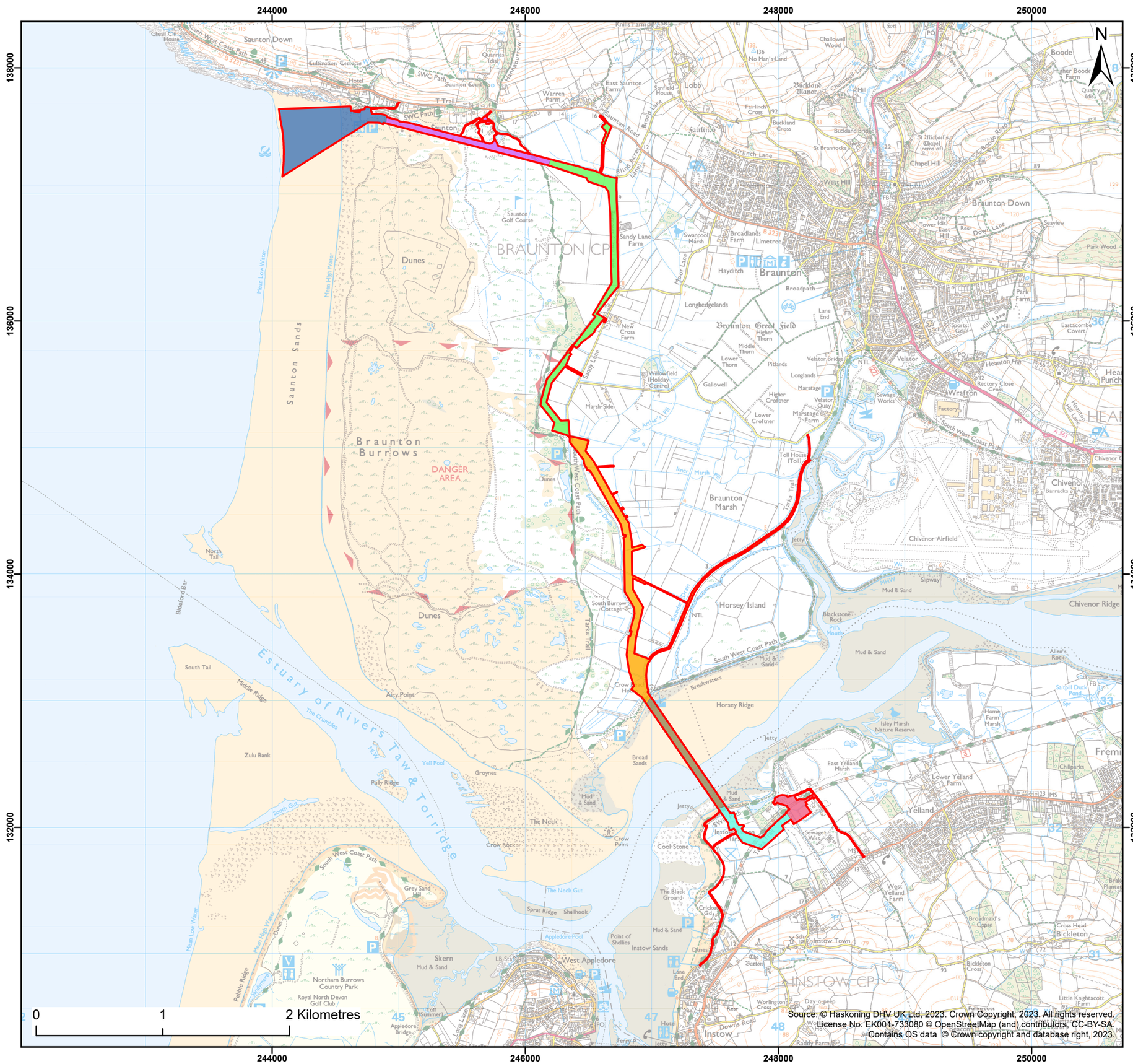
App:	Drawing No:
1.8	PC2978-RHD-ZZ-XX-DR-Z-0732

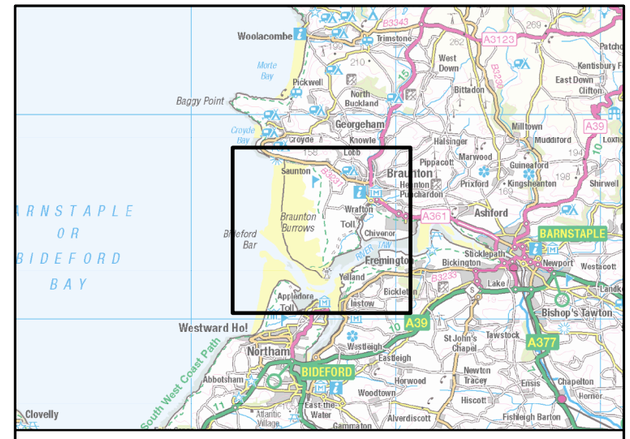
Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	26/02/2024	MT	PO	A3	1:6 000

Co-ordinate system: British National Grid

WHITE CROSS

Royal HaskoningDHV
Enhancing Society Together





Legend:

Onshore Development Area

Onshore Export Cable Corridor Sections

- Section 1
- Section 2
- Section 3
- Section 4
- Section 5
- Section 6
- Section 7

Client: Offshore Wind Ltd.

Project: White Cross Offshore Windfarm

Title: Project Location

App: 1.1

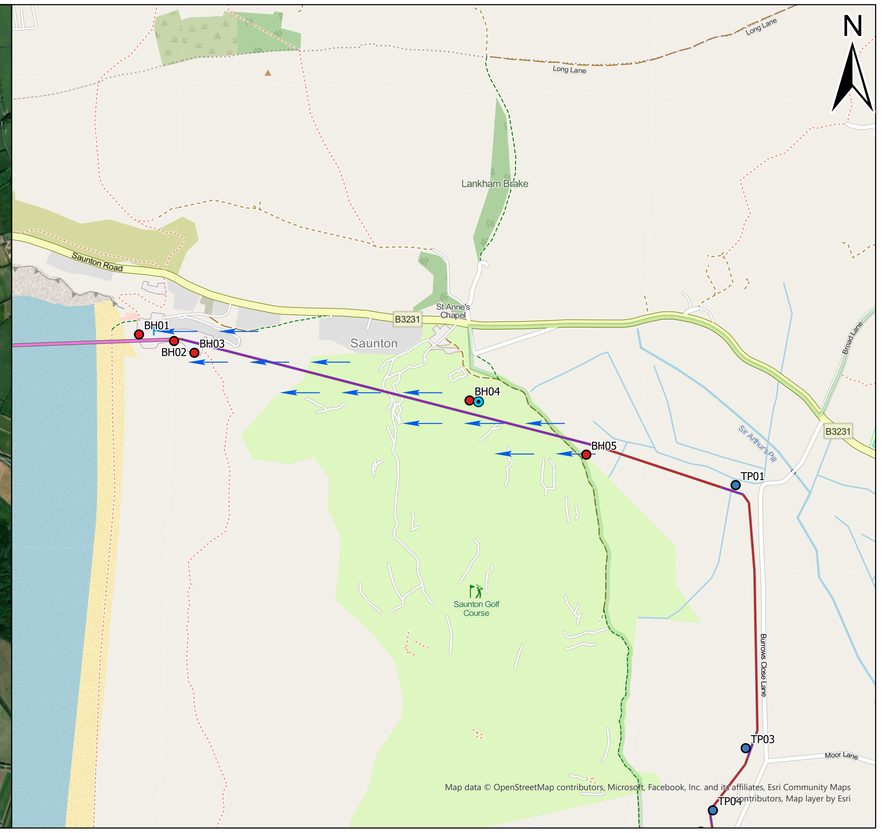
Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0725

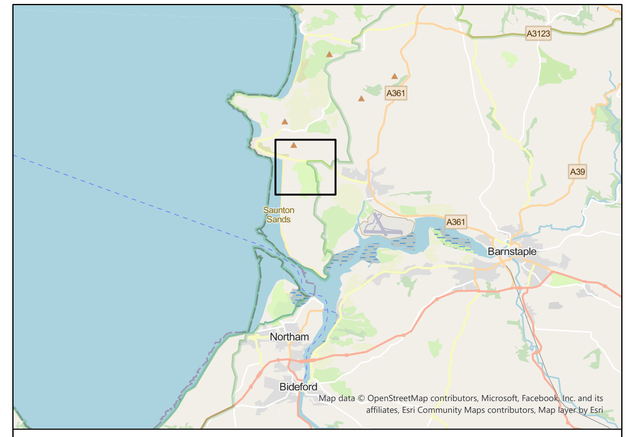
Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	26/02/2024	MT	PO	A3	1:30 000

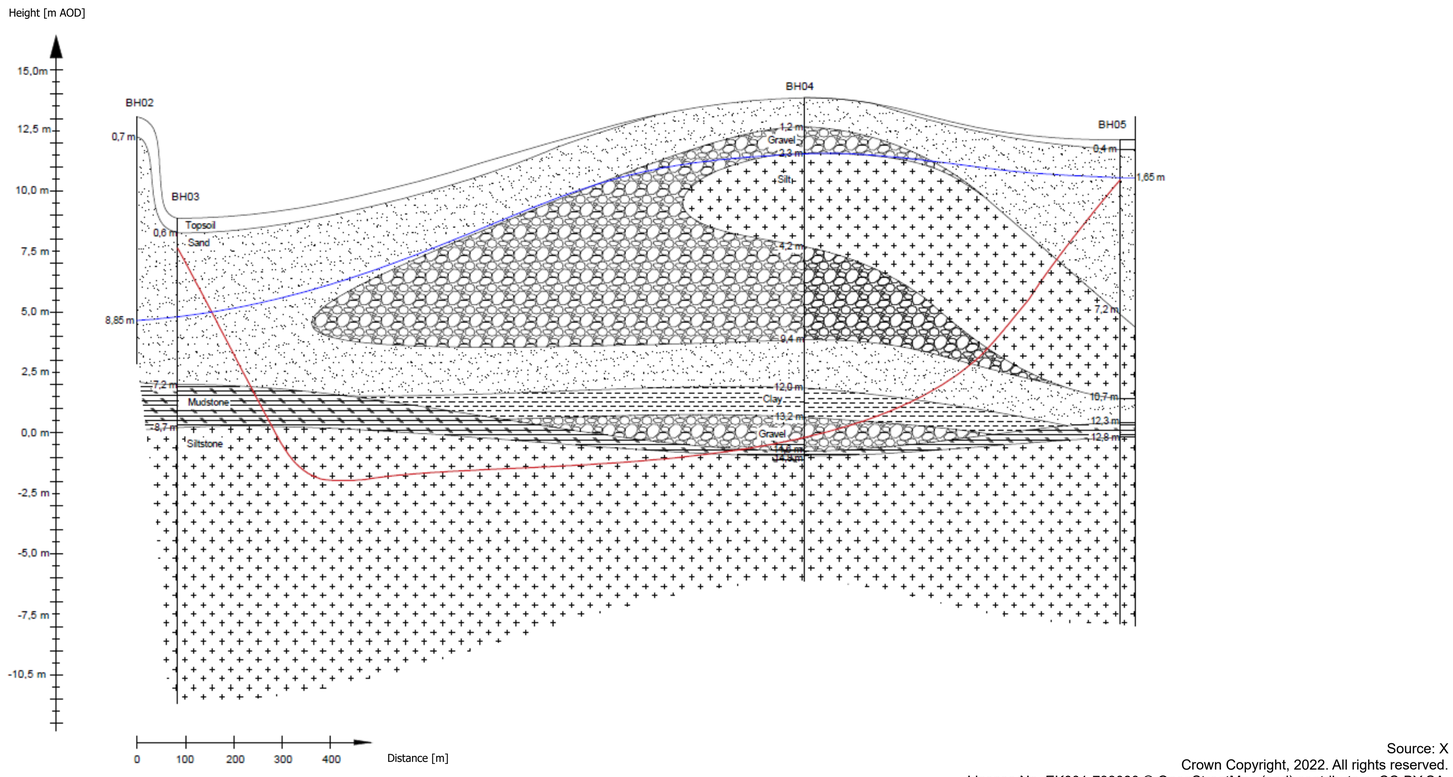
Co-ordinate system: British National Grid

WHITE CROSS

Royal HaskoningDHV
Enhancing Society Together







Legend:

- boreholes
- trial pits
- Saunton Golf Club borehole no. 1
- Trenchless crossing
- Landfall
- Open Cut
- cable pathway
- average groundwater table
- presumed groundwater flow direction

0 500 1 000 m

Source: X

Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm

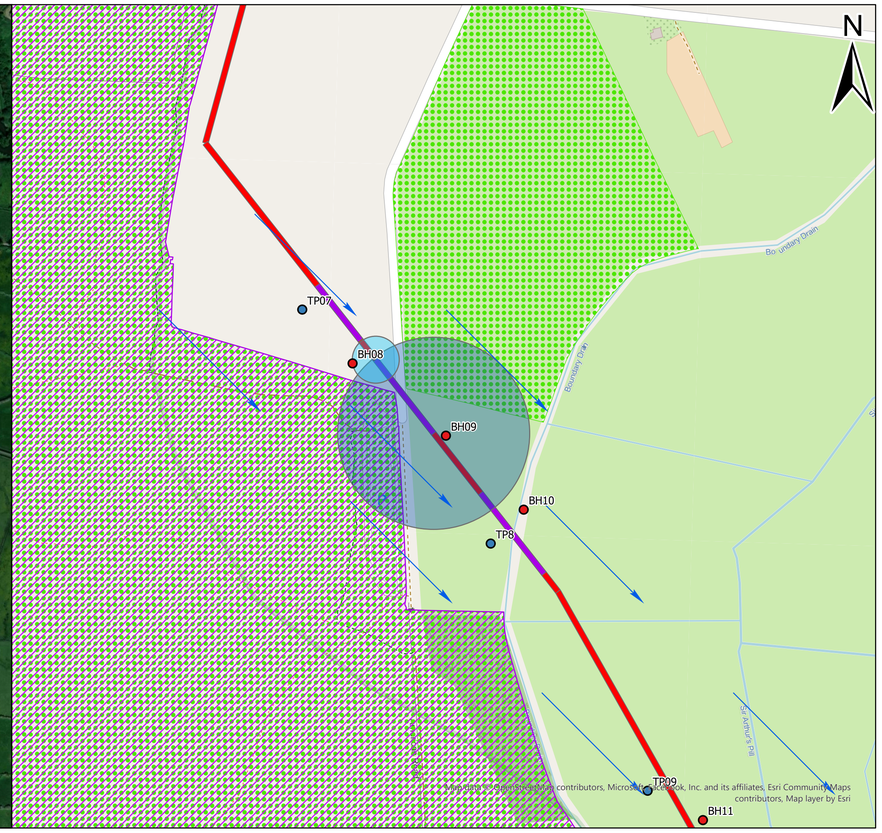
Title: Conceptual Site Model
Site 1: RDX 1-Braunton Burrows / Golf Course

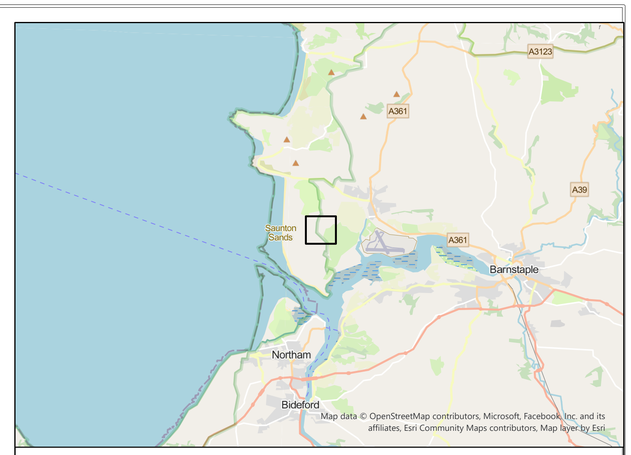
Annex 2	Drawing No:	PC2978-RHD-ZZ-XX-DR-Z			
Revision:	Date:	Drawn:	Checked:		Scale:
P01	10/06/2024	MT	PO	A3	1:10 000

Co-ordinate system: British National Grid

WHITE CROSS

Royal HaskoningDHV
Enhancing Society Together

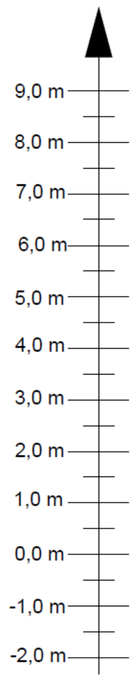


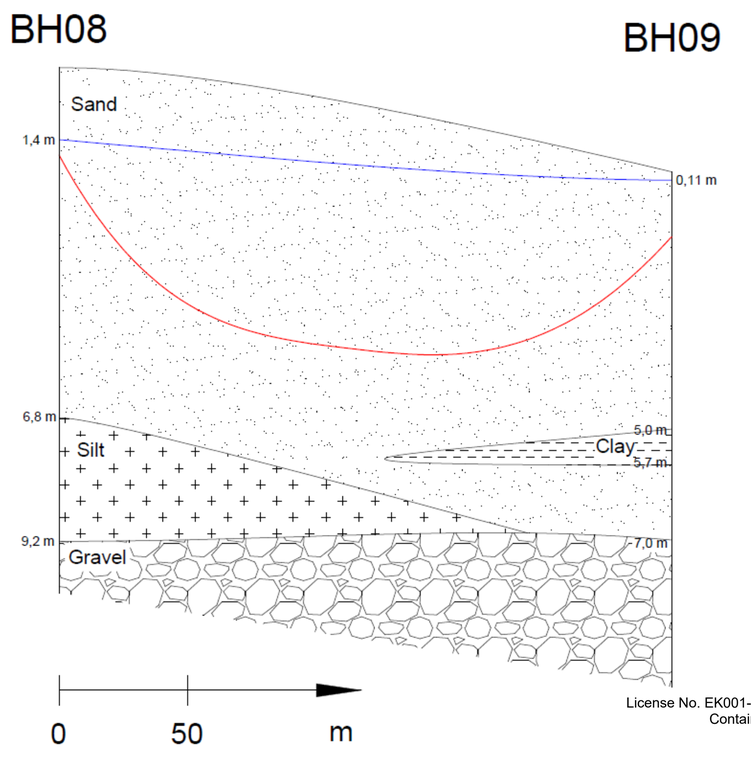


Legend:

- boreholes
- trial pits
- HDD
- Open Cut
- Sites of Special Scientific Interest
- Special Area of Conservation
- Range of depression cone for RDX2-Sandy Lane / American Road crossing From the entry of HDD
- Range of depression cone for RDX2-Sandy Lane / American Road crossing From the exit of HDD
- cable pathway
- groundwater table
- presumed groundwater flow direction

0 0,25 0,5 km





Boundary Drain

Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm

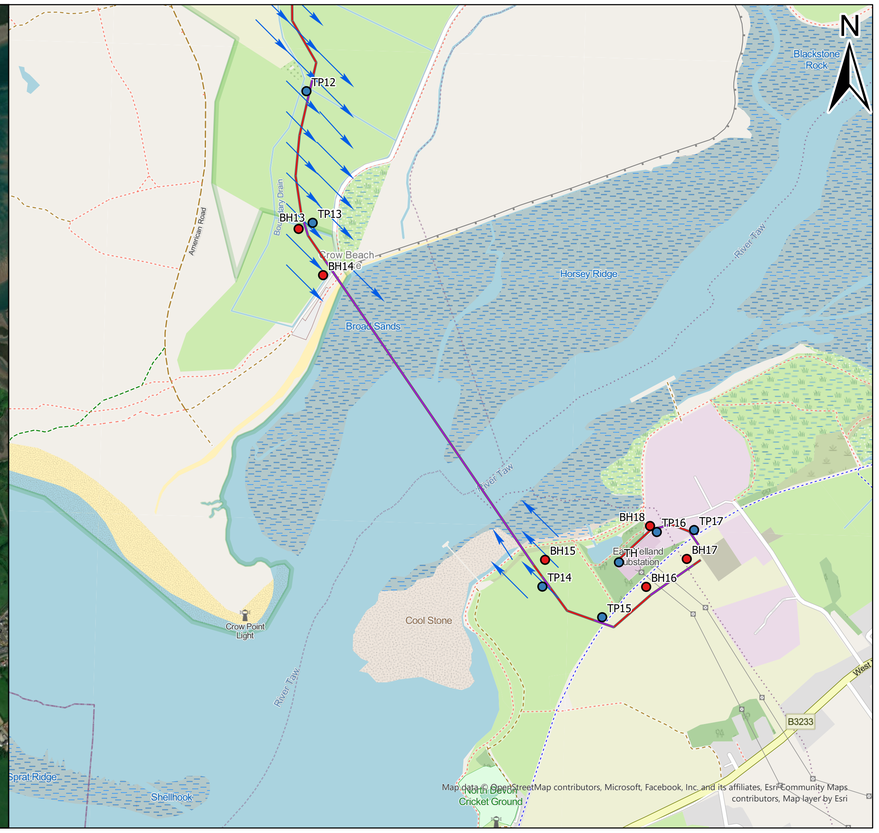
Title:
Conceptual Site Model
Site 2: RDX2-Sandy Lane / American Road

App.3	Drawing No:	PC2978-RHD-ZZ-XX-DR-Z			
Revision:	Date:	Drawn:	Checked:		Scale:
P01	17/05/2024	MT	PO	A3	1:5 000

Co-ordinate system: British National Grid

WHITE CROSS

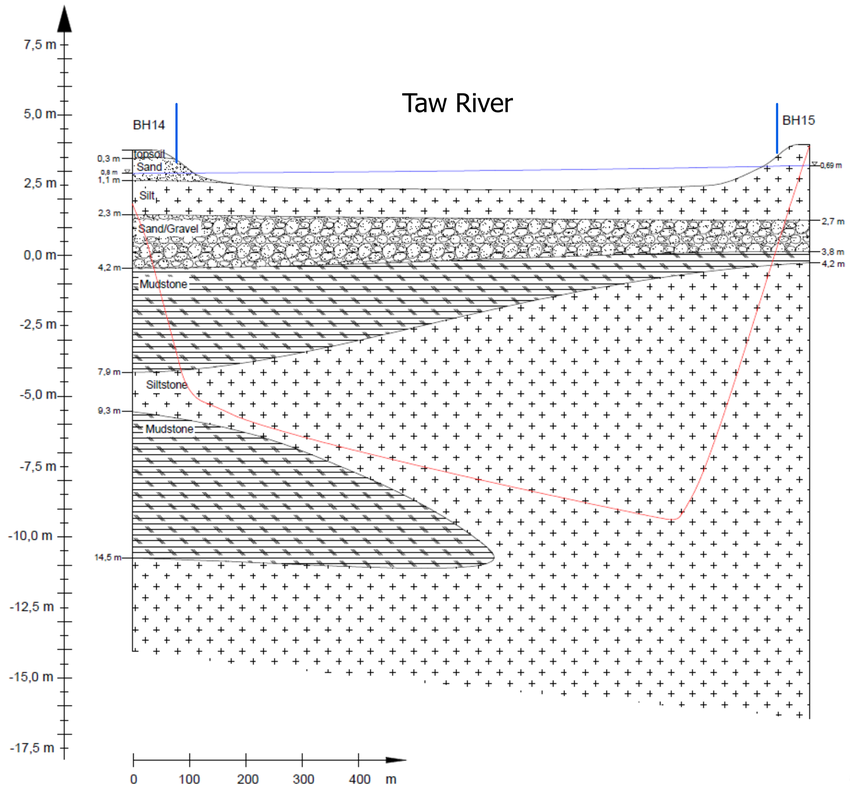
Royal HaskoningDHV
Enhancing Society Together



Legend:

- boreholes
- trial pits
- HDD
- Open Cut
- cable pathway
- groundwater table
- presumed groundwater flow direction

0 0,5 1 km



Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm

Title: Conceptual Site Model
Site 3: RVX1-River Taw

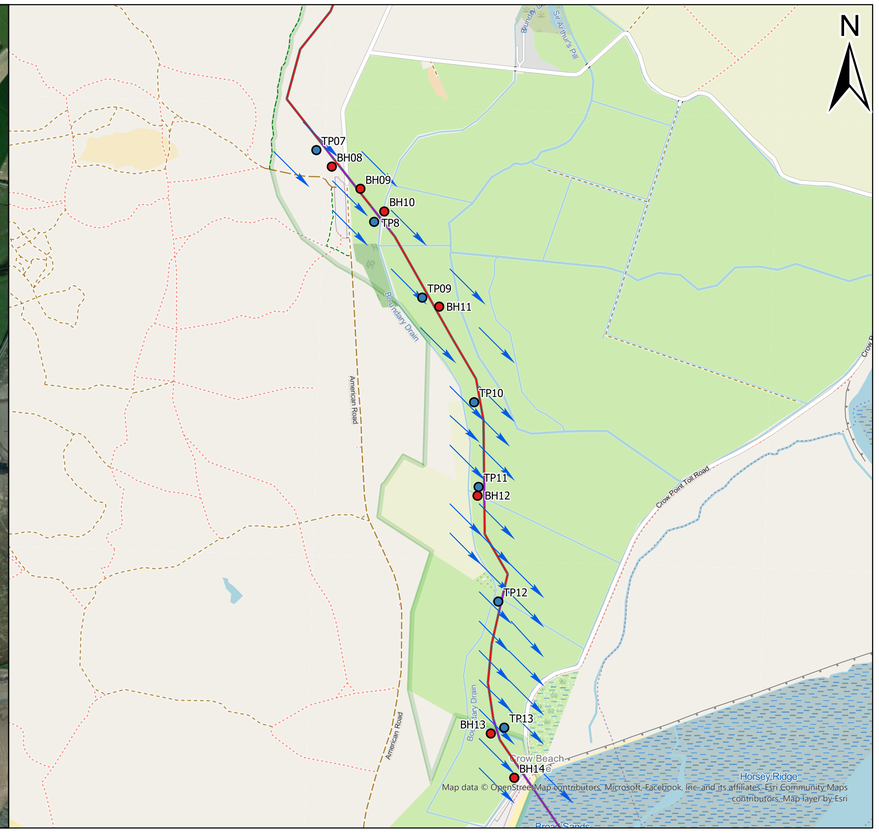
App. 4 | Drawing No: PC2978-RHD-ZZ-XX-DR-Z

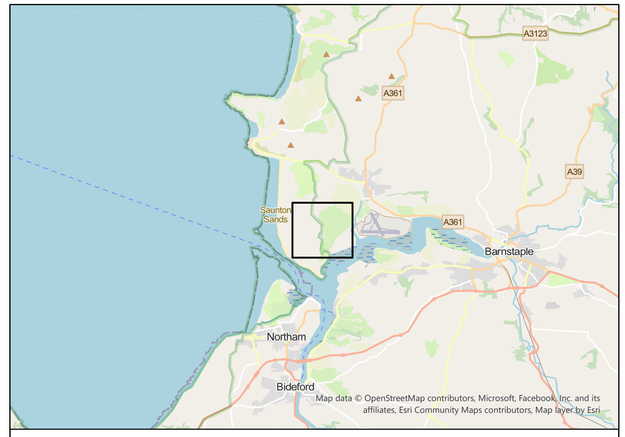
Revision:	Date:	Drawn:	Checked:		Scale:
P01	17/05/2024	MT	PO	A3	1:10 000

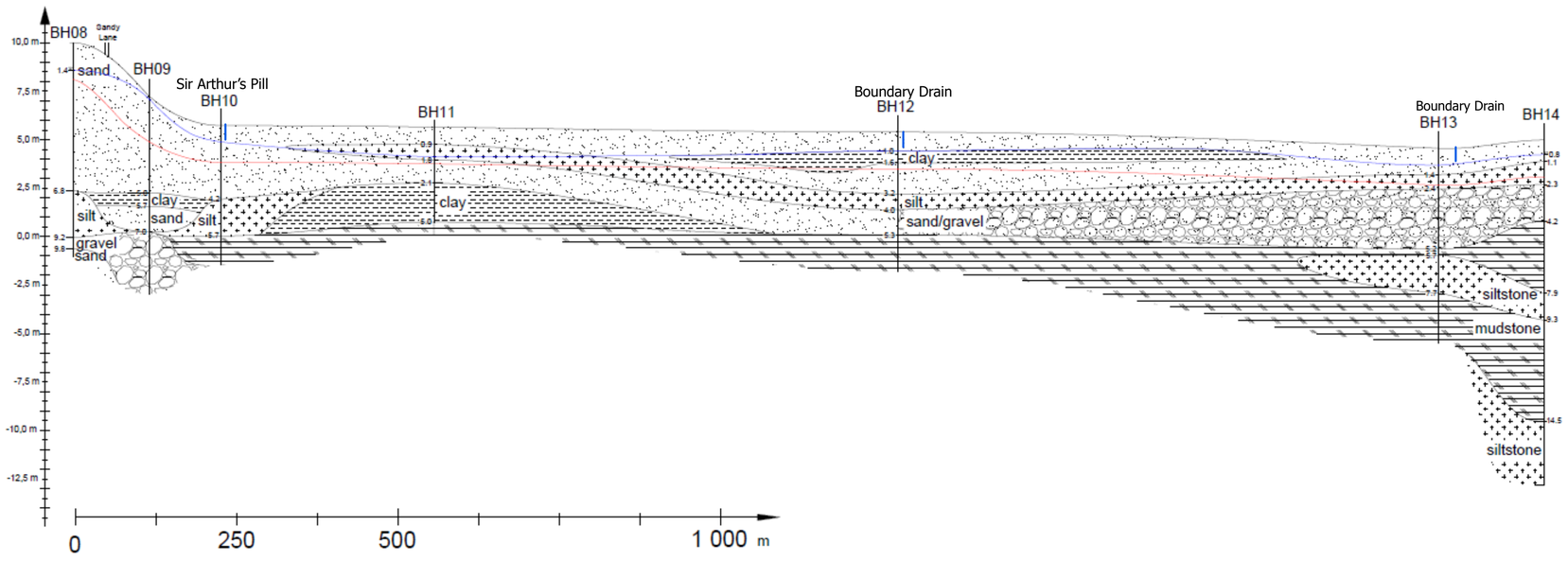
Co-ordinate system: British National Grid

WHITE CROSS

Royal HaskoningDHV
Enhancing Society Together







Legend:

- boreholes
- trial pits
- HDD
- Open Cut
- cable pathway
- groundwater table
- presumed groundwater flow direction

0 0,5 1 km

Client: Offshore Wind Ltd.	Project: White Cross Offshore Windfarm

Title:
Conceptual Site Model
Site 4: Braunton Marshes (Export Cable Corridor Section 4)

App. 5 | Drawing No: PC2978-RHD-ZZ-XX-DR-Z

Revision:	Date:	Drawn:	Checked:		Scale:
P01	17/05/2024	MT	PO	A3	1:10 000

Co-ordinate system: British National Grid

WHITE CROSS

Royal HaskoningDHV
Enhancing Society Together