

# MONA OFFSHORE WIND PROJECT

## Outline Landfall Construction Method Statement

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Image of an offshore wind farm

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## Glossary

Term	Meaning
Intertidal access area	The area from Mean High Water Springs to Mean Low Water Springs which will be used for access to the beach and construction-related activities.
Landfall	Where the offshore export cables make contact with land and the transitional area where the offshore cabling connects to the onshore cabling
Sublittoral	Area extending seaward of low tide to the edge of the continental shelf

## Acronyms

Acronym	Description
CoCP	Code of Construction Practice
HDD	Horizontal Directional Drilling
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
NRW	Natural Resources Wales
PRoW	Public Rights of Way
SSSI	Site of Special Scientific Interest
TJB	Transition Joint Bays

## Units

Unit	Description
%	Percentage
M	Metres
m <sup>2</sup>	Square metres

# 1 OUTLINE LANDFALL CONSTRUCTION METHOD STATEMENT

## 1.1 Introduction

### 1.1.1 Background

1.1.1.1 This Outline Landfall Construction Method Statement supports the application for a Development Consent Order (DCO) for the Mona Offshore Wind Project. The Outline Method Statement is provided as an annex to the Outline Code of Construction Practice (CoCP) (Document reference J26), which seeks to manage the environmental impacts of the construction process.

1.1.1.2 Works to be undertaken for the Mona Offshore Wind Project include (amongst other things) the construction of the landfall, where up to four export cables are brought ashore by trenchless technique.

1.1.1.3 The Outline Landfall Construction Method Statement focuses on potential impacts that occur ~~seaward~~landward of Mean Low Water Springs (MLWS) to the Transition Joint Bay (TJB). The elements of the Mona Offshore Wind Project that occur in this location are:

- Mona Landfall (between MLWS and Mean High Water Springs (MHWS))
- Onshore Cable Corridor (from MHWS to the TJB).

1.1.1.4 The Mona Landfall is located at Llanddulas, North Wales. The site selection process identified the environmental, engineering and land constraints associated with this location and reviewed the feasibility and potential impacts against other short-listed options. The process is set out in Volume 1, Chapter 4: Site selection and consideration of alternatives of the Environmental Statement.

1.1.1.5 The Mona Landfall and Onshore Cable Corridor (between MLWS and the TJB) will be constructed within the local authority area of Conwy County Borough Council (CCBC).

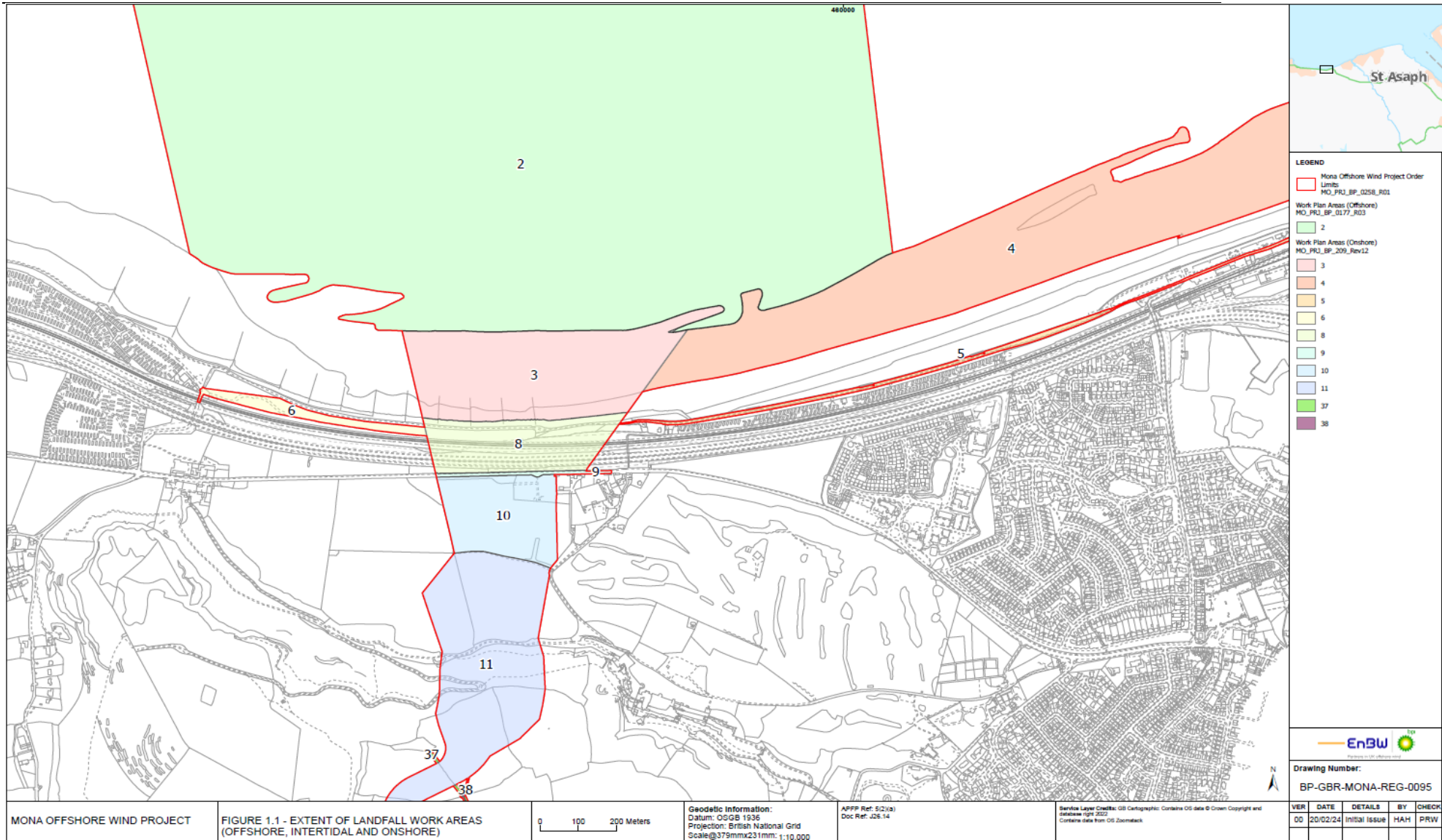
### 1.1.2 Purpose of the Outline Landfall Construction Method Statement

1.1.2.1 The draft Development Consent Order (DCO) (Document Reference: C1) includes a ~~Requirement to prepare a~~requirement for the preparation of a final CoCP. The final CoCP will be supported by a series of management plans including an Outline Landfall Construction Method Statement; (Document Reference J26.14), which must be submitted to, and approved by, the relevant planning authority prior to the commencement of ~~Works No. 2, 3, 8, 9 and 10 (see ). The extent of Works No. 2 is shown in the Works Plans – Offshore (Document Reference: B4) and the extent of Works Nos. 3, 8, 9 and 10 are shown in the Onshore Works Plan (Document Reference: B3).~~onshore works.

1.1.2.2 This Outline Landfall Method Statement sets out the key elements of the construction methodology of the Mona Landfall such as construction information, environmental considerations and survey planning associated with the landfall construction. It does not include details on the construction of the joint bays; onshore cables; temporary construction compounds; haul road; or access, which are located within Work No. 10. This is an outline document that is based on the design assessed in the Environmental Statement.



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**Figure 1.1** Extent of Landfall work areas (offshore, intertidal and onshore)

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- 1.1.2.3 The Outline Landfall Construction Method Statement should be read in conjunction with the Outline CoCP (Document reference J26) and the Outline Construction Method Statement (Document reference J26.15) which considers the rest of the Onshore Cable Corridor, Onshore Substation and the temporary construction compounds and accesses within the Mona Onshore Development Area.

## 1.2 Scope of the Outline Landfall Construction Method Statement

- 1.2.1.1 The scope of this Outline Landfall Construction Method Statement applies to onshore site preparation works and construction activities of the Mona Offshore Wind Project located landward of MLWS to the Transition Joint Bay. The Outline Landfall Construction Method Statement does not consider construction impacts seaward of MLWS.
- 1.2.1.2 Onshore site preparation works will be undertaken prior to the commencement of construction. These works will be undertaken in line with this Outline Landfall Construction Method Statement as certified through the DCO.
- 1.2.1.3 The final Landfall Construction Method Statement will be in accordance with the principles established in the Outline Landfall Construction Method Statement and will be agreed with the relevant authority prior to commencing construction of the relevant stage of the onshore works (landward of MLWS). For this Outline Landfall Construction Method Statement, the term 'construction' includes all related engineering, construction and restoration activities as authorised by the DCO within the Order Limits.

## 1.3 Roles and Responsibilities

### 1.3.1 Overview

- 1.3.1.1 Although the construction team has not been appointed at the time of writing this plan, the key roles and associated responsibilities with regard to this Outline Landfall Construction Method Statement are set out below. The Construction (Design and Management) Regulations 2015 also identify the legal duties, responsibilities and obligations of all the major roles within the construction team.
- 1.3.1.2 The responsibilities of each role will be refined in the final Landfall Construction Method Statement.

### 1.3.2 Applicant

- 1.3.2.1 The Applicant will be responsible for the following:
- Ensuring that the Landfall Construction Method Statement is implemented effectively, with a focus on providing communications in the Welsh language where possible
  - Giving necessary direction to contractors (for example, setting contractual obligations)
  - Reviewing, revising and refining the Landfall Construction Method Statement

### 1.3.3 Ecological Clerk of Works

1.3.3.1 The Ecological Clerk of Works will be responsible for supervising any planned construction works in the intertidal zone. Further detail on the responsibilities of this role is set out in the Outline Landscape and Ecological Management Plan (Document Reference J22).

### 1.21.4 Rationale for Use of Trenchless Techniques at Landfall

~~1.2.1.1~~ 1.4.1.1 The Mona Offshore Wind Project has committed to the use of a trenchless technique at the landfall [through this document](#) to avoid potential impacts on the North Wales coastline as part of the embedded mitigation. ~~Refer to the Onshore Crossing Schedule (Document Reference: F5.4.3) for these commitments.~~ This is anticipated to:

- Avoid direct physical disruption to the nearshore *Saballeria alveolata* reef and *Mytilus edulis* beds (blue mussels);
- Avoid direct physical disruption to the nearshore piddock habitats;
- Avoid disturbance to the alongshore sediment transport processes that feed the Traeth Pensarn Site of Special Scientific Interest (SSSI) designated vegetated shingle bank;
- Avoid the need for cable protection measures in the intertidal and shallowest nearshore zones;
- Minimise the need for cable protection measures elsewhere across the sea bed;
- Avoid interaction with Pensarn Beach; and
- Avoid interaction with onshore receptors including the Natural Resources Wales (NRW) coastal defences, the former Llanddulas Beach Landfill, the Wales Coast Path, the North Wales railway line, the A55 North Wales Expressway, the A547 and the Gwrych Castle Grade II listed historic boundary wall.

~~1.2.1.2~~ 1.4.1.2 This commitment means that the trenchless technique will have entry / exit pits seaward of MLWS and landward of MHWS. The export cables will be buried underground between these two points. Any construction activity between these two locations is associated only with access purposes for construction (e.g. in the event of a bentonite break-out for access, where required- see Section 1.10.4).

### 1.31.5 Consultation

~~1.3.1.1~~ The Applicant notes the interests of Natural Resources Wales, ~~Marine Management Organisation (MMO)~~ and Conwy County Borough Council (CCBC) ~~regarding the construction of the landfall and will consult with these stakeholders in~~. The Draft DCO (Document Reference C1) includes a requirement for the preparation of ~~the final CoCP including a final Landfall Construction Method Statement prior to submission of the final Landfall Construction Method Statement to~~ (Document Reference J26.14), ~~which must be submitted to and approved by~~ the relevant planning authority ~~for approval in accordance with the~~ prior to the commencement of onshore works. Requirement ~~within the draft DCO (Document Reference: C1).~~



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~~1.3.1.2~~ 1.5.1.1 Furthermore, in accordance with the the draft DCO (Document Reference: C1), the MMO and 9 also provides for Natural Resources Resoruces Wales will also be consulted by Conwy County Borough Council (CCBC) in the approval of the final Landfall Construction Method Statement as part of the discharge of the Requirement.

~~1.3.1.3~~ The Applicant will also notify CCBC after all of the works described within Work Nos. 2, 3, 8, 9 and 10 have been completed.

## 1.4 1.6 Surveys

### 1.4.1 1.6.1 Surveys undertaken to inform trenchless technique commitments

~~1.4.1.1~~ 1.6.1.1 A series of site investigations on Pensarn beach between MHWS and MLWS were undertaken in June 2022, October 2022 and June 2023 to collect shallow geotechnical data at locations within the intertidal area. The purpose of the survey was to provide sufficient data to inform the assessment of trenchless techniques and potential burial depth of the cable from the end of the trenchless technique.

~~1.4.1.2~~ 1.6.1.2 A Phase I intertidal walkover survey with macrofauna sampling was undertaken in May 2022. The survey was undertaken between MHWS and MLWS to characterise the benthic environment at the landfall. The results of the survey are reported in Volume 6, Annex 2.1: Benthic subtidal and intertidal ecology technical report of the Environmental Statement.

~~1.4.1.3~~ 1.6.1.3 Habitats above MHWS were surveyed as part of the Phase I habitat survey across the Mona Onshore Development Area from April 2022 to January 2023. The results of the survey are reported in Volume 7, Annex 3.2: Extended phase 1 habitat survey technical report of the Environmental Statement.

### 1.4.2 1.6.2 Future surveys

~~1.4.2.1~~ 1.6.2.1 Key to ensuring that the design of the trenchless technique is appropriate for the location and can be constructed safely, is understanding ground conditions at the landfall. Detailed onshore and offshore geotechnical investigations will be conducted at the landfall in order to characterise ground conditions, establish the chemical and mechanical properties of the ground and identify the hydrology and hydrogeology of the site and inform the detail design of the trenchless technique solution.

~~1.4.2.2~~ 1.6.2.2 Specifically, onshore investigations at the landfall may include:

- Boreholes: Drilled to underlying rockhead and providing a profile of soil characteristics through the full depth. There will be a minimum of one boreholes onshore. Boreholes will be securely capped on completion.
- Hydrological monitoring: At least one of the above-mentioned boreholes will be fitted with hydrological monitoring equipment (i.e. stand pipe and piezometer) to provide ongoing data on groundwater hydrology.
- Geotechnical, chemical and environmental laboratory testing: Testing undertaken on samples retrieved during the investigation to provide detailed ground soil profile characteristics and parameter to aid design..

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~~1.4.2.3~~[1.6.2.3](#) Onshore geotechnical investigations will be conducted with a small workforce operating from mobile temporary welfare units. Equipment and machinery will be modest in size and likely to be towed by 4x4 vehicles and mid-sized excavators for completion of trial pits. No equipment or machinery associated with the landfall will be operated or stored within the Traeth Pensarn SSSI.

~~1.4.2.4~~[1.6.2.4](#) Investigations will also be conducted offshore from a vessel, which will provide data to support the trenchless technique design. This may include:

- Boreholes: Drilled in the nearshore area along the potential trenchless technique drill line routes, drilled to rockhead and providing a profile of soil characteristics through the full depth, and associated laboratory testing
- Bathymetric survey: Providing detailed information for water depths and topography of the seabed
- Geophysical survey: Mapping geological features of the seabed, including a focus on confirming the extent of any geological outcrops within the identified offshore cable corridor.

## ~~1.5~~[1.7](#) Baseline environment

~~1.5.1.1~~[1.7.1.1](#) The trenchless technique drill splay for the Mona Landfall covers a length of Pensarn Beach approximately 500m in width. The upper shore of the eastern extent is characterised by a coastal defence wall leading to a wide band of shingle dominated by cobbles and pebbles. A large expanse of gently sloping fine to medium grained sand is present across most of the mid and lower shore. The western extent does not include any NRW coastal defences, however groynes are present along the coastline in this area, which mitigate the impacts of coastal erosion.

~~1.5.1.2~~[1.7.1.2](#) An extensive outcrop of clay is present at the lower shore: this feature is characterised by the biotope piddocks. This intertidal habitat is referred to as 'sublittoral very soft chalk or clay with piddocks': it is a nationally protected habitat under the Environment (Wales) Act 2016 [and its location in relation to the intertidal zone is shown on Figure 1.2, as TN2 CR.MCR.SfR.Pid](#). Further information about this habitat is provided in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement: [\(Document Reference F2.2\). The Mona intertidal works will be located outside the piddock habitat.](#)

~~1.5.1.3~~[1.7.1.3](#) A section of the intertidal zone along the proposed landfall area is designated as a SSSI (Traeth Pensarn) of botanical interest for its vegetated shingle beach. The shingle ridges are mostly composed of locally derived Carboniferous Limestone together with a mixture of calcareous sand within the shingle and non-limestone material. Seaward of the shingle bank the intertidal area is predominantly composed of medium to coarse sand with the presence of parallel sand banks in the nearshore. The shingle beach is recharged by longshore sediment transport processes.

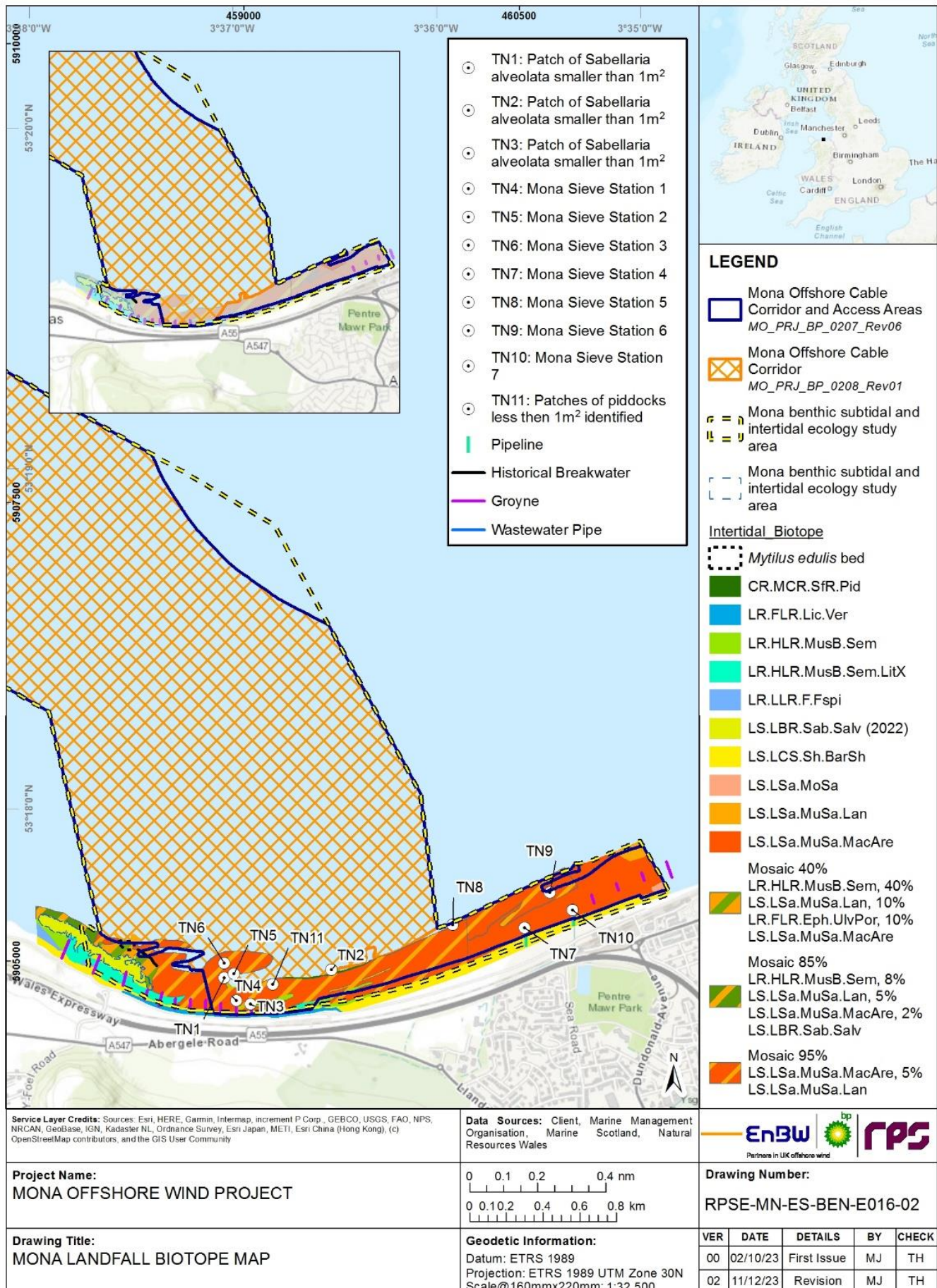
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~~1.5.1.4~~1.7.1.4 The upper shore of the western extent is reinforced with cut-boulders beneath which is a band of shingle dominated by cobbles. The boulders were installed in 2016 to provide temporary 'rock armour' protection to the former Llanddulas Beach Landfill. The Wales Coast Path extends along the coast for almost 17km between Colwyn Bay and Rhyl and is used by walkers, joggers, dog walkers and people visiting the area. The Coast Path also doubles up as National Cycle Route 5 in this location. Beyond the Wales Coast Path is the former Llanddulas Beach Landfill, Castle Cove holiday park and Beach caravan park. Further inland is the railway line, A55 North Wales Expressway and the A547. The proposed Transition Joint Bays (TJBs) are located within farmland to the south of the A547.



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**Figure 1.2: Mona Landfall Biotope Map**

## 1.6.1.8 Overview of the landfall construction

~~1.6.1.1~~ 1.8.1.1 The landfall construction will install cable ducting via trenchless techniques in order to minimise potential impacts at the landfall. This cable ducting via trenchless technique will extend from below MLWS to the TJBs located above MHWS. This approach will avoid open cut trenching in the intertidal area and therefore, avoid damage to the piddock habitat. The suite of survey campaigns referred to in Section 1.6.1 and initial engineering design have confirmed the feasibility of this approach.

~~1.6.1.2~~ 1.8.1.2 The landfall construction will comprise onshore and offshore elements. The following onshore elements will be identified as part of the detailed design and will be set out in the final Landfall Construction Method Statement :

- Construction of the landfall compound and associated access
- Construction of the duct welding and storage compound
- Construction of the TJBs
- Trenchless technique and support equipment
- Export cable pull in
- Jointing of the onshore to the offshore export cable
- HV testing of the onshore and offshore export cables
- Backfilling of TJBs, removal of compounds and reinstatement works.

~~1.6.1.3~~ 1.8.1.3 The following elements will also be identified as part of the detailed design and will be set out in the final Landfall Construction Method Statement:

- Entry pit locations (above MHWS)
- Exit pit locations (below MLWS)
- Vertical and horizontal alignment of the duct profile along the length of the duct profile.

## 1.7.1.9 Site Set Up

### 1.7.1.1.9.1 General set up

~~1.7.1.1~~ 1.9.1.1 Temporary compounds/laydown areas are needed to support the landfall construction works. These will comprise:

- Landfall compound;
- Beach vehicle laydown; and
- Railway monitoring area.

~~1.7.1.2~~ 1.9.1.2 Use of the trenchless technique at the landfall will require 24-hour working at certain times due to the nature of the works, typically during drilling.

~~1.7.1.3~~ 1.9.1.3 Continuous periods of construction, such as those associated with ~~trenchless techniques~~ [the landfall works](#), are permitted within the draft DCO (Document Reference: C1) subject to the timing and duration of such construction works being approved in advance by the relevant planning authority.



## 1.7.2.1.9.2 Landfall compound

~~1.7.2.1~~1.9.2.1 The location of the landfall compound is identified within farmland to the south of the A547 within Work Area No. 10 as shown on the ~~Onshore~~ Works Plan ~~Onshore~~ (Document reference B3). The landfall compound will extend up to ~~200-m x 150-m~~ 15,000 m<sup>2</sup> and will accommodate ~~the TJB works as well as any works,~~ equipment and facilities ~~required for the trenchless techniques. The~~; there will also be a Transition Joint Bay (TJB) compound extending to 15,000 m<sup>2</sup> that will accommodate the TJBs and landfall works area. The compounds will be set up prior to the commencement of the landfall construction and will follow the sequence of activities below:

- Fencing of the compound
- Modification of access into the TJB compound (e.g. widening of the gates)
- Stripping and storage of the topsoil following the procedures set out in the Outline Soil Management Strategy (Document reference J26.8) (secured as part of the Outline CoCP (Document Reference: J26)).
- Stone will be imported for surfacing, followed by site setup works and Portacabin deliveries
- Delivery of the drill rig and associated equipment to site and setup ready for drilling operations;
- Installation of welfare facilities for the workforce including connection of services such as water, power, lighting and telecoms services
- Installation of security fencing or other means of enclosure in line with the details in the Outline Construction Fencing Plan (Document Reference J26.5) ~~that will be~~ (secured as part of the Outline CoCP (Document Reference: J26)). Consideration will be given to the use of appropriately coloured hoarding where views of the fencing and landfall construction area are visible from public rights of way or public highway
- Installation of temporary lighting in line with the Outline Artificial Light Emissions Management Plan (Document Reference: J26.10) (secured as part of the Outline CoCP (Document Reference: J26)).
- Installation of site surface water and site drainage system in line with the Outline Construction Surface Water and Drainage Management Plan (Document Reference: J26.6) (secured as part of the Outline CoCP (Document Reference: J26)).

## 1.7.3.1.9.3 Construction noise control

~~1.7.3.1~~1.9.3.1 A Construction Phase and Vibration Plan will be prepared post-consent, in line with the Outline Construction Noise and Vibration Plan (Document Reference: J26.3) (secured as part of the Outline CoCP (Document Reference: ~~D26~~)). The Construction Noise and Vibration Management Plan will set out the specific measures in relation to the control of construction phase noise, which will be reflective of the sensitivities of the properties within the vicinity of the landfall, and must be submitted to and approved by CCBC prior to commencement of the relevant stage of the onshore works.

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~~1.7.3.2~~1.9.3.2 It is noted that physical barriers erected around working areas would provide secondary additional benefits in relation to containing dust.

### ~~1.7.4~~1.9.4 Beach vehicle laydown

~~1.7.4.1~~1.9.4.1 The beach vehicle laydown area will extend up to ~~40 m x 20 m~~ 800 m<sup>2</sup> and will provide ~~overnight~~ parking for construction support vehicles: and emergency vehicles during the construction of the landfall. The laydown area will be located above MHWS within Work Area No. 57 of the ~~Onshore~~ Works Plan - Onshore (Document reference B3). The beach vehicle laydown area will be fenced and security will be established prior to construction of the landfall. The installation of the fencing will be limited to a period of up to four weeks for each of the four proposed cable circuits.

~~1.7.4.2~~1.9.4.2 The vehicles will be used to support the drilling of the boreholes and installation of the ducts, including monitoring for potential bentonite frack out (if the trenchless technique selected requires the use of bentonite). No construction activities will be undertaken on the beach. Up to six vehicles will be parked at the laydown area; the types of vehicles are listed in section 1.10.6.

### ~~1.7.5~~1.9.5 Railway monitoring

~~1.7.5.1~~1.9.5.1 To the west of the trenchless technique drill splay (within Work Area No. 6 of the ~~Onshore~~ Works Plan - Onshore (Document reference B3)) an additional access will be ~~provided~~ used for support vehicles undertaking monitoring of the duct installation in the western part of the landfall including under the former landfill and railway.

## ~~1.8~~1.10 Construction of the Landfall

### ~~1.8.1~~ DCO compliance

~~1.8.1.1~~ The draft DCO (Document Reference: C1) requires the preparation of a Landfall Construction Method Statement, which must be submitted to, and approved by, the relevant planning authority prior to the commencement of Works No. 2, 3, 8, 9 and 10. The extent of Works No. 2 is shown in the Works Plans – Offshore (Document Reference: B4) and Works Nos. 3, 8, 9 and 10 are shown in the Onshore Works Plan (Document Reference B3).

### 1.10.1 Final Landfall Construction Method Statement

~~1.8.1.2~~1.10.1.1 The final Landfall Construction Method Statement will contain full details of the construction methodology selected for the landfall as per section 1.8 and include appropriate remedial measures as per the selected trenchless technique; ~~to be agreed with the relevant planning authority as part of the discharge of requirements post-consent.~~

### ~~1.8.2~~1.10.2 TJBs

~~1.8.2.1~~1.10.2.1 The offshore export cables will be connected to the onshore export cables at the TJBs. The TJBs will be located in farmland to the south of the A547 within Work Area No. 10 as shown on the ~~Onshore~~ Works Plan - Onshore (Document reference B3).

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**1.8.2.2** **1.10.2.2** A TJB is a concrete lined pit within which the jointing of the offshore export cable to the onshore export cable takes place within clean and dry conditions. The TJBs will be up to 4 m deep. One TJB is required per export cable circuit therefore, there will be up to four TJBs. The TJBs will be located adjacent to each other.

**1.8.2.3** **1.10.2.3** Once the joint has been completed, the TJBs will be backfilled with a combination of cement bound sand (CBS) and the previously excavated material and the land will be reinstated. Link pit chambers will be constructed at the TJBs with manhole covers to allow inspections during the operations and maintenance phase.

### **1.8.3** **1.10.3** **Trenchless Techniques**

**1.8.3.1** **1.10.3.1** The landfall works will be constructed using trenchless techniques such as Horizontal Directional Drilling (HDD), Direct Pipe, thrust bore drilling or microtunnelling; the selection of the method will be confirmed during detailed design.

**1.8.3.2** **1.10.3.2** Following the survey activities outlined in section 1.6.2 and engineering review, a preferred trenchless technique method will be selected. Ground investigations will influence such matters as the equipment to be used; entry pit and punch out locations; drill profile; drill depth below ground; pilot hole diameter; and subsequent reaming diameter(s). Account will also be given to the natural envelope of beach profile change over time from historical beach profiles to inform the final detailed design of the drill duct profile to avoid the risk of cable exposure at the beach.

**1.8.3.3** **1.10.3.3** The Landfall Construction Method Statement will define the details and appropriate remedial measures as per the selected methodology 1.5. ~~The final Landfall Monitoring Plan will be prepared post-consent and must accord within the Outline Landfall Monitoring Plan to be agreed as per section~~ such as any requirements for monitoring or remedial action associated with significant changes to coastal processes; or bentonite mud break-out response planning if ~~a~~an HDD technique is selected. An outline bentonite mud break-out response plan is provided in Section 1.10.4.

**1.8.3.4** **1.10.3.4** Trenchless techniques will involve drilling a long borehole from the landfall compound (located ~~above~~landward of MHWS) under the NRW coastal defences, the Wales Coast Path, the former Llanddulas Beach Landfill, the North Wales railway line, the A55 North Wales Expressway, the A547 and the Gwrych Castle Grade II listed historic boundary wall. The borehole will extend to ~~below~~seaward of MLWS (subtidal) and therefore, no open cut trenching will be required between MHWS and MLWS.

### **1.8.4** **1.10.4** **Bentonite break-out**

#### **Risks**

**1.8.4.1** **1.10.4.1** During trenchless technique operations, the drill head is lubricated with either water or bentonite clay and is injected under high pressure. If drilling occurs too close to the surface and the ground is not stable, the pressure of the lubricant and the vibration of the drill head cause a weak point to form which results in bentonite break out or “frac-out” i.e. the unintentional return of drilling fluid to the surface.

**1.8.4.2** **1.10.4.2** Bentonite is a fine clay material which is non-toxic and is commonly used in farming practices. However, it is also alkaline and when discharged into the water environment, it can affect water quality and water habitats by smothering plants and river gravels.

## Purpose of a bentonite break-out plan

~~1.8.4.3~~1.10.4.3 The purpose of a bentonite break-out plan is:

- Minimise the potential for a bentonite break-out associated with the trenchless technique crossings
- Provide for the timely detection of bentonite break outs
- Identify how ecologically sensitive areas will be protected
- Ensure an organised, timely and minimum impact incident response; and
- Establishes procedures to ensure that the NRW and any other relevant authority is notified and that the incident is documented.

## Geotechnical evaluation

~~1.8.4.4~~1.10.4.4 A site investigation will be undertaken ~~at each proposed trenchless technique location~~ to characterise the local ground conditions and to evaluate the geotechnical suitability of the underlying geology formations to be drilled using trenchless techniques. The investigation and evaluation will be undertaken by an appropriately qualified and experienced geotechnical engineer. The evaluation will be used to design the trenchless technique crossing, including confirmation of the location and ~~depth of the watercourse channel and~~ the properties of the superficial geology. This information will be used to determine the potential for the trenchless technique crossing to fail and bentonite break out to occur. The design will also include a controlled water risk assessment for the trenchless techniques under the Llanddulas Beach landfill site to ensure the crossing would not lead to a mobilisation of contaminants from the landfill leading to a deterioration in groundwater quality.

## Location of drill entry and exit points

~~1.8.4.5~~1.10.4.5 The primary areas of concern for inadvertent returns of drilling fluid are at the drill entry and exit pits where the drilling equipment is at its shallowest: the likelihood of bentonite break out occurring decreases as the depth of the pipe increases. To minimise the risk to riparian habitats, the drill entry and exit points will be located at an appropriate distance from the banks of the watercourse (for example, NRW recommends that the stand-off distance from watercourses less than 5 m wide, would be a minimum of 1.5 times the stream width. For larger watercourses (i.e. larger than 5 m wide) the stand-off distance would be 1.0 times the width of the watercourse).

~~1.8.4.6~~1.10.4.6 The drill entry and exit pits will be surrounded by construction fencing and silt fencing to minimise the potential for migration of bentonite. Straw bales or sedimentation fences will be placed between the pits and the watercourse to intercept any runoff.

~~1.8.4.7~~1.10.4.7 A settling basin will be located at the drill exit to contain the drilling mud.

~~1.8.4.8~~1.10.4.8 The pressure of the drilling mud will be reduced when the drill is close to the entry and exit pit and shallow in the ground.

## Monitoring

~~1.8.4.9~~ 1.10.4.9 During drilling, a watching brief will be undertaken to look for observable bentonite break out conditions. This will include monitoring the fluid pressure will be monitored during drilling as a drop in pressure can indicate a break out. Monitoring will be undertaken at an appropriate distance from the drill location as it is acknowledged that bentonite break outs may occur some distance from the drill site.

## Emergency response

~~1.8.4.10~~ 1.10.4.10 Where a bentonite break-out is detected, an emergency response procedure and remediation plan will be implemented. The procedure will be developed as part of the final Spillage and Emergency Response Plan, prepared in consultation with NRW prior to the commencement of any trenchless technique activities.

## ~~1.8.5~~ 1.10.5 Borehole drilling and installation of ducts

~~1.8.5.1~~ 1.10.5.1 The trenchless techniques will extend up to 1km seaward of MLWS and into the subtidal area to avoid impacts in the intertidal area. The technical feasibility of this approach was tested via the site investigation in the nearshore in 2022. Shallow geotechnical samples were also taken to inform the design of the duct installation and provide data for the burial assessment of the cable end of the duct.

~~1.8.5.2~~ 1.10.5.2 The maximum design scenario assumes up to four boreholes will be drilled from the landfall compound (~~above~~landward of MHWS) into the subtidal area (~~below~~seaward of MLWS).

## ~~1.8.6~~ 1.10.6 Plant and vehicles

~~1.8.6.1~~ 1.10.6.1 The onshore plant used specifically for the landfall construction could include (but is not limited to):

- Mobile crane
- Flat bed articulated trucks
- 360 excavators
- Compressors
- Piling equipment
- Lighting towers and CCTV equipment
- Concrete mixer lorries and pumps
- Trenchless boring equipment
- Mud mixing and recycling plant
- Steel and plastic welding plant (butt fusion welders)
- Cable winches
- Cable drums
- Compaction rollers
- Jointing containers



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- HV test lorries
- Water pumping equipment
- Stone delivery trucks.

~~1.8.6.2~~ 1.10.6.2 Construction support vehicles / plant will be used to support and monitor the drilling under the beach and railway and to provide an emergency response where required. The following vehicles / plant could be required (but are not limited to):

- 4 x 4 type vehicles
- Telehandler
- JCB / back hoe loader
- Tractor and trailer.

~~1.8.6.3~~ 1.10.6.3 A temporary beach vehicle laydown area (located within Work Area No. 7 on the ~~Onshore~~ Works Plan - Onshore (Document reference B3)) will provide overnight parking for up to six vehicles during the landfall works. The beach vehicle laydown area will be located ~~above~~landward of MHWS and will not interact with the intertidal habitat.

~~1.8.6.4~~ 1.10.6.4 An access will be provided to the west of the trenchless technique drill splay (within Work Area No. 6 of the ~~Onshore~~ Works Plan – Onshore (Document reference B3)) for monitoring of the drilling under the railway.

~~1.8.6.5~~ 1.10.6.5 Vehicle access to the beach area will follow a ~~dedicated~~ route from the beach car park to ~~MLWS~~the Work No. 3 area, and vehicles will traverse across the beach ~~to the works location~~along that route. The route will be located as far away as possible from the piddock habitat although noting the precise route will have to change over time depending on where the tide is. Vehicles will not be permitted to travel across the vegetated shingle beach: the area of vegetated shingle bank associated with the Traeth Pensarn SSSI has been removed from the ~~DCO order limits~~Order Limits. This is identified in the ~~Onshore~~ Works Plan – Onshore (Document reference B3)). Construction support workers will access temporary welfare facilities (Work No. 5) on foot. To ensure that vehicles and pedestrians avoid the designated piddock and vegetated shingle beach habitat, pre-construction surveys will be undertaken in accordance with the Outline Landscape and Ecology Management Plan (REP2-034) to confirm the extent of the habitats. The results of these surveys will be used to define specific routes for vehicles and pedestrians. These routes will be reviewed each time activities are undertaken at the beach, to taking into account the tide. In addition, construction support workers will also receive training, in the form of toolbox talks, on the location of the habitats and how to avoid them.

## ~~1.8.7~~ 1.10.7 Programme

~~1.8.7.1~~ 1.10.7.1 The nature of the landfall construction is expected to be complex due to the offshore punch out and the relatively long drill length. For this reason, it has been assumed that multiple trenchless technique rigs will be employed to reduce the overall time frame for the landfall works and allow sufficient time for other associated works such as the construction of the TJBs, offshore and onshore export cable installation to the TJBs and the jointing and testing of the completed cables.

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~~1.8.7.2~~1.10.7.2 The timeframe for drilling the bores (using trenchless techniques) and installing the ducts will take up to nine months and may be undertaken in two phases over a period of up to 24 months. The timeframe for the export cable pull in, TJB works and cable jointing will be up to 33 months.

~~1.8.7.3~~

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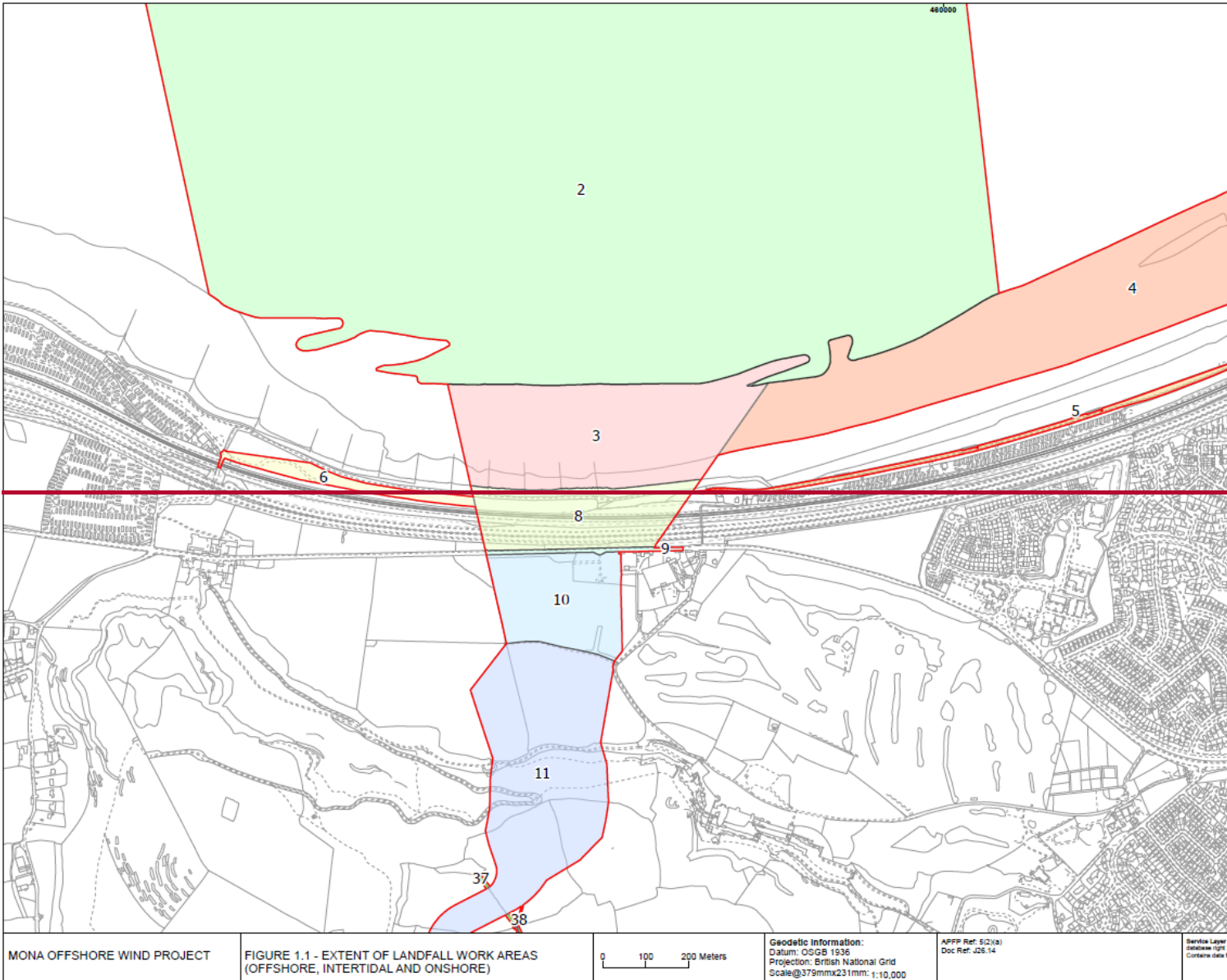


Figure .: Extent of Landfall work areas (offshore, intertidal and onshore)