MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS

Environmental Statement

Volume 3, Annex 2.3: Flood risk assessment - part 2 of 3

December 2024
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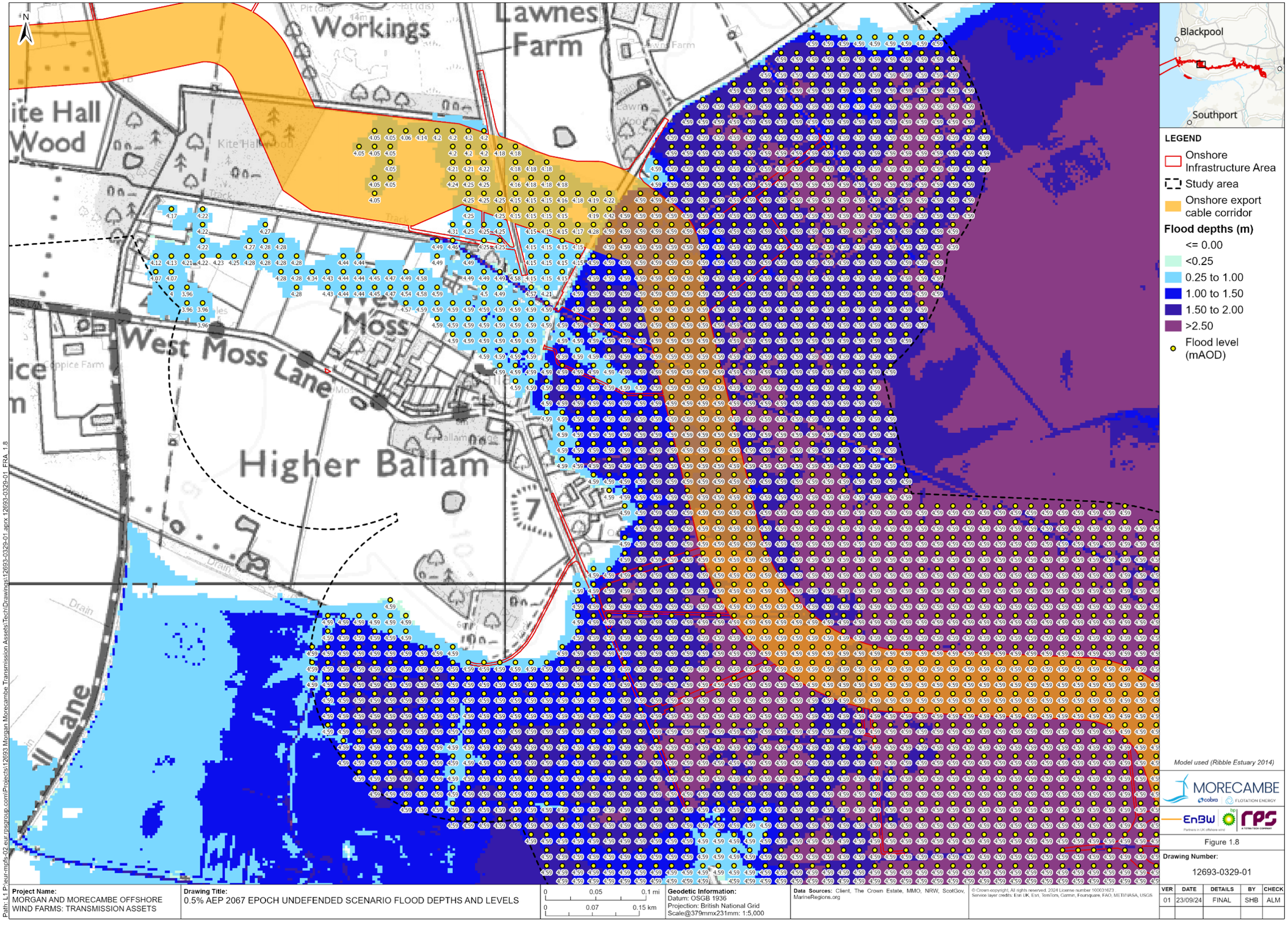
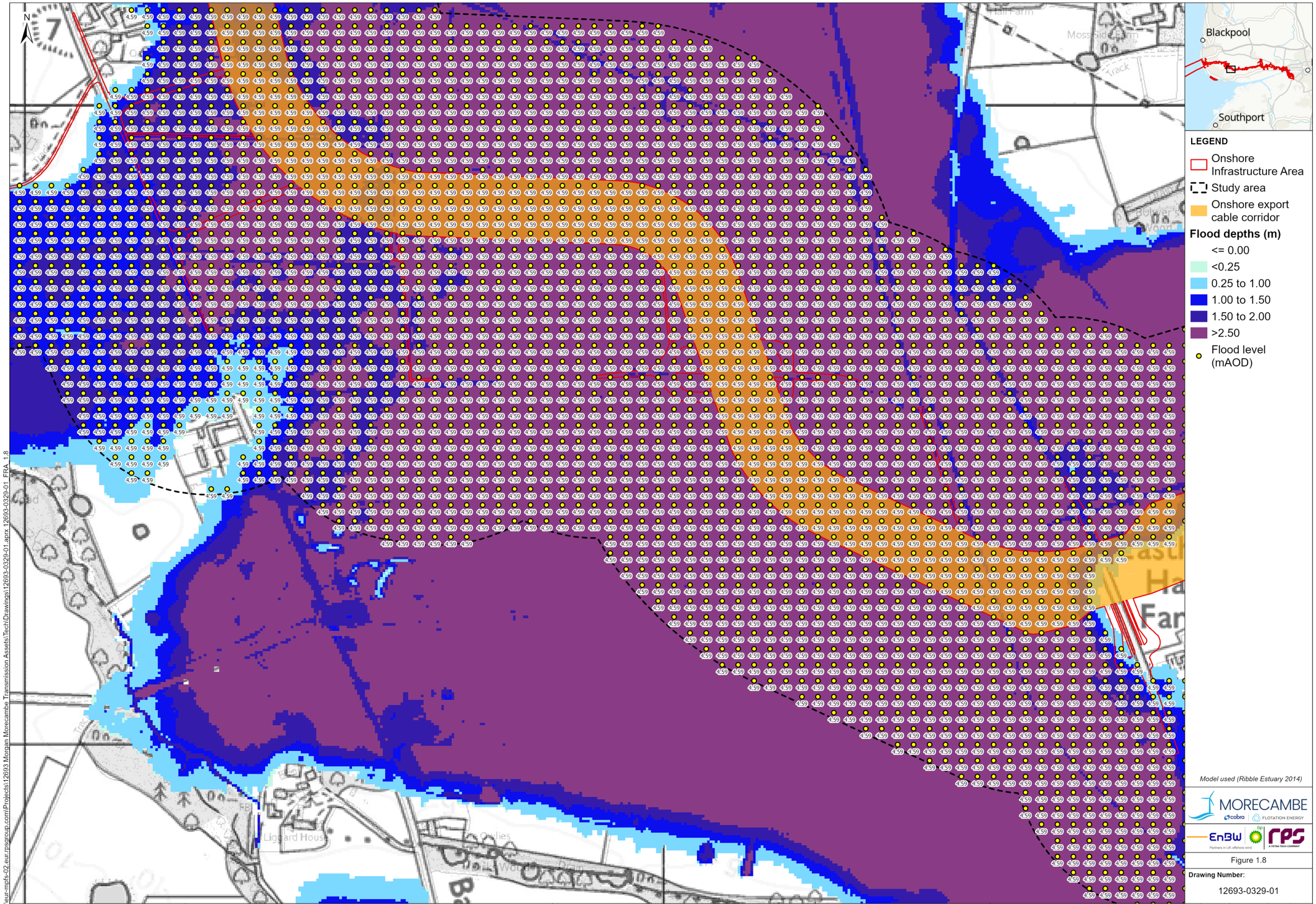


Figure 1.8a: 0.5% AEP 2067 epoch undefended scenario flood depths and levels



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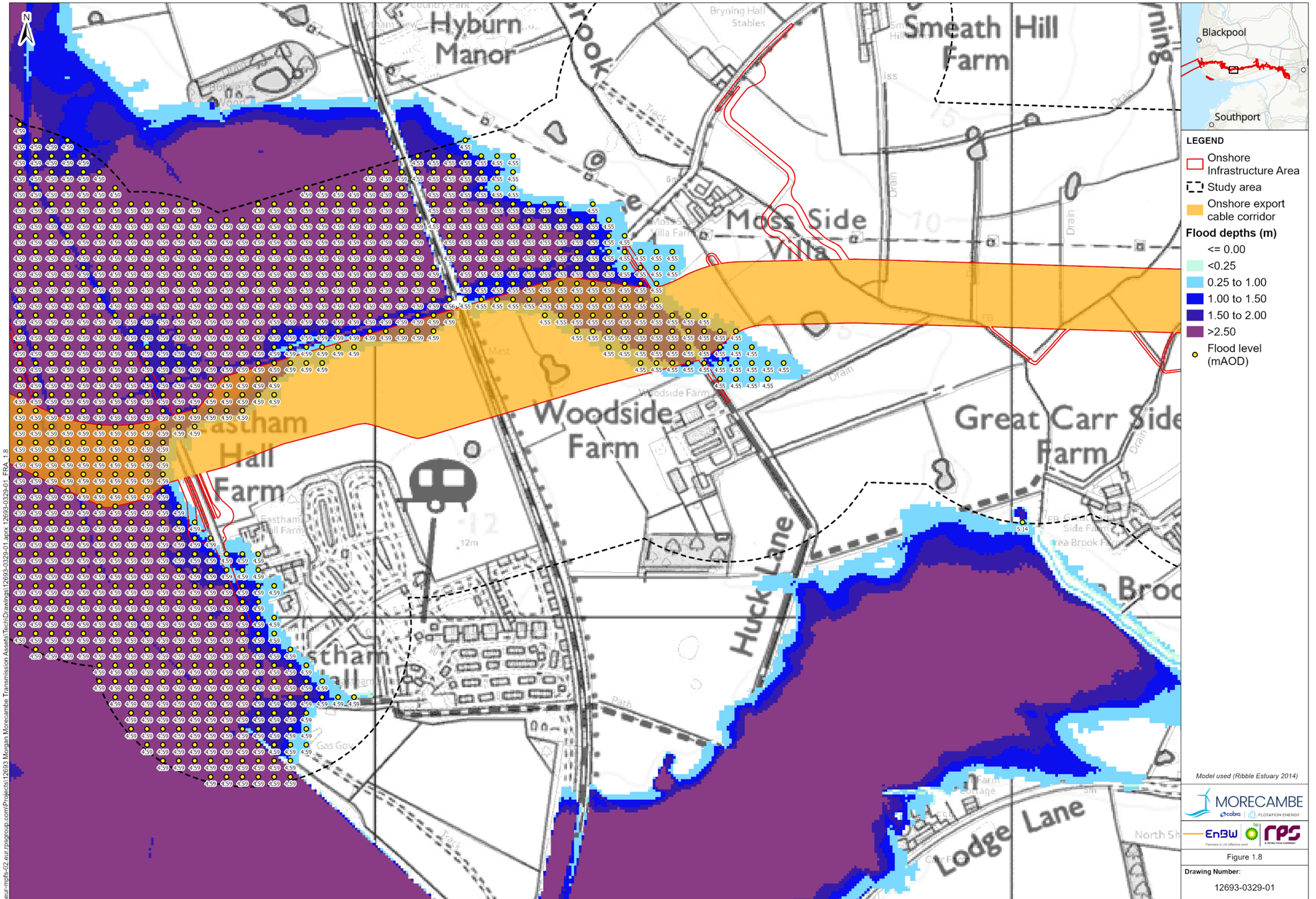

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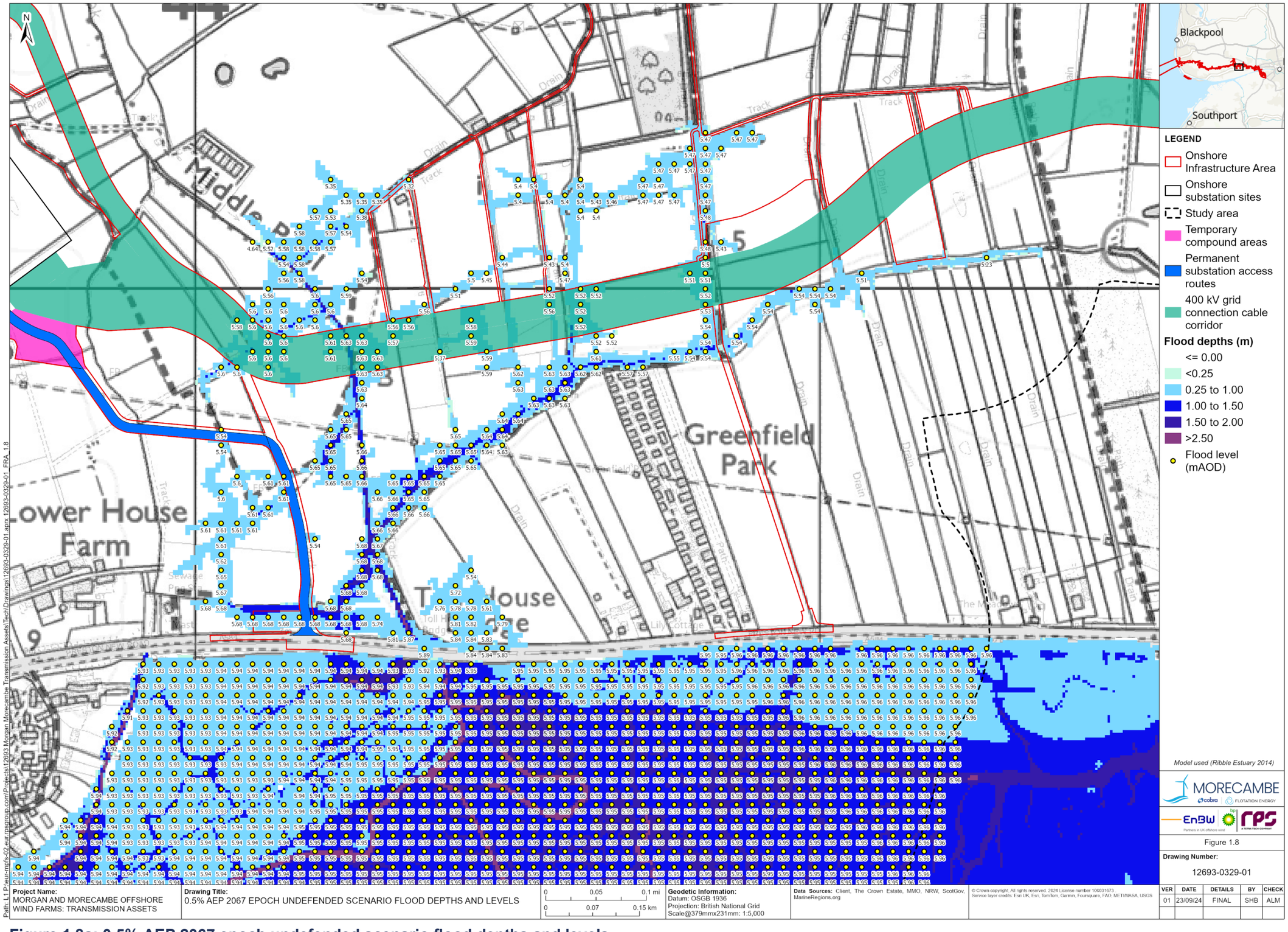

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Project Name: MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS	**Drawing Title:** 0.5% AEP 2067 EPOCH UNDEFENDED SCENARIO FLOOD DEPTHS AND LEVELS	0 0.05 0.1 mi 0 0.07 0.15 km	**Geodetic Information:** Datum: OSGB 1936 Projection: British National Grid Scale@379mmx231mm: 1:5,000	**Data Sources:** Client, The Crown Estate, MMO, NRW, ScotGov, MarineRegions.org

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Figure 1.8

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Figure 1.8a: 0.5% AEP 2067 epoch undefended scenario flood depths and levels

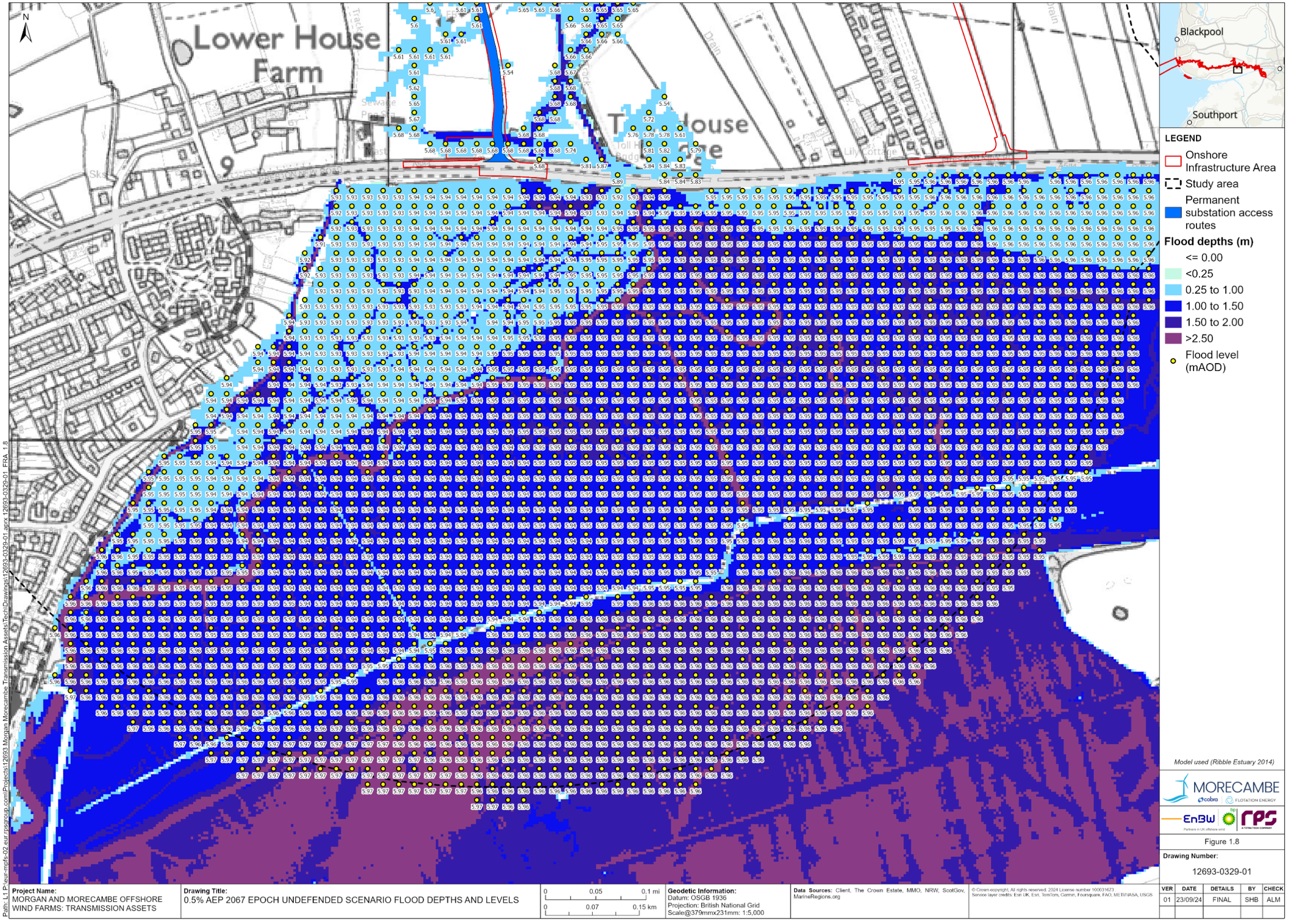


Figure 1.8a: 0.5% AEP 2067 epoch undefended scenario flood depths and levels

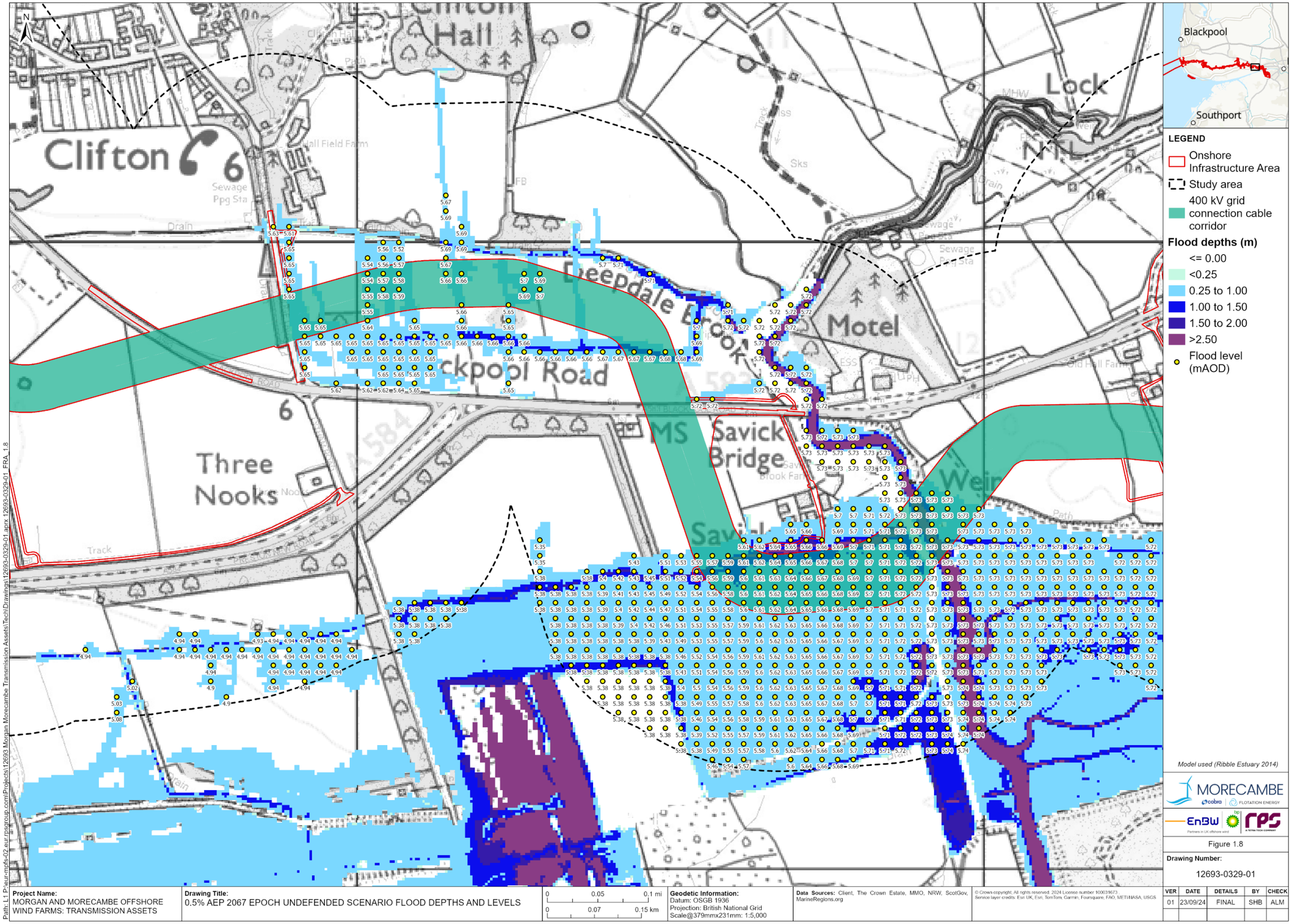
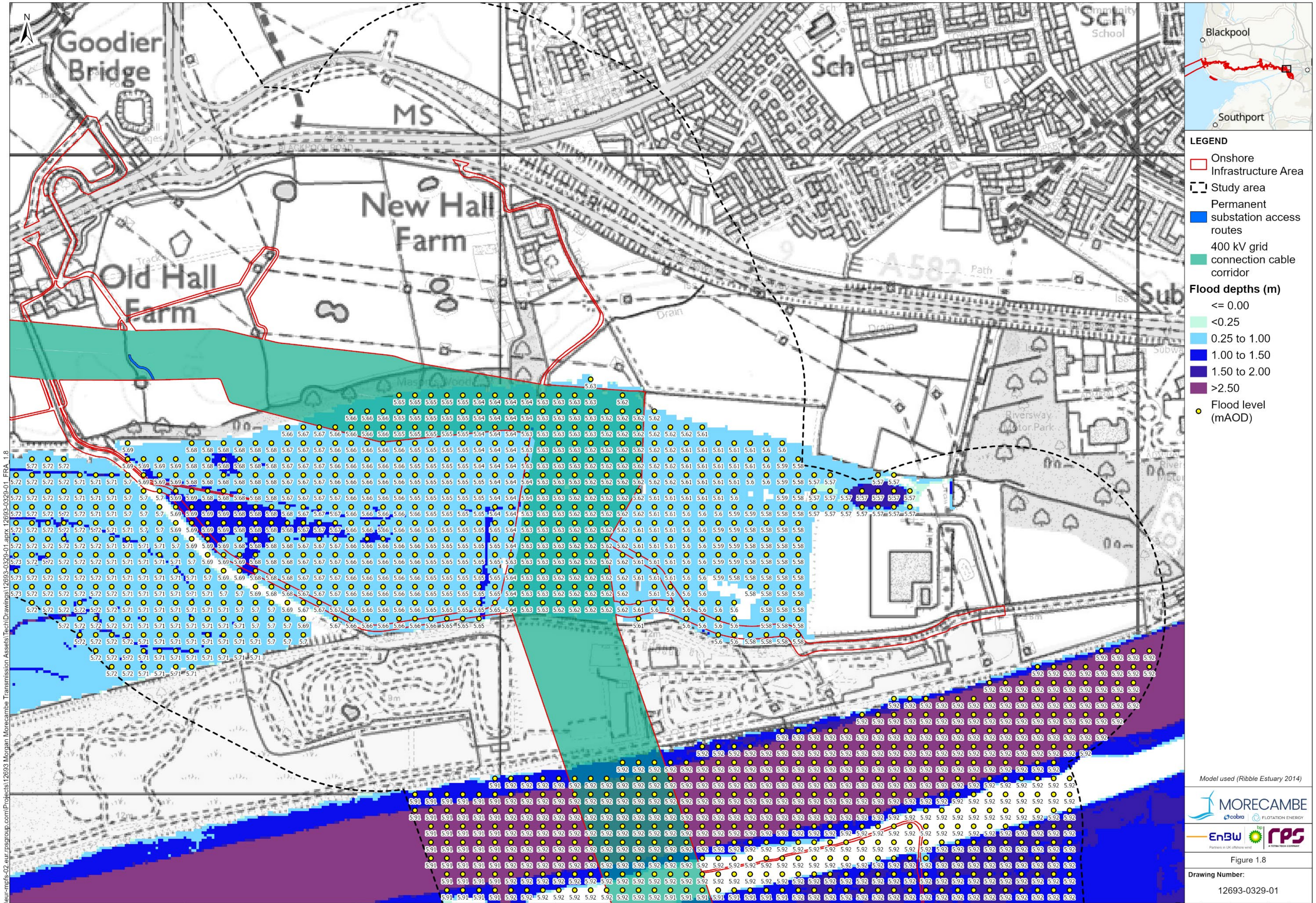


Figure 1.8a: 0.5% AEP 2067 epoch undefended scenario flood depths and levels



Project Name: MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS

Drawing Title: 0.5% AEP 2067 EPOCH UNDEFENDED SCENARIO FLOOD DEPTHS AND LEVELS

0 0.05 0.1 mi
0 0.07 0.15 km

Geodetic Information:
Datum: OSGB 1936
Projection: British National Grid
Scale@379mmx231mm: 1:5,000

Data Sources: Client, The Crown Estate, MMO, NRW, ScotGov, MarineRegions.org

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Figure 1.8a: 0.5% AEP 2067 epoch undefended scenario flood depths and levels

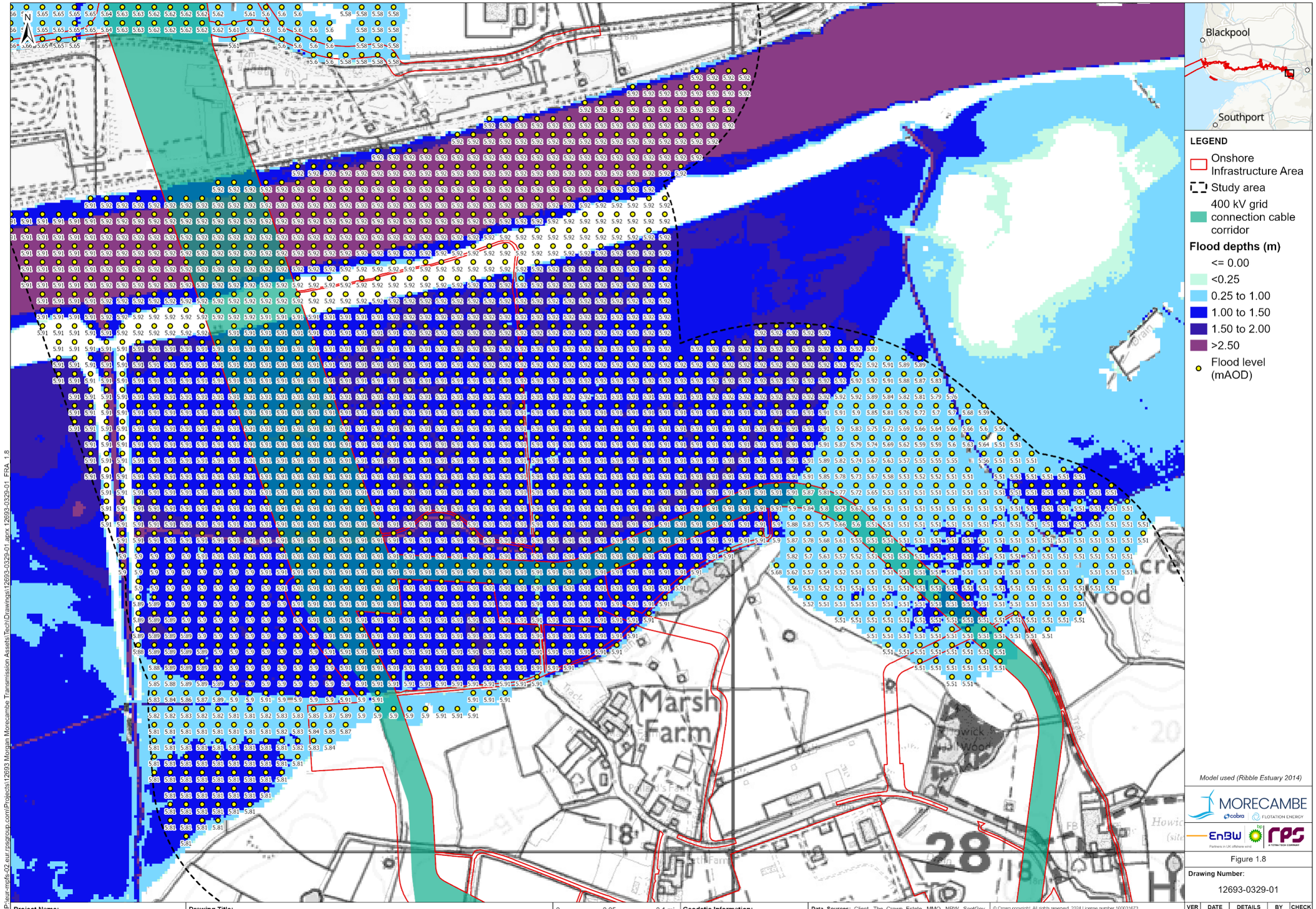


Figure 1.8a: 0.5% AEP 2067 epoch undefended scenario flood depths and levels

Mitigation measures (commitments)

1.5.4.22 The following mitigation measures (commitments) presented below within **Table 1.18** are proposed to manage flood risk and vulnerability to site workers during the construction phase. Commitments are also presented within **Section 1.8, Table 1.44**. Commitments are to be secured through requirements of the DCO.

Table 1.18: Summary of CoT for fluvial flood risk for Morgan onshore substation

CoT	Summary	Reason	How CoT is to be secured
CoT08	Post-construction, the working area will be reinstated to pre-existing condition as far as reasonably practical in line with the DEFRA Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (PB13298), Institute of Quarrying (IQ) Good Practice Guide for Handling Soils in Mineral Workings (IQ, 2021) and British Society of Soil Science (BSSS) Working with Soil Guidance Note on Benefitting from Soil Management in Development and Construction (BSSS, 2022).	To ensure working areas are reinstated to pre-existing conditions after construction has been completed	DCO Schedules 2A & 2B, Requirement 18 (Restoration of land temporarily used for construction); DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT09	The Outline Code of Construction Practice (CoCP) has been submitted as part of the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP includes information about drainage during construction.	To implement construction phase drainage to control runoff during this phase of the Transmission Assets.	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)
CoT27	All temporary compounds will be removed and sites will be reinstated when construction has been completed.	To ensure working areas are reinstated to pre-existing conditions after construction has been completed	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice); and DCO Schedules 2A and 2B, Requirement 16 (Restoration of land used temporarily for construction)
CoT35	An Outline Code of Construction Practice (CoCP) has been prepared and submitted with the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP will include measures to maintain and address:	To implement control measures in regards to fluvial and tidal flooding, including: • Measures to prevent a reduction in the capacity of the fluvial floodplain which can increase flood risk downstream;	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)

CoT	Summary	Reason	How CoT is to be secured
	• […] flood protection and control measures; • -water environment and drainage; and • pollution prevention […]	• Measures regarding dewatering; • Measures regarding restricting the placement of stockpiling, storage of fuels and chemicals and refuelling to Flood Zone 1 (where practical) and at least 8 m from ordinary watercourses and Main Rivers and 16m from tidal Main Rivers to reduce vulnerability to flood risk;	
CoT36	Onshore Decommissioning Plan(s) will be developed prior to decommissioning. The Onshore Decommissioning Plan(s) will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure (if and where relevant and practicable), and details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The Onshore Decommissioning Plan(s) will be in line with the latest relevant available guidance.	To manage flood risk during decommissioning	DCO Schedules 2A & 2B, Requirement 22 (Onshore decommissioning)
CoT82	Where trenchless techniques are proposed for crossing ordinary watercourses, the entry and exit pits will be set back a minimum of 8 m from the bank of the watercourse. These crossings are detailed in the Onshore Crossing Schedule. Where required, geomorphological surveys will be undertaken on ordinary watercourses that may be crossed by trenched techniques. These will be used to inform detailed designs prior to construction.	To reduce fluvial flood risk	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT121	Where watercourses are to be crossed by haul roads and temporary access tracks, the culverting or bridging will be appropriately sized to ensure conveyance of existing flows to mitigate the potential for increased flood risk. This will be agreed in consultation with the Lead Local Flood Authority for	To ensure fluvial flood risk is not increased	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)

CoT	Summary	Reason	How CoT is to be secured
	Ordinary watercourses; or the Environment Agency for Environment Agency Main Rivers.		

Summary

1.5.4.23 The Morgan onshore substation development platform, associated surface water attenuation and temporary and permanent access tracks are located within Flood Zone 1. The temporary construction compounds are located within Flood Zone 1, 2 and 3a and is inundated by fluvial flooding during the construction phase. The Morgan onshore substation is not at risk during the operation and maintenance phase, or from tidal sources With the implementation of mitigation measures presented within **Table 1.18** flood risk from fluvial and tidal sources is assessed to be low.

1.5.5 Groundwater flood risk

1.5.5.1 Groundwater flood risk mapping included within the Groundsure Enviro and Geo Insight report (2023) shows the Morgan onshore substation site has a 'moderate' to 'high' risk of groundwater flooding. The majority of the 1 km study area is shown to have a 'low' to 'high' risk of flooding with limited areas with a 'negligible' risk of flooding.

Mitigation measures (commitments)

1.5.5.2 Mitigation measures (commitments) presented below within **Table 1.19** are proposed to manage flood risk and vulnerability to site workers during the construction phase. No commitments relating to groundwater flooding are required during the operation and maintenance phase. Commitments are also presented within **Section 1.8, Table 1.44.** Commitments are to be secured through requirements of the DCO**.**

Table 1.19: Summary of CoT for groundwater flood risk for Morgan onshore substation

CoT	Summary	Reason	How CoT is to be secured
CoT09	The Outline Code of Construction Practice (CoCP) has been submitted as part of the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP includes information about drainage during construction.	To implement construction phase drainage to control runoff during this phase of the Transmission Assets.	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)
CoT35	An Outline Code of Construction Practice (CoCP) has been prepared and submitted with the application for development	To implement control measures in regards to fluvial and tidal flooding, including:	DCO Schedules 2A and 2B, Requirement 8

CoT	Summary	Reason	How CoT is to be secured
	consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP will include measures to maintain and address: • […] flood protection and control measures; • -water environment and drainage; and • pollution prevention […]	• Measures to prevent a reduction in the capacity of the fluvial floodplain which can increase flood risk downstream; • Measures regarding dewatering; Measures regarding restricting the placement of stockpiling, storage of fuels and chemicals and refuelling to Flood Zone 1 (where practical) and at least 8 m from ordinary watercourses and Main Rivers and 16m from tidal Main Rivers to reduce vulnerability to flood risk;	(Code of Construction Practice)
CoT36	Onshore Decommissioning Plan(s) will be developed prior to decommissioning. The Onshore Decommissioning Plan(s) will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure (if and where relevant and practicable), and details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The Onshore Decommissioning Plan(s) will be in line with the latest relevant available guidance.	To manage flood risk during decommissioning	DCO Schedules 2A & 2B, Requirement 22 (Onshore decommissioning)

Summary

1.5.5.3 With the implementation of commitments listed within **Table 1.19** the overall risk of flooding from groundwater is assessed to be low.

1.5.6 Surface water flood risk

1.5.6.1 The EA's Long Term Flood Risk Mapping, available online and presented within **Figure 1.9** shows that the majority of study area is classified at 'very low' risk, with localised areas at 'low' to 'high' risk of flooding from surface water.

1.5.6.2 The temporary construction compounds and Morgan onshore substation development platform is shown to have a 'low' risk of flooding from isolated areas of surface water ponding with greatest depths up to 900 mm during the worst-case scenario event.

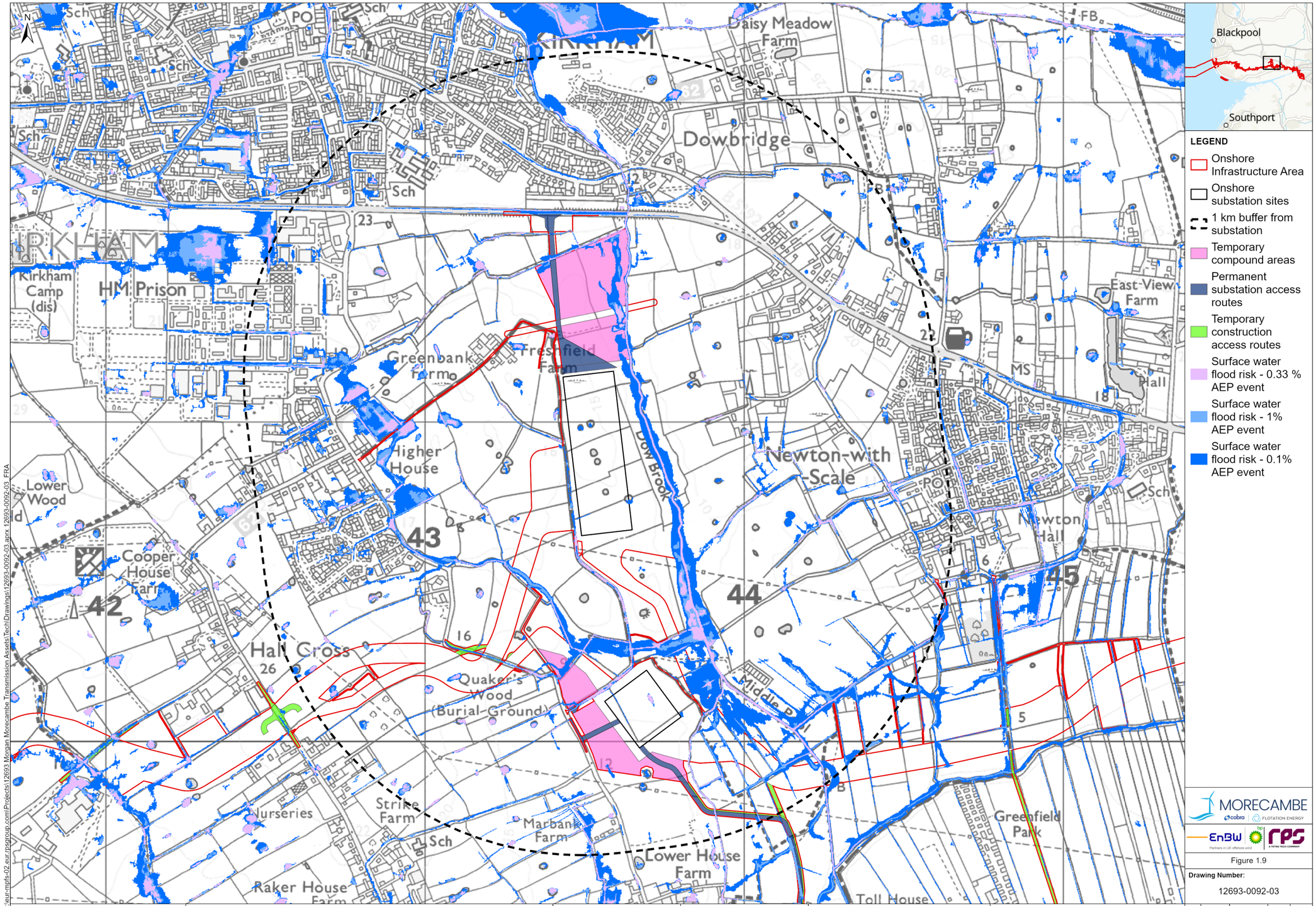
1.5.6.3 The temporary and permanent access road is shown to have a 'low' to 'high' risk of flooding associated with out of bank flooding from small watercourses,

with greatest depths and flood velocities of up to 1200 mm and over 0.25 m/s. Greatest flood depths are conveyed within the channels of watercourses.

1.5.6.4 Within the 1 km study area, Flooding is predominantly associated with overland flow pathways and isolated areas of flooding. There are also isolated areas of surface water ponding across the Morgan substation site and associated 1 km study area, likely associated with topographical low points.

Fylde Borough Council Strategic Flood Risk Assessment (2011)

1.5.6.5 The Fylde Council SFRA indicates that no known flooding hotspots from surface water are located within the Morgan onshore substation site or the study area.



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Project Name: MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS	**Drawing Title:** MORGAN ONSHORE SUBSTATION - ENVIRONMENT AGENCY LONG TERM FLOOD RISK FROM SURFACE WATER FLOODING	0 0.1 0.2 mi 0 0.15 0.3 km	**Geodetic Information:** Datum: OSGB 1936 Projection: British National Grid Scale@379mmx231mm: 1:10,000	**Data Sources:** Client, The Crown Estate, MMO, NRW, ScotGov, MarineRegions.org

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Figure 1.9

Drawing Number:
12693-0092-03

Figure 1.9: Morgan onshore substation – Environment Agency long term flood risk from surface water flooding

Mitigation measures (commitments)

1.5.6.6 Mitigation measures (commitments) presented below within **Table 1.20** are proposed to manage flood risk and vulnerability to site workers during the construction phase and operation and maintenance phase. Commitments are also presented within **Section 1.8, Table 1.44.** Commitments are to be secured through requirements of the DCO**.**

Table 1.20: Summary of CoT for surface water flood risk for Morgan onshore substation

CoT	Summary	Reason	How CoT is to be secured
CoT09	The Outline Code of Construction Practice (CoCP) has been submitted as part of the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP includes information about drainage during construction.	To implement construction phase drainage to control runoff during this phase of the Transmission Assets.	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)
CoT11	An Outline Operational Drainage Management Plan for the substation sites has been prepared and submitted with the application for development consent. The Plan will include measures to ensure that existing land drainage is reinstated and/or maintained. This will include measures to limit discharge rates and attenuate flows to maintain greenfield runoff rates at the onshore substations. It will also include measures to control surface water runoff, including measures to prevent flooding of the working areas or offsite and to ensure any runoff is treated appropriately. Detailed Operational Drainage Management Plan(s) will be developed in accordance with the Outline Operational Drainage Management Plan and in line with the latest relevant drainage guidance notes in consultation with the Environment Agency and the Lead Local Flood Authority (Lancashire County Council).	To ensure flood risk is not increased during operation.	DCO Schedules 2A and 2B, Requirement 20 (Outline Operational Drainage Management Plan)
CoT24	Where practicable, during construction, access routes within the onshore export cable corridor and 400 kV grid connection corridor (i.e. for example, the use of haul roads) will be used, to minimise potential impacts to the local road network.	To not increase impermeable areas associated with haul roads and in turn increase surface water runoff and flood risk from this source	DCO Schedules 2A & 2B, Requirement 9 (Traffic and Transport) Access to Works Plan
CoT27	All temporary compounds will be removed and sites will be reinstated when construction has been completed.	To not increase surface water runoff as a result of greater impermeable areas during the operation and maintenance phase	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice); and

CoT	Summary	Reason	How CoT is to be secured
			DCO Schedules 2A and 2B, Requirement 16 (Restoration of land used temporarily for construction)
CoT35	An Outline Code of Construction Practice (CoCP) has been prepared and submitted with the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP will include measures to maintain and address: • […] flood protection and control measures; • -water environment and drainage; and • pollution prevention […]	To implement control measures in regards to fluvial and tidal flooding, including: • Measures to prevent a reduction in the capacity of the fluvial floodplain which can increase flood risk downstream; • Measures regarding dewatering; Measures regarding restricting the placement of stockpiling, storage of fuels and chemicals and refuelling to Flood Zone 1 (where practical) and at least 8 m from ordinary watercourses and Main Rivers and 16m from tidal Main Rivers to reduce vulnerability to flood risk;	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)
CoT36	Onshore Decommissioning Plan(s) will be developed prior to decommissioning. The Onshore Decommissioning Plan(s) will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure (if and where relevant and practicable), and details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The Onshore Decommissioning Plan(s) will be in line with the latest relevant available guidance.	To manage flood risk during decommissioning	DCO Schedules 2A & 2B, Requirement 22 (Onshore decommissioning)

Summary

1.5.6.7 Commitments listed in **Table 1.20** above will ensure the Morgan onshore substation will not be impacted by or cause any adverse effect on surface water flooding during the construction phase. As such, flood risk from this source is assessed to be low.

1.5.7 Reservoir flood risk

1.5.7.1 A portion of the land adjacent to the Dow Brook within the permanent Morgan onshore substation and associated 1 km study area is located within the reservoir flood extent. Flooding from reservoirs is associated with when there is also flooding from rivers. The site is not at risk of flooding from reservoirs when rivers are normal. Reservoir flood risk mapping within the study area is presented within **Figure 1.10.**

1.5.7.2 Due to the regular inspection and maintenance regime in place for large reservoirs, the likelihood of catastrophic failure and therefore risk of flooding to the site from this source is unlikely to occur. Flood risk from this source is therefore assessed to be very low.

1.5.8 Flood risk from sewer and water main failure

1.5.8.1 Flooding from sewerage failure occurs when a rainfall event exceeds the maximum capacity of the surrounding network. The most common causes of flooding from sewers are inadequate flow capacity, blockages, pumping station failures, burst water mains, water inflow from rivers or the sea, tide locking, siltation, fats/greases, and sewer collapse. Should any of these events occur there is a risk of flooding within the vicinity of the sewer by surcharge where the flood is in excess of the sewer capacity (usually 1 in 30-year event or greater).

1.5.8.2 Morgan onshore substation is agricultural and therefore, unlikely to have sewer assets within the site.

1.5.8.3 As per section 3.16.8 of Volume 1, Chapter 3: Project description of the ES, to ensure damage to sewers and water pipelines and thus flooding from this source is prevented during the construction phase, prior to the commencement of works, any construction activities will need to be undertaken in accordance with the water authorities design standards prior to gaining approval. This includes providing evidence to confirm the presence/lack of presence of any water authority assets (e.g. sewers and water mains) and if they are present, how final design and construction methods will be implemented to divert their assets (which will need additional approval) or avoid their assets.

Mitigation measures (commitments)

1.5.8.4 Mitigation measures (commitments) presented below within **Table 1.21** are proposed to manage flood risk and vulnerability to site workers during the construction phase. No commitments relating to groundwater flooding are required during the operation and maintenance phase. Commitments are also presented within **Section 1.8, Table 1.44.** Commitments are to be secured through requirements of the DCO**.**

Table 1.21: Summary of CoT for flood risk from sewers for Morgan onshore substation

CoT	Summary	Reason	How CoT is to be secured
CoT09	The Outline Code of Construction Practice (CoCP) has been submitted as part of the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP includes information about drainage during construction.	To implement construction phase drainage to control runoff during this phase of the Transmission Assets.	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)
CoT35	An Outline Code of Construction Practice (CoCP) has been prepared and submitted with the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP will include measures to maintain and address: • […] flood protection and control measures; • -water environment and drainage; and • pollution prevention […]	To implement control measures in regards to fluvial and tidal flooding, including: • Measures to prevent a reduction in the capacity of the fluvial floodplain which can increase flood risk downstream; • Measures regarding dewatering; Measures regarding restricting the placement of stockpiling, storage of fuels and chemicals and refuelling to Flood Zone 1 (where practical) and at least 8 m from ordinary watercourses and Main Rivers and 16m from tidal Main Rivers to reduce vulnerability to flood risk;	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)
CoT36	Onshore Decommissioning Plan(s) will be developed prior to decommissioning. The Onshore Decommissioning Plan(s) will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure (if and where relevant and practicable), and details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The Onshore Decommissioning Plan(s) will be in line with the latest relevant available guidance.	To manage flood risk during decommissioning	DCO Schedules 2A & 2B, Requirement 22 (Onshore decommissioning)

Summary

1.5.8.5 With implementation of commitments listed within **Table 1.21,** flood risk from sewers is therefore assessed to be very low.

1.5.9 Flood risk from artificial sources

1.5.9.1 Field drainage is expected to be present within agricultural land within the study area and could pose localised sources of flooding if impacted during construction.

Mitigation measures (commitments)

1.5.9.2 Mitigation measures (commitments) presented below within **Table 1.22** are proposed to manage flood risk and vulnerability to site workers during the construction phase. No commitments relating to flooding from artificial sources are required during the operation and maintenance phase. Commitments are also presented within **Section 1.8, Table 1.44.** Commitments are to be secured through requirements of the DCO**.**

Table 1.22: Summary of CoT for flood risk from artificial sources for Morgan onshore substation

CoT	Summary	Reason	How CoT is to be secured
CoT09	The Outline Code of Construction Practice (CoCP) has been submitted as part of the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP includes information about drainage during construction.	To implement construction phase drainage to control runoff during this phase of the Transmission Assets.	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)
CoT35	An Outline Code of Construction Practice (CoCP) has been prepared and submitted with the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP will include measures to maintain and address: • […] flood protection and control measures; • -water environment and drainage; and • pollution prevention […]	To implement control measures in regards to fluvial and tidal flooding, including: • Measures to prevent a reduction in the capacity of the fluvial floodplain which can increase flood risk downstream; • Measures regarding dewatering; Measures regarding restricting the placement of stockpiling, storage of fuels and chemicals and refuelling to Flood Zone 1 (where practical) and at least 8 m from ordinary watercourses and Main Rivers and 16m from tidal Main Rivers to reduce vulnerability to flood risk;	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)

CoT	Summary	Reason	How CoT is to be secured
CoT36	Onshore Decommissioning Plan(s) will be developed prior to decommissioning. The Onshore Decommissioning Plan(s) will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure (if and where relevant and practicable), and details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The Onshore Decommissioning Plan(s) will be in line with the latest relevant available guidance.	To manage flood risk during decommissioning	DCO Schedules 2A & 2B, Requirement 22 (Onshore decommissioning)
CoT84	An Outline Code of Construction Practice (CoCP) has been prepared and submitted with the application for development consent. Detailed CoCP(s) will be developed in accordance with the Outline CoCP. In order to manage impacts to field drainage, the Outline CoCP stipulates field drainage plans will be developed in consultation with the relevant landowners. If required, additional field drainage will be installed to ensure the existing drainage of the land is maintained during and after construction.	To prevent flooding from field drainage	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)

Summary

1.5.9.3 With implementation of commitments listed within **Table 1.22,** flood risk from artificial sources is therefore assessed to be very low.

1.5.10 Historic flooding

1.5.10.1 The Environment Agency Historic Flood Map shows the entirety of the Morgan onshore substation site and surrounding 1 km study area is located outside of the mapped extent of historical flooding. The Environment Agency historical flood extent mapping is presented within **Figure 1.11**.

Strategic Flood Risk Assessment (Fylde Borough Council, 2011)

1.5.10.2 Fylde Council do not hold any records of historical flooding.

1.5.11 Summary of flood risk

1.5.11.1 A summary of assessed flood risk is presented below within **Table 1.23**: .

Table 1.23: Morgan onshore substation flood risk summary

Source of flooding	Assessed risk to Morgan onshore substation	Commitment measures to be adopted
Fluvial and tidal	Low	CoT08, CoT09, CoT27, CoT35, CoT36, CoT82, CoT121
Groundwater	Low	CoT09, CoT35, CoT36, CoT41
Surface water	Low	CoT09. CoT11, CoT24, CoT27, CoT35, CoT36
Reservoir	Very low	None
Sewer	Very low	CoT09, CoT35, CoT36
Artificial Sources	Very low	CoT09, CoT35, CoT36, CoT84

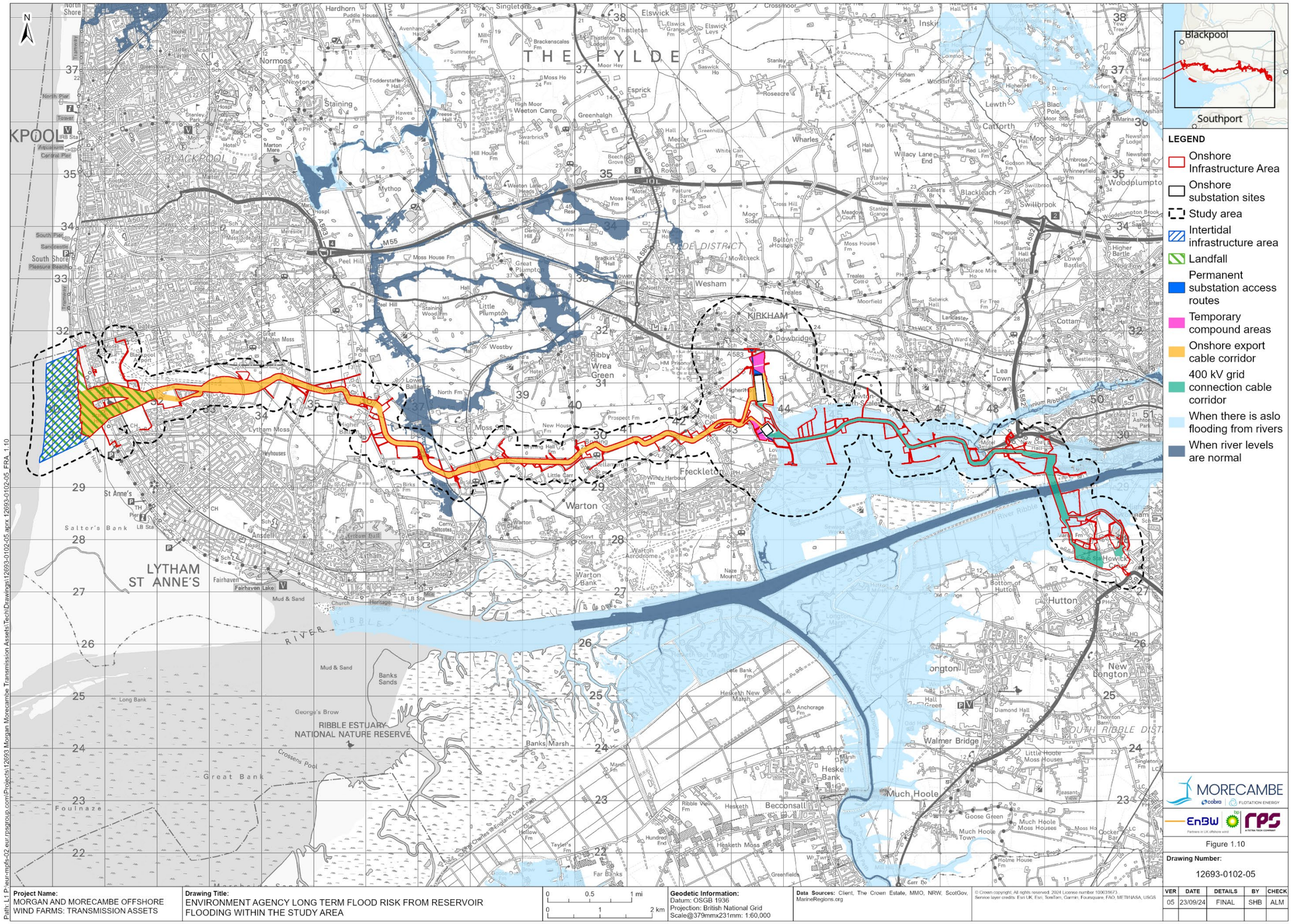


Figure 1.10: Environment Agency long term flood risk from reservoir flooding within the study area

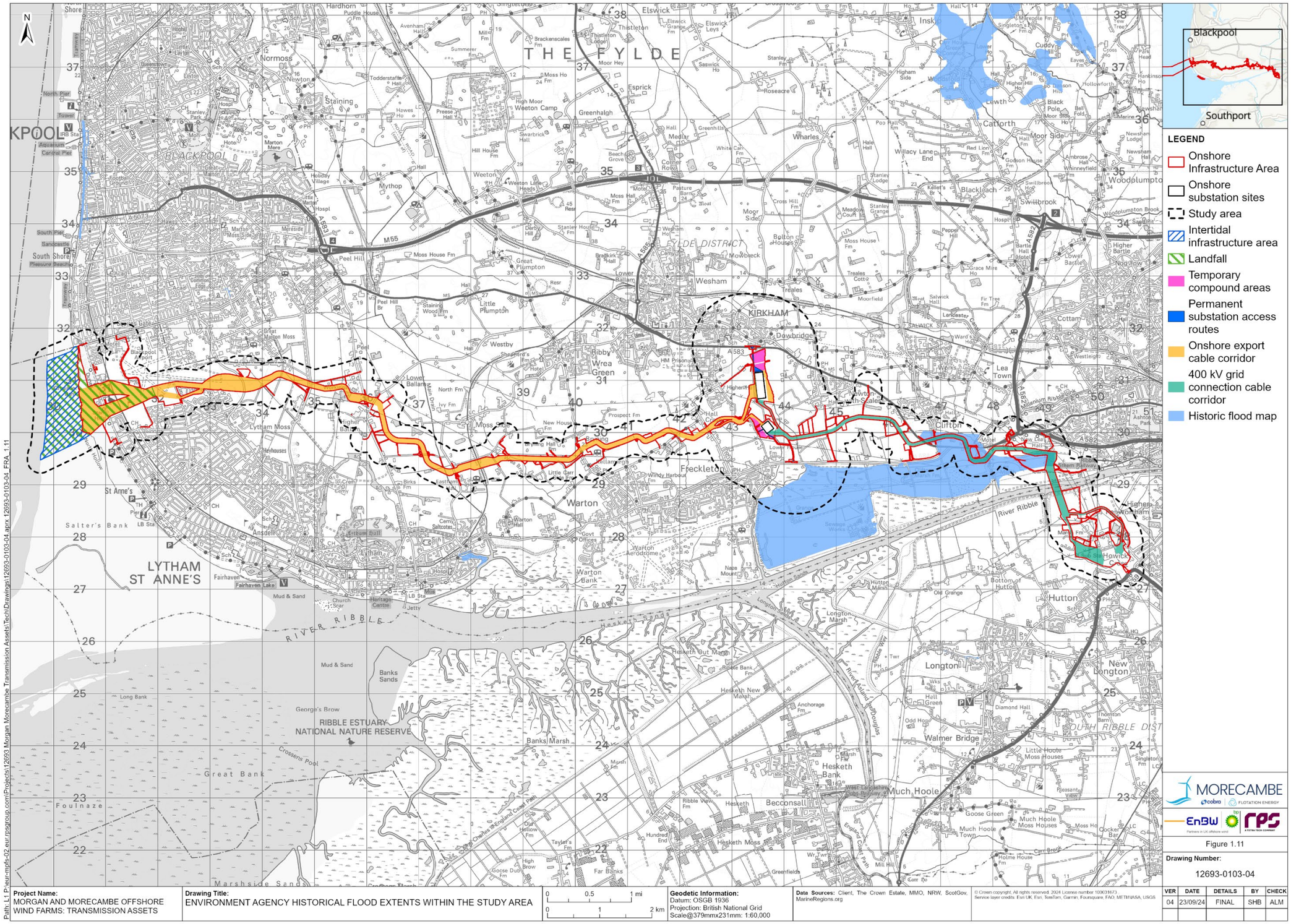


Figure 1.11: Environment Agency historical flood extents within the study area

1.6 Morecambe onshore substation site flood risk assessment

1.6.1 Baseline conditions

Location

1.6.1.1 This substation site is located to the south of the Morgan onshore substation site, east of Lower Lane and to the north of Freckleton. A track bisects the proposed development and Dow Brook is located to the east. The location of the Morecambe onshore substation site study area is presented within **Figure 1.1.**

Topography

1.6.1.2 The proposed site boundary associated with the Morecambe onshore substation site falls from 12 m AOD within the west of the site to approximately 7 m AOD within the east. The local topography within the 1 km study area generally falls towards Dow Brook, located to the east of the site.

Existing use

1.6.1.3 The Morecambe onshore substation site currently comprises agricultural fields, with field margins delineated by mature trees and hedgerows. A track bisects the proposed development. Several ordinary watercourses are located within the north of the site, conveying flow to Dow Brook and one pond is within the southern extent of the site.

1.6.1.4 The 1 km study area associated with the Morecambe onshore substation site comprises predominantly agricultural land use, with residential areas associated with Freckleton to the south. Several additional ordinary watercourses, ponds and agricultural reservoirs are also present within the study area. Newton Marsh Site of Special Scientific Interest (SSSI) is located approximately 175 m to the south east, downstream of the site at its closest point and is presented within **Figure 1.12**.

Proposed use

1.6.1.5 The MDS for Morecambe onshore substation is presented within **Table 1.24.** Additional information is provided within Volume 1, Chapter 3: Project description of the ES.

Table 1.24: Morecambe onshore substation MDS

Substation compounds/buildings	Morecambe MDS
Permanent development	
Area of permanent footprint (m^2) including attenuation pond/ditch, access and landscaping.	59,500
Area of permanent LSS footprint (m^2) excluding attenuation area and landscaping	29,700
Area of permanent attenuation (m^2)	5,010

Substation compounds/buildings	Morecambe MDS
Area of main building (m^2)	450
Area of secondary buildings (m^2)	3,500
Number of permanent access tracks	1
Permanent access track width with drainage and potential services (m)	15
Information on operational activities	Unmanned substation; continuously monitoring remotely. operational and maintenance staff visiting to undertake preventative and corrective works on a regular basis.
Temporary development	
Substation temporary construction compound (m^2)	52,500
Substation temporary construction compound asphalt surface area (m^2)	Not available
Substation temporary construction compound hardstanding area (m^2)	Not available
Area of asphalt surface with substation compound (m^2)	Not available
Number of temporary access tracks	1
Temporary access width (including passing places) (m)	20
Construction duration (months)	24

1.6.1.6 Temporary construction access tracks are to be taken via Preston New Road (A584) and is to be retained into the operation and maintenance phase. A second permanent access is to be taken via Lower Lane.

1.6.1.7 The drainage strategy for the Morecambe onshore substation are presented within the Outline Operational Drainage Management Plan (document reference J10) and is to be secured through requirements of the DCO.

Decommissioning

1.6.1.8 The design life for the onshore substations will exceed 35 years. The case for decommissioning the onshore substations in the event of the Generation Assets being decommissioned will be reviewed in discussion with the transmission system operator and any relevant regulators in the light of any other existing or proposed future use of the onshore substations.

1.6.1.9 Activities associated with decommissioning will operate within the parameters of those established for construction. If complete decommissioning takes place, then all the electrical infrastructure will be removed, and any waste arising disposed of in accordance with relevant regulations and where applicable any legislative requirements at the time. Foundations will be broken up and the site reinstated, or alternately repurposed for another use. Where alternate uses may be explored, these may be subject to additional relevant consents and licenses at the time. For the purposes of EIA, decommissioning

of the onshore substations is assumed to be similar to the construction and in reverse sequence.

1.6.1.10 An Onshore Decommissioning Plan (see **Section 1.8, Table 1.44**) will be developed prior to decommissioning in a timely manner. The Onshore Decommissioning Plan will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure and details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The Onshore Decommissioning Plan will be in line with the latest relevant available guidance.

1.6.2 Hydrological overview

1.6.2.1 A 1 km study area was selected for the Morecambe onshore substation site to identify any potential receptors that might be affected by the substation. The 1 km study area is considered an appropriate study area to identify changes in flood risk in the surrounding area.

1.6.2.2 The Dow Brook bifurcates into two Environment Agency designated Main Rivers to the east of the site; forming Dow Brook and Middle Pool watercourses. The Dow Brook flows southwards along the eastern boundary of the Morecambe onshore substation site while Middle Pool conveys flow southwards some 180 m to the east at its closest point. The temporary and permanent access road crosses the Dow Brook. The watercourses are shown to converge within the southern extent of the 1 km study area. Watercourses are shown within **Figure 1.13.**

1.6.2.3 The Dow Brook discharges into the River Ribble at a point 1.9 km downstream. As such, the site is considered to be at risk of flooding from tidal and fluvial sources.

Flood defences

1.6.2.4 The Environment Agency Spatial Flood Defences (including standardised attributes) mapping is presented within **Figure 1.13** and shows that flood defences classified as 'natural high ground' are present along the banks of the Dow Brook within the 1km study area. Flood defences comprise of naturally high ground, providing an average 50-year standard of protection. Information regarding flood defences is presented within **Table 1.25** below.

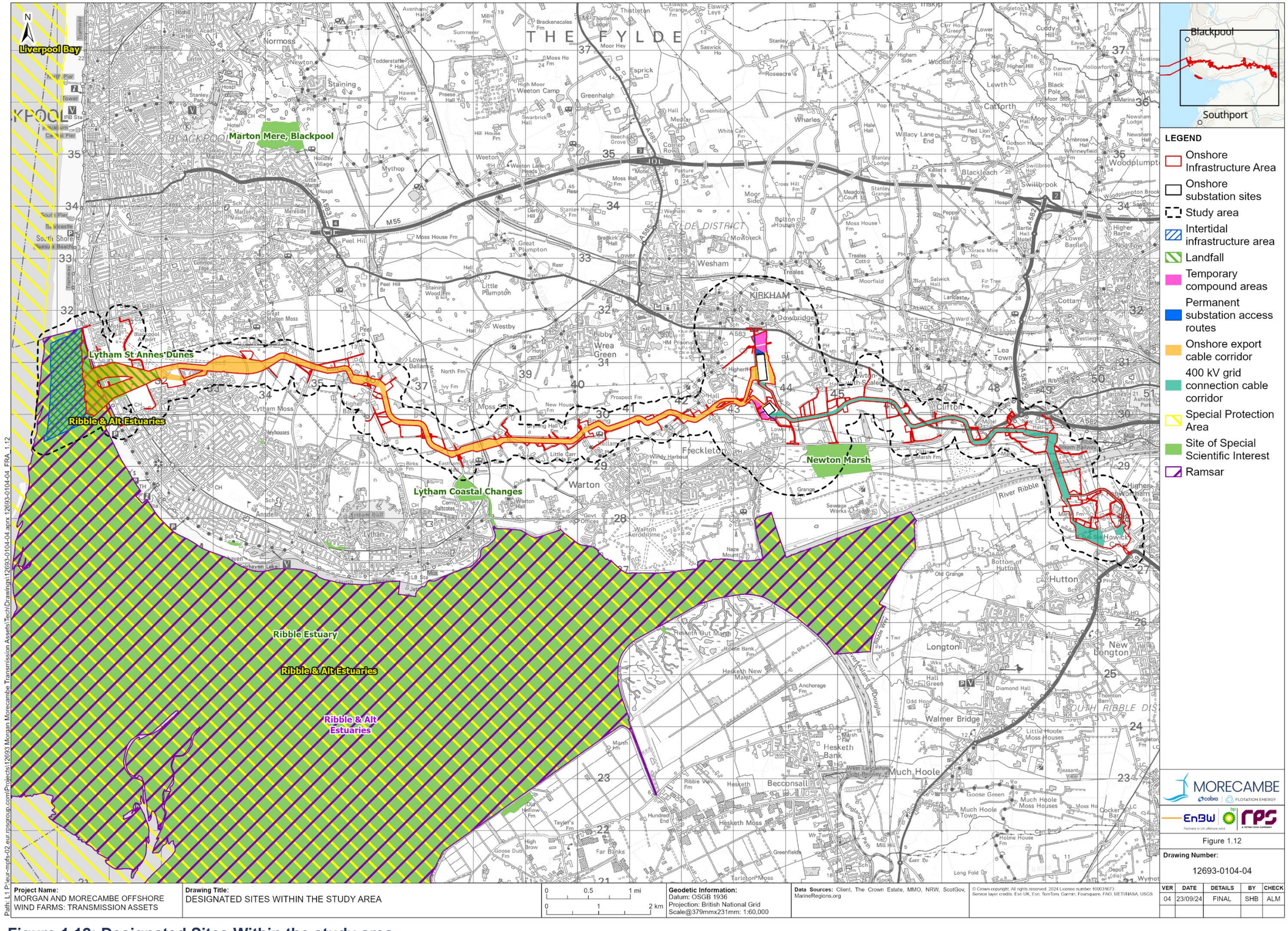
Table 1.25: Flood defences within the Morecambe onshore substation

FRMS code	Asset id	Asset type	Asset maintainer	current condition	Design standard of protection
FR/09/S124	64839	Natural High Ground	Unknown	unknown	50 years
FR/09/S124	90994	Natural High Ground	Unknown	unknown	50 years
FR/09/S124	64308	Natural High Ground	Unknown	unknown	50 years

1.6.2.5 The Lancashire County Council asset register lists several flood risk assets within the county council's boundary. No assets specifically for flood defence were recorded within Morecambe onshore substation or 1 km study area.

Flood warning/flood alert

1.6.2.6 The eastern extent of the Morecambe onshore substation site and associated 1 km study area is located within the 'Lancashire coastline at Clifton Marsh, between Freckleton and Savick Brook' Flood Warning Area 012FWCTL14B and 'Ribble estuary west of Preston' Flood Alert Area 012WATRE. Flood warnings and flood alerts are presented within **Figure 1.3.**



Project Name: MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS	**Drawing Title:** DESIGNATED SITES WITHIN THE STUDY AREA	0 0.5 1 mi / 0 1 2 km	**Geodetic Information:** Datum: OSGB 1936 Projection: British National Grid Scale@379mmx231mm: 1:60,000	**Data Sources:** Client, The Crown Estate, MMO, NRW, ScotGov, MarineRegions.org	© Crown copyright. All rights reserved. 2024 License number 100031673 Service layer credits: Esri UK, Esri, TomTom, Garmin, Foursquare, FAO, METI/NASA, USGS.	Figure 1.12	**Drawing Number:** 12693-0104-04	

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Figure 1.12: Designated Sites Within the study area

1.6.3 Hydrogeological overview

Geological setting

1.6.3.1 The BGS Geology of Britain mapping (1:50,000 scale) indicates the majority of the Morecambe onshore substation site is underlain by Devensian till (diamicton). A small area within the eastern extent is underlain by tidal flat deposits, 1 (silt, clay and sand). The associated 1 km study area is also predominantly underlain by Devensian Till (diamicton) with limited areas also underlain by tidal flat deposits, 1 (silt, clay and sand), head (clay, silt, sand and gravel) and Devensian glaciofluvial ice contact deposits (gravel, sand and silt). Superficial deposits within the study area are presented within **Figure 1.4**.

1.6.3.2 The western extent of the Morecambe onshore substation site and majority of the associated 1 km study area is underlain by Breckells Mudstone Member (mudstone). The eastern extent of the site and remainder of the 1 km study area is underlain by Sherwood Sandstone Group (sandstone). Bedrock geology within the study area is presented within **Figure 1.5**.

1.6.3.3 The geological setting is discussed in further detail within Volume 3, Chapter 1: Geology, hydrogeology and ground conditions of the ES.

Groundwater

1.6.3.4 A BGS borehole record reference SD42NW47 (located at SD 43820 29720) is present within the Morecambe onshore substation site where permanent and temporary access tracks are proposed and encountered groundwater at 3.00 m below ground level.

Aquifer designation

1.6.3.5 Bedrock Geology Aquifer Designation mapping indicates mudstones of the Breckells Mudstone Member are designated as a Secondary B aquifer. These are predominantly lower permeability layers which may store and yield limited amounts of groundwater. Sherwood sandstone group (sandstone) is classified as a principal aquifer; permeable geology able to provide a high level of water storage and able to support water supply and/or river base flow on a strategic scale.

1.6.3.6 Superficial Deposits Aquifer Designation mapping indicates extents of blown sand deposits within the 1 km study area comprise Secondary A aquifers (formations of permeable layers capable of supporting water supplies at a local scale, in some cases forming an important source of base flow to rivers). Secondary (Undifferentiated) aquifers (i.e., rock considered to have variable and insignificant contributions to water resources and river base flows) reflect the distribution of superficial deposits with low permeability such as glacial till and tidal flat deposits.

1.6.3.7 Additional detail can be found within Volume 3, Chapter 1: Geology, hydrogeology and ground conditions of the ES.

Source Protection Zones

1.6.3.8 The entirety of Morecambe onshore substation site and the associated 1 km study area is located outside of any SPZ. SPZs within the study area are presented within **Figure 1.6**.

Soils classification

1.6.3.9 The National Soils Research Institute Soilscapes viewer classifies soils underlying Morecambe onshore substation site to be '*slightly acid loamy and clayey soils with impeded drainage*'.

1.6.3.10 The associated 1 km study area also *includes* '*slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils*' within the east and west, '*slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils*' within the south west and *'loamy and clayey soils of coastal flats with naturally high groundwater*' within the south east.

1.6.4 Fluvial and tidal flood risk

Flood Map for Planning

1.6.4.1 The Environment Agency Flood Zones refer to the probability of flooding from rivers and sea in a given year, assuming no defences (as presented within **Table 1.8**) are in place. Mapping does not account for climate change. A figure demonstrating Environment Agency Flood Zones in relation to Morecambe onshore substation is presented within **Figure 1.13**. Land not included within hatching associated with Flood Zone 2 and 3 is considered to be Flood Zone 1.

1.6.4.2 The Morecambe onshore substation, including surface water attenuation and temporary construction compounds are located within Flood Zone 1.

1.6.4.3 The permanent access track to be taken via Lower Lane is located within Flood Zone 1. The temporary and permanent access track taken via Preston New Road (A584) is partially located within Flood Zone 1 but predominantly located within Flood Zone 2 and 3.

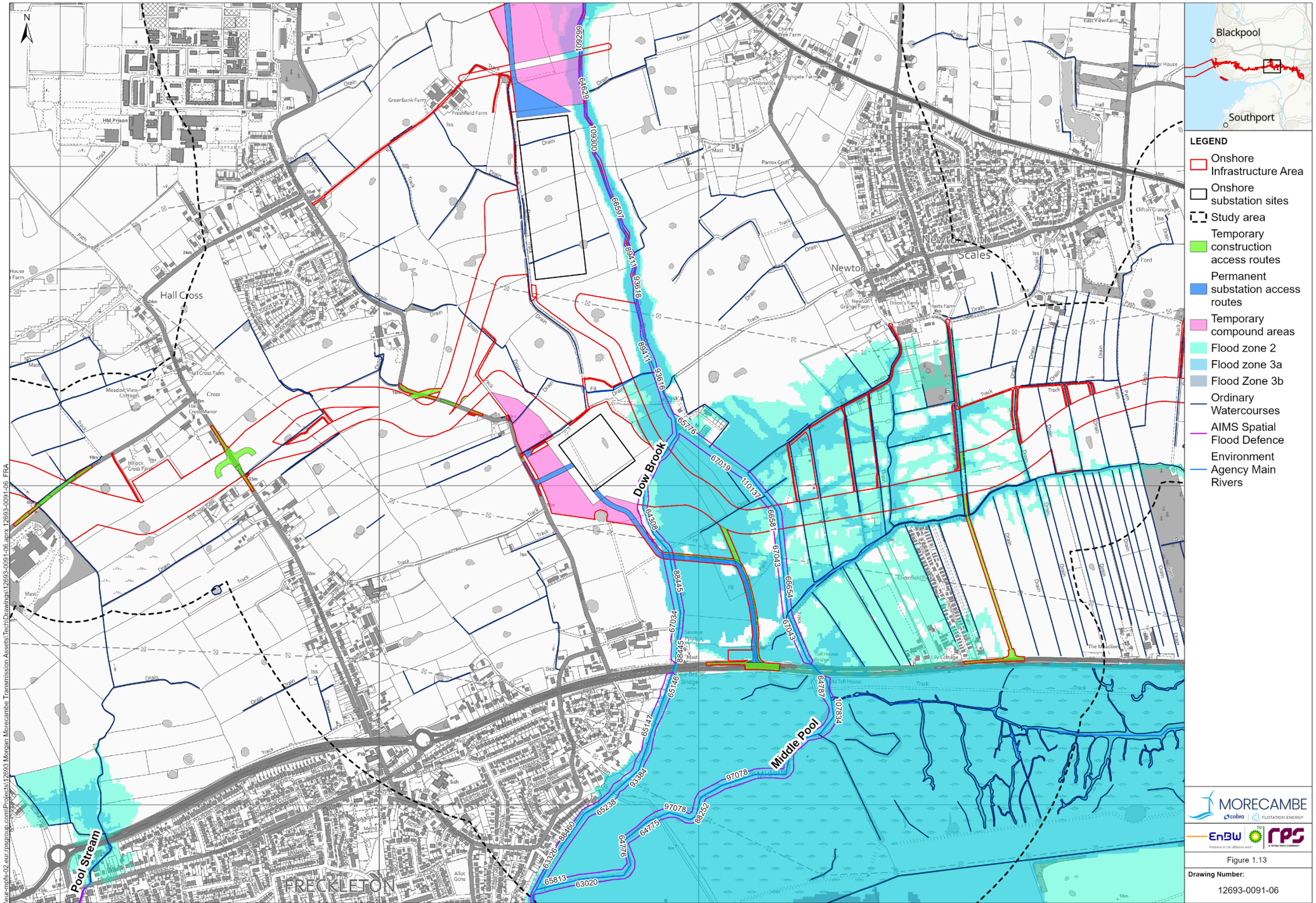
1.6.4.4 Throughout the 1 km study area, land adjacent to the Dow Brook and Middle Pool is assessed to be located within Flood Zones 2 and 3.

Delineation of Flood Zone 3a and 3b

1.6.4.5 The delineation between Flood Zone 3a and 3b has been undertaken via the use of the 3.3% AEP extent from with the Ribble Estuary (2014) hydraulic model and the 4% AEP extent from the Ribble Douglas (2010) hydraulic model.

1.6.4.6 The Morecambe onshore substation is not located within the Flood Zone 3b extent and is such classified to be located within Flood Zone 3a. Further information regarding SFRA data is presented within **Paragraph 1.6.4.26**.

1.6.4.7 The majority of Flood Zone 3 within the 1 km study area are classified as Flood Zone 3a. A small extent within the south of the 1 km study area is located within Flood Zone 3b.



Project Name: MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS	**Drawing Title:** MORECAMBE ONSHORE SUBSTATION - WATERCOURSES, EA FLOOD ZONES AND EA SPATIAL FLOOD DEFENCES	**Geodetic Information:** Datum: OSGB 1936 Projection: British National Grid Scale@379mmx231mm: 1:10,000	**Data Sources:** Client, The Crown Estate, MMO, NRW, ScotGov, MarineRegions.org	© Crown copyright, All rights reserved 2024 License number 100031673 Service layer credits: Esri UK, Esri, TomTom, Garmin, Foursquare, FAO, METI/NASA, USGS

Figure 1.13

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Figure 1.13: Morecambe onshore substation - Watercourses, EA Flood Zones and EA Spatial Flood Defences

Environment Agency Flood Model data

Fluvial flooding

1.6.4.8 The Environment Agency confirmed flood extents within proximity to the Dow Brook have been informed by JFLOW modelling which does not account for the effects of climate change and is not appropriate to use within FRAs, as per standard Environment Agency guidance.

1.6.4.9 The fluvial catchment of the Dow Brook is relatively small, incorporating an area of 16.69 km^2 at a point downstream of the Morgan and Morecambe onshore substations. Due to the small nature of the catchment, flood risk from this catchment can be assessed within the Environment Agency Long Term Flood Risk from surface water mapping.

1.6.4.10 In lieu of no available climate change information available for the Dow Brook within proximity to the Morecambe onshore substation, the Long Term Flood Risk from surface water mapping 1% and 0.1% AEP data has been used to assess how fluvial flood risk from the Dow Brook evolves due to climate change. It is noted flows associated with the 1% AEP event from the Dow Brook catchment are conveyed within the river channel.

1.6.4.11 In order to establish if the use of the 0.1% AEP surface water event as a proxy for the 1% AEP year plus climate change event is appropriate an assessment of local flow rates based on catchment descriptors has been undertaken. The descriptors for the Dow Brook have been extracted for this watercourse with the main catchment features presented below.

- Area: 16.69 km^2.
- SAAR 61-90: 940 mm.
- PROP WET: 0.5.
- BFIHOST19: 0.43.

1.6.4.12 At this location the watercourse is situated within the Ribble Management Catchment as such the 29% allowance should be used which assess the 2050's higher central peak river flow allowance.

1.6.4.13 Extracted ReFH2 values for the peak flow indicate that the 0.1% AEP produces higher results than 1% + 29% climate change and 1% + 44% climate change allowance, as presented within **Table 1.27**. It is therefore, considered acceptable to use the 0.1% AEP surface water flood extents at this location in the absence of climate change data at this location.

Table 1.26: ReFH2 Peak flows for the Dow Brook

		Peak flow (m^3/s)			
Location	**Description**	**1% AEP**	**1% AEP + 29% CC**	**1% AEP + 44% CC**	**0.1% AEP**
343950, 429450	Dow Brook	8.21	10.59	11.82	12.02

1.6.4.14 Using the National LIDAR Programme 1 m resolution Digital Surface Model data, the 0.1% AEP surface water flooding extent from the Long Term Flood Risk mapping corresponds to the 5.80 m AOD contour level. Flood depths associated with this event outside of the river channel are up to 300mm. The Morecambe onshore substation is to be raised upon a platform between 8.46 and 10.18 m AOD. The surface water attenuation is located above 9.17m AOD. The Morecambe onshore substation and access track via Lower Lane is located between 10 m AOD and 12 m AOD and are located within the 0.1% AEP Long Term Flood Risk from surface water mapping event, with flood depths outside of watercourse channels assessed to be up to 300 mm.

1.6.4.15 Whilst not used within the assessment of flood risk, the extent of Flood Zone 3 (which includes Flood Zone 3a and 3b) from JFLOW data has been used to inform extents where no profiling of ground levels is to take place, as presented within the Outline CoCP. The retaining of existing ground levels within Flood Zone 3 (which includes Flood Zone 3a and 3b) will ensure floodplain capacity is maintained as well as flow conveyance as to not increase flood risk downstream of the development. Mitigation measures to reduce development and user vulnerability are presented within **Table 1.27**.

Credible maximum climate change scenario

1.6.4.16 The upper estimate peak river flow allowance has been used to assess the credible maximum climate change scenario from fluvial flows. This is 44% for the Dow Brook under the 2050's epoch, as per **Table 1.9**. As demonstrated within **Table 1.27**, peak flows from the 1% AEP + 44% climate change scenario event are lower than the 0.1% AEP event which has been used to assess fluvial flood risk to the onshore substation. As such the Morecambe onshore substation is not considered to be at risk from the credible maximum climate change scenario from fluvial flows.

Tidal flooding

1.6.4.17 The Environment Agency provided the Ribble Estuary Tidal model (2014) under a conditional licence. Tidal flood depths have been ascertained from provided Environment Agency modelled flood levels from the Ribble Estuary tidal model (2014).

1.6.4.18 The 0.5% AEP scenario from the Ribble Estuary tidal model (2014) has been used to assess tidal flood risk to the Morecambe onshore substation by applying an allowance for sea level rise from the year of dataset production (2014 for the Ribble Estuary Tidal model) to the end of the construction and the development lifetime of the Transmission Assets.

1.6.4.19 The Morecambe onshore substation and access track via Lower Lane is located between 10 m AOD and 12 m AOD and remains flood-free until the end of the operation and maintenance phase. The permanent and temporary access track via Preston New Road has a residual flood risk from flooding if defences were not present (undefended scenario) during the 2032 and 2067 epochs.

1.6.4.20 It is noted the Ribble Estuary tidal model (2014) has smaller flood extents in comparison to the Flood Map for Planning within the temporary and permanent

access tracks. It is expected the additional extent within the Flood Map for Planning is also incorporates JFLOW modelling extents which reflects flooding from fluvial sources.

Construction phase

1.6.4.21 To account for sea level rise to the end of the construction period (2032 epoch), 108.3 mm has been applied to the 2014 0.5% AEP undefended tidal flood extent from the Ribble Estuary tidal flood model (2032 0.5% AEP).

1.6.4.22 During the 2032 0.5% AEP event, maximum flood depths up to 0.68 m inundate the temporary access road, associated with tidal flooding propagating upstream and causing out of bank flooding from the channels of ordinary watercourses within the area. The construction compound to the west of the access road's junction with Preston New Road is inundated with flood depths up to 0.68m.

Operational and maintenance phase

1.6.4.23 To account for sea level rise up to 2067, 450.9 mm has been applied to the 2014 0.5% AEP undefended tidal flood level from the Ribble Estuary tidal flood model. Mapping of flood levels and depths associated with this event are presented within **Figure 1.7.**

1.6.4.24 During the 2067 0.5% AEP, maximum flood depths up to 1.23 m are present and associated with out of bank flooding from ordinary watercourses within the area.

Credible maximum climate change scenario

1.6.4.25 H++ sea level rise projections have been assessed via the application of 1.9m to the 0.5% AEP 2014 tidal scenario. This produces a maximum H++ tidal flood level of 7.41 m AOD within the south of the study area. The onshore The Morecambe onshore substation is to be raised upon a platform between 8.46 and 10.18 m AOD and remain above the H++ tidal flood level. As such, the H++ approach is not considered necessary to be applied.

Fylde Borough Council Strategic Flood Risk Assessment (2011)

1.6.4.26 The FC SFRA classifies flood extents adjacent to the Dow Brook are classified as Flood Zone 3a. It is assumed a small extent beyond the extent of Flood Zone 3a is classified as Flood Zone 2, however mapping resolution is too low to confirm this. The extent of Flood Zone 3a is slightly greater in extent than the EA Flood Map for Planning Flood Zone 3.

1.6.4.27 It is noted the maps to inform the FC SFRA were created in May 2011 and as such are considered to be superseded by data presented within the EA Flood Map for Planning.

Mitigation measures

1.6.4.28 The permanent and temporary access track via Preston New Road is located within Flood Zones 1, 2 and 3a and is to serve as access to the Morecambe

onshore substation for HGVs. During construction, If a Flood Warning/Flood Alert is issued for the 'Lancashire coastline at Lytham St. Annes, along the coast from Squires Gate to Warton Bank' Flood Warning Area (reference 012FWCTL13A) and the 'Coast at Lytham St Annes' Flood Alert area (reference 012WACLS) works within the relevant areas within the landfall area would also be stopped whilst the Flood Warning/Flood Alert is active (CoT97).The permanent use would be for heavy goods vehicle and abnormal loads deliveries only and therefore operational use would be rare and an outline operational drainage management plan (document reference J10) has been submitted with the application.

1.6.4.29 The following mitigation measures (commitments) presented below within **Table 1.27** are proposed to manage flood risk and vulnerability to site workers during the development lifetime. Commitments are also presented within **Section 1.8, Table 1.44.** Commitments are to be secured through requirements of the DCO**.**

Table 1.27: Summary of CoT for fluvial flood risk for Morecambe onshore substation

CoT	Summary	Reason	How CoT is to be secured
CoT08	Post-construction, the working area will be reinstated to pre-existing condition as far as reasonably practical in line with the DEFRA Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (PB13298), Institute of Quarrying (IQ) Good Practice Guide for Handling Soils in Mineral Workings (IQ, 2021) and British Society of Soil Science (BSSS) Working with Soil Guidance Note on Benefitting from Soil Management in Development and Construction (BSSS, 2022).	To ensure working areas are reinstated to pre-existing conditions after construction has been completed	DCO Schedules 2A & 2B, Requirement 18 (Restoration of land temporarily used for construction); DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT09	The Outline Code of Construction Practice (CoCP) has been submitted as part of the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP includes information about drainage during construction.	To implement construction phase drainage to control runoff during this phase of the Transmission Assets.	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)
CoT27	All temporary compounds will be removed and sites will be reinstated when construction has been completed.	To ensure working areas are reinstated to pre-existing conditions after construction has been completed	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice); and DCO Schedules 2A and 2B, Requirement 16

CoT	Summary	Reason	How CoT is to be secured
			(Restoration of land used temporarily for construction)
CoT35	An Outline Code of Construction Practice (CoCP) has been prepared and submitted with the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP will include measures to maintain and address: • […] flood protection and control measures; • -water environment and drainage; and • pollution prevention […]	To implement control measures in regards to fluvial and tidal flooding, including: • Measures to prevent a reduction in the capacity of the fluvial floodplain which can increase flood risk downstream; • Measures regarding dewatering; Measures regarding restricting the placement of stockpiling, storage of fuels and chemicals and refuelling to Flood Zone 1 (where practical) and at least 8 m from ordinary watercourses and Main Rivers and 16m from tidal Main Rivers to reduce vulnerability to flood risk;	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)
CoT36	Onshore Decommissioning Plan(s) will be developed prior to decommissioning. The Onshore Decommissioning Plan(s) will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure (if and where relevant and practicable), and details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The Onshore Decommissioning Plan(s) will be in line with the latest relevant available guidance.	To manage flood risk during decommissioning	DCO Schedules 2A & 2B, Requirement 22 (Onshore decommissioning)
CoT82	Where trenchless techniques are proposed for crossing ordinary watercourses, the entry and exit pits will be set back a minimum of 8 m from the bank of the watercourse. These crossings are detailed in the Onshore Crossing Schedule. Where required, geomorphological surveys will be undertaken on ordinary watercourses that may be crossed by trenched techniques. These will be used to inform detailed designs prior to construction.	To reduce fluvial flood risk	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT95	The Outline Code of Construction Practice (CoCP) has been	To reduce vulnerability to flood risk	DCO Schedules 2A & 2B, Requirement

CoT	Summary	Reason	How CoT is to be secured
	submitted as part of the application for development consent. Detailed CoCP(s) will be developed in accordance with the Outline CoCP. The Outline CoCP includes that during the construction phase the Principal Contractor(s) will sign up to the Flood Warning Service and will be alerted by a phone call or text when a Flood Warning becomes active. The flood warning will be applied to the entire Onshore Infrastructure Area located within Flood Zones 2 and 3 to enable site personnel to be evacuated from the site in a timely manner prior to a flood event occurring, if appropriate.		8 (Code of Construction Practice)
CoT121	Where watercourses are to be crossed by haul roads and temporary access tracks, the culverting or bridging will be appropriately sized to ensure conveyance of existing flows to mitigate the potential for increased flood risk. This will be agreed in consultation with the Lead Local Flood Authority for Ordinary watercourses; or the Environment Agency for Environment Agency Main Rivers.	To ensure fluvial flood risk is not increased	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)

Summary

1.6.4.30 The permanent Morecambe onshore substation, associated surface water attenuation and permanent access track via Lower Lane is located within Flood Zone 1 and remains flood free until the end of the operation and maintenance phase . The temporary and permanent access track taken from Preston New Road is located within Flood Zones 1, 2 and 3a and is inundated by the tidal undefended 0.5% AEP event during the construction phase and during the development lifetime. With the implementation of mitigation measures presented within **Table 1.27** flood risk from fluvial and tidal sources is assessed to be low.

1.6.5 Groundwater flood risk

1.6.5.1 Groundwater flood risk mapping shows the Morecambe onshore substation site has a ‘moderate’ to ‘high’ risk of groundwater flooding. The majority of the 1 km study area is shown to have a ‘low’ to ‘high’ risk of flooding with limited areas with a ‘negligible’ risk of flooding.

Mitigation measures (commitments)

1.6.5.2 Mitigation measures (commitments) presented below within **Table 1.28**: are proposed to manage flood risk and vulnerability to site workers during the construction phase. No commitments relating to groundwater flooding are required during the operation and maintenance phase. Commitments are also presented within **Section 1.8, Table 1.44.** Commitments are to be secured through requirements of the DCO**.**

Table 1.28: Summary of CoT for groundwater flood risk for Morecambe onshore substation

CoT	Summary	Reason	How CoT is to be secured
CoT09	The Outline Code of Construction Practice (CoCP) has been submitted as part of the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP includes information about drainage during construction.	To implement construction phase drainage to control runoff during this phase of the Transmission Assets.	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)
CoT35	An Outline Code of Construction Practice (CoCP) has been prepared and submitted with the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP will include measures to maintain and address: • […] flood protection and control measures; • -water environment and drainage; and • pollution prevention […]	To implement control measures in regards to fluvial and tidal flooding, including: • Measures to prevent a reduction in the capacity of the fluvial floodplain which can increase flood risk downstream; • Measures regarding dewatering; Measures regarding restricting the placement of stockpiling, storage of fuels and chemicals and refuelling to Flood Zone 1 (where practical) and at least 8 m from ordinary watercourses and Main Rivers and 16m from tidal Main Rivers to reduce vulnerability to flood risk;	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)

CoT	Summary	Reason	How CoT is to be secured
CoT36	Onshore Decommissioning Plan(s) will be developed prior to decommissioning. The Onshore Decommissioning Plan(s) will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure (if and where relevant and practicable), and details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The Onshore Decommissioning Plan(s) will be in line with the latest relevant available guidance.	To manage flood risk during decommissioning	DCO Schedules 2A & 2B, Requirement 22 (Onshore decommissioning)
CoT41	Where the onshore export cable corridor or 400 kV grid connection cable corridor crosses sites of particular sensitivity (e.g. embanked Environment Agency surface watercourses, Sites of Special Scientific Interest or groundwater inner Source Protection Zones) hydrogeological risk assessment(s) will be undertaken to inform a site-specific crossing method statement(s) where required. These will be agreed with the relevant stakeholders prior to construction.	To inform groundwater flood risk	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)

Summary

1.6.5.3 With the implementation of commitments listed within **Table 1.28** the overall risk of flooding from groundwater is assessed to be low.

1.6.6 Surface water flood risk

1.6.6.1 The Environment Agency Long Term Flood Risk from Surface Water mapping, presented within **Figure 1.14**, shows that although the majority of the Morecambe onshore substation and study area has 'very low' risk of flooding from surface water.

1.6.6.2 A 'low' to 'high' risk of surface water ponding located within the centre of the Morecambe onshore substation development platform, associated with an isolated topographical low point. Two areas of 'low' risk is also present within the extent of the development platform, one in the west and a second in the east. During the worst case 0.1% surface water flooding event, flood depths are shown to be up to 900 mm within areas of ponding.

1.6.6.3 Within the study area, flooding is predominantly associated with overland flow pathways. There are also isolated areas of surface water ponding across study area, likely associated with topographical low points.

Strategic Flood Risk Assessment (Fylde Borough Council, 2011)

1.6.6.4 The FC SFRA indicates that no known flooding hotspots are located within the Morecambe onshore substation site or the 1 km study area.

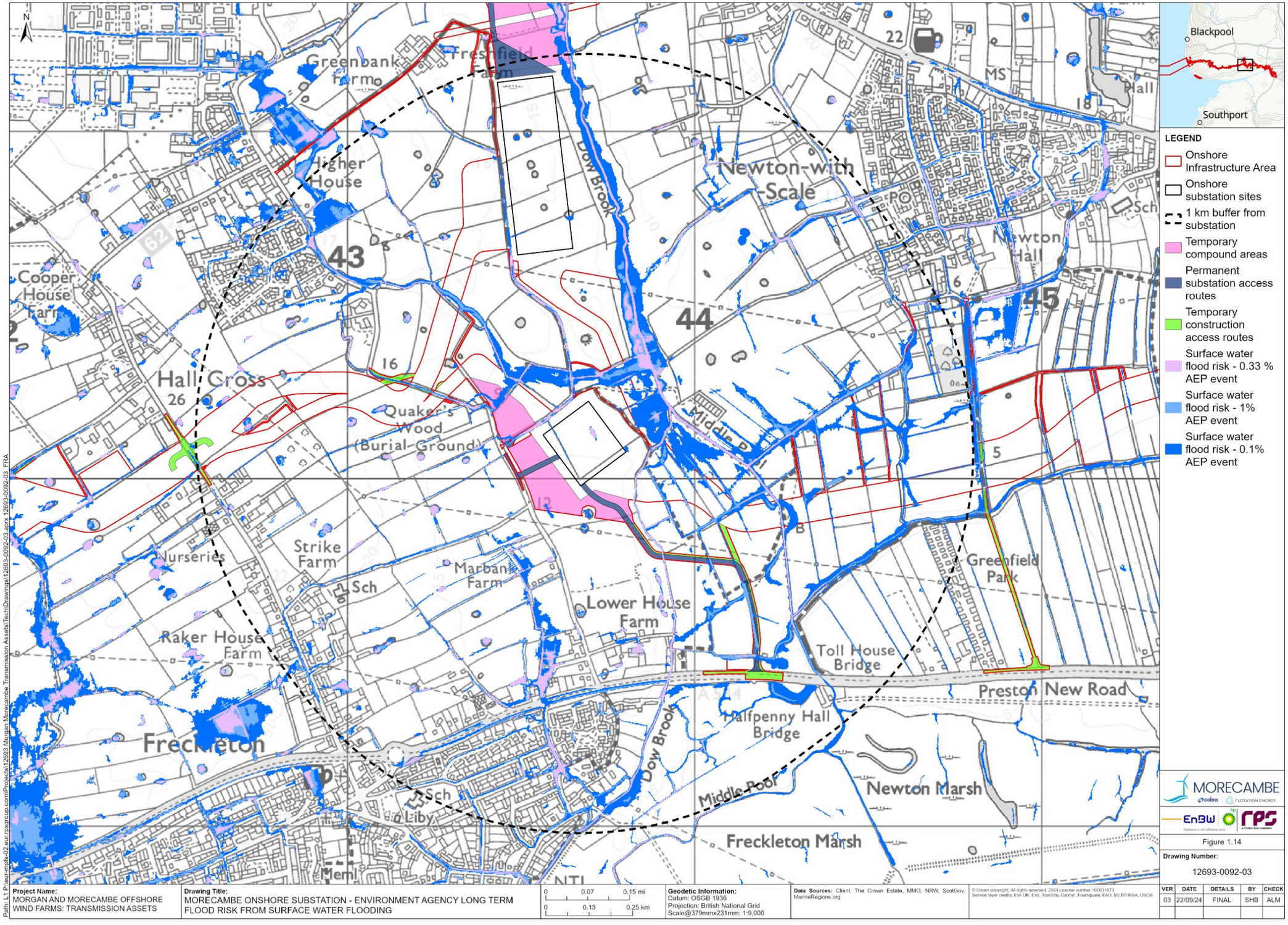


Figure 1.14: Morecambe onshore substation - Environment Agency Long term flood risk from surface water flooding

Mitigation measures (commitments)

1.6.6.5 Mitigation measures (commitments) presented below within **Table 1.29** are proposed to manage flood risk and vulnerability to site workers during the construction phase and operation and maintenance phase. Commitments are also presented within **Section 1.8, Table 1.44.** Commitments are to be secured through requirements of the DCO**.**

Table 1.29: Summary of CoT for surface water flood risk for Morecambe onshore substation

CoT	Summary	Reason	How CoT is to be secured
CoT09	The Outline Code of Construction Practice (CoCP) has been submitted as part of the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP includes information about drainage during construction.	To implement construction phase drainage to control runoff during this phase of the Transmission Assets.	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)
CoT11	An Outline Operational Drainage Management Plan for the substation sites has been prepared and submitted with the application for development consent. The Plan will include measures to ensure that existing land drainage is reinstated and/or maintained. This will include measures to limit discharge rates and attenuate flows to maintain greenfield runoff rates at the onshore substations. It will also include measures to control surface water runoff, including measures to prevent flooding of the working areas or offsite and to ensure any runoff is treated appropriately. Detailed Operational Drainage Management Plan(s) will be developed in accordance with the Outline Operational Drainage Management Plan and in line with the latest relevant drainage guidance notes in consultation with the Environment Agency and the Lead Local Flood Authority (Lancashire County Council).	To ensure flood risk is not increased during operation.	DCO Schedules 2A and 2B, Requirement 20 (Outline Operational Drainage Management Plan)
CoT24	Where practicable, during construction, access routes within the onshore export cable corridor and 400 kV grid connection corridor (i.e. for example, the use	To not increase impermeable areas associated with haul roads and in turn increase surface water runoff and flood risk from this source	DCO Schedules 2A & 2B, Requirement 9 (Traffic and Transport)

CoT	Summary	Reason	How CoT is to be secured
	of haul roads) will be used, to minimise potential impacts to the local road network.		Access to Works Plan
CoT27	All temporary compounds will be removed and sites will be reinstated when construction has been completed.	To not increase surface water runoff as a result of greater impermeable areas during the operation and maintenance phase	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice); and DCO Schedules 2A and 2B, Requirement 16 (Restoration of land used temporarily for construction)
CoT35	An Outline Code of Construction Practice (CoCP) has been prepared and submitted with the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP will include measures to maintain and address: • […] flood protection and control measures; • -water environment and drainage; and • pollution prevention […]	To implement control measures in regards to fluvial and tidal flooding, including: • Measures to prevent a reduction in the capacity of the fluvial floodplain which can increase flood risk downstream; • Measures regarding dewatering; Measures regarding restricting the placement of stockpiling, storage of fuels and chemicals and refuelling to Flood Zone 1 (where practical) and at least 8 m from ordinary watercourses and Main Rivers and 16m from tidal Main Rivers to reduce vulnerability to flood risk;	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)
CoT36	Onshore Decommissioning Plan(s) will be developed prior to decommissioning. The Onshore Decommissioning Plan(s) will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure (if and where relevant and practicable), and details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The Onshore Decommissioning Plan(s) will be in line with the latest relevant available guidance.	To manage flood risk during decommissioning	DCO Schedules 2A & 2B, Requirement 22 (Onshore decommissioning)

Summary

1.6.6.6 Commitments listed in **Table 1.29** above will ensure the Morecambe onshore substation will not be impacted by or cause any adverse effect on surface

water flooding during the construction phase. As such, flood risk from this source is assessed to be low.

1.6.7 Reservoir flood risk

1.6.7.1 The western portion of the Morecambe onshore substation and associated 1 km study area is identified to be within the reservoir flood extent, when there is also river flooding. Environment Agency reservoir flood risk within the study area is presented within **Figure 1.10**.

1.6.7.2 Due to the regular inspection and maintenance regime in place on large reservoirs, the likelihood of catastrophic failure and therefore risk of flooding to the site from this source is unlikely to occur. Flood risk from this source is therefore assessed to be very low.

1.6.8 Flood risk from sewer and water main failure

1.6.8.1 Flooding from sewerage failure occurs when a rainfall event exceeds the maximum capacity of the surrounding network. The most common causes of flooding from sewers are inadequate flow capacity, blockages, pumping station failures, burst water mains, water inflow from rivers or the sea, tide locking, siltation, fats/greases, and sewer collapse. Should any of these events occur there is a risk of flooding within the vicinity of the sewer by surcharge where the flood is in excess of the sewer capacity (usually 1 in 30-year event or greater).

1.6.8.2 Morecambe onshore substation is agricultural and therefore, unlikely to have sewer assets within the site.

1.6.8.3 As per **section 3.16.8** of Volume 1, Chapter 3: Project description of the ES, to ensure damage to sewers and water pipelines and thus flooding from this source is prevented during the construction phase, prior to the commencement of works, any construction activities will need to be undertaken in accordance with the water authorities design standards prior to gaining approval. This includes providing evidence to confirm the presence/lack of presence of any water authority assets (e.g. sewers and water mains) and if they are present, how final design and construction methods will be implemented to divert their assets (which will need additional approval) or avoid their assets.

Mitigation measures (commitments)

1.6.8.4 Mitigation measures (commitments) presented below within **Table 1.30** below are proposed to manage flood risk and vulnerability to site workers during the construction phase. No commitments relating to groundwater flooding are required during the operation and maintenance phase. Commitments are also presented within **Section 1.8, Table 1.44.** Commitments are to be secured through requirements of the DCO**.**

Table 1.30: Summary of CoT for flood risk from sewers for Morecambe onshore substation

CoT	Summary	Reason	How CoT is to be secured
CoT09	The Outline Code of Construction Practice (CoCP) has been submitted as part of the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP includes information about drainage during construction.	To implement construction phase drainage to control runoff during this phase of the Transmission Assets.	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)
CoT35	An Outline Code of Construction Practice (CoCP) has been prepared and submitted with the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP will include measures to maintain and address: • […] flood protection and control measures; • -water environment and drainage; and • pollution prevention […]	To implement control measures in regards to fluvial and tidal flooding, including: • Measures to prevent a reduction in the capacity of the fluvial floodplain which can increase flood risk downstream; • Measures regarding dewatering; Measures regarding restricting the placement of stockpiling, storage of fuels and chemicals and refuelling to Flood Zone 1 (where practical) and at least 8 m from ordinary watercourses and Main Rivers and 16m from tidal Main Rivers to reduce vulnerability to flood risk;	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)
CoT36	Onshore Decommissioning Plan(s) will be developed prior to decommissioning. The Onshore Decommissioning Plan(s) will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure (if and where relevant and practicable), and details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The Onshore Decommissioning Plan(s) will be in line with the latest relevant available guidance.	To manage flood risk during decommissioning	DCO Schedules 2A & 2B, Requirement 22 (Onshore decommissioning)

Summary

1.6.8.5 With implementation of commitments listed within **Table 1.30,** flood risk from sewers is therefore assessed to be very low.

1.6.9 Flood risk from artificial sources

1.6.9.1 Field drainage is expected to be present within agricultural land within the study area and could pose localised sources of flooding if impacted during construction.

Mitigation measures (commitments)

1.6.9.2 Mitigation measures (commitments) presented below within **Table 1.30** below are proposed to manage flood risk and vulnerability to site workers during the construction phase. No commitments relating to flooding from artificial sources are required during the operation and maintenance phase. Commitments are also presented within **Section 1.8, Table 1.44.** Commitments are to be secured through requirements of the DCO**.**

Table 1.31: Summary of CoT for flood risk from artificial sources for Morecambe onshore substation

CoT	Summary	Reason	How CoT is to be secured
CoT09	The Outline Code of Construction Practice (CoCP) has been submitted as part of the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP includes information about drainage during construction.	To implement construction phase drainage to control runoff during this phase of the Transmission Assets.	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)
CoT35	An Outline Code of Construction Practice (CoCP) has been prepared and submitted with the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP will include measures to maintain and address: • […] flood protection and control measures; • -water environment and drainage; and • pollution prevention […]	To implement control measures in regards to fluvial and tidal flooding, including: • Measures to prevent a reduction in the capacity of the fluvial floodplain which can increase flood risk downstream; • Measures regarding dewatering; Measures regarding restricting the placement of stockpiling, storage of fuels and chemicals and refuelling to Flood Zone 1 (where practical) and at least 8 m from ordinary watercourses and Main Rivers and 16m from tidal Main Rivers to reduce vulnerability to flood risk;	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)
CoT36	Onshore Decommissioning Plan(s) will be developed prior to decommissioning. The Onshore Decommissioning Plan(s) will include provisions for the removal of all onshore above ground	To manage flood risk during decommissioning	DCO Schedules 2A & 2B, Requirement 22 (Onshore decommissioning)

CoT	Summary	Reason	How CoT is to be secured
	infrastructure and the decommissioning of below ground infrastructure (if and where relevant and practicable), and details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The Onshore Decommissioning Plan(s) will be in line with the latest relevant available guidance.		
CoT84	An Outline Code of Construction Practice (CoCP) has been prepared and submitted with the application for development consent. Detailed CoCP(s) will be developed in accordance with the Outline CoCP. In order to manage impacts to field drainage, the Outline CoCP stipulates field drainage plans will be developed in consultation with the relevant landowners. If required, additional field drainage will be installed to ensure the existing drainage of the land is maintained during and after construction.	To prevent flooding from field drainage	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)

Summary

1.6.9.3 With implementation of commitments listed within **Table 1.30,** flood risk from artificial sources is therefore assessed to be very low.

1.6.10 Historic flooding

1.6.10.1 The Environment Agency Historic Flood Map shows the Morecambe onshore substation site is located outside the mapped extent of historical flooding. The southern extent of the 1 km study area is shown to be located within an Environment Agency historical flood extent, comprising an area of 97ha. Historical flood extents are within the Transmission Assets study area are presented within **Figure 1.11**.

Strategic Flood Risk Assessment (Fylde Borough Council, 2011)

1.6.10.2 Fylde Council do not hold any records of historical flooding.

1.6.11 Summary of flood risk

1.6.11.1 A summary of assessed flood risk is presented below within **Table 1.32.**

Table 1.32: Morecambe onshore substation flood risk summary

Source of flooding	Assessed risk to Morecambe onshore substation	Commitment measures to be adopted
Fluvial and tidal	Low	CoT08, CoT09, CoT27, CoT35, CoT36, CoT82, CoT95, CoT121
Groundwater	Low	CoT09, CoT35, CoT36, CoT41
Surface water	Low	CoT09. CoT11, CoT24, CoT27, CoT35, CoT36
Reservoir	Very low	None
Sewer	Very low	CoT09, CoT35, CoT36
Artificial Sources	Very low	CoT09, CoT35, CoT36, CoT84

1.7 Landfall, onshore export cables and 400 kV grid connection cable corridor flood risk assessment

1.7.1 Baseline conditions

Location

1.7.1.1 The landfall, onshore export cables and 400 kV grid connection cable corridor FRA focuses on the 250 m study area relevant to the intertidal infrastructure area and onshore infrastructure area, including the following elements:

- Landfall:
  - Landfall site: this is where the offshore export cables are jointed to the onshore export cables. This term applies to the entire landfall area between Mean Low Water Springs (MLWS) and the TJBs. This includes all construction works, including the offshore and onshore cable routes, intertidal working area and landfall compound(s).
- Onshore elements:
  - onshore export cables: these cables will link the landfall site and the proposed onshore substations; and
  - 400 kV grid connection cable corridor: these 400 kV cables will connect the proposed onshore substations to the existing National Grid Penwortham substation. Circuit breaker infrastructure may also be required within the 400 kV grid connection cable corridor.

1.7.1.2 The onshore substations are considered within the previous sections and are not considered further in this section.

1.7.1.3 The landfall is located at Lytham St. Annes. From the landfall, the onshore export cable corridor routes east away from the coast to the onshore substations just west of Newton-with-Scales. The 400 kV grid connection cable corridor routes eastwards and crosses the River Ribble to the west of Preston and connects to the National Grid Penwortham substation located to the west of Penwortham. The study area is presented within **Figure 1.1**.

Existing use

1.7.1.4 The Transmission Assets makes landfall at Lytham St Annes beach and crosses Blackpool Airport before running through predominantly agricultural land uses. There are several built-up areas and settlements within and adjacent to the study area, including Blackpool, Preston, Kirkham, Penwortham, Ashton-on-Ribble, Lytham St Annes, and Freckleton.

1.7.1.5 The A583 and A584 route broadly east to west are located within the eastern extent of the study area. Other infrastructure within the study area include several major roads and the Blackpool South to Preston railway line which bisects the central extent of the study area.

1.7.1.6 The study area crosses several watercourses across the route, including the River Ribble at a location to the east of Freckleton.

1.7.1.7 Several designated sites are located within the study area, as presented within **Figure 1.12**, including:

- Ribble and Alt Estuaries Special Protection Area and Ramsar within the southern extent of the study area and seaward of the landfall area;
- Ribble Estuary SSSI (biological) within the southern extent of the study area and seaward of the landfall area;
- Newton Marsh SSSI (biological) within the central-eastern part of the study area;
- Lytham St Anne's Dunes SSSI (biological) in the landfall part of the study area;
- Lytham Coastal Changes SSSI (geological) within the central-southern part of the study area, which is also designated as the Lytham St. Annes – Starr Hills Dunes Local Geodiversity Site.

Proposed use

1.7.1.8 For the purpose of this FRA, the maximum design scenarios for the Transmission Assets are identified within Volume 1, Chapter 3: Project description of the ES and are summarised below.

- Up to four compounds required between the TJBs and MLWS
  - Compound 1 (welfare): 300 m^2 to be active for 36 weeks;
  - Compound 2: 2,500 m^2 to be active for 48 weeks;
  - Compound 3: 510 m^2 to be active for 48 weeks; and
  - Compound 4: 600 m^2 to be active for 36 months.
- Up to two compounds within Blackpool Airport to facilitate construction works for the TJBs, to be active for up to 66 months
  - Landfall compound: 10,000 m^2 for Morgan and 10,000 m2 for Morecambe; and
  - Maximum working area of the TJB: 4,900 m^2 for Morgan and 2,800 m^2 for Morecambe
- The offshore export cables between the TJB working area and the beach will be installed using the direct pipe trenchless technique for a maximum length of 1,500m. It is anticipated the direct pipe exit will be within the intertidal area.
- Entry pits within the TJB area are to be each 450 m^2 in area for each circuit and 6 m in depth, to be active for up to 66 months. There will also be up to six exit pits on the beach 15m from the boundary of Lytham St Annes Dunes SSSI, each with a cofferdam area of 15 * 5m (75 m^2) and depth of 3 m, to be active for two weeks.
- Following the completion of the pulling-in of offshore export cables into the TJBs, the offshore export cables will be buried between the direct pipe/duct exit pits and MLWS. The initial burial starts at the direct pipe/duct exit pit (i.e. at the cofferdam locations) via open trenching,

towards MLWS. The maximum number of trenches between the direct pipe exit and MLWS is six. Each trench is to be stepped with depth, with a maximum width at ground level of 10m. The maximum length of each trench is 300m. The maximum volume of excavated material is 35,100 m^3. Cable pull in and burial will take up to six weeks per cable, spread across a 36 month construction period.

- Onshore export cable corridor (approximately 100 m wide (including temporary area) and 17 km in length; once installed the cables will occupy a permanent corridor up to 70 m wide):
  - Up to six cable trenches, each trench up to 4 m wide at ground level with a 1.8m target trench depth.
  - To be active for a maximum of 66 months
- 400 kV grid connection cable corridor(approximately 76 m wide (including temporary area) and 13 km in length; once installed the cables will occupy a permanent corridor of approximately 50 m wide):
  - Up to four cable trenches, each trench up to 4 m wide at ground level.
- Up to 120 HDD locations with main HDD compounds measuring up to 100 m x 50 m (5,000 m^2) in size.
  - HDD launch and reception pit areas both a maximum of 10 * 10m (100m^2). Maximum HDD cable burial depth is 15m.
- Up to 16 temporary compounds along the onshore export cable corridor and 400 kV grid connection cable corridor:
  - 4 Type A compounds measuring up to 15,000m^2 (150 x 100) in size;
  - 8 Type B compounds measuring up to 15,000m^2 (150 x 100) in size; and
  - 4 Type C compounds measuring up to 10,000m^2 (100 x 100) in size.
- Two temporary 6 m wide haul roads constructed using imported engineering granular fill with geotextile style layers and a nominal thickness of 400 mm and maximum thickness of up to 1,000 mm; and
- River Ribble to be crossed by micro tunnelling or direct pipe up to 650m in length with:
  - Up to 4 starting pits each 450m^2 and up to 45m in depth within a launch pit measuring up to 60,000m^2 in size,
  - Up to 4 finishing pits each 750m^2 and up to 45m in depth within a launch pit measuring up to 7,500m^2 in size.

Decommissioning

1.7.1.9 An Onshore Decommissioning Plan (see CoT36, **Table 1.31**) will be developed prior to decommissioning in a timely manner. The Onshore Decommissioning Plan will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground

infrastructure and details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The Onshore Decommissioning Plan will be in line with the latest relevant available guidance.

1.7.1.10 Activities associated with decommissioning will operate within the parameters of those established for construction. To minimise the environmental disturbance during decommissioning the onshore export cables and 400 kV grid connection cables may be recovered and removed by pulling the cables through the ducts (e.g., for recycling). Otherwise, they will be left in place in the ground with the cable ends cut, sealed and securely buried as a precautionary measure.

1.7.1.11 Joint bays and link boxes will be removed only if it is feasible with minimal environmental disturbance or if their removal is required to return the land to its current agricultural use.

1.7.2 Hydrological overview

1.7.2.1 A 250 m study area was selected for the landfall, onshore export cables and 400 kV grid connection cable corridor. Further justification of the study area is presented within **Section 1.2.2**.

1.7.2.2 The study area is situated within the North West River Basin District and is located within Ribble and Douglas Environment Agency management catchments, respectively located to the north and south of the Ribble Estuary. Designated Main Rivers, ordinary watercourses and offshore water bodies within the study area are presented within **Figure 1.15.**

Sea

1.7.2.3 The landfall of the Transmission Assets is located at Lytham St Anne's. The Irish Sea is located beyond the intertidal area.

Main rivers

1.7.2.4 The study area includes the following designated Main Rivers:

- Main Drain and associated tributaries, including Branch Drain;
- Moss Sluice (also known as Liggard Brook downstream of the study area) and associated tributaries;
- Dow Brook and associated tributaries;
- Middle Pool;
- Wrea Brook;
- Pool Stream;
- Ribble Link/Savick Brook;
- River Ribble; and
- Mill Brook.

1.7.2.5 It is noted the Canal and Rivers Trust lease Savick Brook to enable navigation and connectivity to the Lancaster Canal (commencing in Preston). The Canal and Rivers Trust own and manage several locks upon the watercourse to enable navigation and connectivity to the Lancaster Canal. The Canal and Rivers Trust also have a right of navigation over the Ribble Link (River Ribble) which provides connectivity to Savick Brook.

Ordinary watercourses

1.7.2.6 The study area includes the following ordinary watercourse features:

- Deepdale Brook;
- Tributaries of Moss Sluice;
- Tributaries of Branch Drain and Main Drain;
- Tributaries of Wrea Brook;
- Tributaries of Pool Stream;
- Tributaries of Middle Pool; and
- Tributaries of Mill Brook;

Internal drainage boards

1.7.2.7 The study area does not encompass any watercourses under the jurisdiction of an internal drainage board.

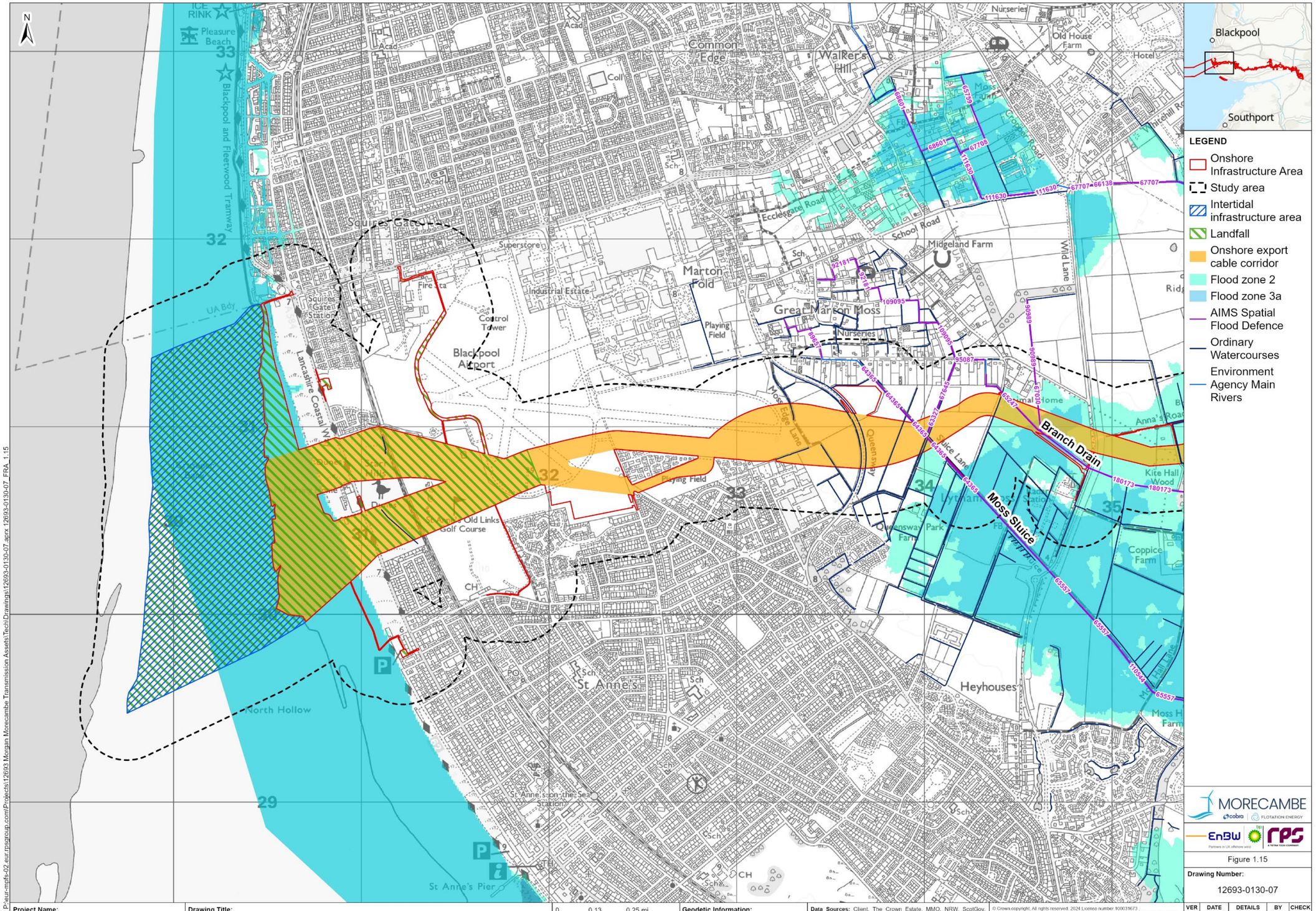
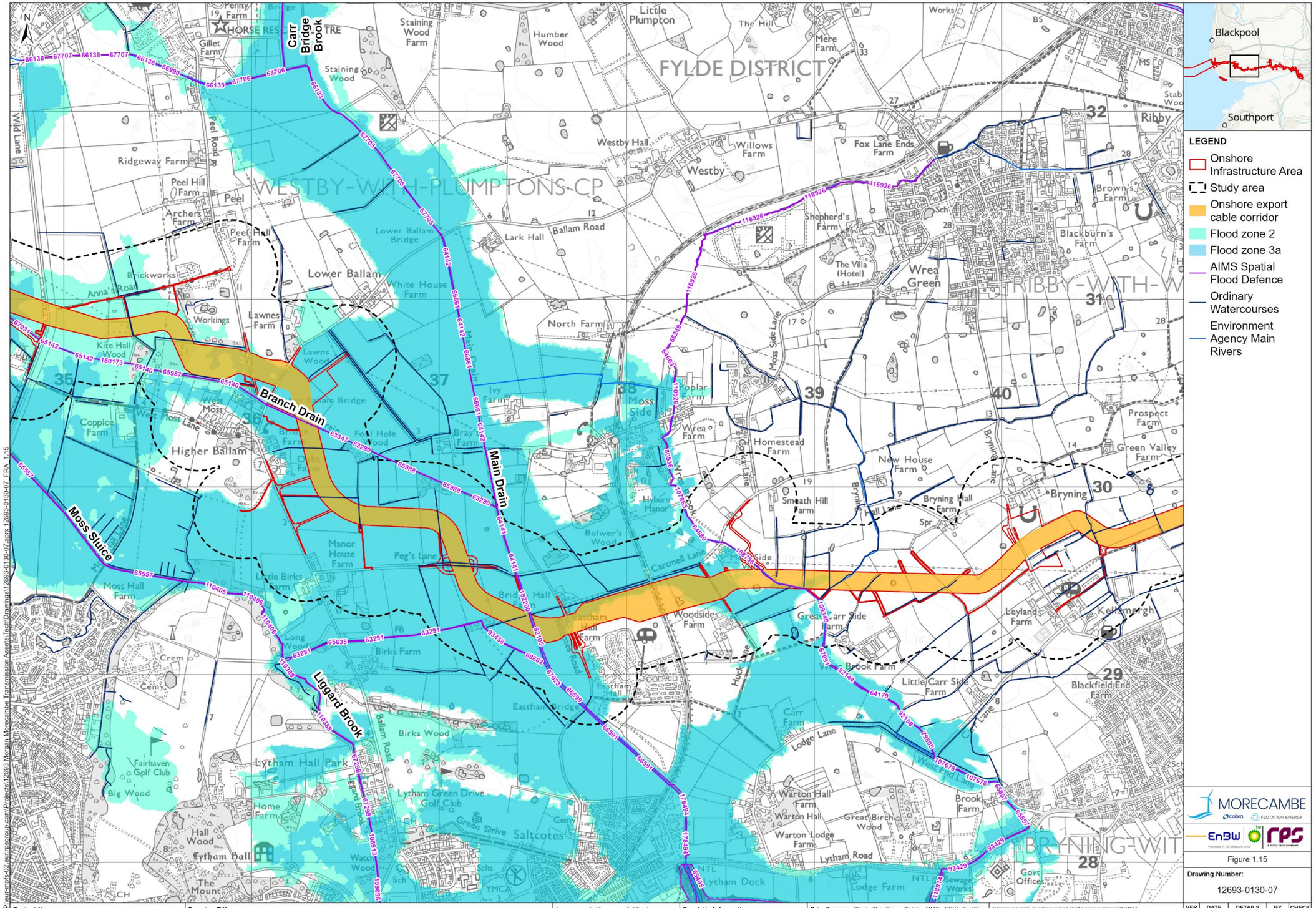


Figure 1.15: Transmission Assets: landfall, onshore export cable corridor and 400 kV grid connection cable corridor - Watercourses, EA Flood Zones and EA Spatial Flood Defences



Project Name: MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS	**Drawing Title:** TRANSMISSION ASSETS: LANDFALL, ONSHORE EXPORT CABLE CORRIDOR AND 400 KV GRID CONNECTION CABLE CORRIDOR - WATERCOURSES, EA FLOOD ZONES AND EA SPATIAL FLOOD DEFENCES	0 0.13 0.25 mi 0 0.25 0.5 km	**Geodetic Information:** Datum: OSGB 1936 Projection: British National Grid Scale@379mmx231mm: 1:17,000	**Data Sources:** Client, The Crown Estate, MMO, NRW, ScotGov, MarineRegions.org

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Figure 1.15

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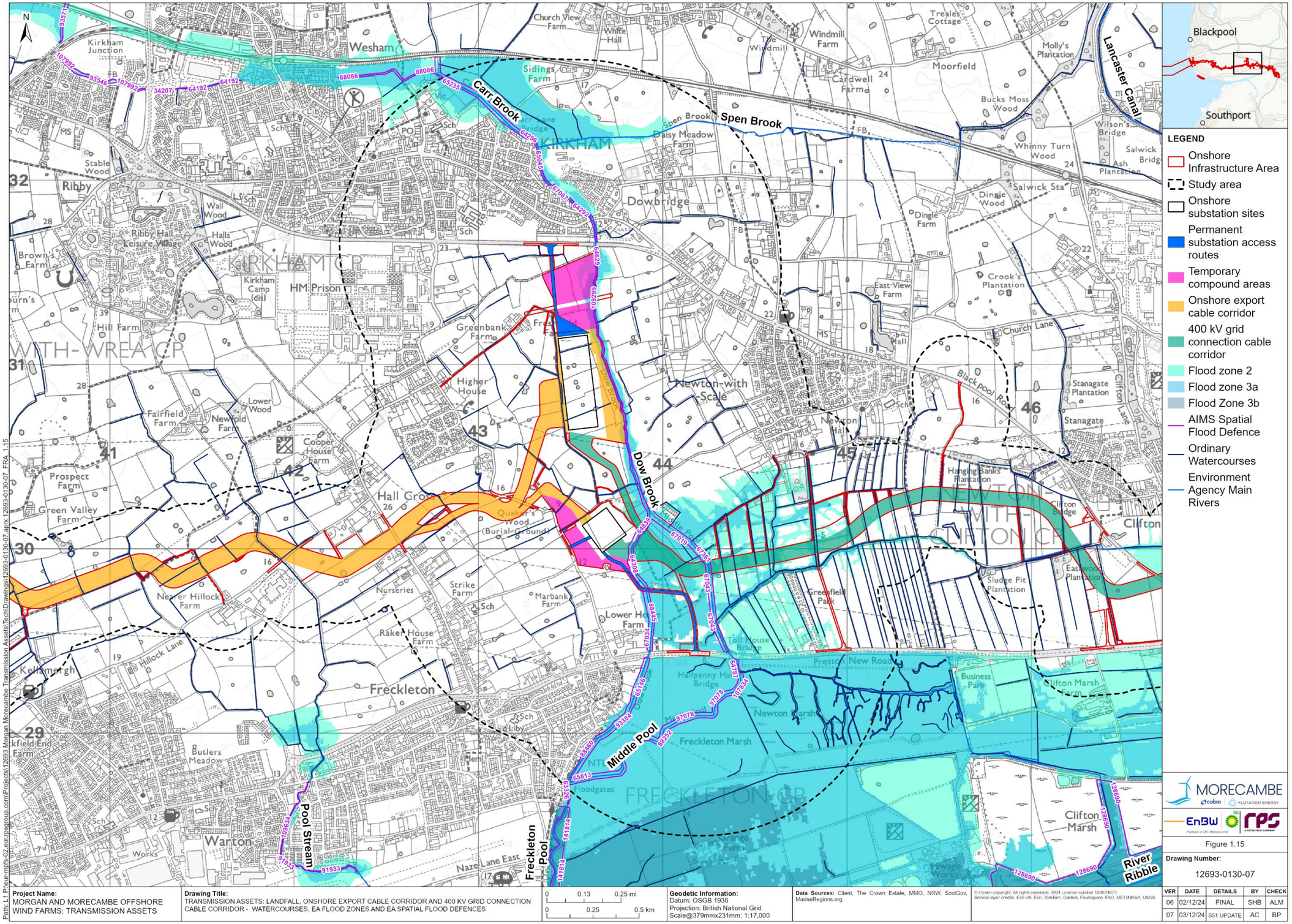
Figure 1.15: Transmission Assets: landfall, onshore export cable corridor and 400 kV grid connection cable corridor - Watercourses, EA Flood Zones and EA Spatial Flood Defences



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Project Name: MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS	**Drawing Title:** TRANSMISSION ASSETS: LANDFALL, ONSHORE EXPORT CABLE CORRIDOR AND 400 KV GRID CONNECTION CABLE CORRIDOR - WATERCOURSES, EA FLOOD ZONES AND EA SPATIAL FLOOD DEFENCES	0 0.13 0.25 mi 0 0.25 0.5 km	**Geodetic Information:** Datum: OSGB 1936 Projection: British National Grid Scale@379mmx231mm: 1:17,000	**Data Sources:** Client, The Crown Estate, MMO, NRW, ScotGov, MarineRegions.org	© Crown copyright. All rights reserved. 2024 License number 100031673. Service layer credits: Esri UK, Esri, TomTom, Garmin, Foursquare, FAO, METI/NASA, USGS.

MORECAMBE cobra FLOTATION ENERGY
EnBW bp Partners in UK offshore wind rps A TETRA TECH COMPANY

Figure 1.15

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06	02/12/24	FINAL	SHB	ALM
07	03/12/24	S51 UPDATE	AC	BP

Figure 1.15: Transmission Assets: landfall, onshore export cable corridor and 400 kV grid connection cable corridor - Watercourses, EA Flood Zones and EA Spatial Flood Defences

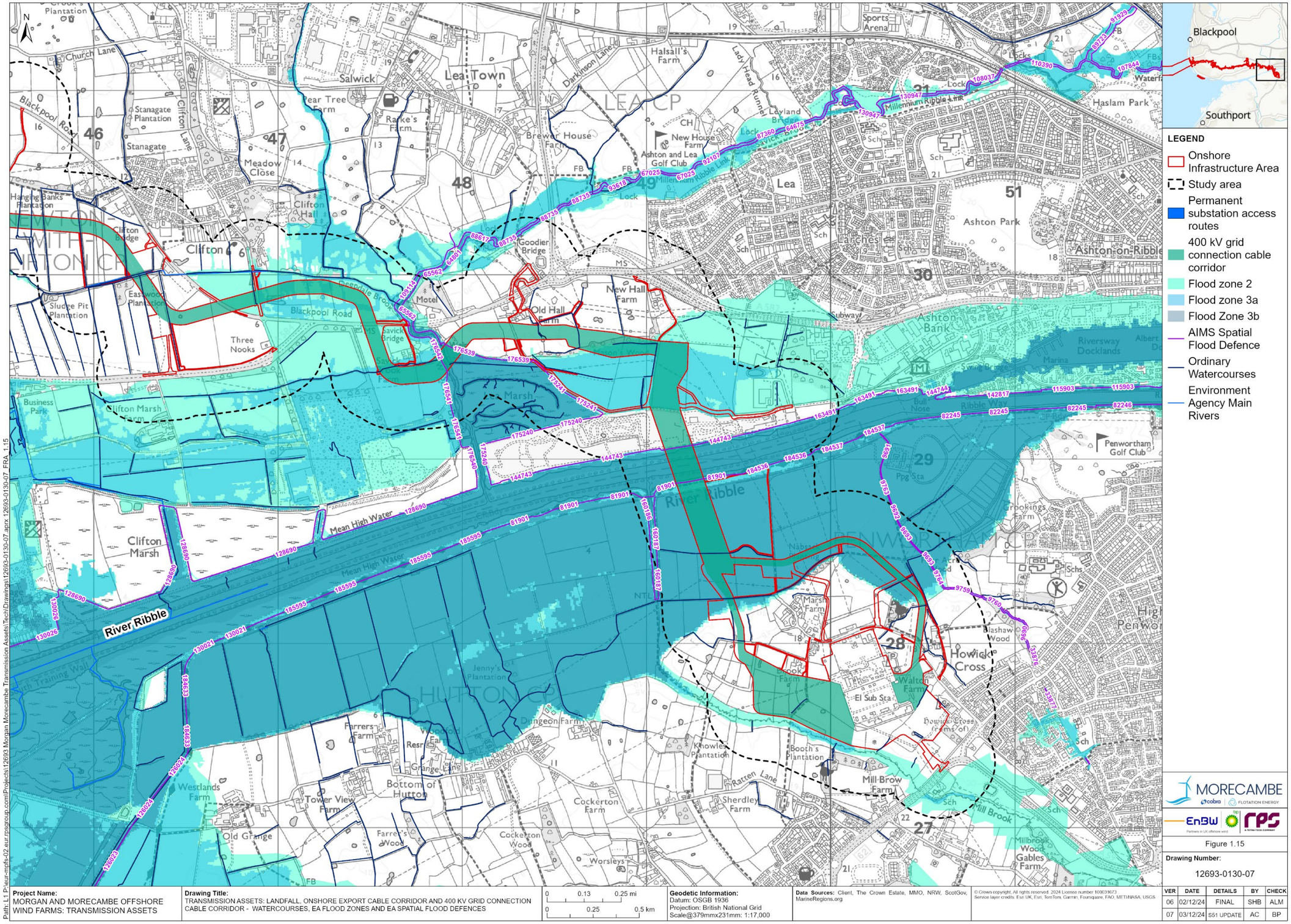


Figure 1.15: Transmission Assets: landfall, onshore export cable corridor and 400 kV grid connection cable corridor - Watercourses, EA Flood Zones and EA Spatial Flood Defences

Flood defences

Environment Agency Spatial Flood Defences (including standardised attributes)

1.7.2.8 The Environment Agency Spatial Flood Defences (including standardised attributes) mapping shows the presence of the following flood defences within the study area. Defences and associated attributes are listed below within **Table 1.33** and presented within **Figure 1.15.**

1.7.2.9 It was been confirmed by the Environment Agency within the first HFR EWG in May 2023 that difference in phasing between the Transmission Assets and Preston and South Ribble Flood Risk Management Scheme makes interaction between the schemes unlikely.

1.7.2.10 Whilst not included within the Environment Agency Spatial Flood Defences dataset, the Fylde sand dunes offer protection from tidal flooding to inland areas by virtue of elevation and also act to reduce wave action.

Table 1.33: Flood Defences

Flood and Coastal Risk Management code	Asset id	Asset type	Asset maintainer	Current condition	Design standard of protection (years)
FR/09/S027	107677	Natural High Ground	Unknown	Unknown	100
FR/09/S027	107865	Natural High Ground	Unknown	Unknown	5
FR/09/S027	107874	Natural High Ground	Unknown	Unknown	70
FR/09/S027	108669	Natural High Ground	Unknown	Unknown	5
FR/09/S027	108758	Natural High Ground	Unknown	Unknown	5
FR/09/S027	109095	Natural High Ground	Unknown	Unknown	5
FR/09/S027	109340	Natural High Ground	Unknown	Unknown	70
FR/09/S027	180173	Natural High Ground	Unknown	Unknown	5
FR/09/S027	182200	Natural High Ground	Unknown	Unknown	5
FR/09/S027	58021	Natural High Ground	Unknown	Unknown	5
FR/09/S027	63290	Natural High Ground	Unknown	Unknown	5
FR/09/S027	63291	Natural High Ground	Unknown	Unknown	50
FR/09/S027	63327	Natural High Ground	Unknown	Unknown	5
FR/09/S027	63347	Natural High Ground	Unknown	Unknown	5
FR/09/S027	63378	Natural High Ground	Unknown	Unknown	5
FR/09/S027	64141	Natural High Ground	Unknown	Unknown	5
FR/09/S027	64365	Natural High Ground	Unknown	Unknown	5
FR/09/S027	64366	Natural High Ground	Unknown	Unknown	5
FR/09/S027	64467	Natural High Ground	Unknown	Unknown	5

Flood and Coastal Risk Management code	Asset id	Asset type	Asset maintainer	Current condition	Design standard of protection (years)
FR/09/S027	64479	Natural High Ground	Unknown	Unknown	100
FR/09/S027	64680	Embankment	Environment Agency	3	5
FR/09/S027	65140	Natural High Ground	Unknown	Unknown	5
FR/09/S027	65142	Natural High Ground	Unknown	Unknown	5
FR/09/S027	65247	Natural High Ground	Unknown	Unknown	100
FR/09/S027	65635	Natural High Ground	Unknown	Unknown	50
FR/09/S027	65694	Natural High Ground	Unknown	Unknown	5
FR/09/S027	65855	Natural High Ground	Unknown	Unknown	70
FR/09/S027	65987	Natural High Ground	Unknown	Unknown	5
FR/09/S027	65988	Natural High Ground	Unknown	Unknown	5
FR/09/S027	66591	Embankment	Environment Agency	3	5
FR/09/S027	66599	Embankment	Environment Agency	3	50
FR/09/S027	67023	Embankment	Environment Agency	3	50
FR/09/S027	67030	Natural High Ground	Unknown	Unknown	5
FR/09/S027	67031	Natural High Ground	Unknown	Unknown	5
FR/09/S027	67091	Embankment	Environment Agency	3	70
FR/09/S027	67131	Embankment	Environment Agency	3	70
FR/09/S027	67645	Natural High Ground	Unknown	Unknown	5
FR/09/S027	68662	Embankment	Environment Agency	3	50
FR/09/S027	80180	Natural High Ground	Unknown	Unknown	5

Flood and Coastal Risk Management code	Asset id	Asset type	Asset maintainer	Current condition	Design standard of protection (years)
FR/09/S027	80536	Natural High Ground	Unknown	Unknown	5
FR/09/S027	82144	Natural High Ground	Unknown	Unknown	70
FR/09/S027	89657	Natural High Ground	Unknown	Unknown	5
FR/09/S027	90202	Natural High Ground	Unknown	Unknown	5
FR/09/S027	90989	Natural High Ground	Unknown	Unknown	5
FR/09/S027	92105	Embankment	Environment Agency	3	5
FR/09/S027	93397	Natural High Ground	Unknown	Unknown	100
FR/09/S027	93458	Natural High Ground	Unknown	Unknown	50
FR/09/S027	95087	Natural High Ground	Unknown	Unknown	5
FR/09/S124	109299	Natural High Ground	Unknown	Unknown	70
FR/09/S124	109300	Natural High Ground	Unknown	Unknown	70
FR/09/S124	64291	Natural High Ground	Unknown	Unknown	70
FR/09/S124	64292	Natural High Ground	Unknown	Unknown	70
FR/09/S124	64463	Natural High Ground	Unknown	Unknown	70
FR/09/S124	64464	Natural High Ground	Unknown	Unknown	70
FR/09/S124	64629	Natural High Ground	Unknown	Unknown	70
FR/09/S124	66369	Natural High Ground	Unknown	Unknown	70
FR/09/S124	66370	Natural High Ground	Unknown	Unknown	70
FR/09/S124	66597	Natural High Ground	Unknown	Unknown	70
FR/09/S124	66658	Natural High Ground	Unknown	Unknown	70

Flood and Coastal Risk Management code	Asset id	Asset type	Asset maintainer	Current condition	Design standard of protection (years)
FR/09/S124	67087	Natural High Ground	Unknown	Unknown	70
FR/09/S124	89411	Natural High Ground	Unknown	Unknown	50
FR/09/S124	93616	Natural High Ground	Unknown	Unknown	50
FR/09/S124	107834	Natural High Ground	Unknown	Unknown	150
FR/09/S126	109114	Embankment	Environment Agency	3	150
FR/09/S124	110137	Natural High Ground	Unknown	Unknown	70
FR/09/S145	144743	Natural High Ground	Private individual, Company or Charity	Unknown	5
FR/09/S145	160186	Embankment	Unknown	Unknown	100
FR/09/S145	160187	Embankment	Unknown	Unknown	100
FR/09/S145	163491	Embankment	Private individual, Company or Charity	Unknown	100
FR/09/S126	175240	High Ground	Unknown	Unknown	150
FR/09/S126	175241	Embankment	Local Authority	Unknown	No information
FR/09/S126	176539	High Ground	Private individual, Company or Charity	Unknown	150
FR/09/S126	176541	Embankment	Environment Agency	3	150
FR/09/S126	176542	Embankment	Environment Agency	3	50
FR/09/S126	176543	Embankment	Environment Agency	3	50
FR/09/S126	176544	Embankment	Environment Agency	3	50
FR/09/S145	184536	Embankment	Unknown	Unknown	100
FR/09/S124	64308	Natural High Ground	Unknown	Unknown	50

Flood and Coastal Risk Management code	Asset id	Asset type	Asset maintainer	Current condition	Design standard of protection (years)
FR/09/S124	64787	Natural High Ground	Unknown	Unknown	150
FR/09/S124	64839	Natural High Ground	Unknown	Unknown	50
FR/09/S124	65146	Natural High Ground	Unknown	Unknown	50
FR/09/S124	65147	Natural High Ground	Unknown	Unknown	50
FR/09/S124	65350	Natural High Ground	Unknown	Unknown	50
FR/09/S124	65351	Natural High Ground	Unknown	Unknown	50
FR/09/S126	65562	Natural High Ground	Unknown	Unknown	50
FR/09/S124	65776	Natural High Ground	Unknown	Unknown	70
FR/09/S124	66580	Natural High Ground	Unknown	Unknown	70
FR/09/S124	66581	Natural High Ground	Unknown	Unknown	70
FR/09/S124	66654	Natural High Ground	Unknown	Unknown	70
FR/09/S124	67019	Natural High Ground	Unknown	Unknown	70
FR/09/S124	67034	Natural High Ground	Unknown	Unknown	50
FR/09/S124	67043	Natural High Ground	Unknown	Unknown	70
FR/09/S124	67361	Natural High Ground	Unknown	Unknown	70
FR/09/S145	81901	Embankment	Unknown	Unknown	100
FR/09/S124	88252	Natural High Ground	Unknown	Unknown	150
FR/09/S124	88445	Natural High Ground	Unknown	Unknown	50
FR/09/S126	88617	Natural High Ground	Unknown	Unknown	50
FR/09/S126	88735	Natural High Ground	Unknown	Unknown	50

Flood and Coastal Risk Management code	Asset id	Asset type	Asset maintainer	Current condition	Design standard of protection (years)
FR/09/S124	90994	Natural High Ground	Unknown	Unknown	50
FR/09/S124	92128	Natural High Ground	Unknown	Unknown	50
FR/09/S126	93428	Natural High Ground	Unknown	Unknown	150
FR/09/S126	93554	Natural High Ground	Unknown	Unknown	50
FR/09/S145	9692	Natural High Ground	Unknown	Unknown	5
FR/09/S145	9693	Natural High Ground	Unknown	Unknown	5
FR/09/S124	97078	Natural High Ground	Unknown	Unknown	150
FR/09/S145	9759	Natural High Ground	Unknown	Unknown	5
FR/09/S145	9763	Natural High Ground	Unknown	Unknown	5
FR/09/S145	9764	Natural High Ground	Unknown	Unknown	5
FR/09/S145	9765	Natural High Ground	Unknown	Unknown	5

1.7.2.11 The Lancashire County Council asset register lists several flood risk assets within the county council's boundary. Assets specifically for flood defence are listed within **Table 1.34** below.

Table 1.34: Lancashire County Council flood risk assets

Reference	Unit type	Location	Easting	Northing
LCC01	Flood defence bank	Squires Gate To St Anne's Pier, Clifton Drive North, Lytham St Annes	330626	431699
LCC02	Flood defence bank	Lea Marsh Flood Defence Bank, Blackpool Road, Preston	348768	429250

Flood alert and flood warnings

1.7.2.12 Flood warning and flood alert areas located within the study area are presented below within **Table 1.35** and **Table 1.36** and shown within **Figure 1.15.**

1.7.2.13 All flood warning and flood alert areas are present within the extents of the landfall, onshore export cable corridor and 400 kV grid connection cable corridor.

Table 1.35: Flood Warnings

Flood Warning Area Code	Description	Flood source
012FWCTL13A	Lancashire coastline at Lytham St. Annes, from Squires Gate to Warton Bank	Irish Sea
012FWCTL12A	Lancashire coastline at Blackpool, along the Promenade from Little Bispham to Squires Gate	Irish Sea
012FWCTL14B	Lancashire coastline at Clifton Marsh, between Freckleton and Savick Brook	Ribble Estuary
012FWCTL37A	Ribble Estuary at Hutton and Longton	Ribble Estuary

Table 1.36: Flood Alerts

Flood Alert Area Code	Description	Flood source
012WACLS	Coast at Lytham St Annes	Irish Sea
012WACFB	Coast from Fleetwood to Blackpool	Irish Sea
012WAFLW	Lower River Wyre	River Wyre, Main Dyke, Dow Brook
012WAFLR	Lower River Ribble and Darwen	Ribble Estuary
012WATRE	Ribble estuary west of Preston	Ribble Estuary

1.7.3 Hydrogeological overview

Bedrock

1.7.3.1 The majority of the study area is underlain by bedrock comprising the mudstones of the Singleton Mudstone Member and Mercia Mudstone Group. The eastern end of the study area is underlain by bedrock comprising sandstones of the Sherwood Sandstone Group.

1.7.3.2 The bedrock within the study area is presented within **Figure 1.5** and discussed in further detail within Volume 3, Chapter 1: Geology, hydrogeology and ground conditions of the ES.

Superficial Deposits

1.7.3.3 The superficial deposits underlying the study area are listed below in **Table 1.37** and presented within **Figure 1.4**.

Table 1.37: Superficial Deposits

Superficial deposits	Location within the study area
Tidal Flat Deposits (clay and silt)	Intertidal zone
Storm Beach Deposits (gravel)	Intertidal zone
Blown Sand (sand)	From intertidal zone to inland
Tidal Flat Deposits (clay and silt)	Inland of sand deposits
Peat (peat)	Localised inland areas
Diamicton Till, Devensian	Inland of Peat, alternating with Head
Alluvium (clay, silt, sand and gravel)	Inland, across River Ribble Tributary
Head (clay, silt, sand and gravel)	Inland of Alluvium deposits, alternating with Till
Tidal Flat Deposits, 1 (silt, clay and sand)	North and south of River Ribble
Tidal River or Creek Deposits (clay, silt and sand)	Beneath River Ribble
River Terrace Deposits, 1 (clay, silt, sand and gravel)	South of River Ribble

Aquifer designation

1.7.3.4 In regard to bedrock deposits, Mudstones of the Singleton Mudstone Member and Mercia Mudstone Group are designated as a Secondary B aquifer. These are predominantly lower permeability layers which may store and yield limited amounts of groundwater. Sherwood sandstone group (sandstone) is classified as a principal aquifer; permeable geology able to provide a high level of water storage and able to support water supply and/or river base flow on a strategic scale.

1.7.3.5 Superficial deposits form a continuous secondary A aquifer at the western end of the study area, reflecting the extent of blown sand deposits; formations formed of permeable layers capable of supporting water supplies at a local scale, in some cases forming an important source of base flow to rivers. The remainder of the study area comprises secondary undifferentiated or

unproductive strata, reflecting the distribution of superficial deposits with low permeability such as glacial till and tidal flat deposits. Additional detail can be found within Volume 3, Chapter 1: Geology, hydrogeology and ground conditions of the ES.

Source Protection Zones

1.7.3.6 An approximate area of 220 ha within the far eastern extent of the study area to the north of the Ribble Estuary is located within a Zone III: Total catchment SPZ. SPZs are presented within **Figure 1.6.**

1.7.4 Fluvial and tidal flood risk

Flood Map for Planning

1.7.4.1 The Environment Agency Flood Map for Planning, as illustrated in **Figure 1.15** shows The landfall construction compound in which the TJB entry pits are located are within Flood Zone 1. The TJB exit pits located within the intertidal area are located within Flood Zone 3. The two remaining landfall compounds are located within Flood Zone 1.

1.7.4.2 The Environment Agency Flood Map for Planning, as illustrated in **Figure 1.15** shows the onshore export cable corridor and associated temporary construction compounds and temporary construction access tracks are located within Flood Zones 1, 2 and 3.

1.7.4.3 The Environment Agency Flood Map for Planning, as illustrated in **Figure 1.15** shows the 400 kV grid connection cable corridor and associated temporary construction compounds and temporary construction access tracks are located within Flood Zones 1, 2 and 3.

1.7.4.4 Throughout the 250 m study area, The Environment Agency Flood Map for Planning, as illustrated in **Figure 1.15** shows land adjacent to watercourses and sea are located within Flood Zone 2 and 3.

Delineation of Flood Zone 3a and 3b

1.7.4.5 The delineation between Flood Zone 3a and 3b has been undertaken via the use of the 3.3% AEP extent from with the Ribble Estuary (2014) hydraulic model and the 4% AEP extent from the Ribble Douglas (2010) hydraulic model.

1.7.4.6 With regards to the Landfall, onshore export cables and 400 kV grid connection cable corridor elements of the Transmission Assets, the following components are located partially within Flood Zone 3a:

- The onshore export cable corridor;
- Areas of the 400kv grid connection cable corridor;
- Areas of temporary construction, and operational access tracks;
- Temporary construction compounds;

1.7.4.7 The following components are located within Flood Zone 3b:

- A small extent of the 400kv grid connection cable corridor in proximity to the River Ribble and Savick Brook;
- An operational access track located to the south of the River Ribble;
- Portions of two 400kv grid connection temporary construction access tracks; and
- Two temporary construction compounds located to the south of the River Ribble.

Construction phase

Environment Agency Flood Model data

1.7.4.8 A number of datasets relating to flood risk have been obtained from the Environment Agency in 2023 under a conditional licence, including:

- Ribble Estuary Tidal model (2014);
- Ribble Douglas model (2010); and
- Coastal Design Sea Levels - Coastal Flood Boundary Extreme Sea Levels dataset (2017).

1.7.4.9 The Coastal Design Sea Levels dataset has been used to assess flood risk at the landfall. The Ribble Estuary tidal model has been used to assess tidal flood risk within the onshore infrastructure area. The Ribble Douglas model has been used to assess fluvial and joint probability fluvial and tidal flooding within the onshore infrastructure area. For additional information regarding Environment Agency flood model data and climate change allowances used within the assessment, see **section 1.2.3** and **section 1.4.3.**

Landfall

1.7.4.10 The 2032-0.5% AEP peak sea levels at chainage 1210 is 6.25m AOD. One metre resolution DSM LIDAR data demonstrates landfall construction compound in which the TJB entry pits are located between 9.10 m AOD and 9.50 m AOD, and is located above peak sea levels, including an uplift for project sea level rise during the construction period.

1.7.4.11 The landing of the offshore export cable at or around MHWS to the landfall compound will be undertaken via trenchless techniques. The trenchless installation will drill underground from the landfall compound and punch out of the direct pipe seaward of the dunes and at least 15m from the toe of the Lytham St Annes dunes. Within this area, ground levels are between 2.50 m AOD and 5.00 m AOD and as such it is expected the area will be at risk of flooding from the 2032 0.5% AEP peak sea level.

Onshore export cable corridor and 400 kV grid connection cable corridor

Tidal flooding

1.7.4.12 To account for sea level rise to the end of the construction phase, 108.3 mm has been applied to the 2014 0.5% AEP undefended tidal flood extent from the Ribble Estuary tidal flood model (2032 0.5% AEP).

1.7.4.13 Mapping of flood levels and spot depths derived from LIDAR data associated with this event are presented within **Figure 1.7.** Tidal flooding generally inundates land within proximity to Main Rivers and ordinary watercourses flowing into the River Ribble.

1.7.4.14 During construction, the majority of the onshore export cable corridor is located outside the extent of inundation associated with the 2032 0.5% AEP tidal flood extent.

1.7.4.15 The central extent of the onshore export cable corridor located between Ballam Road and Moss Side is inundated with flood depth between 1.12 m and 2.54 m. Temporary construction compounds located immediately to the east of Ballam Road are inundated by 0.76 m and 1.55 m of flooding, while the construction compound to the west is inundated by flood depths of up to 0.41 m during the 2032 0.5% AEP event.

1.7.4.16 Whilst the 400 kV grid connection cable corridor and associated temporary compounds are inundated by tidal flooding, the Ribble Douglas (2010, updated 2020) model included modelling of both fluvial and tidal contributions which present greater flood depths (discussed in greater detail within paragraphs **1.7.4.17** to **1.7.4.20**).

Fluvial flooding

1.7.4.17 To account for climate change occurring to peak river flow by the end of the construction phase, the 0.1% AEP + 20% climate change event has been used to assess fluvial flooding to the onshore export cable corridor. During this scenario, a limited section of the 400 kV grid connection cable corridor is inundated by up to 1.5 m of flooding associated with out of bank flows from the Savick Brook, as presented within **Figure 1.16**.

1.7.4.18 During the undefended 0.1% AEP + 20% climate change event as presented within **Figure 1.17**, the 400 kV grid connection cable corridor to the south of the River Ribble is inundated a limited extent of flooding with depths between 0.12 m and 0.35 m. Flooding is associated with out of bank flows from tributaries of Mill Brook.

1.7.4.19 It is additionally noted that fluvial flooding from the 4% AEP and 2% AEP fluvial event inundates the and 400 kV grid connection cable corridor to the north of the River Ribble. Flooding associated with out of bank flows from a tributary of Mill Brook which immediately outfalls to the River Ribble to the west of the site.

1.7.4.20 The fluvial model boundary within the Ribble Douglas model does not include the onshore export cable corridor or landfall area of the Onshore Infrastructure Area.

Fluvial and tidal flooding

1.7.4.21 To account for the fluvial and tidal contribution on flood extents and for the effects of climate change occurring to peak river flow by the end of the construction phase, the 1% AEP + 20% climate change event has modelled alongside tidal flooding to assess flooding to the onshore export cable corridor from both fluvial and tidal sources occurring in unison. Commentary on the worst-case flooding from the defended and undefended events is presented below.

1.7.4.22 The 400 kV grid connection cable corridor is impacted by fluvial flooding. Land to the south of Blackpool Road within the far eastern extent of the cable corridor, presenting flood depths between 0.40 m and 1.55 m during the 0.1% AEP defended event with a 20% climate change uplift in fluvial flows, as presented within **Figure 1.18.** The 400 kV grid connection cable corridor to the south of the River Ribble is not inundated by this event under the defended scenario but during the 0.1% + 20% undefended scenario, flood depths between 0.40 m and 2.89 m are evident across the cable corridor, as presented within **Figure 1.19.**

Credible maximum climate change scenario

Upper estimate peak river flows

1.7.4.23 The upper estimate peak river flow allowance has been used to assess the credible maximum climate change scenario from fluvial flows. This is 27% for the Ribble management catchment and 24% for the Douglas Management catchment under the 2020's epoch, as per **Table 1.9**.

1.7.4.24 The onshore export cable corridor and 400 kV grid connection cable corridor are assessed to be at risk of fluvial flooding during the construction phase and throughout the development lifetime, and thus are considered to be risk from the upper estimate peak river flow extent. However, the construction of these aspects of the Transmission Assets are to be waterproof and not considered to be sensitive to the depth of floodwater inundation. As such, further assessment of fluvial flood data is not considered to be required.

H++ assessment

1.7.4.25 based on the Environment Agency's Coastal Design Sea Levels Level data the H++ flood level is 8.06m AOD at landfall. TJBs are located between 9.10 – 9.50m AOD and as such will not be affected by the H++ scenario, or by flooding during the operational lifetime.

1.7.4.26 The landfall, onshore export cable corridor and 400 kV grid connection cable corridor are assessed to be at risk of flooding during the construction phase and throughout the development lifetime, and thus at risk from the H++ event. However, the construction of these aspects of the Transmission Assets are to be waterproof and not considered to be sensitive to the depth of floodwater inundation. As such, the H++ approach is not considered necessary to be applied.

Operational and maintenance phase

1.7.4.27 The construction phase is expected to continue until 2032 and the operational lifetime of the Transmission Assets is assumed to be 35 years.

1.7.4.28 During the operation and maintenance phase there will be no permanent above ground structures associated with landfall, the onshore export cable corridor and 400 kV grid connection cable corridor other than joint bay and link box covers at ground level. As such, development will not increase flood risk to the surrounding area and has negligible risk of flooding to and from the development.

1.7.4.29 Volume 1, Chapter 3: Project description details activities associated with the operation and maintenance phase of the Transmission Assets and is summarised below.

- The landfall TJBs will only require to be accessed in the event of a cable failure or fault resulting in replacement or repair.
- The operation and maintenance requirements for the onshore export cables and 400 kV grid connection cables is expected to involve routine inspections of the links boxes, which will be places at intervals along the onshore route.
- Joint bays are only expected to require access in the event of a cable failure or fault resulting in replacement or repair.

As such, it is expected mitigation measures within **Table 1.38** will ensure vulnerability of site users is managed during this phase.

Decommissioning

1.7.4.30 Activities associated with decommissioning will operate within the parameters of those established for construction. An Onshore Decommissioning Plan is detailed as a CoT36 (see **Table 1.38**) and will be developed prior to decommissioning in a timely manner. The Onshore Decommissioning Plan will include details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The Onshore Decommissioning Plan will be in line with the latest relevant available guidance.

Mitigation measures (commitments)

1.7.4.31 Site workers will be present within areas of the landfall, onshore export cable corridor and 400 kV grid connection cable corridor at risk of fluvial and tidal flooding (Flood Zone 2 and 3a and 3b) during the construction phase of the development. Occasional operation and maintenance activities are also expected to take place at the landfall, onshore export cable corridor and 400 kV grid connection cable corridor. As outline in the outline operational drainage management plan (document reference J10), the onshore export cables and 400 kV grid connection cables will be installed below ground, and the existing land cover will be reinstated at surface level, in line with best practice, during the construction phase. On this basis it is not considered necessary to provide permanent surface water management measures for the onshore cable route.

1.7.4.32 The following mitigation measures (commitments) presented below within **Table 1.38** below are proposed to manage flood risk and vulnerability to site workers during the construction, operational and maintenance and decommissioning phases. Commitments are also presented within **Section 1.8, Table 1.44.** Commitments are to be secured through requirements of the DCO.

Table 1.38: Summary of CoT for fluvial and tidal flood risk for landfall, the onshore export corridor and 400 kV grid connection cable corridor

CoT	Summary	Reason	How CoT is to be secured
CoT02	The following features will be crossed by trenchless techniques, as set out in the Onshore Crossing Schedule submitted as part of the application for development consent: • - A, B and Classified unnumbered roads (known as C roads) (including the Preston Western Distributor Road, A582 South Ribble Western Distributor Upgrade and M55 Heyhouses Link Road; excluding Leech Lane); • - All Environment Agency Main Rivers, including: Moss Sluice, east of Midgeland Road along Pegs Lane; Savick Brook, south of A583; Wrea Brook southeast of Cartmell Lane; Dow Brook east of Lower Lane between the A584 and the A583; Middle Pool north of Lund Way; and • - All Network Rail crossings, including along the line which runs between Blackpool North and Preston, south of Cartmell Lane; and at the Network Rail crossing along the line which runs to Blackpool North, south east of Squires Gate, parallel to the A584.	To reduce flood risk from fluvial and tidal sources	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)
CoT06	The construction area associated with onshore export cable corridor will be 100 m working width and the 400 kV grid connection cable corridor will be working width 76 m to minimise the construction footprint, except at complex trenchless technique crossings, including, but not limited to: • Network Railway Crossings; • A, B and Classified unnumbered roads (known as C roads), including B5261 (Queensway); • the approach to landfall;	To reduce flood risk from fluvial and tidal sources	DCO Schedules 2A & 2B, Requirement 5 (Detailed design parameters onshore); Works Plans - Onshore and Intertidal

CoT	Summary	Reason	How CoT is to be secured
	• river and water course crossings; and • sensitive utility assets (e.g. high pressure gas pipelines). The widths of both the onshore export cable corridor and 400 kV grid connection cable corridor also increases up to 270 m in width, on the access and egress to the onshore substations, to facilitate consideration of trenchless crossings as well as being subject to detailed design. These increased widths and crossing methodologies are set out in the Onshore Crossing Schedule and Works Plans-Onshore and Intertidal.		
CoT08	Post-construction, the working area will be reinstated to pre-existing condition as far as reasonably practical in line with the DEFRA Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (PB13298), Institute of Quarrying (IQ) Good Practice Guide for Handling Soils in Mineral Workings (IQ, 2021) and British Society of Soil Science (BSSS) Working with Soil Guidance Note on Benefitting from Soil Management in Development and Construction (BSSS, 2022).	To ensure working areas are reinstated to pre-existing conditions after construction has been completed	DCO Schedules 2A & 2B, Requirement 18 (Restoration of land temporarily used for construction); DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT09	The Outline Code of Construction Practice (CoCP) has been submitted as part of the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP includes information about drainage during construction.	To implement construction phase drainage to control runoff during this phase of the Transmission Assets.	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)
CoT10	Where trenchless techniques are proposed for Environment Agency Main Rivers, the following distances will be used: • 8 m from the bank of the Environment Agency Main River or landward toe of any associated flood defence structure; • 16 m from tidal Environment Agency Main Rivers or the landward toe of any flood defences, where the Main River is a sea defence structure; and	To reduce flood risk from fluvial and tidal sources	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)

CoT	Summary	Reason	How CoT is to be secured
	• a minimum of 2 m vertical clearance will be maintained below the hard bed of all Environment Agency Main Rivers, including the landward toe of any associated flood defences. Final vertical clearance depths beneath Environment Agency Main Rivers will be identified during detailed design stage, in consultation with the Environment Agency, to ensure the export cables remain buried for the operational lifetime of the project.		
CoT12	The onshore export cables and the 400 kV grid connection cables will be completely buried underground for the entire length. No overhead pylons will be installed as part of the Transmission Assets.	To reduce flood risk from fluvial and tidal sources	DCO Schedule 1, Part 1, Authorised Development
CoT14	Joint bays will be completely buried, with the land above reinstated. An inspection cover will be provided on the surface for link boxes for access during operation and maintenance phase.	To ensure no above ground development (and potential floodplain displacement) will arise from the installation of joint bays and link boxes	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT27	All temporary compounds will be removed and sites will be reinstated when construction has been completed.	To ensure working areas are reinstated to pre-existing conditions after construction has been completed	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice); and DCO Schedules 2A and 2B, Requirement 16 (Restoration of land used temporarily for construction)
CoT35	An Outline Code of Construction Practice (CoCP) has been prepared and submitted with the application for development consent. Detailed CoCP(s) will be developed in accordance with the outline CoCP. The Outline CoCP will include measures to maintain and address: • […] flood protection and control measures; • -water environment and drainage; and • pollution prevention […]	To implement control measures in regards to fluvial and tidal flooding, including: • Measures to prevent a reduction in the capacity of the fluvial floodplain which can increase flood risk downstream; • Measures regarding dewatering; • Measures regarding restricting the placement of stockpiling, storage of fuels and chemicals and refuelling to Flood Zone 1 (where practical) and at least 8 m from ordinary watercourses and Main Rivers and 16m	DCO Schedules 2A and 2B, Requirement 8 (Code of Construction Practice)

CoT	Summary	Reason	How CoT is to be secured
		from tidal Main Rivers to reduce vulnerability to flood risk;	
CoT36	Onshore Decommissioning Plan(s) will be developed prior to decommissioning. The Onshore Decommissioning Plan(s) will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure (if and where relevant and practicable), and details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The Onshore Decommissioning Plan(s) will be in line with the latest relevant available guidance.	To manage flood risk during decommissioning	DCO Schedules 2A & 2B, Requirement 22 (Onshore decommissioning)
CoT39	Fences, walls, ditches and drainage outfalls will be retained at the landfall and along the onshore export cable corridor and 400 kV grid connection cable corridor, where possible. Where it is not reasonably practicable to retain them, any damage will be repaired and reinstated as soon as reasonably practical. The Environment Agency must be notified if damage occurs to any Environment Agency main river or related flood infrastructure.	To ensure flood risk is not increased as a result of construction activities	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT44	The Project Description (Volume 1, Chapter 3 of the Environmental Statement) sets out that the installation of the offshore export cables under Lytham St Annes SSSI and the St Annes Old Links Golf Course will be undertaken by direct pipe trenchless installation technique. The exit pits associated with the direct pipe installation will be at least 100 m seaward of the western boundary of the SSSI.	To ensure flood risk is not increased at the landfall as a result of construction activities	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT90	The Project Description (Volume 1, Chapter 3 of the Environmental Statement) sets out that the installation of the 400 kV Grid Connection Cable Corridor beneath the River Ribble will be undertaken by direct pipe or micro tunnel trenchless installation techniques.	To ensure flood risk is not increased in proximity to the River Ribble as a result of construction activities	DCO Schedules 2A & 2B, Requirement 5(3)(Detailed design parameters onshore); and Requirement 8 (Code of Construction Practice)"
CoT95	The Outline Code of Construction Practice (CoCP) has been submitted as part of the application for	To reduce vulnerability to flood risk	DCO Schedules 2A & 2B, Requirement 8

CoT	Summary	Reason	How CoT is to be secured
	development consent. Detailed CoCP(s) will be developed in accordance with the Outline CoCP. The Outline CoCP includes that during the construction phase the Principal Contractor(s) will sign up to the Flood Warning Service and will be alerted by a phone call or text when a Flood Warning becomes active. The flood warning will be applied to the entire Onshore Infrastructure Area located within Flood Zones 2 and 3 to enable site personnel to be evacuated from the site in a timely manner prior to a flood event occurring, if appropriate.		(Code of Construction Practice)
CoT97	The Outline Code of Construction Practice (CoCP) has been submitted as part of the application for development consent. Detailed CoCP(s) will be developed in accordance with the Outline CoCP. The Detailed CoCPs detail that where necessary at the compounds located within the landfall area, construction measures will be adopted to maintain the existing level of flood protection during construction. These measures will be discussed with the Environment Agency. If applicable, these measures could include scheduling work windows against tide times and briefing site personnel regarding weather conditions, tide times and heights. If a Flood Warning/Flood Alert is issued for the 'Lancashire coastline at Lytham St. Annes, along the coast from Squires Gate to Warton Bank' Flood Warning Area (reference 012FWCTL13A) and the 'Coast at Lytham St Annes' Flood Alert area (reference 012WACLS) works within the relevant areas within the landfall area would also be stopped whilst the Flood Warning/Flood Alert is active.	To reduced flood risk vulnerability to site users during the construction phase.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)

Strategic Flood Risk Assessment Data

Strategic Flood Risk Assessment (Fylde Borough Council, 2011)

1.7.4.33 Relevant information to fluvial and tidal flood risk from the FC SFRA has been extracted and included as follows.

- Fylde Borough Council do not hold any records of historical flooding.

Central Lancashire Strategic Flood Risk Assessment (2007)

1.7.4.34 Relevant information to fluvial and tidal flood risk from the CL SFRA has been extracted and included as follows.

- Raised river defences have been built across parts of the catchment to prevent flooding.
- Watercourses within the Ribble and Douglas catchments are tidally influenced.

Blackpool Council Strategic Flood Risk Assessment (2014)

1.7.4.35 Relevant information to fluvial and tidal flood risk from the Blackpool Council SFRA has been extracted and included as follows.

- There are no areas of the Transmission Assets that are located within Blackpool in Zone 3b (functional floodplain).
- Historical overtopping of the existing sea defences has occurred during storm events; however, the new sea defences have on the whole, addressed this risk.

Summary

1.7.4.36 At landfall, the TJB entry pits are not considered to be at risk of tidal or fluvial flooding and will only be accessed by site users during the operational and maintenance phase if a repair is required. The offshore export cables landing location is within the intertidal area and as such is considered to be at risk of tidal flooding throughout the construction period.

1.7.4.37 Partial extents of the onshore export cable corridor and 400 kV grid connection cable corridor are at risk of flooding during construction.

1.7.4.38 The installation of below ground cables will be undertaken during the construction phase. During the operation and maintenance phase there will be no permanent above ground structures associated with landfall, the onshore export cable corridor and 400 kV grid connection cable corridor other than joint bay and link box covers at ground level. As such, development will not increase flood risk to the surrounding area and has negligible risk of flooding to and from the development. Furthermore, only planned maintenance activities will take place within these aspects of the Transmission Assets during the operational and maintenance phase, and activities associated with decommissioning will operate within the parameters of those established for construction.

1.7.4.39 Commitments are to be secured through requirements of the DCO. With the implementation of mitigation measures (commitments) presented within **Table 1.38** during the construction, operational and maintenance and decommissioning phases of the landfall, onshore export cable corridor and 400 kV grid connection cable corridor, flood risk from fluvial and tidal source is assessed to be low.

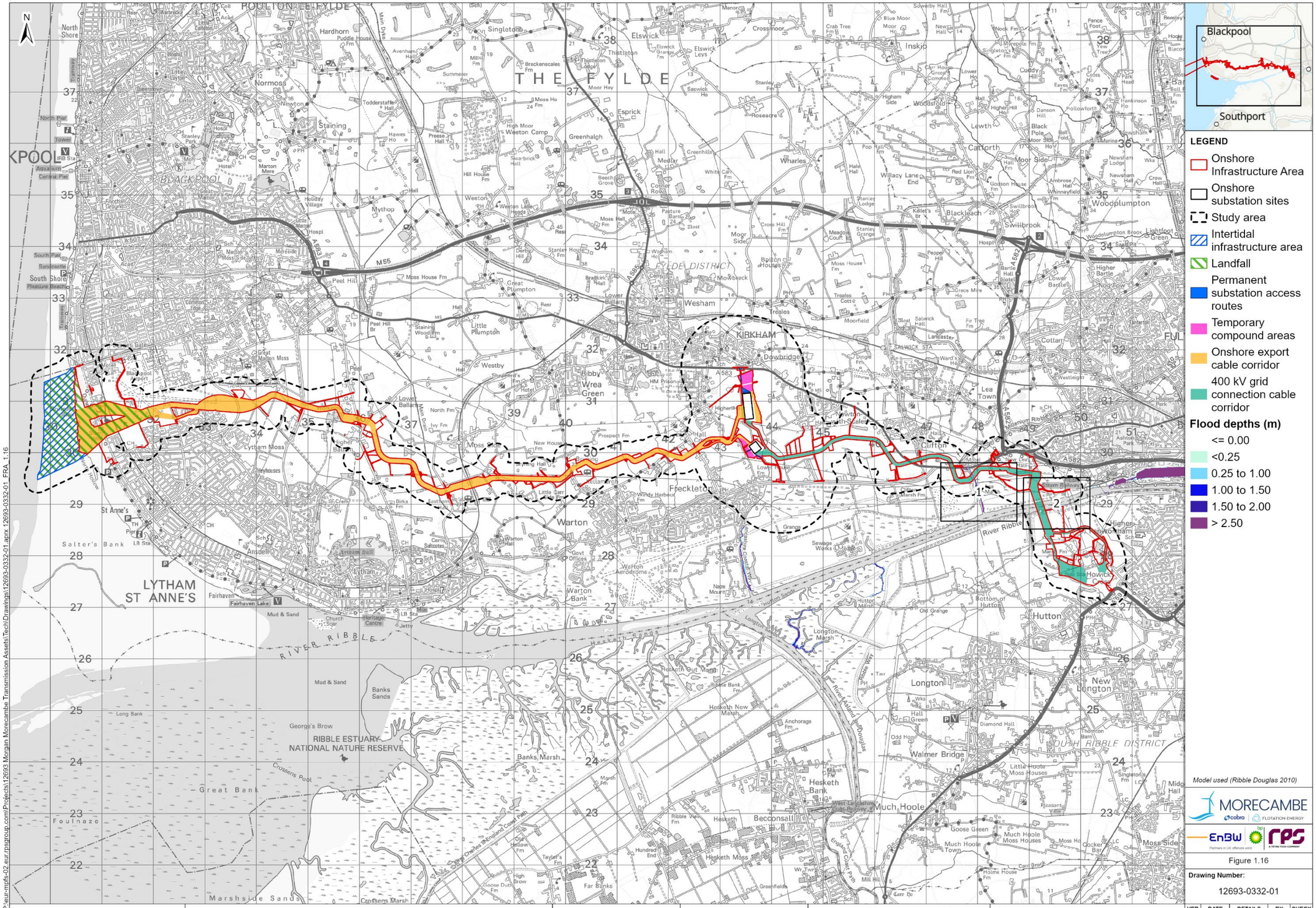
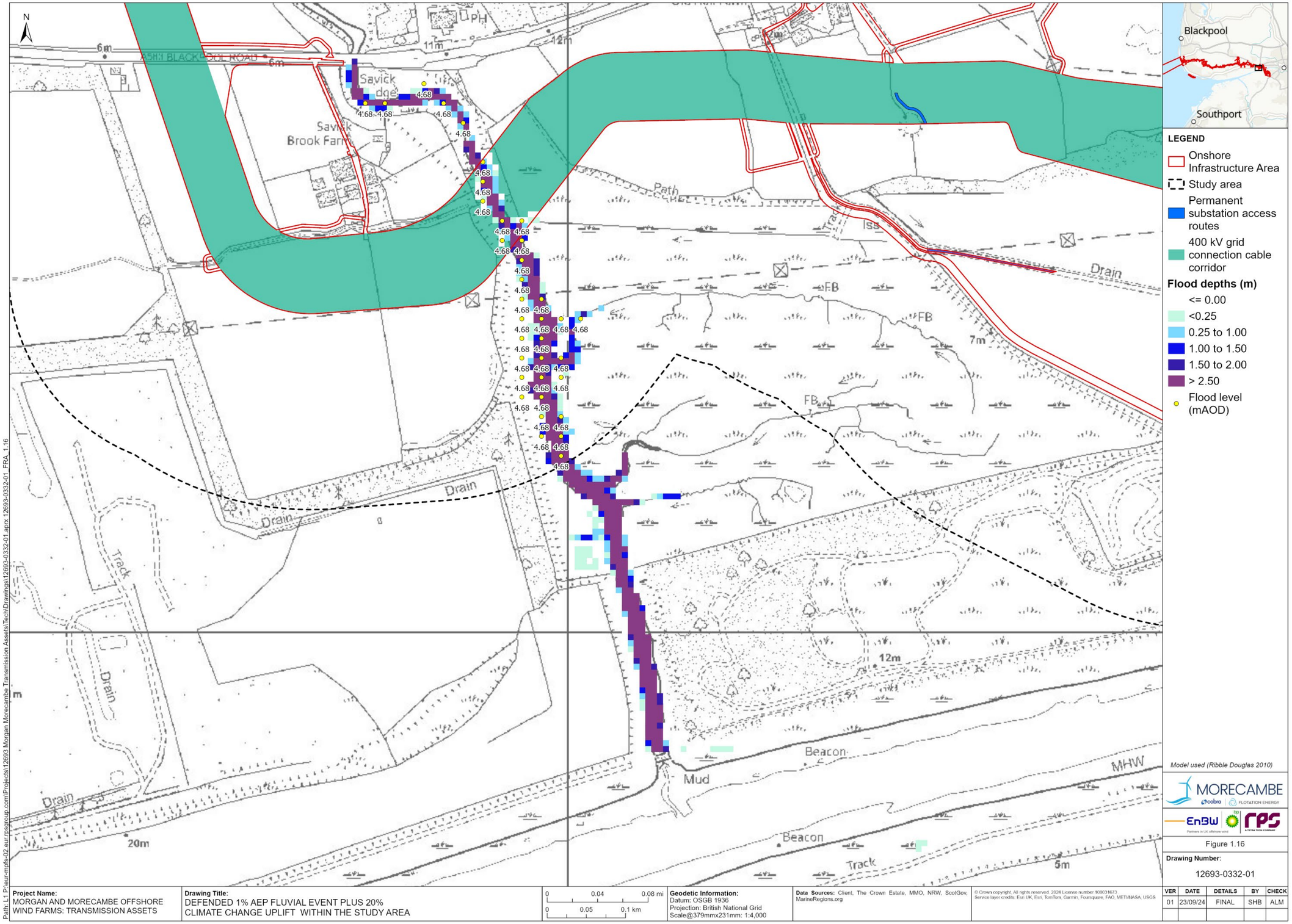


Figure 1.16a: Defended 1% AEP fluvial event plus 20% climate change uplift



Path: L:\P:\eur-nsfs-02.eur.rpsgroup.com\Projects\12693 Morgan Morecambe Transmission Assets\Tech\Drawings\12693-0332-01 aprx 12693-0332-01_FRA_1.16

Project Name: MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS	**Drawing Title:** DEFENDED 1% AEP FLUVIAL EVENT PLUS 20% CLIMATE CHANGE UPLIFT WITHIN THE STUDY AREA	0 0.04 0.08 mi / 0 0.05 0.1 km	**Geodetic Information:** Datum: OSGB 1936 Projection: British National Grid Scale@379mmx231mm: 1:4,000	**Data Sources:** Client, The Crown Estate, MMO, NRW, ScotGov, MarineRegions.org	© Crown copyright: All rights reserved. 2024 License number 100031673. Service layer credits: Esri UK, Esri, TomTom, Garmin, Foursquare, FAO, METI/NASA, USGS.	Figure 1.16 / **Drawing Number:** 12693-0332-01	

VER	DATE	DETAILS	BY	CHECK
01	23/09/24	FINAL	SHB	ALM

Figure 1.16a: Defended 1% AEP fluvial event plus 20% climate change uplift

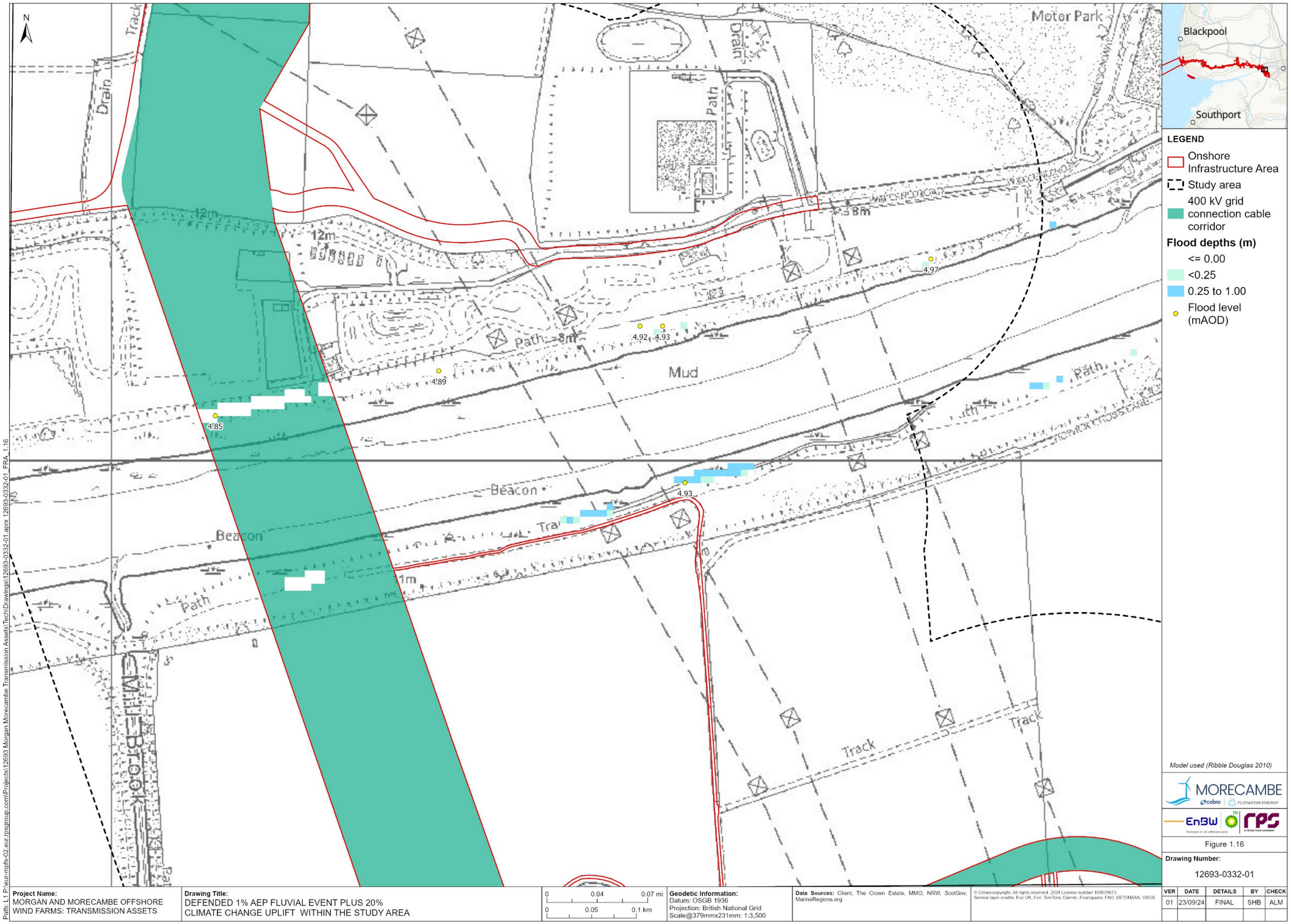


Figure 1.16a: Defended 1% AEP fluvial event plus 20% climate change uplift

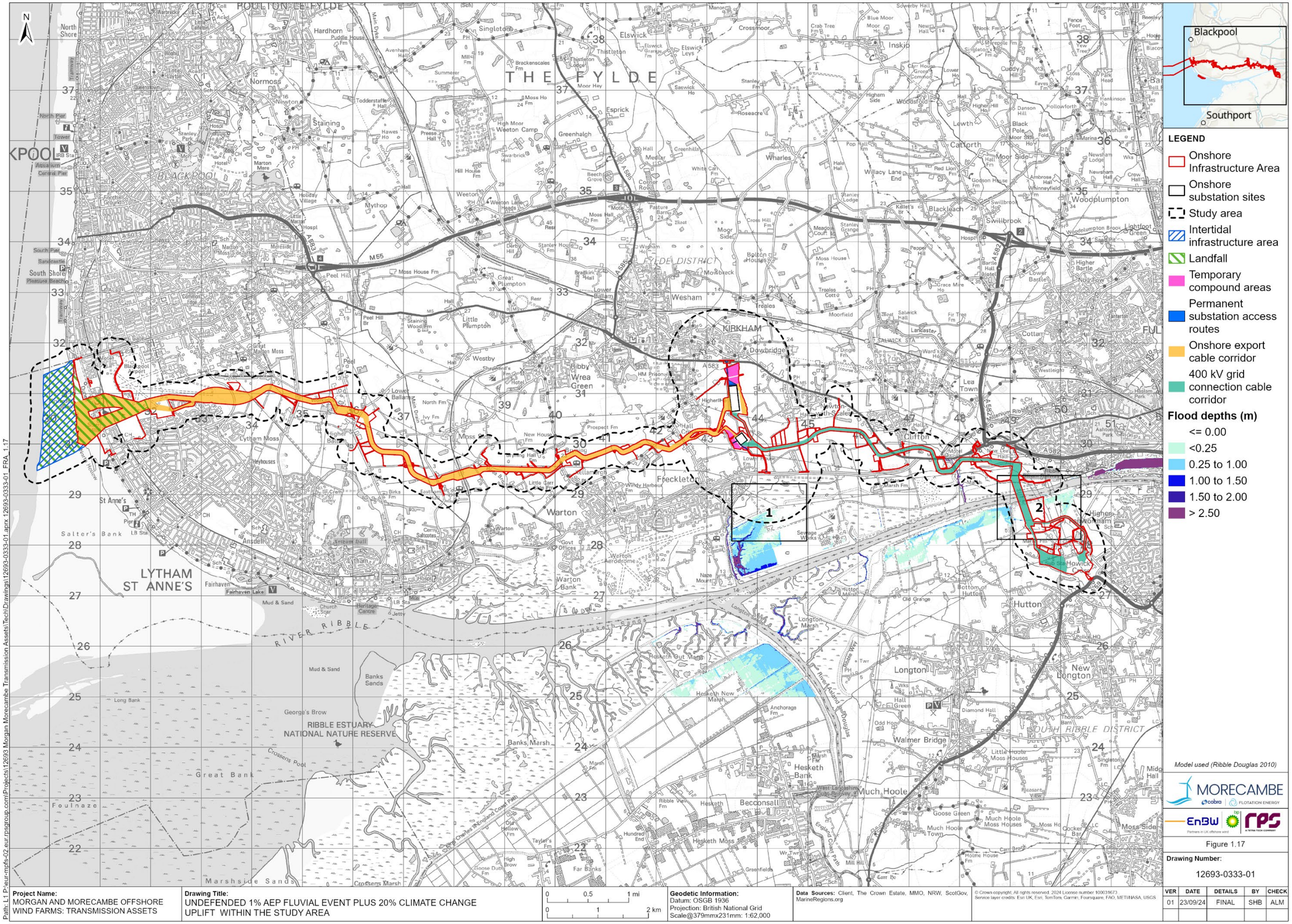


Figure 1.17a: Undefended 1% AEP fluvial event plus 20% climate change uplift

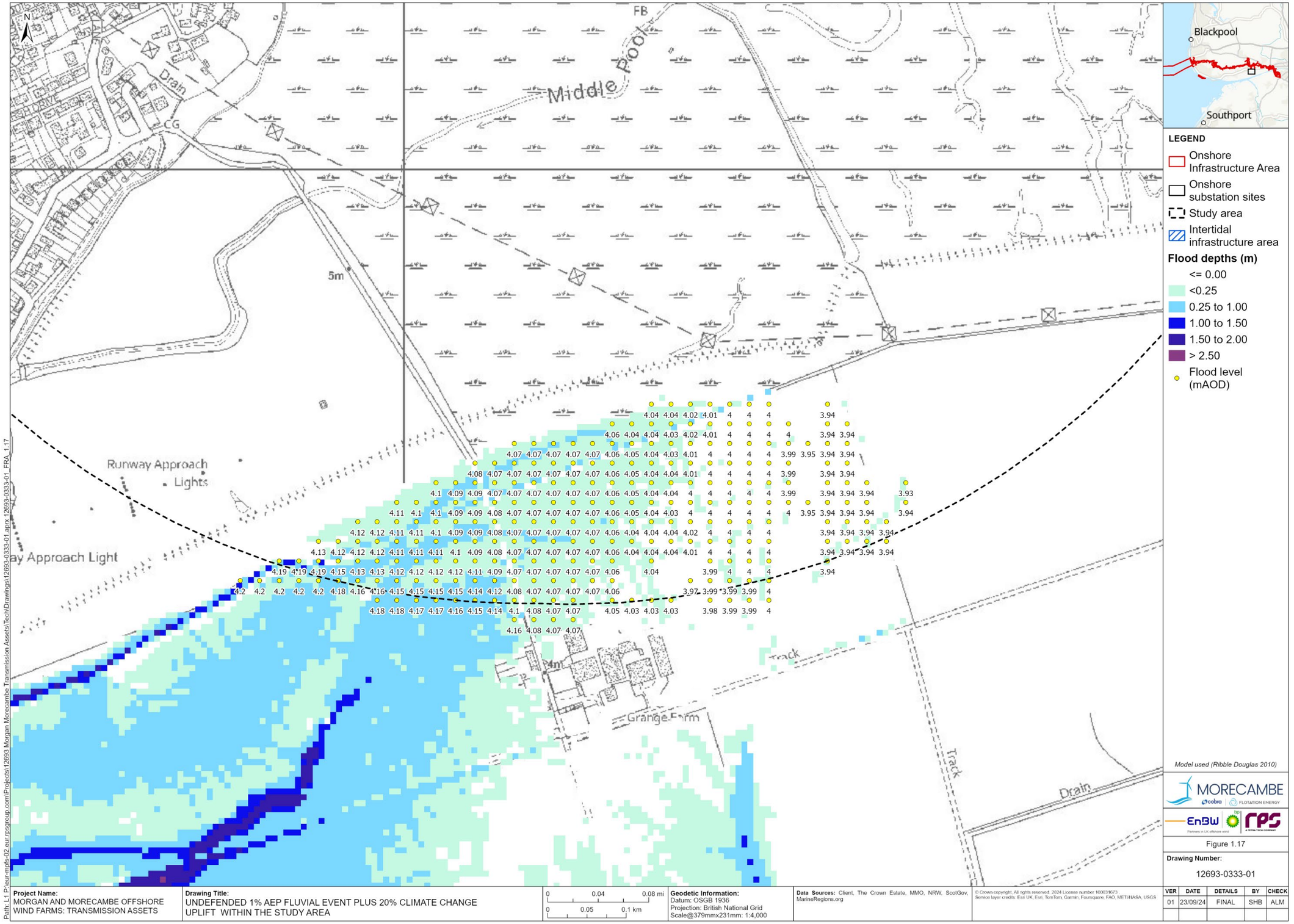


Figure 1.17a: Undefended 1% AEP fluvial event plus 20% climate change uplift

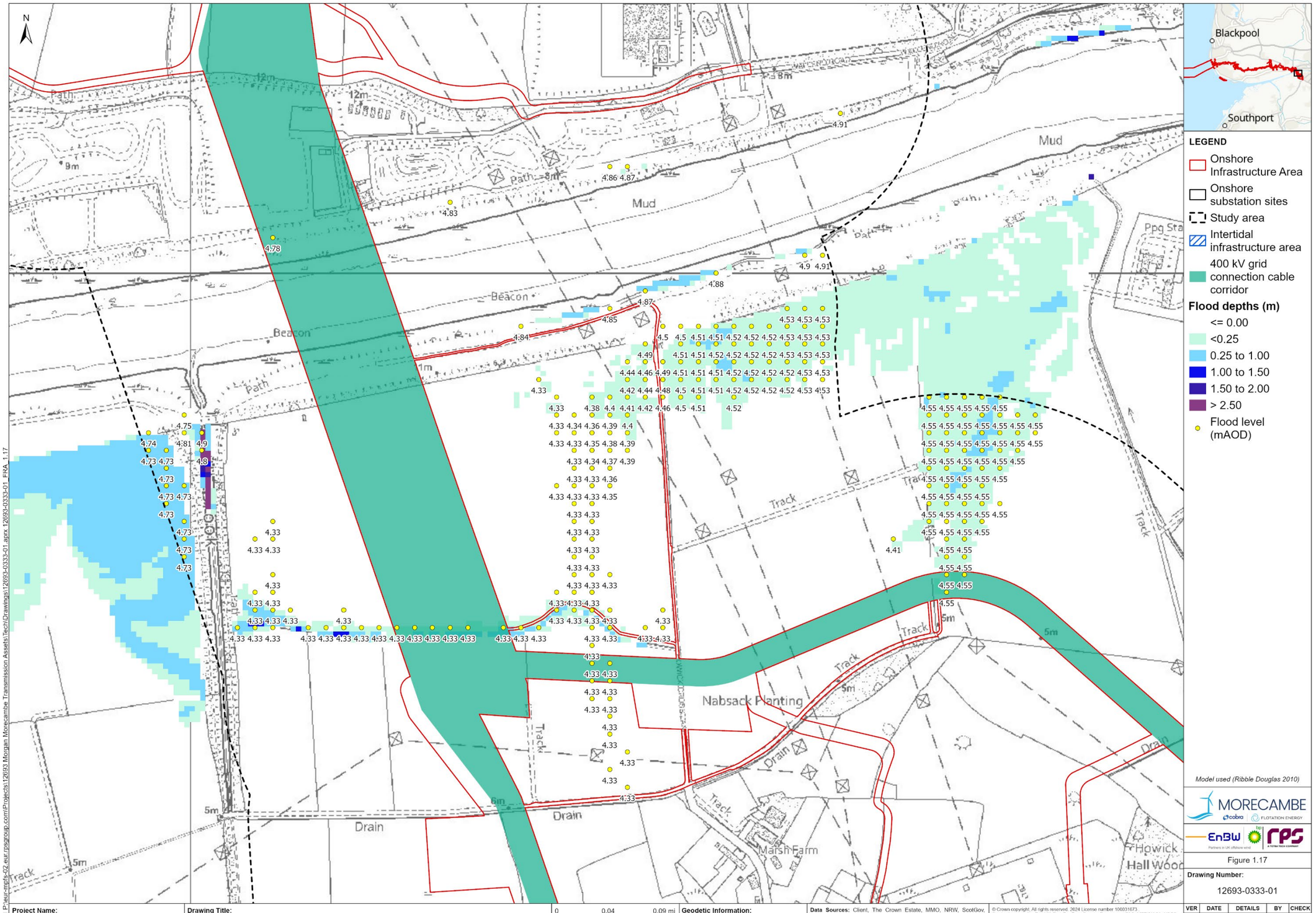


Figure 1.17a: Undefended 1% AEP fluvial event plus 20% climate change uplift