

RWE



Awel y Môr Offshore Wind Farm

Supporting Information for Marine Licence Application for AyM Geotechnical Survey

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www.awelymor.cymru

RWE Renewables UK Swindon Limited

Windmill Hill Business Park

Whitehill Way

Swindon

Wiltshire SN5 6PB

T +44 (0)8456 720 090

www.rwe.com

Registered office:

RWE Renewables UK Swindon Limited

Windmill Hill Business Park

Whitehill Way

Swindon

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1 Introduction

- 1 Awel y Môr Offshore Wind Farm (AyM) is a sister project to the operational Gwynt y Môr Offshore Wind Farm (GyM) originally developed by RWE in the East Irish Sea. AyM will include Wind Turbine Generators (WTGs) and offshore transmission infrastructure, with the offshore Export Cable Corridor (ECC) reaching landfall between Rhyl and Prestatyn to allow a grid connection at Bodelwyddan in Denbighshire.
- 2 Marine Licence application ORML2233 relates to the overall generation (ML1), transmission (ML2), GyM interlink (ML3) and river Clwyd crossing (ML4).
- 3 Geotechnical surveys are included in the Marine Licence application referenced above and were assessed in the Environmental Statement (ES) as such. However, due to conflicting timescales associated between obtaining consent (should the Marine Licence be granted) and contracting a survey vessel, Awel y Môr Offshore Wind Farm Limited (the Applicant) is now seeking to dissociate this activity in a separate Marine Licence.
- 4 The Applicant will undertake an offshore geotechnical site investigation to characterise the site area in order to inform the detailed design and plans to undertake this during Q4 2023 and Q1 2024. Although the impacts associated with this activity will be minimal and are not considered high risk, its value is in excess of £1,000,000 and therefore must be considered as a Band 3 Licence.
- 5 It must be noted that the geotechnical survey activities applied for in this Licence fall within the suite of activities assessed in the ES for Marine Licence application ORML2233. When compared to that full suite of activities, the geotechnical survey is also smaller in scale by orders of magnitude. Furthermore, the activity will be temporary and short-term in duration and as such, any environmental impacts from this activity alone will be lower in magnitude than those assessed in the ES chapters that accompanied the Marine Licence ORML2233 application. Therefore, the significance of effects (in EIA terms) will not exceed those assessed in the ES.

- 6 This document provides supporting information for the Marine Licence application for the geotechnical survey, and discusses:
- ▲ Survey scope and methodology in Section 2;
 - ▲ Safety considerations in Section 3;
 - ▲ Environmental considerations in Section 4;
 - ▲ Habitats Regulations Assessment (HRA) screening in Section 4.3; and
 - ▲ Water Framework Directive (WFD) compliance in Section 6.
- 7 Environmental considerations are primarily made with reference to the existing ES, RIAA and WFD compliance assessment already provided for the AyM ORML2233 application.

2 Survey Scope and Methodology

2.1 Scope of Work

- 8 The contractor will perform an offshore geotechnical survey within the WTG array area (ML1) and offshore ECC (ML2) followed by reporting and laboratory testing. The fieldwork element will comprise 68 boreholes, 98 Seabed Cone Penetration Tests (CPTs) and 30 vibro-cores (including Measuring While Drilling (MWD) data) to include:
 - ▲ CPT push (3m length or refusal);
 - ▲ Thin-walled push sample (1.0 m);
 - ▲ Wireline P-S at 1 m interval;
 - ▲ Natural gamma and caliper; and
 - ▲ Rotary coning where bed rock encountered.
- 9 The samples will be located within the areas shown in Figure 1 below, and in the shapefile provided alongside this marine licence application. The exact locations of individual boreholes have not been determined at this stage, however, wherever possible, they will be evenly distributed around the survey areas in order to gather representative data across the site.
- 10 Table 1 below summarises the parameters associated with the borehole samples proposed.

Table 1: Approximate parameters associated with the offshore samples.

LOCATION	SAMPLE TYPE	MAXIMUM NUMBER	PENETRATION DEPTH (M)	DRILL DIAMETER (MM)	VOLUME (M ³)
Landfall HDD exit (below high water)	Borehole	10	30	146	5.02
Array (WTGs)	Borehole	50	50	146	41.85
	Seabed CPT	50	50	N/A	N/A
Array (Substation)	Borehole	8	80	146	10.71
	Seabed CPT	8	50	N/A	N/A
Array (Cables)	Vibrocores	10	6	146	1.00
	Seabed CPT	10	6	N/A	N/A
Export Cable	Seabed CPT	20	6	N/A	N/A
	Vibrocores	20	6	146	2.01

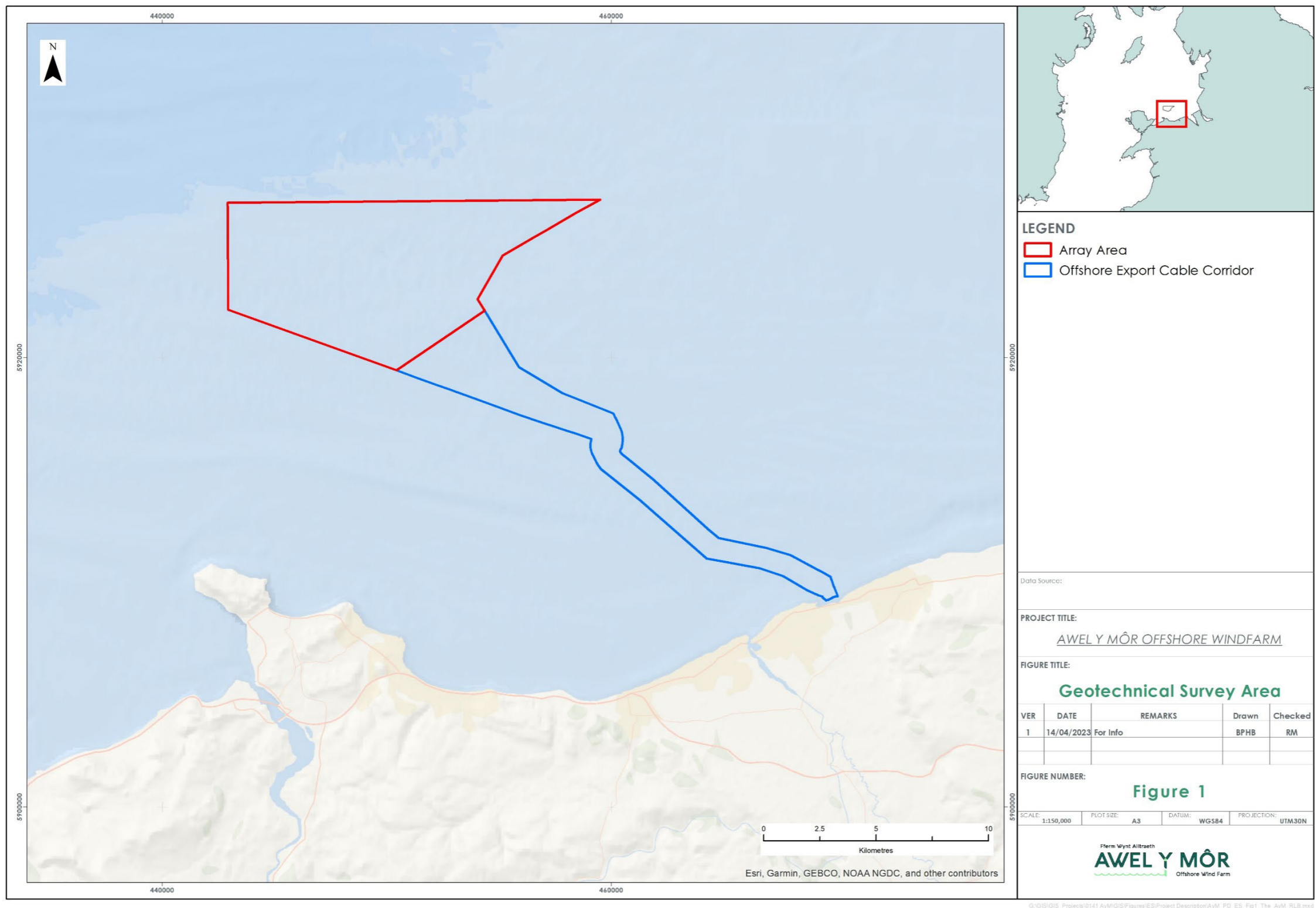


Figure 1: Geotechnical survey area.

2.2 Programme

- 11 The activities are expected to take place from October 2023 until May 2024.

2.3 Vessels

- 12 The survey will be undertaken by a single jack-up vessel. The exact vessel to be used is dependent on availability, which can only be confirmed closer to mobilisation. However, the vessel is likely to be either a bespoke geotechnical drilling vessel, or multipurpose geotechnical survey vessel, and will be smaller than that which is described within the design envelope for jack-up vessel operations within the Offshore Project Description chapter of ORML2233 (Table 6 of document 6.2.1).

2.4 Methodology

- 13 **Reporting:** During fieldwork, the project manager will manage, monitor and/or report the following activities:
- ▲ Offshore daily reporting submitted and agreed with the client or client representative;
 - ▲ Periodic progress reporting (frequency, format and content as agreed);
 - ▲ Registers (quality, health, safety, security and environment (QHSSE), risk);
 - ▲ Key decision points/gateways;
 - ▲ Preparation of field reports;
 - ▲ Any changes to project scope.
- 14 **Drilling operations:** Drilling will be performed using soil boring equipment through a central moon pool using a topdrive power swivel. The equipment includes a fixed derrick rig, mud mixing and pumping unit, and other tools and accessories required to carry out the survey. A heave motion compensator is fitted to the power swivel to ensure the drill bit maintains a uniform pressure on the base of the borehole during drilling operations. An ample supply of drilling mud is provided; a spare string of drill pipe, sufficient spare parts and other supplies required to avoid delays are available.

- 15 Operations will be conducted on a continuous basis, 24 hours a day, seven days a week.
- 16 The most effective drilling solution in these ground conditions is for the downhole CPT locations to be undertaken in American Petroleum Institute (API) mode. The contractor proposes undertaking the CPT borehole first then reviewing the data and deciding whether API or piggyback mode would be more appropriate for the ground conditions, based on the sample borehole.
- 17 Note that if API is selected but the borehole progress and sample quality reduce before the required depth, then the borehole will be terminated early. In which case the sampling will be converted to piggyback coring and destructively drill to the previously achieved depth, before continuing to 60 m with Geobor-S coring. The Geobor-S piggyback coring system is compatible with the proposed downhole CPT equipment.
- 18 **Downhole sampling:** The most appropriate sampler for the *in situ* soil characteristics will be chosen. Sampling is performed using either a thin-walled wireline push sampler with or without a stationary piston (WIP or piston sampler), or a thick-walled wireline push sampler (also WIP sampler). Sampling and testing are performed from the bottom of a vertically stabilised drill string. This provides optimum protection against buckling of tools and drill string. It also makes it possible to accurately control and monitor the penetration of the sampling tube or sensor into the soil below the bottom of the borehole. Most of the equipment utilises a hydraulic jacking system that is operated downhole via an electrohydraulic umbilical cable, which allows the measured data to be displayed at the surface as the test proceeds. Downhole instrumentation is available to check tool position, proper latch-in, total applied thrust and penetration of sensor or sampling tube into the soil. Digital data transmission is used with this equipment.

- 19 A range of thin-walled and thick-walled Shelby tubes is provided. These are used without core catchers for cohesive sediments and with a range of core catchers for non-cohesive soils. For very dense granular soils, thin-walled push sample tubes are supplied with catchers to improve recovery. Push sample tubes are 63 mm to 76 mm outside diameter (OD). Tubes of 50 mm OD are also provided for use in very dense granular soils where 63 mm to 76 mm OD tubes are unable to achieve the necessary recovery. Hammer sampling may be performed, as a last option, where push sampling fails to recover an acceptable sample.
- 20 **Geobor-S piggyback coring:** Where the borehole is expected to contain mainly over-consolidated soils and rock, the best sampling technique is piggyback coring.
- 21 The use of a dedicated Geobor-S coring string working through a riser in a 'piggyback' formation offers many advantages over conventional wireline drilling/coring when sampling in rock. This is achieved by installing a land coring rig into the heave-compensated platform of the main drill system, from which dedicated coring strings can be deployed. The main advantages of this system are:
- ▲ Much higher RPM can be achieved using a land coring rig;
 - ▲ Use of a dedicated coring string reduces the area drilled compared with conventional API drilling, increasing penetration while capturing a higher amount of core;
 - ▲ Working from the heave-compensated platform increases control and accuracy of depth and weight on bit (WOB) over the drilling operation, resulting in higher core quality and recovery as the coring rig is stationary with respect to the seabed.
- 22 **Downhole Piezocone Penetration Testing:** In situ piezocone CPTs (PCPTs) are performed using a system consisting of a wireline downhole jacking unit with a 3 m stroke and a thrust capacity of 90 kN.

- 23 After the borehole has been advanced to the required test level, it is cleaned by mud flushing and if there is a centre insert plug in the drill bit it is retrieved. The system is lowered by its electrohydraulic umbilical to the bottom of the drill pipe, where it sits just behind the drill bit and latches under its own weight. The test sequence is then activated from a surface control cabin and the cone penetrometer is hydraulically pushed into the soil at a constant rate of 2 cm/s. Throughout the test, the measurements of cone resistance, sleeve friction and pore pressure, if measured, are displayed graphically in the control cabin. These data are simultaneously recorded by computer. This facilitates detailed data processing, interpretation and presentation both offshore and onshore. Upon reaching the maximum achievable stroke of either 1.5 or 3 m (depending on which cones are used), or the limiting thrust capacity of 90 kN, the test is terminated and the system depressurised. The drill string is lifted to extract the cone and test rod out of the ground and the unit is retrieved; the complete operation takes 10 to 15 minutes.
- 24 Depending on soil conditions, either a 10 cm² or 5 cm² cone is utilised with a 3 m or 1.5 m stroke respectively.
- 25 Borehole Geophysical Logging (BGL): BGL is a data acquisition method for continuous and discontinuous measurements of physical properties of soil and rock (i.e. formation). This is achieved by operating borehole geophysical tools in open hole borehole. Results typically consist of borehole geophysical logs versus depth. The following tools will be run:
- ▲ Natural gamma radiation tool (GR): measures gamma radiation naturally emitted by the formation, providing inferred information on soil and rock type. GR can be used for correlating data over several runs and between closely spaced boreholes. Open hole logging only;
 - ▲ Caliper tool (CAL): measures borehole diameter using a mechanical caliper providing information on borehole geometry, rugosity and general condition (e.g. borehole stability, swelling, caving). The number of independent or pairs of caliper arms may vary between tool types, allowing for measurements along one or multiple axes. Open hole logging only;

- 30 **Demobilisation:** Once the Applicant accepts that all fieldwork is complete, the vessel(s) proceed to port to demobilise personnel and equipment. Samples and data are dispatched to a laboratory and office for further laboratory testing, and factual and interpretative reporting.
- 31 **Noise & noise mitigation:** The noise generated will be limited to that of the vessel propulsion systems and the vibrocore sampling process. The noise created by the drilling shall be less than that produced by the vessel itself (more information is provided in 4.2 below). Work is expected to be completed by May 2024.

3 Safety

3.1 Health and Safety

- 32 Before mobilisation, the contractor will produce a full quality, health, safety, security and environment (QHSSE) plan for AyM's approval.
- 33 The project kick-off meeting will be held onboard the vessel prior to departure and will be attended by everyone involved in the fieldwork, including RWE's representative and the vessel manager. Its purpose is to brief all parties on the scope of work, data requirements, and, importantly, safety aspects and procedures. The project manager will record the discussion and update the PEP accordingly, before circulating it to all involved.

3.2 Weather

- 34 The contractor's meteorologists and oceanographers will work closely with the survey teams. To allow for safe and efficient programming of works, they will issue the following to all offshore and nearshore geophysical and geotechnical vessels:
- ▲ Twice daily weather forecasts with a 5-day weather outlook period;
 - ▲ Weather windows forecast;
 - ▲ Supply of weather imagery.
- 35 The forecasts will comprise:
- ▲ Meteorological situation;
 - ▲ 24-hour warning section;
 - ▲ Tabular forecast at 3-hourly intervals 120 hours ahead for wind, waves and current data;
 - ▲ Built-in operational limit exceedance based on vessel limits;
 - ▲ Advanced forecast models available to our forecasting team, including Fugro's own inhouse high-resolution metocean numerical models;
 - ▲ Graphic wave and surface wind presentation.

3.3 UXO

- 36 The contractor will take all risk of UXO and ensure that the areas are reduced to As Low As Reasonably Practicable (ALARP) before any intrusive activities commence.

4 Interaction with the Receiving Environment

4.1 Introduction

37 As noted within Section 1, the environmental effects of the geotechnical surveys applied for in this licence are far smaller in scale when compared to the full suite of works applied for in Marine Licence ORML2233. As such, any impacts will be no greater in magnitude than those assessed in the ES chapters that accompanied the Marine Licence application ORML2233.

38 When considering the effects of these geotechnical survey works in isolation, there are a number of important factors to bear in mind when considering their environmental impacts, as well as the sensitivity of receptors to those impacts:

- ▲ The footprints of the sampling events are small and discrete;
- ▲ The undertaking of the survey will be over a relatively short duration at each sample location (no more than a few hours per location, depending on the ground conditions encountered);
- ▲ Any noise from the drilling activity will be limited (see further information in Section 4.2); and
- ▲ The survey activity will be short-term and temporary overall, taking place from October 2023 to May 2024.

4.2 Environmental Considerations

39 Table 2 below identifies the environmental receptors that could potentially be affected by the geotechnical surveys and considers the potential impacts, providing supporting information from the relevant chapters of the ES that accompanied marine licence ORML2233 where appropriate.

Table 2: Table showing the considerations of receptors and potential impacts arising from the geotechnical surveys applied for.

RECEPTOR	POTENTIAL IMPACT	SUPPORTING INFORMATION
Marine Geology, Oceanography and Physical Processes	Direct effects from physical seabed disturbance of geotechnical testing equipment	<p>The interaction between the seabed and survey equipment / jack-up vessel legs has the potential to give rise to suspended sediment plumes and highly localised changes in bed levels as material settles out of suspension. The limited width/footprint of the plume feature means that specific locations will only be affected by an increase in Suspended Sediment Concentration (SSC) for the limited duration it takes for the plume to be advected past by the tide. Physical processes receptors will be insensitive to highly localised changes in SSC, and changes to bed levels associated with the sediment disturbance activities will be immeasurable in practice.</p> <p>All construction effects are assessed as minor adverse (and therefore not significant in EIA terms) within the marine geology, oceanography and physical processes chapter of the ES that accompanied ORML2233 (document reference 6.2.2). Due to works applied for within this marine licence application being considerably smaller in scale than those applied for in ORML2233, it can be stated with confidence that the effects will be no greater and are therefore not significant in EIA terms.</p>
Marine Water and Sediment Quality	Direct effects from physical seabed disturbance of geotechnical testing equipment	<p>It is considered unlikely that changes in water quality through increased SSCs during the construction phase of AyM will result in notable changes in phytoplankton abundance and/ or assemblage. Elevated concentrations would be highly localised to the site of works/ seabed disturbance and short lived as sediments readily disperse. Furthermore, the timing of the surveys does not overlap with the bathing season (15 May to 30 September).</p> <p>All construction effects are assessed as negligible or minor adverse (and therefore not significant in EIA terms) within the marine water and sediment quality chapter of the ES that accompanied ORML2233 (document reference 6.2.3). Due to works applied for within this marine licence application being considerably smaller in scale than those applied for in ORML2233, it can be stated with confidence that the effects will be no greater and are therefore not significant in EIA terms.</p> <p>A WFD compliance assessment has been carried out and can be found in Section 6.</p>
Offshore Ornithology	Disturbance and Displacement from survey vessel movement, presence, noise and lighting.	<p>Disturbance activities will be both temporally and spatially restricted to the area which the surveys are taking place. Furthermore, ornithology receptors are likely to be habituated to vessel movements due to the existing presence of vessel traffic (such as that of the existing O&M vessels for the adjacent GyM).</p> <p>Best practice techniques will be followed, including the avoidance of aggregations of rafting seabirds and the avoidance of over-revving of engines. Vessel crews will be briefed on these best practice techniques.</p>

RECEPTOR	POTENTIAL IMPACT	SUPPORTING INFORMATION
		<p>All construction effects are assessed as negligible or minor adverse (and therefore not significant in EIA terms) within the offshore ornithology chapter of the ES that accompanied ORML2233 (document reference 6.2.4). Due to works applied for within this marine licence application being considerably smaller in scale than those applied for in ORML2233, it can be stated with confidence that the effects will be no greater and are therefore not significant in EIA terms.</p>
Benthic Ecology	Direct effects from physical seabed disturbance of geotechnical testing equipment	<p>The impact on benthic habitats is predicted to be of local spatial extent (i.e. restricted to discrete areas in which the surveys are taking place), short-term duration (as it is limited to the duration of survey activities), intermittent and with high reversibility. The faunal communities that characterise the sandy biotopes present include infaunal mobile species such as polychaetes and bivalves. Such species can re-enter the substratum following temporary habitat disturbance. The recoverability of such communities is likely to occur as a result of the combination of migration from adjacent surrounding unaffected areas combined with larval dispersal.</p> <p>All construction effects are assessed as negligible or minor adverse (and therefore not significant in EIA terms) within the benthic subtidal and intertidal ecology chapter of the ES that accompanied ORML2233 (document reference 6.2.5). Due to works applied for within this marine licence application being considerably smaller in scale than those applied for in ORML2233, it can be stated with confidence that the effects will be no greater and are therefore not significant in EIA terms.</p>
Fish and Shellfish Ecology	Direct effects from physical seabed disturbance of geotechnical testing equipment	<p>In general, fish are able to avoid temporary direct disturbance (EMU, 2004). Shellfish species are considered to have a more limited ability to avoid direct effects due to the relative energetic costs or speed of movement (i.e., scallops) or behaviours (e.g., during breeding) that may make them more susceptible to direct effects due to a sedentary habit. However, due to the predicted local spatial extent, short-term duration and intermittent and reversible nature of the impact, the magnitude of the impact will be low (adverse).</p> <p>Direct damage and disturbance during the construction phase will represent a short-term and localised effect. The magnitude of the impact was determined to be low (adverse). The maximum sensitivity of the receptors was assessed as medium. The effect is therefore considered to be a maximum of minor adverse significance which is not significant in EIA terms.</p> <p>All construction effects are assessed as negligible or minor adverse (and therefore not significant in EIA terms) within the fish and shellfish ecology chapter of the ES that accompanied ORML2233 (document reference 6.2.6). Due to works applied for within this marine licence application being considerably smaller in scale than those applied for in ORML2233, it can be stated with confidence that the effects will be no greater and are therefore not significant in EIA terms.</p>

RECEPTOR	POTENTIAL IMPACT	SUPPORTING INFORMATION
Marine Mammals	Vessel Disturbance	<p>The area in which the geotechnical surveys are to take place already experiences high levels of vessel traffic. Therefore, the introduction of an additional vessel for the purpose of geotechnical surveys is not a novel impact for marine mammals present in the area. The commitment to the adoption of best practice vessel-handling protocols (e.g. following the Codes of Conduct provided by the WiSe Scheme, Scottish Marine Watching Code or Guide to Best Practice for Watching Marine Wildlife) during the surveys will minimize the potential for any impact.</p> <p>All construction effects are assessed as negligible or minor adverse (and therefore not significant in EIA terms) within the marine mammals chapter of the ES that accompanied ORML2233 (document reference 6.2.7). Due to works applied for within this marine licence application being considerably smaller in scale than those applied for in ORML2233, it can be stated with confidence that the effects will be no greater and are therefore not significant in EIA terms.</p>
	Noise	<p>A study by Bach et al., 2013 concluded that the drilling works associated with offshore oil and gas drilling activities, which result in substantially higher noise levels than those anticipated to result from this geotechnical survey, do not pose a significant threat to small cetaceans. The results showed that only short-term behavioural effects could be expected, even during activities that result in high sound intensity levels, for example during the ramming of conductors. Such levels are highly unlikely to be created as a result of the proposed geotechnical works. A study by Erbe and McPherson (2017) measured the underwater noise generated from geotechnical drilling, which were recorded at 142–145 dB re 1 µPa rms @ 1 m (30–2000 Hz) for drilling. By comparison, vessel noise levels for AyM are predicted to be 161-168 dB re 1 µPa rms @ 1 m. Therefore, the noise generated by the drilling activity itself is expected to be less than that generated by the vessel undertaking the survey.</p> <p>The geotechnical works will result in low frequency sound, at a level within or below the typical sound levels produced by shipping. The potential for injury to noise sensitive receptors can therefore be ruled out, and any possible disturbance from the activity would be contained within the footprint of disturbance from the vessel. Furthermore, the guidance identifies that noise disturbance is only likely to cause an offence (in EPS terms) where it persists and is chronic in nature. The noise associated with the geotechnical works will be short term, temporary and intermittent, therefore no potential for significant effects from the geotechnical survey are expected.</p> <p>All construction effects are assessed as negligible or minor adverse (and therefore not significant in EIA terms) within the marine mammals chapter of the ES that accompanied ORML2233 (document reference 6.2.7). Due to works applied for within this marine licence application being considerably</p>

RECEPTOR	POTENTIAL IMPACT	SUPPORTING INFORMATION
		<p>smaller in scale than those applied for in ORML2233, it can be stated with confidence that the effects will be no greater and are therefore not significant in EIA terms.</p>
Commercial Fisheries	Vessel Disturbance and displacement	<p>All fishing fleets are considered to be able to avoid vessel movements related to AyM geotechnical surveys. The impact is predicted to be of regional spatial extent, short term duration, intermittent and high reversibility. A Notice to Mariners shall be issued ahead of the work, detailing the locations of the work.</p> <p>All construction effects are assessed as negligible or minor adverse (and therefore not significant in EIA terms) within the commercial fisheries chapter of the ES that accompanied ORML2233 (document reference 6.2.8). Due to works applied for within this marine licence application being considerably smaller in scale than those applied for in ORML2233, it can be stated with confidence that the effects will be no greater and are therefore not significant in EIA terms.</p>
Shipping and Navigation	Increased vessel collision risk	<p>The vessel will be undertaking the geotechnical works while being jacked-up. While jacked-up with restricted navigation, the vessel shall display the appropriate lighting and navigational warnings to other vessels (as prescribed in the International Rules for the Prevention of Collisions at Sea (COLREGS) Rule 27, to indicate that the survey vessel is restricted in its ability to maneuver). A Notice to Mariners shall be issued ahead of the work, detailing the locations of the work. A listening watch on Channel 16 will be maintained. A proper and effective lookout by sight and sound appropriate to the prevailing circumstances will also be undertaken.</p> <p>All construction effects are assessed as broadly acceptable or tolerable (and therefore not significant in EIA terms) within the shipping and navigation chapter of the ES that accompanied ORML2233 (document reference 6.2.9). Due to works applied for within this marine licence application being considerably smaller in scale than those applied for in ORML2233, it can be stated with confidence that the effects will be no greater and are therefore not significant in EIA terms.</p>
Offshore Archaeology and Cultural Heritage	Direct effects from physical seabed disturbance of geotechnical testing equipment.	<p>The identified Archaeological Exclusion Zones (AEZ) will inform the exact location of sample locations so that the survey works avoid any archaeological features.</p> <p>All construction effects are assessed as minor to negligible (and therefore not significant in EIA terms) within the shipping and navigation chapter of the ES that accompanied ORML2233 (document reference 6.2.11). Due to works applied for within this marine licence application being considerably smaller in scale than those applied for in ORML2233, it can be stated with confidence that the effects will be no greater and are therefore not significant in EIA terms.</p>

RECEPTOR	POTENTIAL IMPACT	SUPPORTING INFORMATION
Other Marine Users and Activities	Direct effects from physical seabed disturbance of geotechnical testing equipment	<p>There will be no overlap between the survey locations and the infrastructure of other marine users (such as other offshore wind farms and non-OWF cables and pipelines) and a Notice to Mariners shall be issued ahead of the work, detailing the locations of the work.</p> <p>All construction effects are assessed as minor (and therefore not significant in EIA terms) within the other marine users and activities chapter of the ES that accompanied ORML2233 (document reference 6.2.12). Due to works applied for within this marine licence application being considerably smaller in scale than those applied for in ORML2233, it can be stated with confidence that the effects will be no greater and are therefore not significant in EIA terms.</p>

4.3 Consideration of Cumulative Effects

- 40 The characterisation of effects presented in Table 2 above has identified that all effects will be highly localised in extent, short-term and temporary in duration, and will not result in any significant effects. Therefore, the potential for geotechnical surveys to contribute to wider effects cumulatively with other plans, projects and activities is highly limited and it is not necessary to consider this further.

5 HRA Screening

- 41 Table 3 shows all sites within 25 km of the geotechnical survey area for the purposes of HRA screening. Due to the highly localised impacts associated with geotechnical survey, this is considered to be a highly precautionary approach based on the approach taken on other geotechnical surveys for offshore wind farms.
- 42 A Report to Inform Appropriate Assessment (RIAA) was submitted with the main Marine Licence application (Document reference: 5.2) and concluded that there would be no Adverse Effect on Integrity (no AEoI) on any site designated as part of the UK National Site Network.

Table 3: Habitats Regulation Assessment Stage 1 Screening.

DESIGNATED SITE	OVERLAP AND / OR RANGE (KM)	FEATURE(S) SCREENED IN	POTENTIAL EFFECT(S)	POTENTIAL FOR LIKELY SIGNIFICANT EFFECT
Liverpool Bay/ Bae Lerpwl (UK) SPA	0.0	<ul style="list-style-type: none"> ▲ Common scoter (non-breeding) ▲ Red-throated diver (non-breeding) ▲ Red-breasted merganser (non-breeding) ▲ Common tern (passage) ▲ Little tern (passage) ▲ Little gull (non-breeding) 	<ul style="list-style-type: none"> ▲ Direct disturbance and displacement 	Disturbance activities will be both temporally and spatially restricted to the area which the surveys are taking place. Furthermore, ornithology receptors are likely to be habituated to vessel movements due to the existing presence of vessel traffic (such of that of the existing O&M vessels for the adjacent Gwynt y Môr offshore wind farm). Best practice techniques will be followed, including the avoidance of aggregations of rafting seabirds and the avoidance of over-revving of engines. Vessel crews will be briefed on these best practice techniques. Therefore, there is no potential for Likely Significant Effect (LSE) at this site.
Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay (UK) SAC	6.1	<ul style="list-style-type: none"> ▲ Sandbanks which are slightly covered by sea water all the time ▲ Reefs ▲ Large shallow inlets and bays ▲ Submerged or partially submerged sea caves 	<ul style="list-style-type: none"> ▲ Physical habitat loss/ disturbance ▲ Suspended sediment and deposition ▲ Pollution ▲ Marine INNS ▲ Changes to physical processes 	Due to the temporary, intermittent and small-scale nature of the surveys, any potential effects will be highly localised. Given the distance from the site, it is not anticipated that there is any pathway for effect, therefore there is no potential for LSE at this site.
		<ul style="list-style-type: none"> ▲ Mudflats and sandflats not covered by seawater at low tide 	<ul style="list-style-type: none"> ▲ Suspended sediment and deposition ▲ Pollution ▲ Marine INNS ▲ Changes to physical processes 	Due to the temporary, intermittent and small-scale nature of the surveys, any potential effects will be highly localised. Given the distance from the site, it is not anticipated that there is any pathway for effect, therefore there is no potential for LSE at this site.
Dee Estuary Ramsar	3.5	<ul style="list-style-type: none"> ▲ Criterion 1: Extensive intertidal mud and sand flats with large expanses of saltmarsh 	<ul style="list-style-type: none"> ▲ Suspended sediment and deposition ▲ Pollution ▲ INNS 	Due to the temporary, intermittent and small-scale nature of the surveys, any potential effects will be highly localised. Given the distance from the site, it is not anticipated that there is any pathway for effect, therefore there is no potential for LSE at this site.

DESIGNATED SITE	OVERLAP AND / OR RANGE (KM)	FEATURE(S) SCREENED IN	POTENTIAL EFFECT(S)	POTENTIAL FOR LIKELY SIGNIFICANT EFFECT
		<ul style="list-style-type: none"> ▲ Redshank (wintering and passage) ▲ Shelduck ▲ Teal ▲ Pintail ▲ Oystercatcher ▲ Grey plover ▲ Knot ▲ Dunlin ▲ Black-tailed godwit ▲ Curlew ▲ Bar-tailed godwit ▲ Waterbird assemblage 	<ul style="list-style-type: none"> ▲ Visual and/ or noise disturbance to species (onshore) 	Disturbance activities will be both temporally and spatially restricted to the area which the surveys are taking place (which is 3.5 km away from the site boundary). Furthermore, ornithology receptors are likely to be habituated to vessel movements due to the existing presence of vessel traffic (such of that of the existing O&M vessels for the adjected Gwynt y Môr offshore wind farm). As such, it is not anticipated that there is any pathway for effect, therefore there is no potential for LSE at this site.
The Dee Estuary (UK) SPA (offshore)	3.5	<ul style="list-style-type: none"> ▲ Sandwich tern (passage) 	<ul style="list-style-type: none"> ▲ Direct disturbance and displacement 	Disturbance activities will be both temporally and spatially restricted to the area which the surveys are taking place (which is 3.5 km away from the site boundary). Furthermore, ornithology receptors are likely to be habituated to vessel movements due to the existing presence of vessel traffic (such of that of the existing O&M vessels for the adjected Gwynt y Môr offshore wind farm). As such, it is not anticipated that there is any pathway for effect, therefore there is no potential for LSE at this site.
		<ul style="list-style-type: none"> ▲ Common tern (passage) ▲ Little tern ▲ Bar-tailed godwit ▲ Redshank ▲ Shelduck ▲ Teal ▲ Pintail ▲ Oystercatcher ▲ Grey plover 	<ul style="list-style-type: none"> ▲ Direct disturbance and displacement 	Disturbance activities will be both temporally and spatially restricted to the area which the surveys are taking place (which is 3.5 km away from the site boundary). Furthermore, ornithology receptors are likely to be habituated to vessel movements due to the existing presence of vessel traffic (such of that of the existing O&M vessels for the adjected Gwynt y Môr offshore wind farm). As such, it is not anticipated that there is any pathway for effect, therefore there is no potential for LSE at this site.

DESIGNATED SITE	OVERLAP AND / OR RANGE (KM)	FEATURE(S) SCREENED IN	POTENTIAL EFFECT(S)	POTENTIAL FOR LIKELY SIGNIFICANT EFFECT
		<ul style="list-style-type: none"> ▲ Knot ▲ Dunlin 		
The Dee Estuary (UK) SPA (onshore)	13.0	<ul style="list-style-type: none"> ▲ Little tern ▲ Sandwich tern ▲ Bar-tailed godwit ▲ Redshank (wintering and passage) ▲ Shelduck ▲ Teal ▲ Pintail ▲ Oystercatcher ▲ Grey plover ▲ Knot ▲ Dunlin ▲ Black-tailed godwit ▲ Curlew ▲ Waterbird assemblage 	<ul style="list-style-type: none"> ▲ Visual and/ or noise disturbance to species 	Disturbance activities will be both temporally and spatially restricted to the area which the surveys are taking place (which is 13 km away from the site boundary). Furthermore, ornithology receptors are likely to be habituated to vessel movements due to the existing presence of vessel traffic (such of that of the existing O&M vessels for the adjected Gwynt y Môr offshore wind farm). As such, it is not anticipated that there is any pathway for effect, therefore there is no potential for LSE at this site.
Dee Estuary/ Aber Dyfrdwy (UK) (England/ Wales) SAC	3.5	<ul style="list-style-type: none"> ▲ Mudflats and sandflats not covered by seawater at low tide ▲ Salicornia and other annuals colonizing mud and sand ▲ Atlantic salt meadows (<i>Glaucopuccinellietalia maritimae</i>) ▲ Estuaries 	<ul style="list-style-type: none"> ▲ Suspended sediment/ deposition ▲ Pollution ▲ Marine INNS 	Due to the temporary, intermittent and small-scale nature of the surveys, any potential effects will be highly localised. Given the distance from the site, it is not anticipated that there is any pathway for effect, therefore there is no potential for LSE at this site.
		<ul style="list-style-type: none"> ▲ Sea lamprey ▲ River lamprey 	<ul style="list-style-type: none"> ▲ Underwater noise ▲ Suspended sediment and deposition ▲ Pollution 	Due to the temporary, intermittent and small-scale nature of the surveys, any potential effects will be highly localised. Given the distance from the site, it is not anticipated that there is any pathway for effect, therefore there is no potential for LSE at this site.

DESIGNATED SITE	OVERLAP AND / OR RANGE (KM)	FEATURE(S) SCREENED IN	POTENTIAL EFFECT(S)	POTENTIAL FOR LIKELY SIGNIFICANT EFFECT
Anglesey Terns/ Morwenoliaid Ynys Mon (UK) SPA	15.2	<ul style="list-style-type: none"> ▲ Sandwich tern (breeding and passage) ▲ Roseate tern (breeding and passage) ▲ Common tern (breeding and passage) ▲ Arctic tern (breeding and passage) 	▲ Direct disturbance and displacement	Disturbance activities will be both temporally and spatially restricted to the area which the surveys are taking place (which is 15.2 km away from the site boundary). Furthermore, ornithology receptors are likely to be habituated to vessel movements due to the existing presence of vessel traffic (such of that of the existing O&M vessels for the adjoined Gwynt y Môr offshore wind farm). As such, it is not anticipated that there is any pathway for effect, therefore there is no potential for LSE at this site.
Ynys Seiriol/ Puffin Island (UK) SPA	17.3	<ul style="list-style-type: none"> ▲ Cormorant 	▲ Direct disturbance and displacement	Disturbance activities will be both temporally and spatially restricted to the area which the surveys are taking place (which is 17.3 km away from the site boundary). Furthermore, ornithology receptors are likely to be habituated to vessel movements due to the existing presence of vessel traffic (such of that of the existing O&M vessels for the adjoined Gwynt y Môr offshore wind farm). As such, it is not anticipated that there is any pathway for effect, therefore there is no potential for LSE at this site.
Traeth Lafan/ Layan Sands, Conway Bay (UK) SPA	21.3	<ul style="list-style-type: none"> ▲ Oystercatcher ▲ Curlew ▲ Great crested grebe ▲ Red-breasted merganser 	▲ Direct disturbance and displacement	Disturbance activities will be both temporally and spatially restricted to the area which the surveys are taking place (which is 21.3 km away from the site boundary). Furthermore, ornithology receptors are likely to be habituated to vessel movements due to the existing presence of vessel traffic (such of that of the existing O&M vessels for the adjoined Gwynt y Môr offshore wind farm). As such, it is not anticipated that there is any pathway for effect, therefore there is no potential for LSE at this site.

DESIGNATED SITE	OVERLAP AND / OR RANGE (KM)	FEATURE(S) SCREENED IN	POTENTIAL EFFECT(S)	POTENTIAL FOR LIKELY SIGNIFICANT EFFECT
North Anglesey Marine/ Gogledd Môn Forol (UK) SAC	23.5	▲ Harbour porpoise	▲ Underwater noise	<p>A study by Erbe and McPherson (2017) measured the underwater noise generated from geotechnical drilling, which were recorded at 142–145 dB re 1 µPa rms @ 1 m (30–2000 Hz) for drilling. By comparison, vessel noise levels for AyM are predicted to be 161–168 dB re 1 µPa rms @ 1 m. Therefore, the noise generated by the drilling activity itself is expected to be less than that generated by the vessel undertaking the survey.</p> <p>Furthermore, the guidance identifies that noise disturbance is only likely to cause an offence (in EPS terms) where it persists and is chronic in nature. The noise associated with the geotechnical works will be short term, temporary and intermittent, therefore it is not anticipated that there is any pathway for effect, therefore there is no potential for LSE at this site.</p>

6 WFD Compliance Assessment

6.1 Introduction

- 43 NRW request that all Marine Licences above a Band 1 should be accompanied by a Water Framework Directive (WFD) assessment.
- 44 Transitional and coastal water bodies are protected under the Water Framework Directive with the aim of achieving good overall status. Therefore, a licensed project or activity seaward of Mean High Water Springs and up to 1 nautical mile must demonstrate that it will not cause 'deterioration in the water body'.
- 45 A WFD Compliance Assessment was completed and submitted with the main Marine Licence application (Document reference: 6.4.3.1) and concluded that there would be no deterioration in status of any WFD waterbody.

6.2 Screening

- 46 Table 4 to Table 14 follow the scoping template provided by the UK government that is endorsed by NRW. These tables set out key information and further information as to whether the proposed geotechnical surveys need to be assessed further.
- 47 Table 4 summarises what potential impacts are identified as needing WFD compliance assessment. These potential impacts are then taken forward into assessment which can be found at Section 6.3.

Table 4: WFD scoping key information table.

YOUR ACTIVITY	DESCRIPTION, NOTES OR MORE INFORMATION
Applicant name	Awel y Môr Offshore Wind Farm Limited
Application reference number (where applicable)	N/A
Name of activity	Geotechnical survey of the Awel y Môr Offshore Wind Farm array and export cable corridor area.
Brief description of activity	Offshore geotechnical site investigation (68 boreholes, 98 Seabed CPTs and 30 vibrocores) to characterise the site area.
Location of activity (central point XY coordinates or national grid reference)	The survey area is shown in Figure 1 above.
Footprint of activity (ha)	17.8 (based on a jack-up footprint of 0.192 ha per sample location).
Timings of activity (including start and finish dates)	1/10/2023 – 31/05/2024
Extent of activity (for example size, scale frequency, expected volumes of output or discharge)	<p>Landfall HDD (or other trenchless technique) exit (below high water):</p> <ul style="list-style-type: none"> ▲ 10 x Borehole samples taken using a jack-up vessel, sampled to a depth of 30 m (boreholes to be grouted on completion) <p>Array WTGs:</p> <ul style="list-style-type: none"> ▲ 50 x Borehole samples taken using a jack-up or marine vessel, sampled to a depth of 50 m. ▲ 50 x Seabed CPTs taken from a marine vessel, sampled to a depth of 50 m. <p>Array Substation:</p> <ul style="list-style-type: none"> ▲ 8 x Borehole samples taken using a jack-up or marine vessel, sampled to a depth of to 80 m. ▲ 8 x Seabed CPTs taken from a marine vessel, sampled to a depth of 50 m. <p>Array Cables:</p> <ul style="list-style-type: none"> ▲ 10 x Vibrocores taken using a marine vessel, sampled to a depth of 6 m. ▲ 10 x Seabed CPTs taken using a marine vessel, sampled to a depth of 6 m. <p>Export Cable:</p> <ul style="list-style-type: none"> ▲ 20 x Seabed CPTs taken using a marine vessel, sampled to a depth of 6 m. ▲ 20 x Vibrocores taken using a marine vessel, sampled to a depth of 6 m.
Use or release of chemicals (state which ones)	Bentonite (defined as readily biodegradable and non-bioaccumulative by the Offshore Chemical Notification Scheme).

Table 5: Current status of scoped in coastal and transitional waterbodies (source: Cycle 3 Classifications (NRW, 2021b)).

WFD WATER BODY NAME	North Wales
WATER BODY ID	GB641011650000
RIVER BASIN DISTRICT NAME	Western Wales
WATER BODY TYPE (ESTUARINE OR COASTAL)	Coastal
WATER BODY TOTAL AREA (HA)	14,627.8
OVERALL WATER BODY STATUS (2015)	Moderate
ECOLOGICAL STATUS	Moderate
CHEMICAL STATUS	Moderate (Fail)
TARGET WATER BODY STATUS AND DEADLINE	Good by 2033
HYDROMORPHOLOGY STATUS OF WATER BODY	Not Assessed
HEAVILY MODIFIED WATER BODY AND FOR WHAT USE	Yes - Coast protection use
HIGHER SENSITIVITY HABITATS PRESENT	Mussel beds and polychaete reef (<i>Sabellaria alveolata</i>)
LOWER SENSITIVITY HABITATS PRESENT	Intertidal soft sediment, Subtidal soft sediments and Rocky shore
PHYTOPLANKTON STATUS	Moderate
HISTORY OF HARMFUL ALGAE	Not Recorded
WFD PROTECTED AREAS WITHIN 2KM	<p>To align with the WFD assessment of ORML2233, the Applicant has used a Zone of Influence (Zol) in place of the 2 km buffer zone. This has been defined by the project-specific sediment modelling (See documents 6.4.2.3. and 6.3.2 that accompany ORML2233) from the proposed offshore works and 2 km from the onshore draft Order Limits. This distance aligns with the Environment Agency's 'Clearing the Waters for All' guidance.</p> <p>The following WFD protected areas have been identified within the Zol of the proposed development:</p> <ul style="list-style-type: none"> ▲ Bathing Waters: <ul style="list-style-type: none"> ▪ Abergele (Pensarn); ▪ Kinmel Bay (Sandy Cove);

- Rhyl East;
- Rhyl;
- Marine Lake, Rhyl; and
- Prestatyn.
- ▲ Shellfish Water Protected Areas:
 - There are no Shellfish Water Protected Areas within the AyM Zol. The closest are Dee (West) and Rhos-on-Sea to the east and west of the offshore ECC, respectively.
- ▲ Sensitive Areas:
 - The Rhyl Bathing Water Sensitive Area is within the AyM Zol, directly overlapping the offshore ECC.
- ▲ Nitrate Vulnerable Zones (NVZ)s:
 - Existing groundwater NVZ; and
 - Existing surface water NVZ.
- ▲ National Site Network sites and Ramsar sites:
 - Dee Estuary/ Aber Dyfrdwy SAC;
 - Menai Strait and Conwy Bay SAC;
 - Coedwigoedd Dyffryn Elwy / Elwy Valley Woods SAC; and
 - Liverpool Bay / Bae Lerpwl (Wales) SPA.
 - There are no Ramsar sites within the defined AyM Zol.
- ▲ Drinking Water Protected Areas (Surface and Ground):
 - There are no Drinking Water Protected Areas within the AyM Zol. The closest is approximately 4 km from the onshore ECC.

Table 6: Hydromorphology Risk Information.

CONSIDER OF YOUR ACTIVITY:	YES	NO	HYDROMORPHOLOGY RISK ISSUE(S)
Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status	Requires impact assessment	Impact assessment not required	Given the small scale and temporary nature of proposed works, it is considered unlikely that geotechnical survey activities will result in significant impacts to hydromorphology.
Could significantly impact the hydromorphology of any water body	Requires impact assessment	Impact assessment not required	Given the small scale and temporary nature of proposed works, it is considered unlikely that geotechnical survey activities will result in significant impacts to hydromorphology.
Is in a water body that is heavily modified for the same use as your activity	Requires impact assessment	Impact assessment not required	The waterbody is not heavily modified for the same use of the activity being applied for.

Table 7: Biology – Habitats Risk Information.

CONSIDER IF THE FOOTPRINT OF YOUR ACTIVITY IS:	YES	NO	BIOLOGY HABITATS RISK ISSUE(S)
0.5km ² or larger	Yes to one or more – requires impact assessment	No to all – impact assessment not required	The footprint of survey works will be more than 0.5 km ² .
1% or more of the water body's area			The footprint of survey works will be less than 1% of the water body's area.
Within 500m of any higher sensitivity habitat			Within the proximity of the offshore ECC, there are Mussel beds and <i>Sabellaria alveolata</i> (distance to offshore ECC approximately 400 m).
1% or more of any lower sensitivity habitat			The footprint of survey works does not overlap with any lower sensitivity habitat.

Table 8: Biology – Fish Risk Information.

CONSIDER IF YOUR ACTIVITY IS:	YES	NO	BIOLOGY HABITATS RISK ISSUE(S)
Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary	Continue with questions	Go to next section	The closest estuary, the Clwyd, is more than 2 km from the proposed geotechnical survey site and therefore it is considered that the works could delay or prevent fish entering it or could affect fish migrating through the estuary.
Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)	Requires impact assessment	Impact assessment not required	N/A
Could cause entrainment or impingement of fish	Requires impact assessment	Impact assessment not required	N/A

Table 9: Water Quality - Phytoplankton Status and Harmful Algae Risk Information.

CONSIDER IF YOUR ACTIVITY:	YES	NO	WATER QUALITY RISK ISSUE(S)
Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)	Requires impact assessment	Impact assessment not required	Although the geotechnical surveys could result in a short-term increase in SSC that could affect water clarity, this will be localised and short lived (less than a spring neap tidal cycle) as sediments readily disperse.
Is in a water body with a phytoplankton status of moderate, poor or bad	Requires impact assessment	Impact assessment not required	The North Wales coastal waterbody is currently classified as being of moderate phytoplankton status and, therefore, will be taken forward for the impact assessment.
Is in a water body with a history of harmful algae	Requires impact assessment	Impact assessment not required	No history of harmful algae is recorded.

Table 10: Water Quality - Use, Release or Disturbance of Chemicals Risk Information.

IF YOUR ACTIVITY USES OR RELEASES CHEMICALS (FOR EXAMPLE THROUGH SEDIMENT DISTURBANCE OR BUILDING WORKS) CONSIDER IF:	YES	NO	WATER QUALITY RISK ISSUE(S)
The chemicals are on the Environmental Quality Standards Directive (EQSD) list	Requires impact assessment	Impact assessment not required	The proposed activities do not include the direct discharge of any chemicals listed under the EQSD list. The only substance which may be released into the environment from AyM would be bentonite, used as a drilling mud. Bentonite is a non-toxic, inert, natural clay mineral (<63 µm particle diameter) and is not included on the EQSD list. It is included in the List of Notified Chemicals approved for use and discharge into the marine environment and is classified as a group E substance under the Offshore Chemical Notification Scheme (OCNS). Substances in group E are defined as the group least likely to cause environmental harm and are "readily biodegradable and s non-bioaccumulative". This is further supported by bentonite being included on the OSPAR List of Substances Used and Discharged Offshore which Are Considered to Pose Little or No Risk to the Environment (PLONOR) (OSPAR Commission, 2021). Therefore, no deterioration of the status of any sites designated under the Directive is anticipated from the release of bentonite.
It disturbs sediment with contaminants above Cefas Action Level 1	Requires impact assessment	Impact assessment not required	The project specific surveys confirmed that the composition and grain size present within the offshore ECC, within the North Wales coastal waterbody, is predominantly sand with limited gravel fractions. Based on the project specific surveys, all metals were below Cefas Guideline Action Level 1 within the sampling station in the North Wales coastal waterbody (and all other stations sampled in the offshore ECC). In addition, all the 2 to 6 ring polycyclic aromatic hydrocarbon (PAH) concentrations were below their respective effects range low (ERL) values. Therefore, it is considered unlikely that any sediments disturbed in the North Wales coastal waterbody would

IF YOUR ACTIVITY USES OR RELEASES CHEMICALS (FOR EXAMPLE THROUGH SEDIMENT DISTURBANCE OR BUILDING WORKS) CONSIDER IF:	YES	NO	WATER QUALITY RISK ISSUE(S)
			have contamination levels greater than Cefas Guideline Action Level 1.

Table 11: Water Quality – Mixing Zone Chemicals Risk Information.

IF YOUR ACTIVITY HAS A MIXING ZONE (LIKE A DISCHARGE PIPELINE OR OUTFALL) CONSIDER IF:	YES	NO	WATER QUALITY RISK ISSUE(S)
The chemicals released are on the Environmental Quality Standards Directive (EQSD) list	Requires impact assessment	Impact assessment not required	The geotechnical survey work will not have a discharge pipe or outfall, nor do they intend to release substances on the EQSD list. Therefore, the works will not have a mixing zone for these chemicals.

Table 12: WFD Protected Areas Risk Information.

CONSIDER IF YOUR ACTIVITY IS:	YES	NO	PROTECTED AREA RISK ISSUE(S)
Within 2 km of any WFD protected area	Requires impact assessment	Impact assessment not required	<p>The following WFD protected areas have been identified within the offshore Zol:</p> <p>National Site Network sites:</p> <ul style="list-style-type: none"> ▲ Dee Estuary/ Aber Dyfrdwy SAC; ▲ Y Fenni a Bae Conwy/ Menai Strait and Conwy Bay SAC; and Liverpool Bay / Bae Lerpwl (Wales) SPA. ▲ Bathing Waters: ▲ Abergele (Pensarn); ▲ Kinmel Bay (Sandy Cove); ▲ Rhyl; ▲ Rhyl East; ▲ Marine Lake, Rhyl; and ▲ Prestatyn <p>Sensitive Areas (under the Urban Waste Water Treatment Directive):</p> <ul style="list-style-type: none"> ▲ Rhyl Bathing Water.

Table 13: INNS Risk Information.

CONSIDER IF YOUR ACTIVITY COULD:	YES	NO	INNS RISK ISSUE(S)
Introduce or spread INNS	Requires impact assessment	Impact assessment not required	For the INNS considered in the North Wales coastal water body, it was concluded for all species assessed to either be "Not at risk" or "Probably not at risk". All surveying equipment will be cleaned prior to survey as to reduce the risk of introducing non-native species.

Table 14: Summary of WFD Scoping.

RECEPTOR	POTENTIAL RISK TO RECEPTOR?	NOTE THE RISK ISSUE(S) FOR IMPACT ASSESSMENT
Hydromorphology	No	N/A
Biology: habitats	Yes	Within the proximity of the offshore ECC, there are Mussel beds and <i>Sabellaria alveolata</i> (distance to offshore ECC approximately 400 m).
Biology: fish	No	N/A
Water quality	Yes	The North Wales coastal waterbody is currently (2021) classified as being of moderate phytoplankton status and, therefore, will be taken forward for the impact assessment.
Protected areas	Yes	<p>The following WFD protected areas have been identified within the offshore Zol:</p> <ul style="list-style-type: none"> ▲ National Site Network sites: <ul style="list-style-type: none"> ▪ Dee Estuary/ Aber Dyfrdwy SAC; ▪ Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC; and Liverpool Bay / Bae Lerpwl (Wales) SPA. ▲ Bathing Waters: <ul style="list-style-type: none"> ▪ Abergele (Pensarn); ▪ Kinmel Bay (Sandy Cove); ▪ Rhyl; ▪ Rhyl East; ▪ Marine Lake, Rhyl; and ▪ Prestatyn ▲ Sensitive Areas (under the Urban Waste Water Treatment Directive): Rhyl Bathing Water.
Invasive non-native species	No	N/A

6.3 Impact Assessment

48 The potential impacts to be taken forward for further assessment are:

- ▲ Biology (habitats);
- ▲ Water quality; and
- ▲ Protected areas.

6.3.1 Biology (habitats)

49 Within the proximity of the offshore ECC, there are Mussel beds and *Sabellaria alveolata* (distance to offshore ECC approximately 400 m).

50 Table 2 concludes that there would be no adverse significant effects on benthic receptors from habitat disturbance due to activities associated with the geotechnical surveys.

51 The subtidal benthic habitats identified within the AyM red line boundary and wider region, thus including the North Wales coastal waterbody, have been demonstrated to be both common and widespread within the Benthic Subtidal and Intertidal Ecology chapter of the ES that accompanied ORML2233 (document reference 6.2.5). With respect to the higher sensitivity habitats mussel beds and polychaete reef (*Sabellaria alveolata*), the discrete areas present are considered sufficiently spatially remote from survey activities to remain undisturbed and complete. Further, their exposure to naturally high sediment movement, for example during storms, infers an adaption to increased SSC and turbidity events of a level comparable or higher to those experienced during geotechnical survey works.

52 As such, there is not predicted to be a deterioration in the ecological status of the North Wales coastal waterbody. The proposed development is therefore considered to be compliant with the Directive's requirements and therefore would not result in a deterioration of the current status of the North Wales coastal waterbody.

6.3.2 Water quality

- 53 The AyM offshore ECC intersects the North Wales coastal waterbody and, therefore, a requirement exists to consider the potential for a deterioration in water quality (though an increase in suspended sediments, nutrients, oxygen or bacterial concentrations) within this waterbody. Specifically, this includes the potential to detrimentally effect the North Wales coastal waterbody moderate status for phytoplankton.
- 54 As described in the Marine Water and Sediment Quality chapter of the ES that accompanied ORML2233 (document reference 6.2.3), the levels of contamination in sediment samples at AyM is considered to be very low, both within the array and offshore ECC areas. The release of contaminants such as metals and PAHs is likely to be rapidly dispersed with the tidal currents; and increased bioavailability resulting in adverse ecotoxicological effects is not expected. Moreover, given the short-term nature of the works and presence of the sediment plumes, any small uplift in concentrations of EQS substances would be anticipated to return to background levels very quickly. Therefore, it is considered unlikely that the proposed survey works would contribute to a deterioration in any chemical parameters for the North Wales coastal waterbody.
- 55 The introduction of nutrients (mainly inorganic nitrogen) to the marine environment can result in phytoplankton blooms under the right conditions. These blooms can produce extremely toxic compounds that have harmful effects on fish, shellfish, mammals, birds and, potentially, humans. While it is predicted that sediments will be mobilised due to geotechnical survey activities, it is unlikely that this will result in significant nutrient uplift in the surrounding waters. Such inputs are typically associated with, for example, agricultural use of fertilisers and surface water runoff. The proposed works will largely be completed in open waters (high potential for dispersal/dilution), effects will be temporary and do not involve the planned release of nutrients. Therefore, it is considered unlikely that activities in the marine environment will result in phytoplankton blooms within the North Wales coastal waterbody (or any other connected waterbody).

- 56 It is noted that the biological parameter 'Phytoplankton' is currently (2021) at moderate status for the North Wales coastal waterbody. This suggests that algal biomass is substantially outside of the range associated with type-specific reference conditions and that persistent blooms may occur in summer months. Nevertheless, as noted above, it is considered unlikely that the proposed development will contribute to a significant change in phytoplankton composition and abundance, nor prevent this parameter from meeting future WFD objectives (i.e., to achieve good status).
- 57 There is not predicted to be a deterioration in the water quality of the North Wales coastal waterbody identified within the AyM Zol. Neither is there an expectation that the moderate phytoplankton status of the North Wales coastal waterbody will be compromised. The proposed development is therefore considered to be compliant with the Directive's requirements and would not result in a deterioration of the current status of these features.

6.3.3 WFD protected areas

- 58 The following WFD protected areas have been identified within the offshore Zol:
- ▲ National Site Network sites:
 - Dee Estuary/ Aber Dyfrdwy SAC;
 - Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay SAC; and Liverpool Bay / Bae Lerpwl (Wales) SPA.
 - ▲ Bathing Waters:
 - Abergele (Pensarn);
 - Kinmel Bay (Sandy Cove);
 - Rhyl;
 - Rhyl East;
 - Marine Lake, Rhyl; and
 - Prestatyn
 - ▲ Sensitive Areas (under the Urban Waste Water Treatment Directive):
 - Rhyl Bathing Water.

National Site Network sites

- 59 The identified protected areas have been subjected to the HRA process in section 4.3. The HRA screening concluded that it is not anticipated that there is any pathway for effect and therefore there is no potential for LSE at any sites.

Bathing Waters and Sensitive Areas

- 60 The following six designated Bathing Waters have been identified within in the AyM Zol:
- ▲ Abergele (Pensarn);
 - ▲ Kinmel Bay (Sandy Cove);
 - ▲ Rhyl;
 - ▲ Rhyl East;
 - ▲ Marine Lake, Rhyl; and
 - ▲ Prestatyn
- 61 In addition, the offshore ECC directly overlaps the Rhyl Bathing Water Sensitive Area (designated under the Urban Waste Water Treatment Directive) and, therefore, has been included as part of this assessment.
- 62 The limited width/ footprint of the plume feature means that specific locations (e.g., a Bathing Water monitoring point) will only be affected by an increase in SSC for the limited duration it takes for the plume to be advected past by the tide. It is recognised that increases in SSC have the potential to result in localised changes to bacterial abundance. However, the SSC plume will be highly transient and, therefore, the potential for changes in bacterial abundance (and thus impacts to Bathing Water classifications) is considered negligible. In addition, the predicted increases in SSC at the monitoring points are relatively modest and likely to be within natural variation, or conditions experienced during storms events.
- 63 It should also be noted that the timing of the surveys does not overlap with the bathing season (15 May to 30 September).

64 There is not predicted to be a deterioration in the water quality at the six designated Bathing Waters identified within the AyM Zol or Rhyl Bathing Water Sensitive Area. The proposed development is therefore considered to be compliant with the Directive's requirements and would not result in a deterioration of the current status of these protected areas.

Cumulative Effects

65 The scale of potential impacts within the North Wales coastal waterbody as a result of the proposed geotechnical surveys is small, temporary and localised. The potential for significant cumulative effects from the proposed development at AyM with other projects, plans and activities, specifically the existing export cables for offshore wind farms in the area, is considered unlikely to result in a deterioration in status of the North Wales coastal waterbody.

66 The preceding sections have identified that all effects will be highly localised and short term in nature and not result in significant impacts. The potential for the geotechnical surveys contributing in a cumulative manner is, therefore, highly remote and has not been considered further.

6.3.4 Summary

67 Overall, the proposed geotechnical surveys are considered to be compliant with the objectives of the Water Framework Directive and will not result in the deterioration in status of relevant WFD waterbodies, or associated protected areas, both alone and in-combination with other projects, plans and activities.

7 Summary

- 68 This document provides an overview of the geotechnical survey activities being applied for alongside environmental, HRA, and WFD considerations.
- 69 The geotechnical surveys applied for in this licence are smaller in scale by orders of magnitude to the full suite of works applied for in marine licence ORML2233. Furthermore, they are temporary and low risk and as such, it can be reasonably assumed that any effects will not be more than those assessed in the environmental statement (ES) chapters that accompanied the marine licence ORML2233 application.
- 70 It can be concluded that no significant impacts on any of the identified receptors will result from the geotechnical surveys described.



RWE Renewables UK Swindon Limited

Windmill Hill Business Park

Whitehill Way

Swindon

Wiltshire SN5 6PB

T +44 (0)8456 720 090

www.rwe.com

Registered office:

RWE Renewables UK Swindon Limited

Windmill Hill Business Park

Whitehill Way

Swindon