surveys proposed are provided in Section 4 of NIS Volume I: Supporting Information for Screening for Appropriate Assessment Report (Revised March 2026), and EIAR Volume II, Chapter 4: Description of Development (Revised March 2026). Those which are relevant to Increased SSCs and associated deposition are:

Geotechnical survey:

- Boreholes (131 samples);
- CPT (431 samples);
- Vibrocore/ gravity core (300 samples); and
- Grab samples (240 samples).

Metocean survey:

- Floating LiDAR (includes seabed anchor points);
- Acoustic Doppler Current Profiler (ADCP) (deployed on a seabed frame and includes mooring structure); and
- Wave buoy (includes seabed mooring).

Sediment dynamics survey:

- Benthic flume; and
- Benthic lander (ballasted structure which requires no mooring/ anchor).

Site preparation:

Site preparation activities prior to inter-array, interconnector, and offshore export cable installation to include sandwave clearance:

- For inter-array cables, sandwave clearance along a width of 70 m, to a depth of 10 m, along 30% of the inter-array cables length, a total volume of 1,000,000 m^3.
- For export cables, sandwave clearance along a width of 70 m, to a depth of 10 m, along 30% of the export cables length, a total volume of 500,000 m^3.
- For OSP interconnector, sandwave clearance along a width of 70 m, to a depth of 10 m, along 30% of the OSP interconnector length, a total volume of 500,000 m^3.

Potential impact	Phase C O D	Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
		• For scour protection, sandwave clearance along a diameter of 99 m, to a depth of 10 m, along 50%, a total volume of 1,000,000 m^3. • For OSP/WTG installation, sandwave clearance along a diameter of 100 m, to a depth of 5 m, at 20% of locations, a total volume of 117,600 m^3. Sandwave clearance has been modelled at representative locations across the Array Area and Cable Corridor and Working Area. Site preparation activities also include boulder clearance ploughing and picking of 100% of inter-array, export and interconnector cables at a width of 15 m and depth of 0.5 m, with a total seabed area of 2,850,000 m^2. Foundation installation: WTGs and OSPs installed on monopile foundations: • Drilled installation of 25 WTG piles 7-11 m in diameter at 0.2 – 1.0 m/h to full depth of 37 m. 1 concurrent drilling event with a drilling duration per pile of 88 hours and a total of approximately 176,000 m^3 of drill arisings. • Drilled installation of 2 OSP piles 7-14 m in diameter at 0.2 – 1.0 m/h to full depth of 45 m. 1 concurrent drilling event with a drilling duration per pile of 88 hours and total volume of approximately 27,720 m^3 of drill arisings. Modelled at representative locations across the Array Area. Potential refusal of monopiles during construction (where required). Volume of 4,474 m^3 per refusal and a total volume of 22,370 m^3 for a maximum of 5 refusals. Cable installation: Installation of inter-array, export and interconnector cables: • For inter-array cables, total length of 110 – 122 km with a seabed disturbance width of 15 m with a total area of 1,830,000 m^2 of seabed disturbance. • For export cable, total length of 35 - 40 km with a seabed disturbance width of 15 m with a total areas of 600,000 m^2 of seabed disturbance.	

- For interconnector, total length of 25-28 km with a seabed disturbance width of 15 m with a total area of 420,000 m^2 of seabed disturbance.

Modelled at representative locations across Array Area and Cable Corridor and Working Area

Operational and maintenance phase

Cable repair and maintenance:

Operational dredging of inter-array, export and interconnector cables:

- For inter-array cables, operational dredging of 300,000 m^3 every five years
- For export cable and interconnector cables, operational dredging of 100,00 m^3 every five years.
- These activities are anticipated to result in approximately 275,000 m^2 of temporary subtidal habitat loss or disturbance per maintenance campaign.

Inter-array, export and interconnector cable repair/reburial activities.

- For inter-array cables, repair and reburial of cables between 110 km and 122 km in length over the lifetime of the Proposed Development with disturbance of seabed material from 15 m wide and 1.5 m deep trench (cable repair and re-burial once every three years).
- For export cables, repair and reburial of cables between 30 km and 40 km in length over the lifetime of the Proposed Development with disturbance of seabed material from 15 m wide and 2.5 m deep trench (cable repair once every five years and cable re-burial once every five years).
- Interconnector cables: repair and reburial of cables of between 25 km and 28 km in length over the lifetime of the Proposed Development with disturbance of seabed material from 15 m wide and 10 m deep trench (cable repair and re-burial once every three years).

Jack-up Vessels:

Presence of jack-up vessels during operational and maintenance activities:

Potential impact	Phase C	Phase O	Phase D	Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
				• Disturbance of 613,200 m^2 of seabed from jack-up barge across construction period. **Decommissioning phase** Piles will be cut 2 m below the seabed and lifted. Scour protection, cables and cable protection would be left *in situ*.	
Accidental release of pollutants	✓	✓	✓	Project Design Option 1 **Construction Phase:** Foundation installation: • Installation of 53 WTGs and two OSPs within the Array Area. Cable installation: • Installation of inter-array cables between 110 – 122 km in length, OSP interconnector cables between 25 – 28 km in length, and offshore export cables between 35 – 40 km in length. Landfall: • Potential contamination of nearshore/intertidal habitats; Drilling mud (bentonite) used to facilitate the installation of offshore export cables via trenchless techniques i.e. HDD and Direct Pipe. Vessels: • 66 vessels on site at one time comprised of jack up barges, cargo, support, tug/anchor, cable installation, guard, survey, crew transfer, sandwave clearance and UXO clearance vessels. • 4,150 return trips across construction period and 1,797 return trips per year. • Construction schedule of 24 hours a day, 7 days a week for a period of four years. • 294 helicopter return trips over the construction phase and 118 helicopter return trips per year.	Within the construction phase Project Design Option 1 consists of a larger number of foundations to be installed – 55 monopile foundations in total (53 for WTGs and 2 for OSPs), whilst Project Design Option 2 comprises of 49 foundations in total (47 for WTGs and 2 for OSPs). Other potential causes for the accidental release of pollutants are present however are the same within both Project Design Options. Therefore, Project Design Option 1 will have a marginally higher potential for accidental pollution and is considered conservatively representative of Project Design Option 2. Within the operational and maintenance phase, Project Design Option 1 will have a marginally higher potential for accidental pollution due to larger number of WTGs and is therefore considered conservatively representative of Project Design Option 2. Within the Decommissioning Phase Project Design Option 1 will result in the deconstruction and removal of all 53 WTGs and two OSPs whilst Project Design Option 2 consists of the deconstruction and complete removal of all 47 WTGs and two OSPs. Other potential causes for

Potential impact	Phase C O D	Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
		Operational and maintenance phase Foundations: • Presence of 53 WTGs and two OSPs. • Maintenance activities of 53 WTGs and two OSPs. Vessels: • 30 vessels on site at one time comprised of crew transfer, jack-up, cable repair, service operations, cable survey and excavator vessels. • 1,359 return trips per year. • 485 helicopter return trips per year. **Decommissioning phase** Foundations: • Decommissioning of 53 WTGs and two OSPs Vessels: • Presen and movement of vessels during the decommissioning phase (NIS Volume III, Appendix 4.1: Rehabilitation Schedule).	the accidental release of pollutants are present however are the same within both Project Design Options. Therefore, Project Design Option 1 will have a marginally higher potential for accidental pollution and is therefore considered conservatively representative of Project Design Option 2.
		Project Design Option 2 **Construction phase** Foundation installation: • Installation of 47 WTGs and two OSPs within the Array Area. Cable installation:	

- Installation of inter-array cables between 110 – 122 km in length, OSP interconnector cables between 25 – 28 km in length, and offshore export cables between 35 – 40 km in length.

Vessels:

- A maximum of 66 vessels on site at one time comprised of jack up barges, cargo, support, tug/anchor, cable installation, guard, survey, crew transfer, sandwave clearance and UXO clearance vessels.
- 4,150 vessel return trips across construction period and 1,797 return trips per year.
- Construction schedule of 24 hours a day, 7 days a week for a period of four years.
- 294 helicopter return trips over the construction phase and 118 helicopter return trips per year.

Operational and maintenance phase

Foundations:

- Presence of 47 WTGs and two OSPs.
- Maintenance activities of 47 WTGs and two OSPs.

Vessels:

- A maximum of 30 vessels on site at one time comprised of crew transfer, jack-up, cable repair, service operations, cable survey and excavator vessels.
- 1,359 return trips per year.
- 485 helicopter return trips per year.

Decommissioning phase

Foundations:

Potential impact	Phase C O D	Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
		• Decommissioning of 47 WTGs and two OSPs. Vessels: • Presence and movement of vessels during the decommission phase (NIS Volume III, Appendix 4.1: Rehabilitation Schedule).	
Changes to physical processes	✓	**Operational and maintenance phase** Project Design Option 1 <u>Foundations:</u> • Presence of 53 WTGs with base diameter of 7-11m and individual seabed footprints of 38-96 m^2 per pile, equating to a total seabed footprint of 2,014-5,088 m^2. • Presence of two OSPs with base diameter of 7-14 m and individual seabed footprints of 38-154 m^2 per pile, equating to a total seabed footprint of 76-308 m^2. • For the WTG foundations, presence of 615-4,779 m^2 of scour protection (scour mattresses, rock dumping, artificial fronds, rock bags and/or geotextile sand containers) per pile, equating to a total seabed footprint of 32,595-253,287 m^2. The corresponding scour protection volume is 307-14,429 m^3 per WTG foundation, equating to a total volume of 16,271-764,737m^3. • For OSPs, presence of 615-7,543 m^2 of scour protection (scour mattresses, rock dumping, artificial fronds, rock bags and/or geotextile sand containers) per pile, equating to a total seabed footprint of 1,230-15,086 m^2. The corresponding scour protection volume is 307-22,629 m^3 per OSP, equating to a total volume of 614-45,258 m^3. • Scour protection material type may include scour mattresses, rock dumping, artificial fronds, rock bags and/or geotextile sand containers. <u>Cables:</u>	Within the construction phase Project Design Option 1 consists of a larger number of foundations to be installed – 55 monopile foundations in total (53 for WTGs and 2 for OSPs), whilst Project Design Option 2 comprises of 49 foundations in total (47 for WTGs and 2 for OSPs). Therefore, Project Design Option 1 is considered representative of Project Design Option 2 for assessing potential influences on habitat change in relation to tidal currents, wave climate, sediment transport and seabed morphology.

Potential impact	Phase C O D	Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
		• For inter-array cables, total cable protection footprint of 146,400 m^2 and volume of 219,600 m^3. • For export cables, total cable protection footprint of 64,000 m^2 and volume of 96,000 m^3. • For export cables, total of cable crossings required, with a total cable crossings footprint of 750-24,000 m^2 and volume of 375-60,000 m^3. • For interconnector cables, total cable protection footprint of 140,000 m^2 and volume of 252,000 m^3. Project Design Option 2 <u>Foundations:</u> • Presence of 47 WTGs with base diameters of 7-11m and individual seabed footprints of 38-96 m^2 per pile, equating to a total seabed footprint of 1,786-4,521 m^2. • Presence of two OSPs with base diameters of 7-14 m and individual seabed footprints of 38-154 m^2 per pile, equating to a total seabed footprint of 76-308 m^2. • For the WTG foundations, presence of 615-4,779 m^2 of scour protection (scour mattresses, rock dumping, artificial fronds, rock bags and/or geotextile sand containers) per pile, equating to a total seabed footprint of 28,905-224,613 m^2. The corresponding scour protection volume is 307-14,429 m^3 per WTG foundation, equating to a total volume of 14,429-678,163 m^3. • For OSPs, presence of 615-7,543 m^2 of scour protection (scour mattresses, rock dumping, artificial fronds, rock bags and/or geotextile sand containers) per pile, equating to a total seabed footprint of 1,230-15,086 m^2. The corresponding scour protection volume is 307-22,629 m^3 per OSP, equating to a total volume of 614-45,258 m^3. • Scour protection material type may include scour mattresses, rock dumping, artificial fronds, rock bags and/or geotextile sand containers.	

Potential impact	Phase C O D	Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
		Cables: • For inter-array cables, total cable protection footprint of 146,400 m^2 and volume of 219,600 m^3. • For export cables, total cable protection footprint of 64,000 m^2 and volume of 96,000 m^3. • For export cables, total of cable crossings required, with a total cable crossings footprint of 750-24,000 m^2 and volume of 375-60,000 m^3. • For interconnector cables, total cable protection footprint of 140,000 m^2 and volume of 252,000 m^3.	

6.2 Assessment of Proposed Development Alone for Annex I Coastal and Marine Habitat QIs

6.2.1 Overview and Supporting Information for the Assessment

6.2.1.1 Increases of suspended sediments and associated sediment deposition are predicted to occur during the construction and decommissioning phases as a result of confirmatory surveys (Table 6.3), installation/removal of the foundations, sand wave clearance activities and installation of inter-array, interconnector and offshore export cables. Increases of suspended sediments and associated sediment deposition are also predicted to occur during the operational and maintenance phase due to inter-array, interconnector and offshore export cable repair and reburial events.

6.2.1.2 Accidental pollution may occur during the construction, operational and maintenance, and decommissioning phases as a result of accidental spills or releases of chemicals or materials from vessels and associated activities.

6.2.1.3 Changes to physical processes (i.e. tidal currents, sediment transport processes and seabed morphology) may occur during the operational and maintenance phase due to the presence of windfarm infrastructure on the seabed.

6.2.1.4 NIS Volume I: Supporting Information for Screening for Appropriate Assessment (Revised March 2026) concluded that further specialist evaluation was required for seven SACs with Marine and Coastal Habitat QIs. This Stage 2 Appropriate Assessment therefore examines the impact pathways identified at screening in greater detail, informed by topic-specific assessments, numerical modelling where relevant, and consideration of factored-in measures.

6.2.1.5 In particular, sediment plume modelling has been used to assess the potential for habitat deterioration arising from increased suspended sediments and sediment deposition, while morphodynamic modelling has been used to assess the potential for habitat alteration arising from changes to hydrodynamics, wave climate, sediment transport and seabed morphology resulting from the presence of windfarm infrastructure.

6.2.1.6 This further assessment is required in relation to Wicklow Reef SAC, Magherabeg Dunes SAC, Buckroney-Brittas Dunes and Fen SAC, Kilpatrick Sandhills SAC, The Murrough Wetlands SAC, Cahore Polder and Dunes SAC or Blackwater Bank SAC as potential for LSE could not be ruled out at the screening stage.

Coastal Processes Numerical Modelling

OVERVIEW

6.2.1.7 This section is intended to provide an overview of the coastal processes modelling that has been conducted to inform various assessments related to suspended sediment and deposition and changes to coastal processes from the presence of infrastructure. This modelling is summarised here as it has been used to understand potential impacts to the Annex I Coastal and Marine Habitats. The full details including model calibration, methodology and output can be found in detail in the following documents:

- NIS Volume III, Appendix 6.1: Marine Physical Processes Numerical Modelling (Revised March 2026):
    - For the methodology applied to assess the characteristics of sediment plumes and associated changes in bed level from settling of material, including details of model set-up and calibration.
- NIS Volume III: Arklow Bank Sediment Mobility Assessment (RFI March 2026) (Deltares, 2025):

  - For details of the morphodynamic numerical modelling (including model set-up and calibration, as well as and baseline (do-nothing) assessments of sediment mobility) carried out in response to RFI (7e(i)).

- NIS Volume III: Arklow Bank - Quantitative Assessment of the Influence of In-place Infrastructure on the Local Sediment Transport System (RFI March 2026) (Deltares, 2026):
  - For the results of morphodynamic numerical modelling applied to assess the potential changes to the hydrodynamic and sediment transport regime and morphology associated with the Proposed Development.
- EIAR Volume II, Chapter 6: Coastal Processes (Revised March 2026):
  - For full presentation of an assessment of sediment plumes and associated changes in bed level, including results, modelling approach, and conceptual understanding, as well as an assessment of potential changes to the hydrodynamic and sediment transport regime and morphology associated with the Proposed Development.

SEDIMENT PLUME MODELLING

6.2.1.8 Proposed Development construction activities will result in the disturbance of sediments and the consequential release into the water column. In turn, this will give rise to suspended sediment plumes and localised changes in bed levels as the material settles out of suspension. Those construction activities that will result in the greatest seabed sediment disturbance, due to the associated temporal scale, spatial scale and sediment volumes are presented in Table 6.3. These activities are:

- Sandwave clearance for WTG foundations and along the Cable Corridor and Working Area including spoil disposal via a Trailing Suction Hopper Dredger (TSHD);
- Pre-lay cable trenching using Controlled Flow Excavation (CFE) tools at the seabed for cable installation within the Array Area and along the Cable Corridor and Working Area;
- Foundation installation using drilling techniques; and
- Drilling fluid release during HDD, or other trenchless technique, operations.

6.2.1.9 Where monitoring results are available from comparable activities in similar conditions, these have been provided as part of the assessment. As outlined in NIS Volume III, Appendix 6.1: Marine Physical Processes Numerical Modelling (Revised March 2026), this has been supplemented by a suite of project specific numerical modelling simulations with the release events simulated within the numerical model specifically designed to capture the full range of realistic precautionary outcomes in terms of:

- Sediment plume concentrations;
- Sediment plume extent;
- Vertical deposition depth (bed level change); and
- Horizontal extent of deposition (spatial extent (area) of bed level change).

6.2.1.10 The methodology used to characterise sediment plumes and associated bed level changes is described in detail in (NIS Volume III, Appendix 6.1: Marine Physical Processes Numerical Modelling (Revised March 2026)), including the sediment types and source terms modelled for each scenario, supported by site-specific particle size analysis grab-sample results (NIS Volume III, Appendix 9.2: Aquafact Benthic Survey Report 2025 (RFI March 2026)). Detailed information on model set-up, baseline conditions and full model outputs is provided in the modelling report; this section presents a summary of the key results relevant to assessment of Annex I Coastal and Marine Habitats. Further details of the modelling approach adopted are presented in paragraph 6.10.1.6 to paragraph 6.10.1.7 of EIAR Volume II, Chapter 6: Coastal Processes (Revised March 2026).

6.2.1.11 In the following sections, modelling outputs showing sediment plumes and associated deposition with the largest magnitude and spatial extent in relation to the SACs considered for Annex I Coastal and Marine Habitats have been presented in this NIS. These figures illustrate the potential resulting sediment plume and associated deposition in proximity to the relevant SACs. For visualisations of all modelling outputs, the reader is referred to Section 6.10.1 of EIAR Volume II, Chapter 6: Coastal Processes. These results should be considered in the context of ambient background turbidity occurring across the Study Area, as described in Table 6.9 of Volume II, Chapter 6: Coastal Processes. Average values of near-bed turbidity have been identified from acoustic backscatter data and provide a reference point of baseline average (31.7 mg/l) and maximum (74.6 mg/l) near-bed turbidity, which is presented for context in the legend of the relevant visualisations.

SANDWAVE CLEARANCE INCLUDING SPOIL DISPOSAL VIA A TRAILER SUCTION HOPPER DREDGER IN THE ARRAY AREA

6.2.1.12 The sediment volume likely to be removed for seabed levelling within the Array Area (excluding export cables) is up to 2,639,200 m^3 over the entire construction period and is to be excavated using a TSHD with an assumed hopper volume of 20,000 m^3. Whilst the hopper is being filled, overspill is likely to develop a near-surface sediment plume composed primarily of fine sediments. Once each hopper is filled, dredged material (spoil) will be returned to the seabed at a specified disposal site (in accordance with any future Dumping at Sea permit and associated licence conditions) as a relatively sudden release from under the vessel. Five discrete disposal sites have been identified within the boundary of the Array Area (the locations of which are shown in Figure 6.1 of EIAR Volume II, Chapter 6: Coastal Processes (Revised March 2026)).

6.2.1.13 Numerical modelling simulated both overspill during excavation and spoil disposal at representative disposal locations in the central Array Area (Zones 3 and 4) and southeast Array Area (Zone 2). Sediment was released at the water surface during overspill and at approximately 10 m below the surface during disposal. Figures 6.15 to 6.20 of EIAR Volume II, Chapter 6: Coastal Processes (Revised March 2026) present the modelling simulations described below for Zone3, Zone 4 and Zone 2 disposal sites.

6.2.1.14 Modelling of suspended sediment associated with sandwave clearance in the Array Area show that, for one dredging cycle, within the first five hours of sandwave clearance[1], limited concentrations of fine sediment are observed within 5 km of seabed works. These concentrations are generally below 5 mg/l and disperse within a matter of hours.

6.2.1.15 Disposal of the TSHD load at the disposal points in the centre of the Array Area (Zone 3 and Zone 4) initially result in the formation of a plume with maximum concentrations of the order of 2,500 mg/l. The elevated SSC forms a narrow plume extending from the point of disposal, generally between 250 m and 500 m in width (although this can reach up to 1.5 km in certain scenarios) and extending up to 8.5km away. As the plume is advected along the tidal axis, it is simultaneously dispersed, which causes the SSC levels to decrease. Rapid dispersion is evident such that within five hours the concentrations in the plume are below 100 mg/l. Elevated SSC above 1 mg/l (which is considered functionally immeasurable) is not predicted after 15 hours following the initial sandwave clearance. Under all tidal flow simulations (speeds and direction), elevated SSC (i.e. above background concentration) are not shown to disperse outside of the Cable Corridor and Working Area that surrounds the Array Area.

[1] For a release during high current speeds. During lower current speeds, the plumes' SSC remain of similar orders of magnitude, but its extent is reduced as would be expected due to the reduced dispersive energy of the tidal regime.

6.2.1.16 For the results from the Zone 2 disposal site, where 50 successive dredging cycles have been modelled, plumes are formed and then disperse with each dredging cycle. Depending on the tidal state, successive plumes may persist for longer periods of time, resulting in localised additive effects, however these will be short-term and expected to disperse within several tidal cycles of the cessation of works. Maximum concentrations of 5,000 mg/l are observed within 1.5 km of the activities, reducing to low hundreds of mg/l within approximately 2 km of the works. Measurable elevated SSC (i.e. above 1 mg/l) is not shown to disperse beyond 9 km from the disposal site, and all measurable SSC is shown to have fully dispersed approximately five days after the conclusion of the works. These results should be considered in the context of ambient background turbidity as outlined in paragraph 6.2.1.11, with baseline average (31.7 mg/l) and maximum (74.6 mg/l) values of near-bed turbidity

6.2.1.17 Modelling of sediment deposition associated with sandwave clearance within the Array Area indicates that current speed strongly influences the spatial extent and thickness of deposited material. Under higher current speeds, deposition is characterised by a greater spatial extent and lower thickness, whereas under lower current speeds deposition is more spatially limited but thicker. This pattern is more pronounced at the Zone 4 disposal site than at Zone 3. Deposition aligns with the predominantly north–south tidal flow axis within the Array Area.

6.2.1.18 Sediment deposition is greatest in the immediate vicinity of the works, with thicknesses generally between 50 mm and 150 mm, and locally exceeding 200 mm, within approximately 1 km of the installation activities for the Zone 3 and Zone 4 disposal sites. Beyond this distance, deposited thicknesses reduce rapidly to below 35 mm within several kilometres and continue to decrease with distance, such that between approximately 1.5 km (low current scenarios) and 5 km (high current scenarios) from the source, deposition is typically of the order of 1–2.5 mm. Beyond these distances, deposited thicknesses are negligible (<1 mm) under both scenarios.

PRE-LAY INTER-ARRAY CABLE TRENCHING AT THE SEABED

6.2.1.19 Of the pre-lay cable trenching techniques considered for the Proposed Development, the use of CFE tools has been numerically assessed, as they have the greatest potential to disturb and suspend seabed sediment, and therefore represent the most precautionary scenario. Results are presented below for inter-array cable trenching operations at the north and south of the Array Area.

6.2.1.20 As outlined in Table 6.3, CFE trenching would excavate a trench approximately 15 m wide and 1.5 m deep, resulting in a total seabed sediment disturbance area of approximately 1,830,000 m². Trenching is undertaken between foundations, with temporary cessation of works between sections to facilitate cable termination and installation activities. Where weather conditions allow, trenching interruptions of up to approximately 24 hours are anticipated.

6.2.1.21 The temporary (24 hours) break in the trenching activity will allow suspended material to be dispersed/deposited in the absence of seabed disturbance activities. The trenched sediment volume will be forced into suspension to a height of around 3 m above the seabed with the finer material settling within several meters of the trench. Displaced material will not be removed from the sedimentary system, and these small-scale changes in bed levels are likely to be quickly redistributed by the energetic hydrodynamic processes present within the Array Area.

6.2.1.22 Numerical modelling results for CFE operations at the north and south of the Array Area indicate that maximum SSCs occur within the immediate vicinity of the activity, with SSC exceeding 2,000 mg/l within 1 km of the activity in the north of the Array Area. Due to rectilinear tidal flows, elevated SSCs form a narrow plume aligned with the tidal axis. Under high northerly and high southerly current scenarios, SSCs of less than 2.5 mg/l extend up to approximately 17 km north and 9 km south of the trenching activities, respectively. In the south of the Array Area, peak SSCs are lower, generally not exceeding 1,500 mg/l close to the works, and elevated SSCs are not predicted to extend beyond approximately 4 km from the trenching location. These results should be

considered in the context of ambient background turbidity as outlined in paragraph 6.2.1.11, with baseline average (31.7 mg/l) and maximum (74.6 mg/l) values of near-bed turbidity.

6.2.1.23 Numerical modelling results for CFE operations in the north and south of the Array Area indicate that sediment is deposited within the SSC's plume. In the north of the Array Area, maximum deposition occurs close to the trenching activities, reaching up to approximately 100 mm. Under high northerly and high southerly current scenarios, deposition is predicted to extend up to approximately 18 km and 10 km, respectively, with thicknesses reducing to ≤2.5 mm at these distances. In the south of the Array Area, maximum deposition thicknesses are higher, reaching up to approximately 215 mm, however it is worth noting that deposition is not predicted to occur beyond approximately 3 km from the trenching activities. Maximum deposition is associated with lower current speed scenarios, where sediment settles more rapidly. Deposited material is expected to be continually reworked through tidal and wave-driven re-suspension and redistribution.

6.2.1.24 See Figure 6.2 and Figure 6.3 for the results of numerical modelling simulations of SSCs and associated sediment deposition undertaken for inter-array cable trenching operations in the north of the Array Area, and for the resulting sediment plume extent in relation to the SACs screened in for Annex I Coastal and Marine Habitats. The results for inter-array cable trenching operations in the south of the Array Area are presented in EIAR Volume II, Chapter 6: Coastal Processes (Revised March 2026).

FOUNDATION INSTALLATION USING DRILLING TECHNIQUES

6.2.1.25 Numerical modelling (NIS Volume III, Appendix 6.1: Marine Physical Processes Numerical Modelling (Revised March 2026)) has simulated drilling at two representative locations; at a WTG location on the western side of Arklow Bank and the southern OSP. The release of drill arisings is simulated to persist for 88 hours (at the WTG), followed by a 12 hour pause, followed by another 88-hour period of drilling (at the southern OSP). The location of the two releases is such that, due to the orientation of the tidal axis and the absence of wave influence, there is opportunity for the disturbed sediment to be additive. These timings have been developed based on expert judgment of comparative works, informed by active engagement with the industry and consultation with subject matter experts.

6.2.1.26 Modelling of SSCs indicates that SSC increase with drilling duration, with greater spatial extents predicted under higher current speeds. In all scenarios, elevated SSC remain confined within the Zone of Influence (ZoI). Peak SSC occur towards the end of drilling at each location, with higher concentrations associated with OSP drilling due to greater volumes of drill arisings (5,280 m³ (Project Design Option 1) and 7,040 m³ (Project Design Option 2) for WTG foundations, compared to 13,860 m³ for the OSP).

6.2.1.27 Under high ebb (southerly) current conditions, following completion of WTG drilling (88 hours), peak SSC of approximately 25 mg/l are predicted within the plume centre, with concentrations dissipating prior to commencement of OSP drilling. During OSP drilling, SSC exceeding 100 mg/l are confined to the immediate vicinity of the activity and reduce to <25 mg/l beyond the drilling location. Along the tidal axis, SSC <25 mg/l extend up to approximately 18 km to the north in a narrow plume (<1 km wide) and up to approximately 6 km to the south.

6.2.1.28 Twelve hours following completion of OSP drilling, SSC up to approximately 2.5 mg/l are predicted up to approximately 7 km south of the Array Area, with maximum concentrations of approximately 10 mg/l confined to within several hundred metres of the works. Approximately two days following completion, no measurable elevated SSC is observed. Under low current conditions, SSC magnitudes are similar, with a greater areal extent of ~2.5 mg/l elevations, remaining within the ZoI. These results should be considered in the context of ambient background turbidity as outlined in paragraph 6.2.1.11, with baseline average (31.7 mg/l) and maximum (74.6 mg/l) values of near-bed turbidity.

6.2.1.29 The depth and spatial extent of sediment deposition increase over the course of foundation installation activities, with deposition controlled by tidal currents and occurring within the ZoI. Deposited material is expected to be subject to ongoing tidal- and wave-driven reworking in the energetic conditions present at the site. Deposition is greatest under lower (flood; northerly) tidal current conditions, and results from these scenarios are therefore considered representative of the maximum deposition case.

6.2.1.30 Twelve hours following completion of WTG drilling, sediment deposition exceeding approximately 15 mm is predicted immediately adjacent to the foundation, with a narrow (<0.25 km wide) depositional footprint extending up to approximately 12 km along the tidal axis. Following commencement and completion of OSP drilling, a second depositional area develops, again concentrated in the immediate vicinity of the works, with maximum deposition depths of approximately 15 mm predicted following completion of OSP installation.

6.2.1.31 See Figure 6.4 and Figure 6.5 for the numerical modelling simulations of SSCs and associated sediment deposition undertaken for foundation installation using drilling techniques, and for the resulting sediment plume extent in relation to the SACs screened in for Annex I Coastal and Marine Habitats.

SANDWAVE CLEARANCE INCLUDING SPOIL DISPOSAL VIA A TRAILER SUCTION HOPPER DREDGER IN THE CABLE CORRIDOR AND WORKING AREA

6.2.1.32 Sandwaves may be cleared along a corridor of 70 m in width (for each cable) with 10 m depth of material being relocated. This may occur across 30% (12 km) of the total export cable length (maximum 40 km), resulting in, circa, 500,000 m^3 to be excavated using a TSHD with an assumed hopper volume of 20,000 m^3. The behaviour of the sediment upon collection and as spoil is presented in paragraph 6.2.1.12.

6.2.1.33 Numerical modelling has simulated the filling of a TSHD hopper load, in addition to overspill, followed by discharged at a spoil disposal site (as set out in NIS Volume III, Appendix 6.1: Marine Physical Processes Numerical Modelling (Revised March 2026)). Results are presented for disposal at Zone 5 (Figure 6.6 and Figure 6.7) in order to identify potential impacts to the nearby Wicklow Reef SAC.

6.2.1.34 Disposal of the TSHD load at the Zone 5 disposal site initially results in the formation of a thin (less than 0.2 km wide) plume within 11 km of the seabed works, with maximum concentrations of the order of 2,000 mg/l immediately adjacent to the TSHD location. As this plume is advected by the tidal currents along the tidal axis, it is also dispersed such that the SSC levels reduce with increasing distance from the release location. Measurable elevated SSC (above 1 mg/l) is not predicted after five hours following the disposal, and are not shown to disperse beyond 8 km from the Cable Corridor and Working Area. These results should be considered in the context of ambient background turbidity as outlined in paragraph 6.2.1.11, with baseline average (31.7 mg/l) and maximum (74.6 mg/l) values of near-bed turbidity.

6.2.1.35 Sediment deposition is shown when under higher current speeds because the resultant deposition is shown to have a greater areal extent and lower thickness than under lower current speeds when the resultant deposition is shown to have a lesser areal extent and relatively larger thickness. The deposition location aligns with the axis of tidal flow, which are relatively linear to the north and south of Arklow Bank. Sediment deposition is greatest in the vicinity of the disturbance activity, with thicknesses up to 250 mm occurring within 1 km. Beyond this, the thickness of deposited sediment rapidly reduces such that at 10 km from the active disturbance, the deposited thickness is of the order of 2.5 mm. Beyond this, the thickness of deposited sediment becomes immeasurable. In reality, deposited sediment will become re-worked and entrained back into the sediment transport system under the actions of both tides and waves.

6.2.1.36 Figure 6.6 and Figure 6.7 illustrates the results of numerical modelling simulations of SSCs and associated sediment deposition undertaken for seabed preparation for foundation installation and associated spoil disposal at the Zone 5 disposal site, and for the resulting sediment plume extent in relation to the SACs screened in for Annex I Coastal and Marine Habitats.

PRE-LAY CABLE TRENCHING AT THE SEABED IN THE CABLE CORRIDOR AND WORKING AREA

6.2.1.37 Of the different pre-lay cable trenching techniques considered by the Developer, for which more information is presented in Section 4 of NIS Volume I: Supporting Information for Screening for Appropriate Assessment Report (Revised March 2026), and EIAR Volume II, Chapter 4: Description of Development (Revised March 2026), the use of CFE has been numerically assessed here as it provides the potential for seabed sediment to be disturbed to the greatest extent into the water column . As presented in Table 6.3, this process would be used to excavate a trench with a width at the seabed of 15 m and a depth of 2.5 m and represents a maximum total seabed area of disturbance of 600,000 m^2. Results are presented for operations within both the northern and southern extents of Cable Corridor and Working Area.

6.2.1.38 For the purposes of the northern scenarios modelled for this assessment, the tool is simulated to be moving along a 2 km section of the cable route, approximately 5.2 km offshore. The tool moves at a rate of 50 m per hour, such that trenching activities are continuous for 40 hours and the material is released 3 m above the bed. For the purpose of the southern scenario modelled for this assessment, the tool is simulated to be moving along a 2.2 km section of the cable route, before travelling to the site of the exit pit (taking approximately 10 minutes). Then a further excavation occurs for 400 m from the centre of the exit pit for a period of 60 minutes. The material is released at 3 m above the seabed. These timings have been developed based on expert judgment of comparative works, informed by active engagement with the industry and consultation with subject matter experts.

6.2.1.39 Full details of the assumptions and parameters used in the modelling scenarios are provided in NIS Volume III, Appendix 6.1: Marine Physical Processes Numerical Modelling (Revised March 2026).

6.2.1.40 Figure 6.8 and Figure 6.9 show SSC and deposited sediment for CFE trenching operations in the northern part of the Cable Corridor and Working Areas, and Figure 6.10 and Figure 6.11 show the numerical modelling outputs of SSC and associated deposition for CFE trenching operations in the southern part of the Cable Corridor and Working Areas.

6.2.1.41 Numerical modelling results for CFE trenching operations at the north and south of the Cable Corridor and Working Areas indicate that the spatial distribution of elevated SSC is greater under higher tidal currents, whereas lower tidal current speeds result in plumes with a smaller area but higher concentrations in the plumes' centre. The greatest increase in SSC is observed immediately adjacent to the active works, with levels circa 1,500 mg/l although reaching up to 2,500 mg/l in some areas. Concentrations are higher at the northern location, with maximum concentrations at the southern scenario not exceeding 1,500 mg/l. Levels above background (2.5 mg/l) are observed up to 10 km from the point of disturbance for the northern scenario, and 14 km at the southern scenario. In the south, the reversal of the tide can also be observed, with linear plumes extending both northeast and southwest of the modelled cable route. Following completion of the active seabed disturbance, the elevated SSC rapidly reduces such that levels are comparative to background concentrations. These results should be considered in the context of ambient background turbidity as outlined in paragraph 6.2.1.11, with baseline average (31.7 mg/l) and maximum (74.6 mg/l) values of near-bed turbidity.

6.2.1.42 Sediment deposition is shown when under higher current speeds because the resultant deposition is shown to have a greater areal extent and lower thickness than under lower current speeds when the resultant deposition is shown to have a lesser areal extent and relatively larger thickness. The deposition location aligns with the axis of tidal flow, which are relatively linear to

the north and south of Arklow Bank. Sediment deposition is greatest in the vicinity of the disturbance activity, with thicknesses up to 150 mm (for the southern scenario) and 100 mm (for the northern scenario) occurring within 1 km. Beyond this, the thickness of deposited sediment rapidly reduces such that less than 2 km from the active disturbance, the deposited thickness is less than 2.5 mm for both scenarios. Beyond 2 km away, the thickness of deposited sediment becomes immeasurable. In reality, deposited sediment will become re-worked and entrained back into the sediment transport system under the action of both tides and waves.

6.2.1.43 Offshore export cable installation closer to the coastline may potentially lead to a small amount of localised sedimentation on the foot of the dunes at the Magherabeg Dunes and Buckroney-Brittas Dunes and Fen SACs (see Figure 6.9). In the event that any sediment is deposited here, the sediment deposited would be native to the site and would be neutral to beneficial in the accretive behaviour of the dune systems.

DRILLING FLUID RELEASE DURING HDD, OR OTHER TRENCHLESS TECHNIQUE, OPERATIONS

6.2.1.44 The subsea export cable ducts will be installed underneath the beach using trenchless installation techniques as detailed in NIS Volume I: Supporting Information for Screening for Appropriate Assessment Report (Revised March 2026) and outlined in Table 6.3. The drilling activity utilises a viscous drilling fluid which consists of a mixture of water and bentonite, a non-toxic, naturally occurring clay mineral. The release of drilling fluid and drill cuttings from trenchless techniques will result in a plume of elevated SSC. The drilling fluid has an overall density and viscosity similar to seawater and so is anticipated to behave in a similar manner.

6.2.1.45 Numerical modelling has been used to simulate the release of bentonite over a 4.5 day period during HDD operations which are considered representative of other trenchless operations. Further detail is provided in NIS Volume III, Appendix 6.1: Marine Physical Processes Numerical Modelling (Revised March 2026).

6.2.1.46 The modelling results demonstrate that elevated SSC will be of localised extent and temporary duration, with maximum concentrations of 50 mg/l occurring only at the location of the punch-out HDD exit pit and during the installation works. Rapid dispersion by tides and waves will result in the immediate dispersion and dilution of these concentrations. SSC is advected along the coast along the tidal axis to distances of up to 4 km, although concentrations at this distance are limited to below 25 mg/l. Of note is that dispersion to the south, following a release during a high spring southerly current is, approximately, 1 km less than under the equivalent northerly release (see Figure 6.34 of EIAR Volume II, Chapter 6: Coastal Processes (Revised March 2026)). Away from the Landfall HDD activities and outside the Cable Corridor and Working Area, but within the ZoI, SSC levels are shown to be no greater than 2.5 mg/l. These results should be considered in the context of ambient background turbidity as outlined in paragraph 6.2.1.11, with baseline average (31.7 mg/l) and maximum (74.6 mg/l) values of near-bed turbidity. While these values are based on data from more offshore areas, turbidity is generally higher close to the coast than offshore due to shallower water depths and terrestrial input, and these values are therefore able to demonstrate a precautionary baseline.

6.2.1.47 Sediment deposition following cessation of HDD activities is shown in Figure 6.35 of EIAR Volume II, Chapter 6: Coastal Processes (Revised March 2026). Deposition that is measurable in practice occurs within the immediate proximity of the Landfall works, remaining within the Cable Corridor and Working Area. Maximum deposition occurs during the activity as a result of the active release of the bentonite. Following cessation of the works, any deposited sediment will be re-worked by the tide and wave regimes, reducing its area and depth. Here, 6.5 days following the commencement of installation works, a maximum deposition of 7.5 mm is predicted within a coastal extent of 0.3 km within the Cable Corridor and Working Area (Figure 6.35 of EIAR Volume II, Chapter 6: Coastal Processes (Revised March 2026)). A similar pattern of deposition is predicted for releases during a northerly and southerly tidal flow. Deposition predicted for releases

during high tidal flows, for both northerly and southerly flow, indicates a wider spread of deposition than during the low tidal flows. This is to be expected due to the higher (faster) currents distributing sediment over a wider area. The directionality of the tidal flows is such that any deposited sediment is not transported, and ultimately deposited, in the offshore environment and remains close to the coast.

6.2.1.48 In summary therefore, any measurable increases in SSC and deposition are relatively small-scale, highly localised and are expected to be rapidly redistributed by wave and tidal action.

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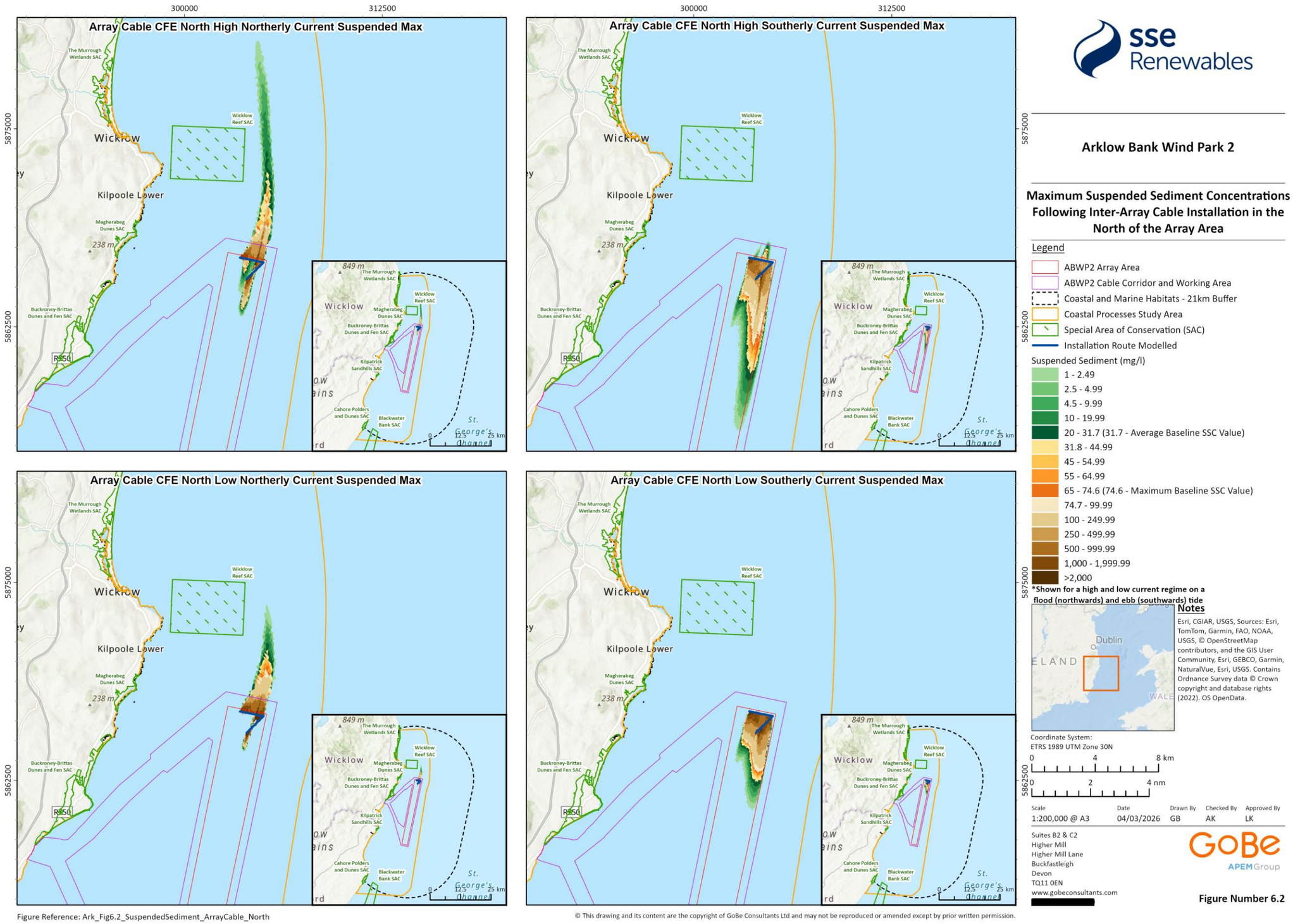

Arklow Bank Wind Park 2

Maximum Suspended Sediment Concentrations Following Inter-Array Cable Installation in the North of the Array Area

Legend

- ABWP2 Array Area
- ABWP2 Cable Corridor and Working Area
- Coastal and Marine Habitats - 21km Buffer
- Coastal Processes Study Area
- Special Area of Conservation (SAC)
- Installation Route Modelled

Suspended Sediment (mg/l)

- 1 - 2.49
- 2.5 - 4.99
- 4.5 - 9.99
- 10 - 19.99
- 20 - 31.7 (31.7 - Average Baseline SSC Value)
- 31.8 - 44.99
- 45 - 54.99
- 55 - 64.99
- 65 - 74.6 (74.6 - Maximum Baseline SSC Value)
- 74.7 - 99.99
- 100 - 249.99
- 250 - 499.99
- 500 - 999.99
- 1,000 - 1,999.99
- >2,000

*Shown for a high and low current regime on a flood (northwards) and ebb (southwards) tide

Notes

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Coordinate System:
ETRS 1989 UTM Zone 30N

0 4 8 km
0 2 4 nm

Scale	Date	Drawn By	Checked By	Approved By
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Figure Number 6.2

Figure Reference: Ark_Fig6.2_SuspendedSediment_ArrayCable_North

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Figure 6.2: Maximum[2] suspended sediment following inter-array cable installation in the north of the Array Area. Shown for a high and low current regime on a flood (northwards) and ebb (southwards) tide.

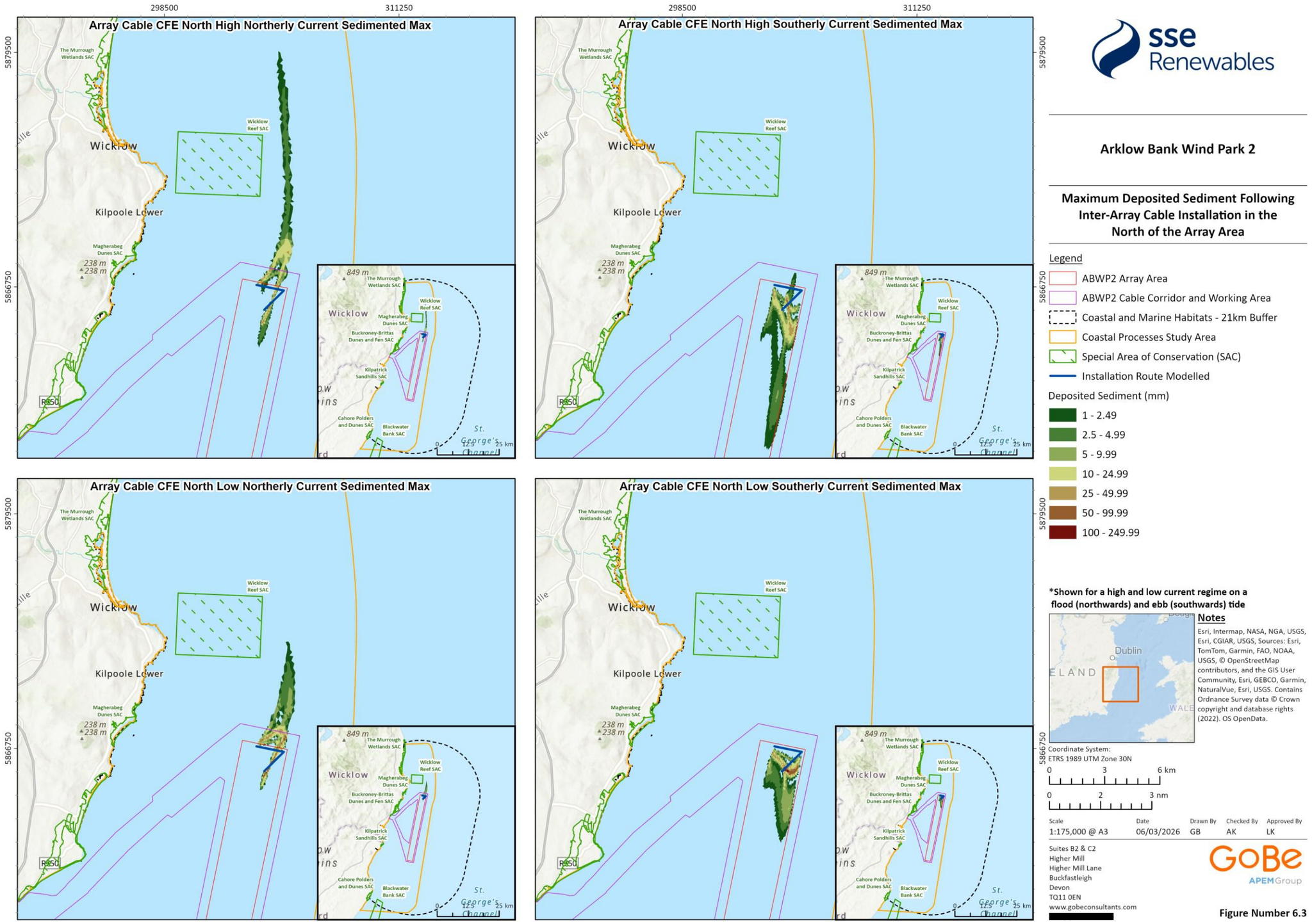

Figure Reference: Ark_Fig6.3_DepositedSediment_ArrayCable_North

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Figure 6.3: Maximum[3] deposited sediment following inter-array cable installation in the north of the Array Area. Shown for a high and low current regime on a flood (northwards) and ebb (southwards) tide.

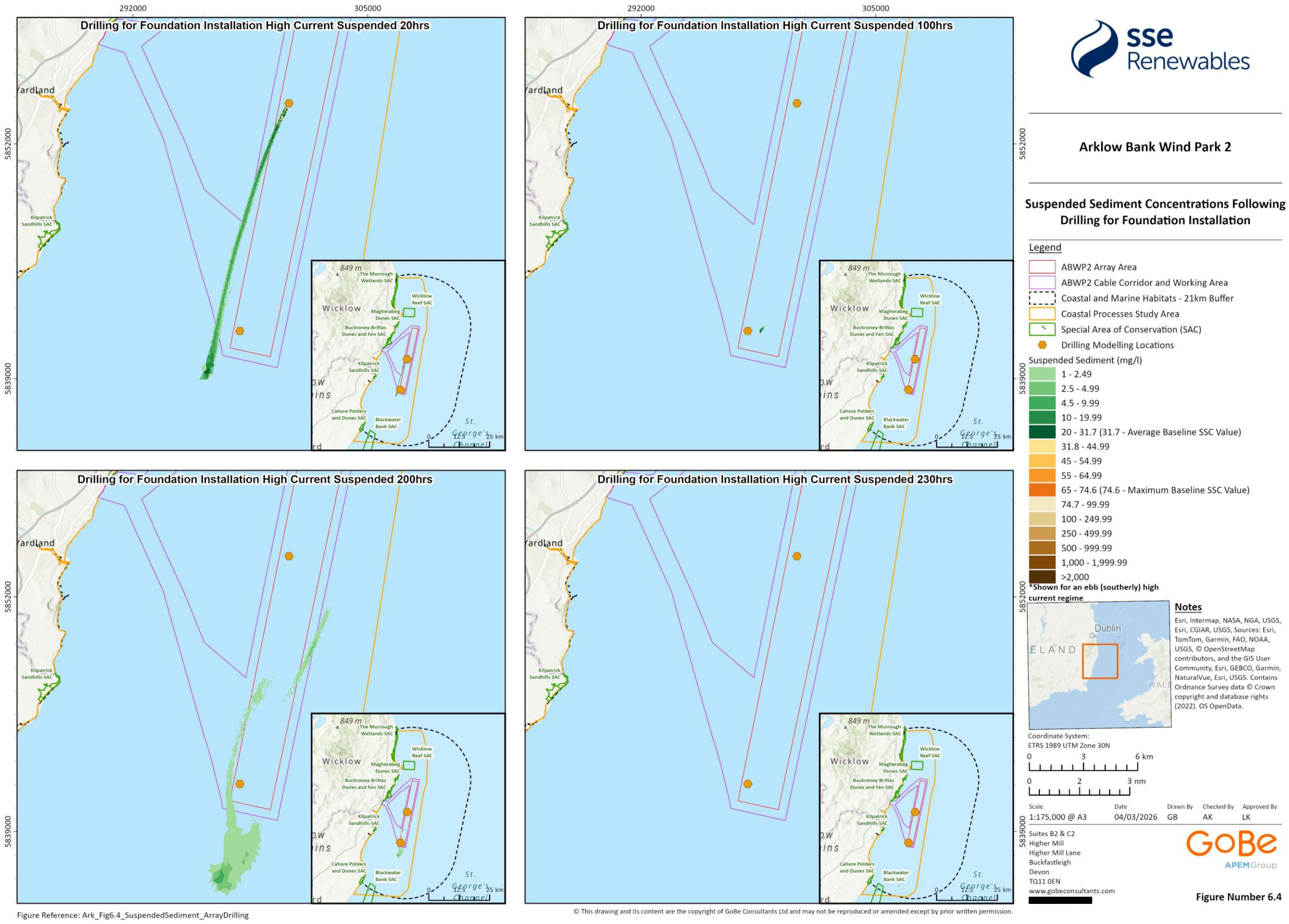

Figure Reference: Ark_Fig6.4_SuspendedSediment_ArrayDrilling

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Figure 6.4: Suspended sediment concentrations following drilling for foundation installation. Shown for an ebb (southerly) high current regime.

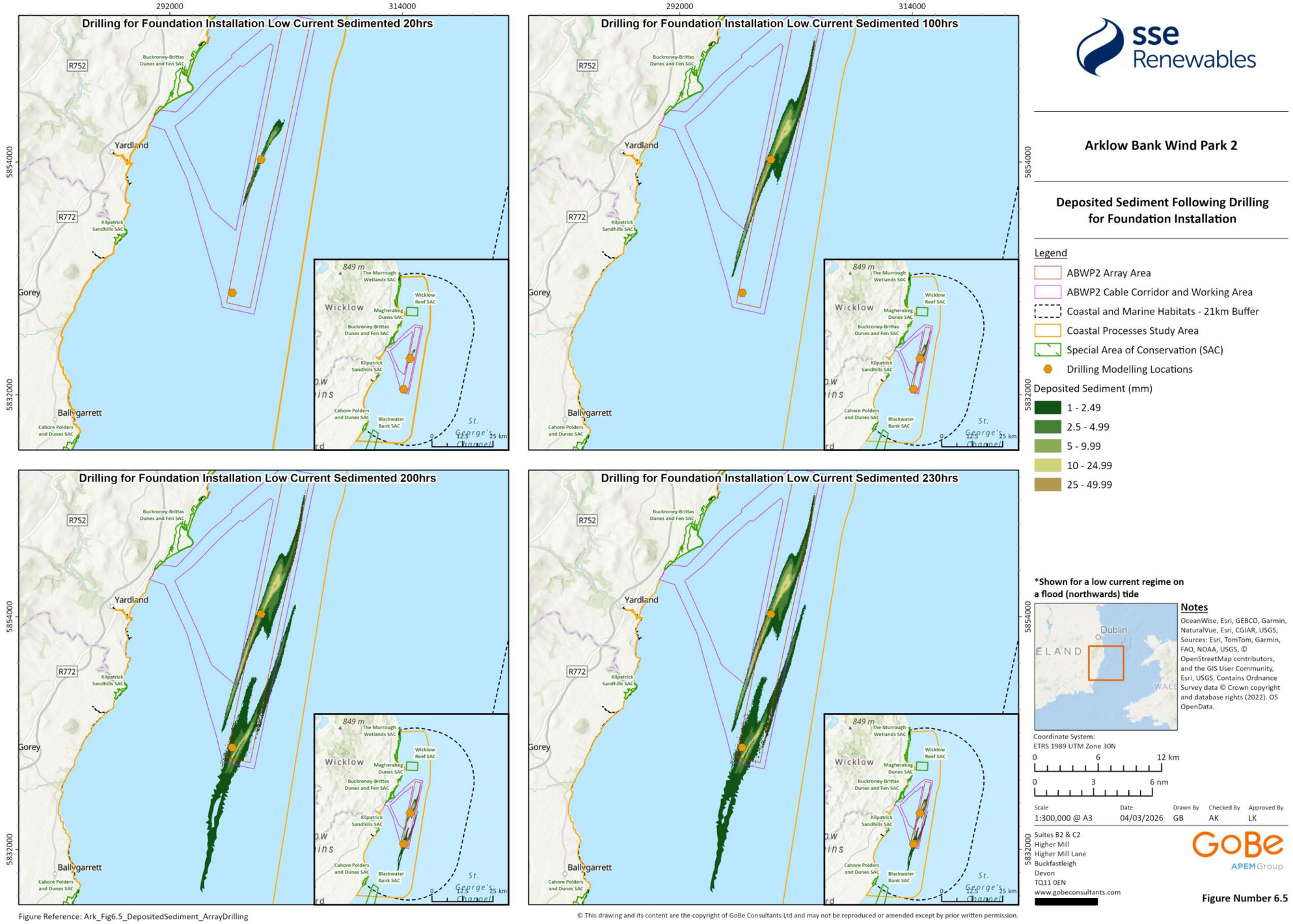

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Figure 6.5 Deposited sediment following drilling for foundation installation. Shown for a low current regime on a flood (northwards) tide.

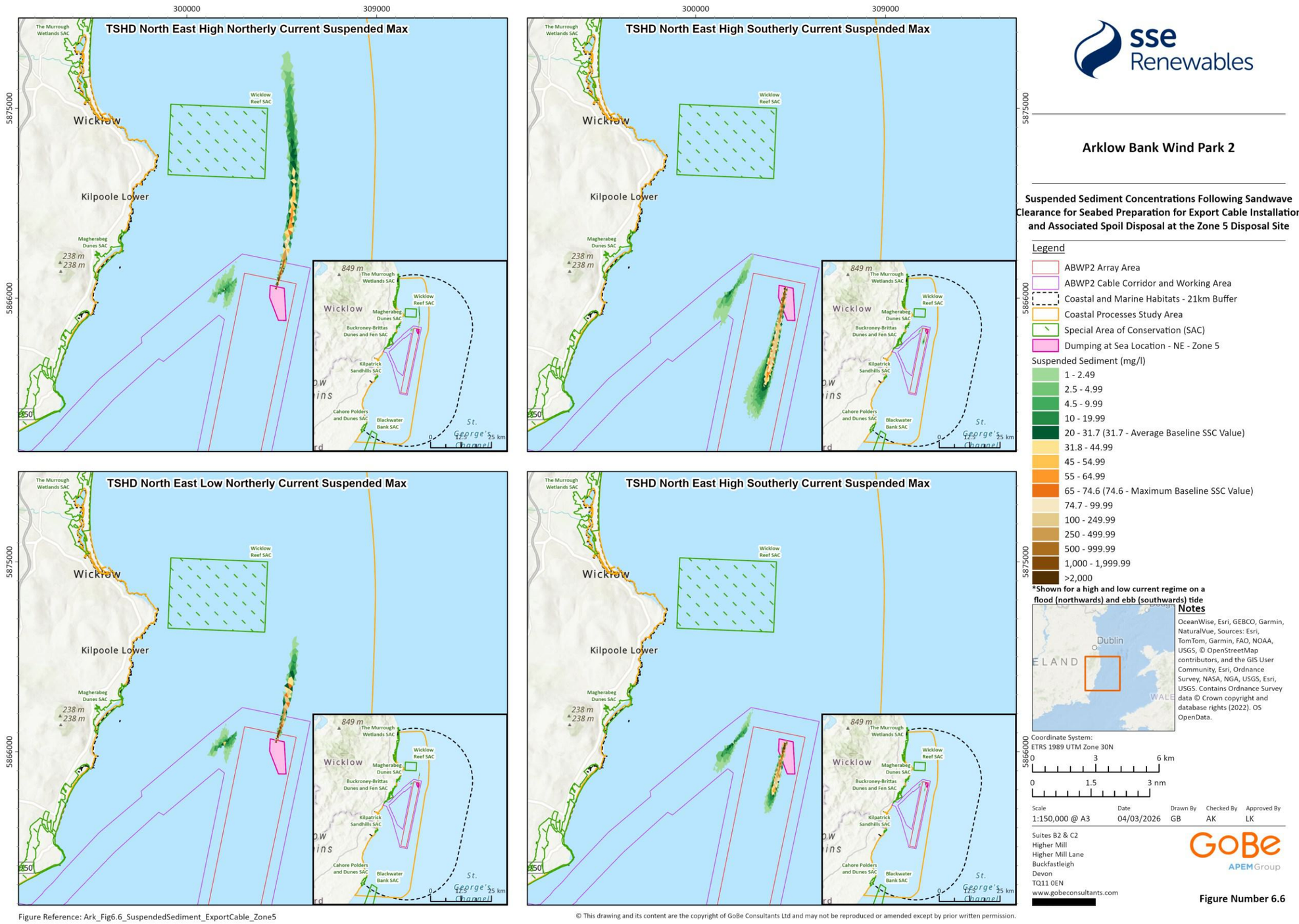

Figure Reference: Ark_Fig6.6_SuspendedSediment_ExportCable_Zone5

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Figure 6.6: Suspended sediment concentrations following sandwave clearance for seabed preparation for export cable installation and the associated spoil disposal at the Zone 5 disposal site. Shown for a flood (northerly) high current regime.

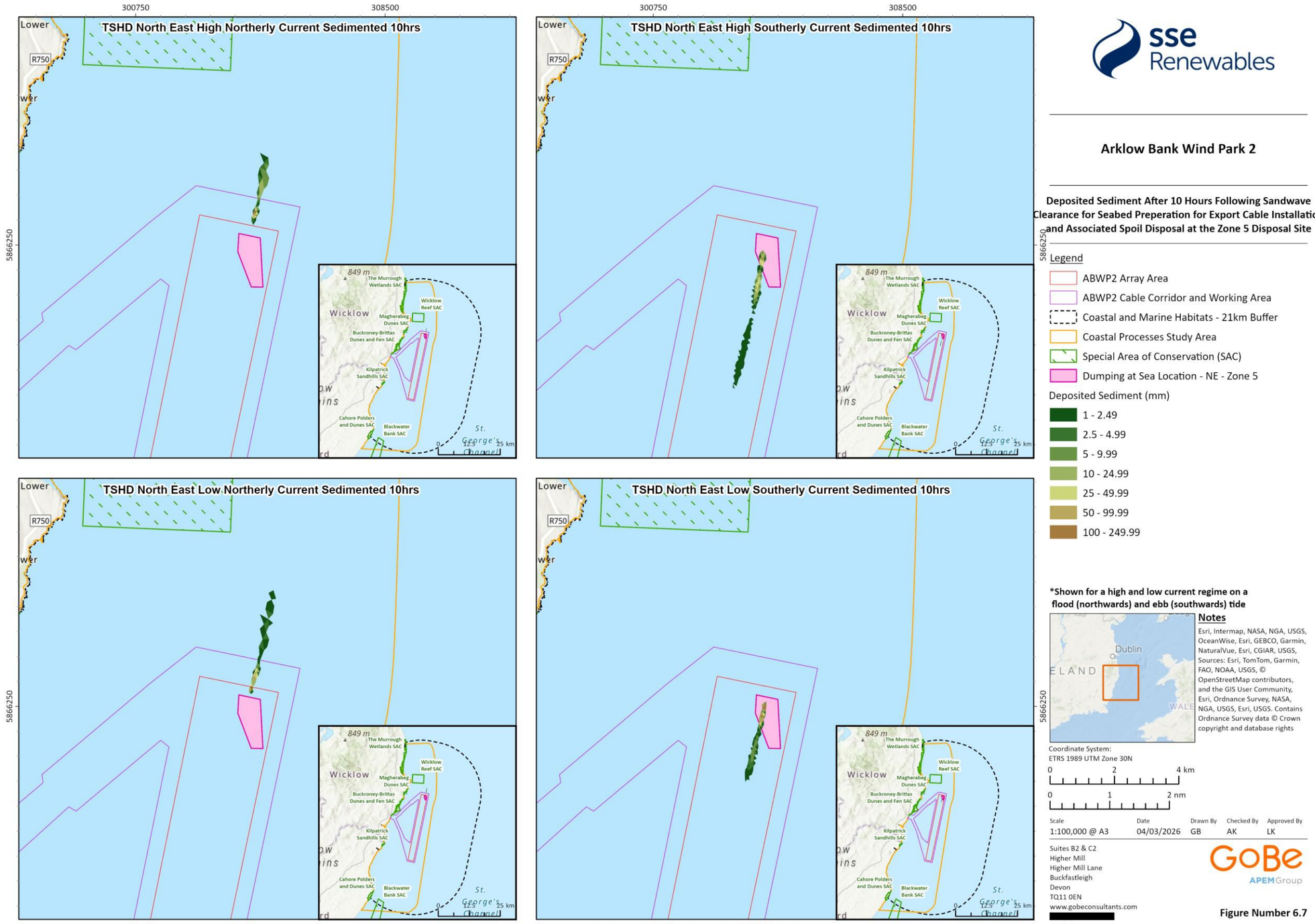

Figure Reference: Ark_Fig6.7_DepositedSediment_ExportCable_Zone5

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Figure 6.7: Deposited sediment following sandwave clearance for seabed preparation for export cable installation and the associated spoil disposal activities at the Zone 5 disposal site. Shown for a high and low current regime on a flood (northwards) and ebb (southwards) tide.

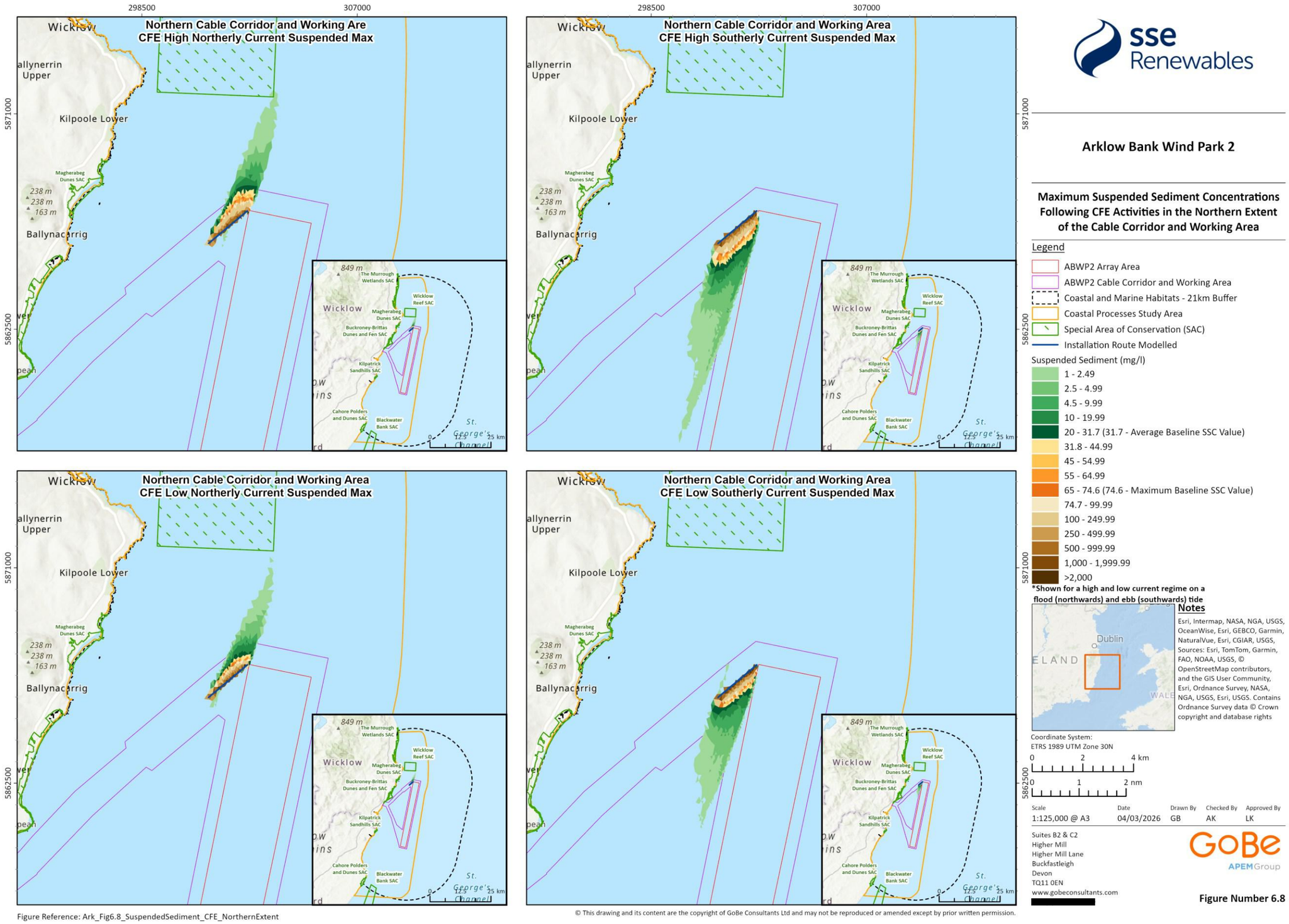

Figure Reference: Ark_Fig6.8_SuspendedSediment_CFE_NorthernExtent

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Arklow Bank Wind Park 2

Maximum Suspended Sediment Concentrations Following CFE Activities in the Northern Extent of the Cable Corridor and Working Area

Legend

- ABWP2 Array Area
- ABWP2 Cable Corridor and Working Area
- Coastal and Marine Habitats - 21km Buffer
- Coastal Processes Study Area
- Special Area of Conservation (SAC)
- Installation Route Modelled

Suspended Sediment (mg/l)

- 1 - 2.49
- 2.5 - 4.99
- 4.5 - 9.99
- 10 - 19.99
- 20 - 31.7 (31.7 - Average Baseline SSC Value)
- 31.8 - 44.99
- 45 - 54.99
- 55 - 64.99
- 65 - 74.6 (74.6 - Maximum Baseline SSC Value)
- 74.7 - 99.99
- 100 - 249.99
- 250 - 499.99
- 500 - 999.99
- 1,000 - 1,999.99
- >2,000

*Shown for a high and low current regime on a flood (northwards) and ebb (southwards) tide

Notes

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0 2 4 km
0 1 2 nm

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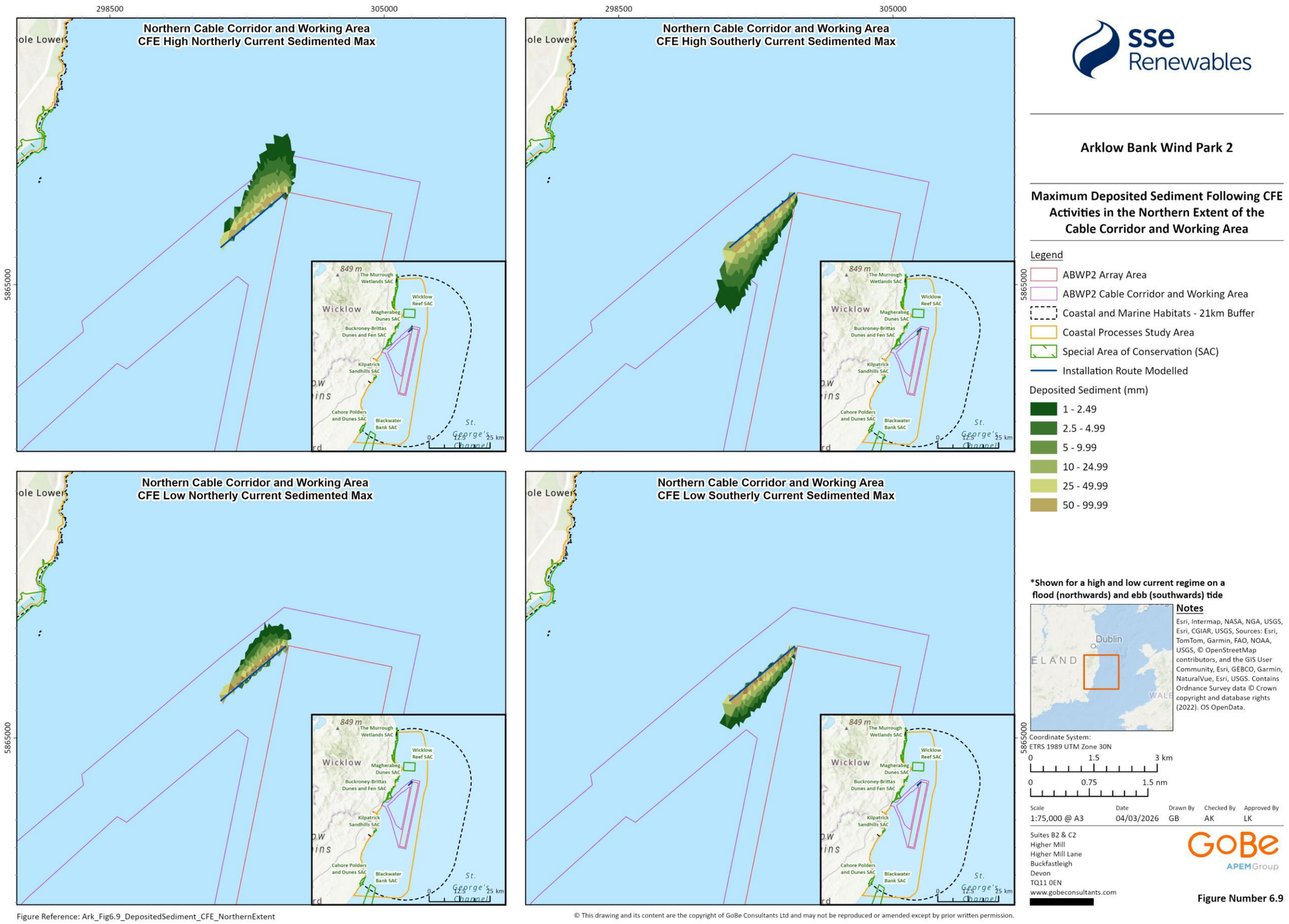
Figure Number 6.8

Figure 6.8: Suspended sediment concentrations following CFE activities within the northern extent of the Cable Corridor and Working Area. Shown for a flood (northerly) low and high current regime.[4]



Arklow Bank Wind Park 2

Maximum Deposited Sediment Following CFE Activities in the Northern Extent of the Cable Corridor and Working Area

Legend

- ABWP2 Array Area
- ABWP2 Cable Corridor and Working Area
- Coastal and Marine Habitats - 21km Buffer
- Coastal Processes Study Area
- Special Area of Conservation (SAC)
- Installation Route Modelled

Deposited Sediment (mm)

- 1 - 2.49
- 2.5 - 4.99
- 5 - 9.99
- 10 - 24.99
- 25 - 49.99
- 50 - 99.99

*Shown for a high and low current regime on a flood (northwards) and ebb (southwards) tide

Notes

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Coordinate System:
ETRS 1989 UTM Zone 30N

0 1.5 3 km

0 0.75 1.5 nm

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Figure Number 6.9

Figure Reference: Ark_Fig6.9_DepositedSediment_CFE_NorthernExtent

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Figure 6.9: Deposited sediment following completion of CFE activities within the northern extent of the Cable Corridor and Working Area. Shown for a high and low current regime on a flood (northwards) and ebb (southwards) tide.

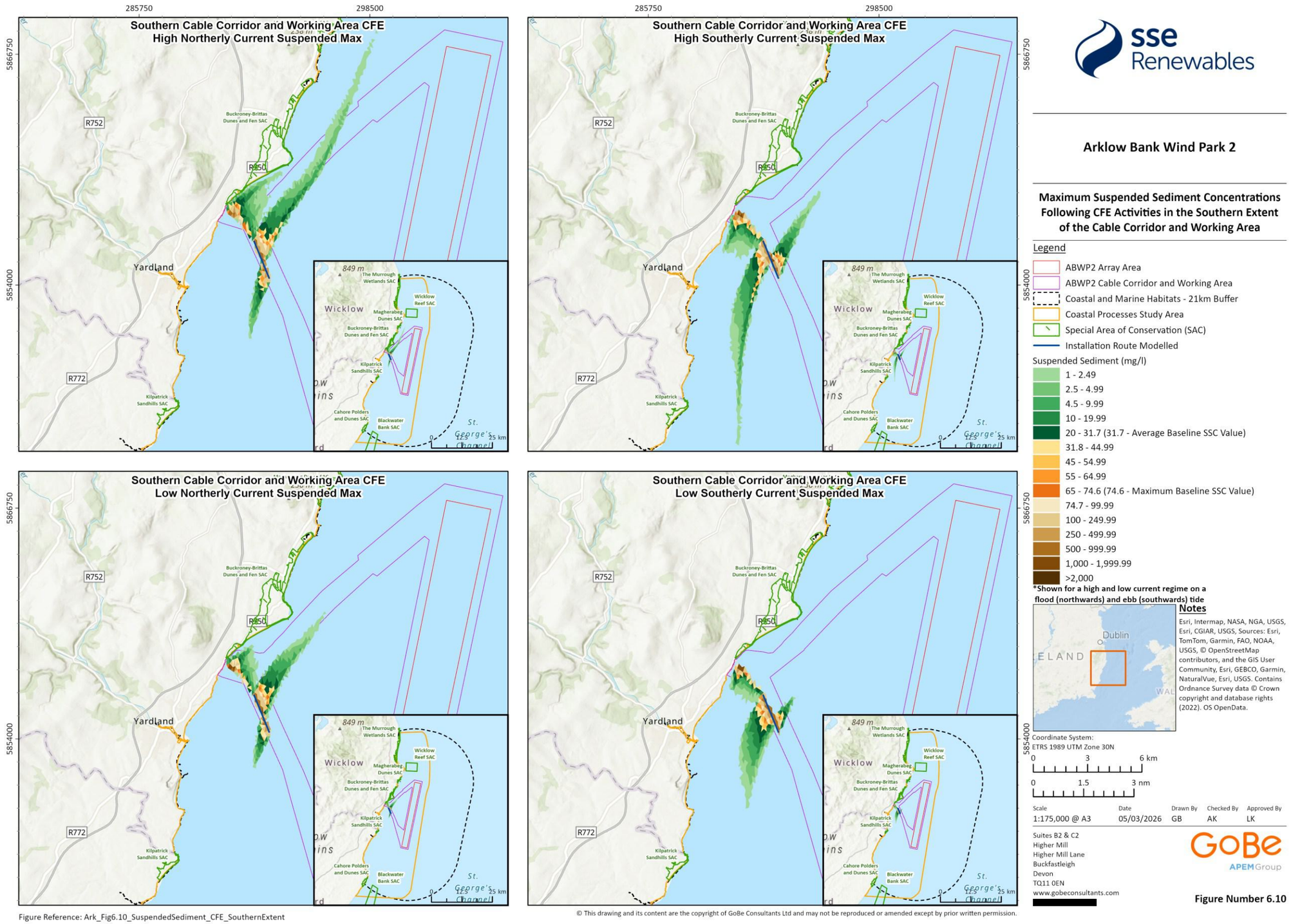

Figure Reference: Ark_Fig6.10_SuspendedSediment_CFE_SouthernExtent

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Figure 6.10: Suspended sediment concentrations following CFE activities within the southern extent of the Cable Corridor and Working Area. Shown for a flood (northerly) low and high current.

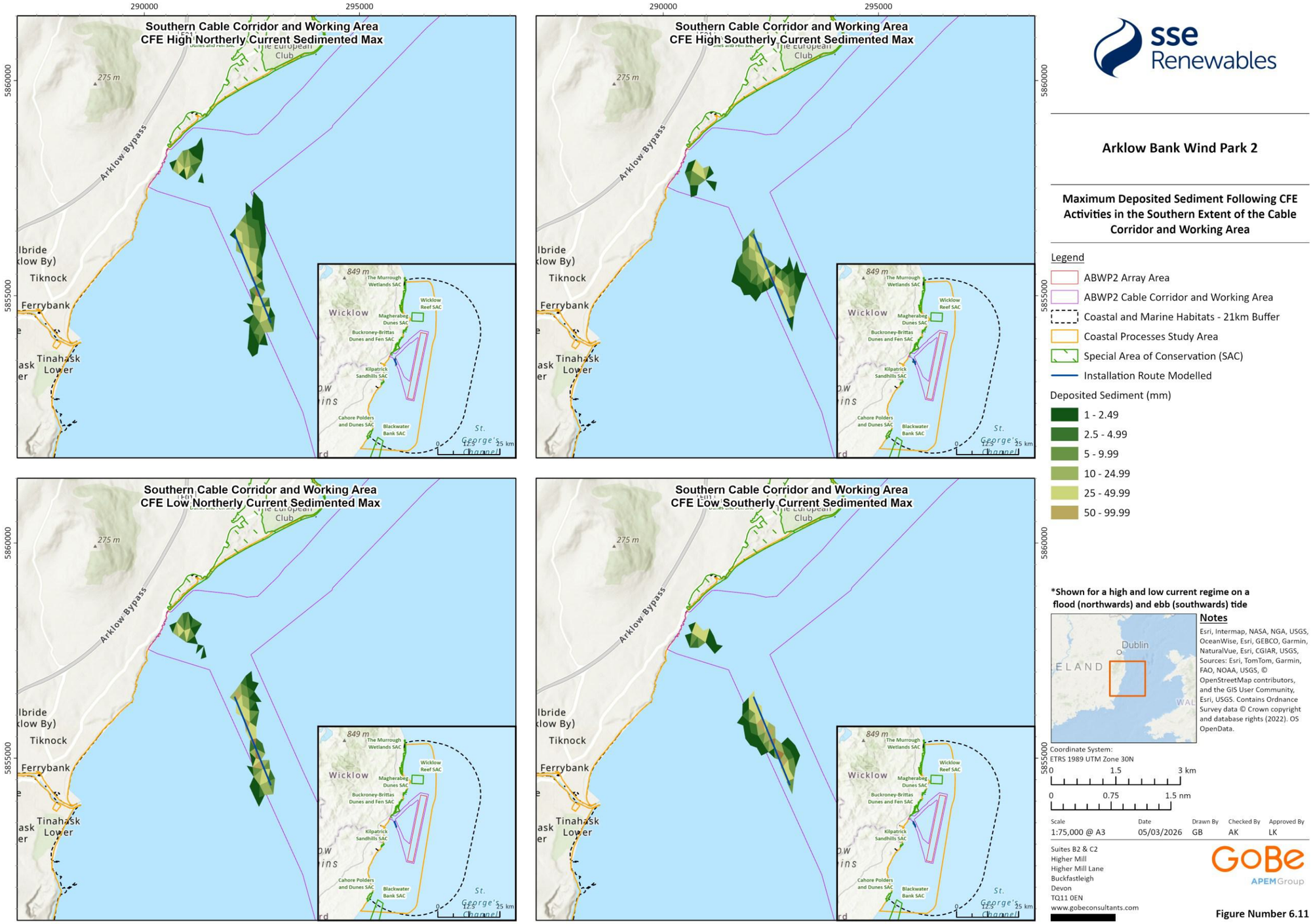

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Figure 6.11: Deposited sediment following completion of CFE activities within the southern extent of the Cable Corridor and Working Area. Shown for a high and low current regime on a flood (northwards) and ebb (southwards) tide.

MORPHODYNAMIC MODELLING

6.2.1.49 Morphodynamic modelling was undertaken to assess the potential for the Proposed Development to influence seabed behaviour at both local and regional scales. This assessment was based on a comparison of modelled seabed conditions for a baseline scenario representing existing conditions and a scenario including the proposed wind farm infrastructure. Numerical simulations were used to evaluate seabed response to the presence of wind turbines and associated infrastructure over long-term periods and under extreme event conditions.

6.2.1.50 The numerical modelling has modelled Project Design Option 1 (53 WTGs and 2 OSPs) which is considered representative of Project Design Option 2 (47 WTGs and 2 OSPs), due to the greater number of structures and therefore greater potential impact on the wave and hydrodynamic regimes.

6.2.1.51 Morphodynamic modelling represents the temporal evolution of the seabed arising from the combined effects of:

- currents and tides,
- waves, and
- sediment transport.

6.2.1.52 The modelling framework captures long-term trends in erosion, deposition, and sediment redistribution, rather than conditions at a single point in time. These processes are directly relevant to seabed integrity and the stability of sediment-dependent habitats, including offshore sandbanks, reefs and coastal systems that rely on sustained sediment supply.

6.2.1.53 Potential effects of the Proposed Development were evaluated by comparing predicted hydrodynamic conditions and seabed morphology between the baseline scenario and the scenario including the wind farm infrastructure.

6.2.1.54 For each scenario, two types of morphodynamic simulations were undertaken:

- a long-term morphodynamic simulation covering a 20-year period (see NIS Volume III, Appendix 6.3: Arklow Bank - Quantitative Assessment of the Influence of In-place Infrastructure on the Local Sediment Transport System (RFI March 2026)); and
- a short-term storm morphodynamic simulation representing a 100-year return period event[5], undertaken to assess seabed response under extreme conditions (see NIS Volume III, Appendix 6.3: Arklow Bank - Quantitative Assessment of the Influence of In-place Infrastructure on the Local Sediment Transport System (RFI March 2026)).

6.2.1.55 The following provides a summary of morphodynamic modelling results relevant to this assessment. Full details of the model setup, comprehensive results, and interpretation of potential local and larger-scale effects are presented in NIS Volume III, Appendix 6.2: Arklow Bank Sediment Mobility Assessment (RFI March 2026) and NIS Volume III, Appendix 6.3: Arklow Bank - Quantitative Assessment of the Influence of In-place Infrastructure on the Local Sediment Transport System (RFI March 2026).

6.2.1.56 Morphodynamic modelling indicates that the introduction of the Proposed Development infrastructure would result in minor and highly localised changes to hydrodynamic conditions and seabed processes. Reductions in flow velocity are typically less than 5%, and changes in wave height are generally below 1%, confined to areas immediately surrounding individual monopile

[5] A 100-year return period (RP100) event is a storm or extreme wave/current event that has a 1% probability of occurring in any given year.

foundations. These effects will hence not alter the wider hydrodynamic regime or sediment dynamics at a scale notable to the designated Annex I Coastal and Marine Habitats.

6.2.1.57 Over the 20-year simulation period, the large-scale morphodynamic behaviour of Arklow Bank is preserved. Characteristic eastward and westward migration patterns remain consistent with the baseline scenario, and net volumes of erosion and sedimentation will remain effectively unchanged. Localised differences in bed level and sediment transport, limited to areas adjacent to monopiles, are typically around a 10% reduction. Overall slope patterns and bank integrity are maintained, with no indication of increased seabed instability.

6.2.1.58 During the simulated extreme storm events, no significant differences in seabed response or sediment transport are predicted between the baseline and infrastructure scenarios, demonstrating that the Proposed Development does not exacerbate erosion, deposition, or sediment mobilisation under extreme hydrodynamic conditions.

6.2.1.59 At a wider spatial scale, the model predicts that impacts on adjacent sandbanks and on regional sediment transport pathways are negligible. The ZoI of the proposed infrastructure is confined to Arklow Bank and immediately adjacent areas, with no alteration of sediment pathways that support offshore sandbank features or coastal sediment-dependent habitats.

6.2.1.60 The modelling further indicates that the crest elevation and morphological function of Arklow Bank are maintained with the Proposed Development in place. This confirms that the bank will continue to play its natural role in reducing wave energy offshore and providing shelter to the adjacent coastline. As a result, the nearshore wave climate and sediment transport processes that support coastal dune, saltmarsh, and wetland habitats at nearby designated sites will remain unaffected.

6.2.2 Wicklow Reef SAC

6.2.2.1 The conservation objective for Wicklow Reef SAC is to maintain the favourable conservation condition of reefs in Wicklow Reef SAC (NPWS, 2013a), which is defined in Table 5.1.

6.2.2.2 There are three potential impacts on reefs associated with the construction, operational and maintenance and decommissioning of the Proposed Development, which are detailed in Table 6.3 and are assessed below for each phase of the Proposed Development:

- Elevated levels of SSCs and associated sediment deposition;
- Accidental release of pollutants; and
- Changes to physical processes.

ELEVATED LEVELS OF SUSPENDED SEDIMENT CONCENTRATIONS AND ASSOCIATED SEDIMENT DEPOSITION

CONSTRUCTION, OPERATIONAL AND DECOMMISSIONING

6.2.2.3 As determined in Table 6.3, Project Design Option 1 and Project Design Option 2 will have the same potential for adverse effects from elevated levels of suspended sediment and associated sediment deposition on coastal and intertidal benthic habitats.

6.2.2.4 It was identified at the Stage 1 Screening Appraisal that the Proposed Development did not present any risk to maintaining the favourable conservation condition of Annex I reef habitat with reference to conservation targets for ‘Habitat area’ or ‘Distribution’, as the Proposed Development would have no bearing whatsoever on whether or not the permanent area (or distribution as the case may be) of reef habitat is stable or increasing, subject to natural processes.

6.2.2.5 The SAC supporting document (NPWS, 2013a) notes that these targets refer to activities or operations that propose to permanently remove reef habitat, thus reducing the permanent amount of reef habitat (or range over which this habitat occurs as the case may be). Importantly, the

targets do not refer to temporary or short-term disturbance of the biology of reef habitats. On this basis, these conservation targets will not be undermined by the predicted increases in SSCs during the construction phase of the Proposed Development.

6.2.2.6 The 'Community structure' target to conserve the reef community complex in a natural condition was identified as having the potential to be undermined by sediment plumes and associated sediment deposition. The results of the modelling discussed above (see Section 6.2; Figure 6.2 to Figure 6.11), confirm that there is no potential for construction phase sediment plumes or associated sediment deposition to smother the reef habitats in Wicklow Reef SAC, which for this particular site is composed of subtidal *Sabellaria alveoleta* reef, or have any effects on the community composition characterising the Annex I reef habitats. The Proposed Development will have no bearing whatsoever on whether the reef community complex in Wicklow Reef SAC is conserved in a natural condition.

6.2.2.7 **There will be no AEoI to the Annex I reef habitat QI of the Wicklow Reef SAC, as defined by the COs of the site, as a result of increased SSCs and associated deposition effects from Project Design Option 1.**

6.2.2.8 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

ACCIDENTAL POLLUTION

CONSTRUCTION AND DECOMMISSIONING

6.2.2.9 As determined in Table 6.3, Project Design Option 1 will have a marginally higher potential for adverse effects from accidental pollution on coastal and intertidal benthic habitats than Project Design Option 2.

6.2.2.10 Construction of the Proposed Development and confirmatory surveys may lead to the accidental release of pollutants through spills and leaks from vessels and equipment. The magnitude of the impact is dependent on the quantities of potential pollutants carried by vessels, helicopters, and equipment. Although many of the large vessels (e.g. installation vessels) may contain large quantities of diesel oil, any accidental spill from vessels, vehicles, machinery from construction activities would be subject to immediate dilution and rapid dispersal. In the unlikely event of an accidental spill or release of chemicals or materials, any resulting effects would be negligible and would not interfere with the conservation objectives of the site, which relate to habitat area, habitat distribution, community structure.

6.2.2.11 The avoidance of effect through design and management measures of the Proposed Development includes an EMP and Marine Pollution Contingency Plan. Adherence to the avoidance by design and standard project environmental protection measures outlined in Table 6.2 and good working practices will significantly reduce the likelihood of an accidental pollution incident occurring and the magnitude of its impact. Given the factored-in measures, the likelihood of accidental release of pollutants is considered to be extremely low.

6.2.2.12 There is also a risk to Annex I reef habitats from water based drilling mud, including bentonite, a non-toxic, naturally occurring clay mineral, which is used during the cable installation via trenchless techniques. Trenchless techniques such as HDD and Direct Pipe will be undertaken to install the offshore export cables at the landfall and potentially across the sandbank for inter-array cable installation. Drilling muds are used in a closed system to minimise loss to the environment; however, it is possible that muds (including bentonite) can break out during drilling operations, which may occur in intertidal or subtidal areas. Bentonite is a non-toxic, naturally occurring clay mineral used as a drilling mud and therefore the risk to reefs is minimal, particularly when considering that any break outs will be quickly diluted (seawater degrades the bentonite fluid, causing it to flocculate and allowing faster dispersal). However, any potential break outs or

accidental spills of bentonite will be managed via good working practices (e.g. monitoring of mud volumes and pressure, detection of break outs and pausing drilling, plugging fissures and ongoing monitoring) such that any loss of bentonite to the environment is minimal and will not reach Annex I Marine Habitats QIs.

6.2.2.13 **Given the inherent low likelihood of accidental pollution from vessel activity, as well as the proposed avoidance/ impacts reduction measures (as set out in Table 6.2), there is no potential for AEoI from accidental pollution on the Annex I reef QI of the Wicklow Reef SAC, as defined by the COs of the site, from Project Design Option 1.**

6.2.2.14 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

OPERATIONAL AND MAINTENANCE

6.2.2.15 As determined in Table 6.3, Project Design Option 1 will have a marginally higher potential for adverse effects from accidental pollution on coastal and intertidal benthic habitats than Project Design Option 2.

6.2.2.16 Operational and maintenance tasks within the Proposed Development may lead to the accidental release of pollutants through spills and leaks from vessels and equipment. The magnitude of the impact will be dependent on the quantities of potential pollutants carried by vessels, helicopters, and equipment. Although many of the large vessels (e.g. installation vessels) may contain large quantities of diesel oil, any accidental spill from vessels, vehicles, or machinery would be subject to immediate dilution and rapid dispersal. In the unlikely event of an accidental spill or release of chemicals or materials, any resulting effects would be negligible and would not interfere with the conservation objectives of the site, which relate to habitat area, habitat distribution, community structure.

6.2.2.17 Given the avoidance of effects by design, the likelihood of accidental release is considered to be extremely low. Adherence to the avoidance of effects by design outlined in Table 6.2 and good working practices will significantly reduce the likelihood of an accidental pollution incident occurring and the magnitude of its impact on reefs.

6.2.2.18 **Given the inherent low likelihood of accidental pollution from vessel activity as well as the proposed avoidance/ impacts reduction measures (as set out in** Table 6.2**), there is no potential for AEoI from accidental pollution during the operational and maintenance phase on the Annex I reef QI of the Wicklow Reef SAC, as defined by the COs of the site, from Project Design Option 1.**

6.2.2.19 **Based on the representative risk of effect of Project Design Option 1, it is concluded that the conclusion of no AEoI would also apply to Project Design Option 2.**

CHANGES TO PHYSICAL PROCESSES

OPERATIONAL AND MAINTENANCE

6.2.2.20 As determined in Table 6.3, Project Design Option 1 is considered representative of Project Design Option 2 for the assessment of potential adverse effects from changes to physical processes on coastal and intertidal benthic habitats.

6.2.2.21 Biogenic reefs are by nature sessile and as such will be unable to avoid changes in the physical environment such as those to the hydrodynamic regime and sediment supply. Physical processes modelling indicates that any changes to water flow and wave height, sedimentation in relation to the Proposed Development will be minimal and will not extend to the Wicklow Reef SAC. Consequently, no impacts are anticipated on Annex I QIs in the SAC such as *Sabellaria* reefs which are known to have high tolerance and recoverability in relation to such pressures.

6.2.2.22 However, as detailed in Section 6.2.1 modelling designed to assess the impacts of the Proposed Development during the operational and maintenance phase on tidal currents, sediment transport and seabed dynamics (Deltares, 2025) indicates that any effects are not anticipated to extend to the regional or larger-scale sediment transport pathways in the south-western Irish sea. More specifically, site-specific modelling indicates that project related morphological and sediment transport changes at Arklow Bank will be insufficient to affect the morphological behaviour of receptors within the wider morphological system (Deltares, 2026).

6.2.2.23 Consequently, there is no potential for changes in current regime and sediment transport patterns associated with operational and maintenance activities that will alter seabed morphology in Wicklow Reef SAC or have any effects on the community composition characterising the Annex I reef habitats.

6.2.2.24 **Given the negligible likelihood of changes to physical processes in relation to operational and maintenance activities, there is no potential for AEoI from changes to physical processes on the Annex I reef habitat QIs of the Wicklow Reef SAC, as defined by the COs of the site, from Project Design Option 1.**

6.2.2.25 **Based on the representative risk of effect of Project Design Option 1, it is concluded that the conclusion of no AEoI would also apply to Project Design Option 2.**

6.2.3 Buckroney-Brittas Dunes and Fen SAC

6.2.3.1 The COs for Buckroney-Brittas Dunes and Fen SAC is to maintain the favourable conservation conditions of annual vegetation of drift lines, Mediterranean salt meadows (*Juncetalia maritimi*), fixed coastal dunes with herbaceous vegetation (grey dunes), dunes with *Salix repens* ssp. *argentea* (*Silicion aremariae*) and Alkaline fens in Buckroney-Brittas Dunes and Fens SAC, and to restore the favourable conservation conditions of perennial vegetation of stony banks, embryonic shifting dunes, shifting dunes along the shoreline with *Ammophila arenaria* (white dunes), Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) and humid dune slacks in Buckroney-Brittas Dunes and Fen SAC. Table 5.1 lists these COs and their corresponding attributes and targets.

6.2.3.2 There are three potential impacts on the intertidal and subtidal benthic habitats associated with the construction, operational and maintenance and decommissioning of the Proposed Development, which are presented in Table 6.3, and are assessed below for each relevant phase of the Proposed Development.

ELEVATED LEVELS OF SUSPENDED SEDIMENT CONCENTRATIONS AND ASSOCIATED SEDIMENT DEPOSITION

CONSTRUCTION, OPERATIONAL AND DECOMMISSIONING

6.2.3.3 As determined in Table 6.3, Project Design Option 1 and Project Design Option 2 will have the same potential for adverse effects from elevated levels of suspended sediment and associated sediment deposition on coastal and intertidal benthic habitats.

6.2.3.4 It was identified at the Stage 1 SISAA (NIS Volume I: Supporting Information for Screening for Appropriate Assessment (Revised March 2026)) that the Proposed Development did not present any risk to maintaining the favourable conservation condition of the designated dune habitats with reference to conservation targets for 'Habitat area' or 'Distribution' as the Proposed Development would have no bearing whatsoever on whether or not the permanent area (or distribution as the case may be) of dune habitat is stable or increasing, subject to natural processes.

6.2.3.5 The SAC supporting document (NPWS, 2017a) notes that these targets refer to activities or operations that proposed to permanently remove dune habitats, thus reducing the permanent amount of dune habitat (or range over which this habitat occurs as the case may be). Importantly,

the targets do not refer to long- or short-term disturbance of the biology of these habitats. On this basis, these conservation targets will not be undermined by the predicted increases in SSCs during the construction phase of the Proposed Development.

6.2.3.6 Whilst implementing the Proposed Development at a distance of 0.05 km from this coastal SAC is unlikely to jeopardise the conservation targets for habitat area, habitat distribution, vegetation structure and vegetation composition of its habitats, the targets for its sand dune habitats listed under 'Physical structure: functionality and sediment supply' are to maintain, or where necessary restore, the natural circulation of sediment and organic matter, without any physical obstructions.

6.2.3.7 Results of modelling discussed in Section 6.2.1 indicate that construction of the Proposed Development will not interrupt or physically obstruct the natural circulation of sediment and organic matter. In addition, with regard to the potential for suspended sediment and deposition, as modelled under various construction scenarios (see Figure 6.2 to Figure 6.11), it is considered highly unlikely that sediment plumes associated with offshore works would reach the Buckroney-Brittas Dunes and Fen SAC. However, installation works in the Cable Corridor and Working Area closer to the coastline may, in a limited scenario, result in a small amount of localised suspended sediment, with a minimal potential for sediment deposition at the foot of the dunes at the Magherabeg Dunes and Buckroney-Brittas Dunes and Fen SACs (see Section 6.2.1.43, Figure 6.10 and Figure 6.11). Any activities with potential for such deposition would be temporary and short-lived, and the material would be native to the site, being neutral to potentially beneficial in supporting the naturally accretive behaviour of the dune systems. These activities do not constitute a physical barrier to sediment transport processes. Therefore, the Proposed Development does not present a credible pathway for effects on the natural circulation of sediment and organic matter for sand dune habitats within Buckroney-Brittas Dunes and Fen SAC.

6.2.3.8 The Proposed Development will have no credible pathway for effect on the natural circulation of sediment and organic matter for sand dune habitats in Buckroney-Brittas Dunes and Fen SAC.

6.2.3.9 **Therefore, it is concluded that there will be no AEoI on the Coastal Habitat QIs of the Buckroney-Brittas Dunes and Fen SAC, as defined by the COs of the site, as a result of suspended sediments and deposition effects for Project Design Option 1.**

6.2.3.10 **Based on the same potential risk of effect as Project Design Option 1, it is concluded that no AEoI on the Coastal Habitat QIs of the Buckroney-Brittas Dunes and Fen SAC would also apply to Project Design Option 2.**

ACCIDENTAL POLLUTION

CONSTRUCTION AND DECOMMISSIONING PHASE

6.2.3.11 As determined in Table 6.3, Project Design Option 1 has a marginally higher potential for adverse effects from accidental pollution on coastal and intertidal benthic habitats than Project Design Option 2.

6.2.3.12 The construction and decommissioning of the Proposed Development and confirmatory surveys may lead to the accidental release of pollutants through spills and leaks from vessels and equipment. The magnitude of the impact is dependent on the quantities of potential pollutants carried by vessels, helicopters, and equipment. Although many of the large vessels (e.g. installation vessels) may contain large quantities of diesel oil, any accidental spill from vessels, vehicles, machinery from construction activities would be subject to immediate dilution and rapid dispersal. In the unlikely event of an accidental spill or release of chemicals or materials, any resulting effects would be negligible and would not interfere with the COs of the site, which relate to habitat area, habitat distribution, physical structure and terrestrial vegetation.

6.2.3.13 The avoidance of effect through design of the Proposed Development includes an Environmental Management Plan (EMP) and Marine Pollution Contingency Plan. Adherence to the avoidance by design measures outlined in Table 6.2 and good working practices will significantly reduce the likelihood of an accidental pollution incident occurring and the magnitude of its impact. Given the factored-in measures, the likelihood of accidental release is considered to be extremely low.

6.2.3.14 There is also a potential impact to Annex I Coastal Habitats from water based drilling mud, including bentonite, which is used as a lubricant during the cable installation via trenchless techniques such as HDD and Direct pipe process. Trenchless techniques such as HDD and Direct pipe will be undertaken to install the offshore export cables at the landfall and potentially across the sandbank for inter-array cable installation. Drilling muds are used in a closed system to minimise loss to the environment; however, it is possible that muds (including bentonite) can break out during drilling operations, which may occur in intertidal or subtidal areas. Bentonite is a non-toxic, naturally occurring clay mineral used as a drilling mud and therefore the potential effect to surrounding areas is minimal, particularly when considering that any break outs will be quickly diluted (seawater degrades the bentonite fluid, causing it to flocculate and allowing faster dispersal). However, any potential break outs or accidental spills of bentonite will be managed via good working practices (e.g. monitoring of mud volumes and pressure, detection of break outs and pausing drilling, plugging fissures and ongoing monitoring) such that any loss of bentonite to the environment is minimal and will not reach Annex I Coastal Habitats QIs.

6.2.3.15 **Given the inherent low likelihood of accidental pollution from vessel activity, as well as the proposed avoidance/ impacts reduction measures (as set out in Table 6.2), and the low risk of pollution from cable installation via trenchless techniques such as HDD and Direct pipe, there is no potential for AEoI from accidental pollution on the Annex I Coastal Habitats of the Buckroney-Brittas Dunes and Fen SAC, as defined by the COs of the site, from Project Design Option 1.**

6.2.3.16 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

OPERATIONAL AND MAINTENANCE

6.2.3.17 As determined in Table 6.3, Project Design Option 1 will have a marginally higher potential for adverse effects from accidental pollution on coastal and intertidal benthic habitats than Project Design Option 2.

6.2.3.18 Operational and maintenance tasks within the Proposed Development may lead to the accidental release of pollutants through spills and leaks from vessels and equipment. The magnitude of the impact will be dependent on the quantities of potential pollutants carried by vessels, helicopters, and equipment. Although many of the large vessels (e.g. installation vessels) may contain large quantities of diesel oil, any accidental spill from vessels, vehicles, machinery or from construction, operational and maintenance and decommissioning activities would be subject to immediate dilution and rapid dispersal. In the unlikely event of an accidental spill or release of chemicals or materials, any resulting effects would be negligible and would not interfere with the COs of the site, which relate to habitat area, habitat distribution, physical structure and terrestrial vegetation.

6.2.3.19 Given the avoidance of effects by design, the likelihood of accidental release is considered to be extremely low. Adherence to the avoidance of effects by design outlined in Table 6.2 and good working practices will significantly reduce the likelihood of an accidental pollution incident occurring and the magnitude of its impact on Annex I Coastal Habitats.

6.2.3.20 **Given the inherent low likelihood of accidental pollution from vessel activity, as well as the proposed avoidance/ impacts reduction measures (as set out in Table 6.2), there is no potential for AEoI from accidental pollution during the operational and maintenance phase**

on the Annex I Coastal Habitats of the Buckroney-Brittas Dunes and Fen SAC, as defined by the COs of the site, from Project Design Option 1.

6.2.3.21 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

CHANGES TO PHYSICAL PROCESSES

OPERATIONAL AND MAINTENANCE

6.2.3.22 The presence of offshore infrastructure during the operational and maintenance phase will have the potential to result in a localised blockage of waves and tides, which could lead to changes to seabed and coastal morphology. This blockage will commence when offshore construction begins, increasing incrementally until the array is installed in its entirety, which is outlined in Table 6.3.

6.2.3.23 As determined in Table 6.3, Project Design Option 1 is considered representative of Project Design Option 2 for the assessment of potential adverse effects from changes to physical processes on coastal and intertidal benthic habitats.

6.2.3.24 Although the Annex I Coastal Habitat QIs of Buckroney–Brittas Dunes and Fen SAC are located above the High Water Mark, they are directly and indirectly dependent on coastal sediment transport processes that are influenced by wave and tidal regimes. Buckroney–Brittas Dunes and Fen SAC support a sequence of dune habitats, including embryonic dunes, mobile dunes and fixed dunes, reflecting a gradient from highly dynamic coastal features to more stable inland habitats. In particular, the coastal dune systems are primarily maintained by wind-driven transport of sand from the beach to inland dune areas (Nordstrom, 2015). The COs relate to maintaining the natural circulation of sediment and organic matter, without any physical obstructions. Accordingly, these Annex I Coastal QIs are considered within this assessment pathway to address the potential for indirect effects arising from changes in sediment transport processes. At the screening stage, it was not possible to rule out such indirect effects, and therefore the habitats are carried forward for assessment on a precautionary basis. The COs for this SAC recognise that the structure and function of these dune systems are inherently linked to sediment availability and are maintained through natural cycles of accretion and erosion (Table 5.1).

6.2.3.25 The regional tidal regime in the vicinity of the Buckroney–Brittas Dunes and Fen SAC is characterised by currents that flow predominantly parallel to the coastline. The Array Area is located 6.8 to 15 km offshore and Array Area infrastructure is not predicted to materially influence alongshore or cross-shore sediment transport processes at the coastline.

6.2.3.26 A suite of project-specific numerical modelling simulations was undertaken in response to the RFIs (see NIS Volume III, Appendix 6.2: Arklow Bank Sediment Mobility Assessment (RFI March 2026) and NIS Volume III, Appendix: Arklow Bank - Quantitative Assessment of the Influence of In-place Infrastructure on the Local Sediment Transport System (RFI March 2026)) with output indicating that any changes to hydrodynamics and sediment transport arising from the presence of offshore infrastructure are highly localised and confined to the immediate vicinity of the Array Area and its boundaries.

6.2.3.27 Potential wind wake effects from the WTGs are small in magnitude (typically less than 0.3 m/s) and only reach the coast under specific wind conditions (easterly winds). Given the infrequency of such conditions and the distance to shore, the impact of the Proposed Development on coastal wind regimes is considered marginal.

6.2.3.28 Importantly, the modelling demonstrates that no changes to wave climate, tidal regime, sediment transport pathways or seabed morphology are predicted to occur at the coastline or within designated Annex I Coastal Habitat sites. Predicted changes are not discernible beyond natural background variability in the physical environment (see Section 6.2.1).

6.2.3.29 In the absence of any predicted changes at the coastline and given the lack of any spatial or functional linkage between the Proposed Development and the Annex I Coastal Habitats with regard to marine physical processes, no adverse pathway of effect exists between changes to physical processes associated with the Proposed Development and the Annex I Coastal Habitats of Buckroney–Brittas Dunes and Fen SAC.

6.2.3.30 **Therefore, it is concluded that there will be no AEoI on the Coastal Habitat QIs of the Buckroney-Brittas Dunes and Fen SAC, as defined by the COs of the site, as a result of changes to physical processes during operational and maintenance phase, from Project Design Option 1.**

6.2.3.31 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.2.4 Magherabeg Dunes SAC

6.2.4.1 The COs for Magherabeg Dunes SAC are to maintain the favourable conservation condition of Annual vegetation of drift lines, Embryonic shifting dunes, Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes), Fixed coastal dunes with herbaceous vegetation (grey dunes) and Atlantic decalcified fixed dunes (*Calluno-Ulicetea*), and to restore the favourable conservation condition of Petrifying springs with tufa formation (Cratoneurion) within Magherabeg Dunes SAC. Table 5.1 lists these COs and their corresponding attributes and targets.

6.2.4.2 There are three potential impacts on the dune habitats associated with the construction, operational and maintenance and decommissioning of the Proposed Development, which are presented in Table 6.3, and are assessed below for each relevant phase of the Proposed Development.

6.2.4.3 **The QI Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) is primarily a terrestrial habitat which will fall outside the scope of works taking place within the Array Area and Cable Corridor and Working Area. Therefore, it is concluded that increases in suspended sediment and deposition, accidental pollution and changes to physical processes will have no AEoI on this Annex I Coastal QI of the Magherabeg Dune SAC from Project Design Option 1.**

6.2.4.4 **Based on the representative potential risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.2.4.5 The magnitude and severity of potential impacts to Annex I Coastal Habitats associated with the Proposed Development are expected to be related to proximity to the site of works for all identified impact pathways, namely:

- increased SSCs and associated deposition;
- accidental pollution; and
- changes to physical processes due to presence of operational infrastructure.

6.2.4.6 Buckroney-Brittas Dunes and Fen SAC is designated for several of the same or similar QIs and is located nearer to the Proposed Development (0.05 km) than Magherabeg Dunes SAC (3.44 km). In particular, the dune habitats at Magherabeg Dunes SAC are similar in structure and sediment dynamics to those at Buckroney-Brittas Dunes and Fen SAC, which are naturally dynamic systems that rely on the continuous supply and circulation of sand, without physical barriers, to maintain functionality and accretion (NPWS, 2017a). In Section 6.2.3, it has been concluded that none of the potential effects on intertidal and subtidal benthic habitats would result in an AEoI of the Annex I Coastal Habitat QIs of the Buckroney-Brittas Dunes and Fen SAC. On this basis, and in line with the relevant COs, it was concluded that the potential for AEoI for Annex I Coastal Habitat QIs is the same or reduced for Magherabeg Dunes SAC as it is for Buckroney-Brittas Dunes and Fen SAC.

6.2.4.7 As reported in Section 6.2.1 (see Figure 6.2 to Figure 6.11), it is considered highly unlikely that sediment plumes associated with offshore works would reach the Magherabeg Dunes SAC under the most precautionary scenario. Installation works within the Cable Corridor and Working Area closer to the coastline may, in a limited scenario, result in a small amount of localised suspended sediment, with a minimal potential for temporary sediment deposition at the foot of the dunes (see see Section 6.2.1.43, Figure 6.10 and Figure 6.11). Any activities with potential for such deposition would be temporary and short-lived, and the material would be native to the site, being neutral to potentially beneficial in supporting the naturally accretive behaviour of the dune systems. These activities do not constitute a physical barrier to sediment transport processes. Therefore, the Proposed Development does not present a credible pathway for effects on the natural circulation of sediment and organic matter for sand dune habitats.

6.2.4.8 Any accidental pollution, if it were to occur, would be minor, subject to rapid dispersal and dilution, and mitigated through the best practice measures outlined in Table 6.2. It is therefore not anticipated to reach or affect any Annex I Coastal Habitat QIs.

6.2.4.9 The morphodynamic modelling presented in Section 6.2.1 (paragraphs 6.2.1.49 to 6.2.1.60) indicates that that no changes to wave climate, tidal regime, sediment transport pathways or seabed morphology are predicted to occur at the coastline or within designated Annex I Coastal Habitat QIs, therefore, no adverse impact pathway exists for changes to physical processes.

6.2.4.10 **Therefore, no AEoI of the Annex I Coastal Habitat QIs of Magherabeg Dunes SAC, as defined by the COs of the site, are identified as a result of any of the impacts considered above affecting intertidal and subtidal benthic habitats from Project Design Option 1.**

6.2.4.11 **Based on the representative potential risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.2.5 Kilpatrick Sandhills SAC

6.2.5.1 The COs for Kilpatrick Sandhills SAC are to maintain the favourable conservation conditions of annual vegetation of drift lines, and to restore the favourable conservation conditions of embryonic shifting dunes, shifting dunes along the shoreline with *Ammophila arenaria* (white dunes), fixed coastal dunes with herbaceous vegetation (grey dunes), and Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) in Kilpatrick Sandhills SAC. Table 5.1 lists these COs and their corresponding attributes and targets.

6.2.5.2 There are three potential impacts on the intertidal and subtidal benthic habitats associated with the construction, operational and maintenance and decommissioning of the Proposed Development, which are presented in Table 6.3 and are assessed below.

6.2.5.3 The QI Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) is primarily a terrestrial habitat which will fall outside the scope of works taking place within the Array Area and Cable Corridor and Working Area. **Therefore, it is concluded that increases in suspended sediment and deposition, accidental pollution and changes in physical processes will have no AEoI on this on this Annex I Coastal Habitat QI of the Kilpatrick Sandhills SAC from Project Design Option 1.**

6.2.5.4 **Based on the representative potential risk of effect of Project Design Option 1, it is concluded that no AEoI on this Annex I Coastal Habitat QI of the Kilpatrick Sandhills SAC would also apply to Project Design Option 2.**

6.2.5.5 The magnitude of potential impacts is influenced by SAC location and distance from the site of works for all three potential impact pathways to Annex I Coastal Habitats, namely:

- increased SSCs and associated deposition;
- accidental pollution; and
- changes to physical processes due to presence of operational infrastructure.

6.2.5.6 Buckroney-Brittas Dunes and Fen SAC is designated for several of the same or similar QIs and is located nearer to the Proposed Development (0.05 km) than Kilpatrick Sandhills SAC (6.80 km). Given the greater distance of Kilpatrick Sandhills SAC, the potential for AEoI of Annex I Coastal Habitat QIs at Kilpatrick Sandhills SAC is considered the same as, or less than, that for Buckroney-Brittas Dunes and Fen SAC. In Section 6.2.3, it has been concluded that none of the potential effects on intertidal and subtidal benthic habitats would result in an AEoI of the QIs.

6.2.5.7 In addition, as reported in Section 6.2.1 (see Figure 6.2 to Figure 6.11), it is not anticipated that sediment plumes will extend to The Kilpatrick Sandhills SAC under the most precautionary scenario, where no impact pathways exist for increased SSCs and associated deposition. Any accidental pollution, if it were to occur, would be minor, subject to rapid dispersal and dilution, and mitigated through the best practice measures outlined in Table 6.2. It is therefore not anticipated to reach or affect any Annex I Coastal Habitat QIs. The morphodynamic modelling presented in Section 6.2.1 (paragraphs 6.2.1.49 to 6.2.1.60) indicates that that no changes to wave climate, tidal regime, sediment transport pathways or seabed morphology are predicted to occur at the coastline or within designated Annex I Coastal Habitat QIs, therefore, no adverse impact pathway exists for changes to physical processes.

6.2.5.8 **Therefore, no AEoI of the Annex I Coastal Habitat QIs of Kilpatrick Sandhills SAC, as defined by the COs of the site, are identified as a result of any of the impacts considered above affecting intertidal and subtidal benthic habitats from Project Design Option 1.**

6.2.5.9 **Based on the representative potential risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.2.6 The Murrough Wetlands SAC

6.2.6.1 The COs for The Murrough Wetlands SAC are to restore the favourable conservation condition of annual vegetation of drift lines, perennial vegetation of stony banks, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), Mediterranean salt meadows (*Juncetalia maritimi*), Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* and Alkaline fens in The Murrough Wetlands SAC. Table 5.1 lists these COs and their corresponding attributes and targets.

6.2.6.2 There are three potential impacts on the intertidal and subtidal benthic habitats associated with the construction, operational and maintenance and decommissioning of the Proposed Development, which are presented in Table 6.3 and are assessed below.

6.2.6.3 The magnitude of potential impacts is influenced by distance from the site of works for all three potential impact pathways to Annex I Coastal Habitats, namely:

- increased SSCs and associated deposition;
- accidental pollution; and
- changes to physical processes due to presence of operational infrastructure.

6.2.6.4 Buckroney-Brittas Dunes and Fen SAC is designated for several of the same or similar QIs and is located nearer to the Proposed Development (0.05 km from the Proposed Development) than The Murrough Wetlands SAC (10.25 km from the Proposed Development). On this basis, the potential for AEoI of Annex I Coastal Habitat QIs at The Murrough Wetlands SAC is considered to be the same as, or less than, that for Buckroney-Brittas Dunes and Fen SAC. In Section 6.2.3, it has been concluded that none of the potential effects on intertidal and subtidal benthic habitats would result in an AEoI of the QIs.

6.2.6.5 In addition, as reported in Section 6.2.1 (see Figure 6.2 to Figure 6.11), it is not anticipated that sediment plumes will extend to The Murrough Wetlands SAC under the most precautionary scenario, where no impact pathways exist for increased SSCs and associated deposition. Any accidental pollution, if it were to occur, would be minor, subject to rapid dispersal and dilution,

and mitigated through the best practice measures outlined in Table 6.2. It is therefore not anticipated to reach or affect any Annex I Coastal Habitat QIs. The morphodynamic modelling presented in Section 6.2.1 (paragraphs 6.2.1.49 to 6.2.1.60) indicates that that no changes to wave climate, tidal regime, sediment transport pathways or seabed morphology are predicted to occur at the coastline or within designated Annex I Coastal Habitat QIs, therefore, no adverse impact pathway exists for changes to physical processes.

6.2.6.6 **Therefore, no AEoI of the Annex I Coastal Habitat QIs of The Murrough Wetlands SAC, as defined by the COs of the site, are identified as a result of any of the impacts considered above affecting intertidal and subtidal benthic habitats from Project Design Option 1.**

6.2.6.7 **Based on the representative potential risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.2.7 Cahore Polders and Dunes SAC

6.2.7.1 The COs for Cahore Polders and Dunes SAC are to restore the conservation conditions of annual vegetation of drift lines, Embryonic shifting dunes, shifting dunes along the shoreline with *Ammophila arenaria* (white dunes), fixed coastal dunes with herbaceous vegetation (grey dunes) and humid dune slacks. Table 5.1 lists these COs and their corresponding attributes and targets.

6.2.7.2 There are three potential impacts on the intertidal and subtidal benthic habitats associated with the construction, operational and maintenance and decommissioning of the Proposed Development, which are presented in Table 6.3 and are assessed below.

6.2.7.3 The magnitude of potential impacts is influenced by distance from the site of works for all three potential impact pathways to Annex I Coastal Habitats, namely:

- increased SSCs and associated deposition;
- accidental pollution; and
- changes to physical processes due to presence of operational infrastructure.

6.2.7.4 Buckroney-Brittas Dunes and Fen SAC is designated for several of the same or similar QIs and is located nearer to the Proposed Development (0.05 km from the Proposed Development) than Cahore Polders and Dunes SAC (18.19 km from the Proposed Development). On this basis, the potential for AEoI of Annex I Coastal Habitat QIs at Cahore Polders and Dunes SAC is considered the same, or less than, that for Buckroney-Brittas Dunes and Fen SAC. In Section 6.2.3, it has been concluded that none of the potential effects on intertidal and subtidal benthic habitats would result in an AEoI of the QIs.

6.2.7.5 In addition, as reported in Section 6.2.1 (see Figure 6.2 to Figure 6.11), it is not anticipated that sediment plumes will extend to the Cahore Polders and Dunes SAC under the most precautionary scenario, where no impact pathways exist for increased SSCs and associated deposition. Any accidental pollution, if it were to occur, would be minor, subject to rapid dispersal and dilution, and mitigated through the best practice measures outlined in Table 6.2. It is therefore not anticipated to reach or affect any Annex I Coastal Habitat QIs. The morphodynamic modelling presented in Section 6.2.1 (paragraphs 6.2.1.49 to 6.2.1.60) indicates that that no changes to wave climate, tidal regime, sediment transport pathways or seabed morphology are predicted to occur at the coastline or within designated Annex I Coastal Habitat QIs, therefore, no adverse impact pathway exists for changes to physical processes.

6.2.7.6 **Therefore, no AEoI of the Annex I Coastal Habitat QIs of Cahore Polders and Dunes SAC, as defined by the COs of the site, are identified as a result of any of the impacts considered above affecting intertidal and subtidal benthic habitats from Project Design Option 1.**

6.2.7.7 **Based on the representative potential risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.2.8 Blackwater Bank SAC

6.2.8.1 The COs for Blackwater Bank SAC are to maintain the favourable conservation conditions of sandbanks which are slightly covered by sea water all the time in Blackwater Bank SAC. Table 5.1 lists the COs and their corresponding attributes and targets.

6.2.8.2 There are three potential impacts on the intertidal and subtidal benthic habitats associated with the construction, operational and maintenance and decommissioning of the Proposed Development, which are detailed in Table 6.3 and assessed for each phase of the development:

- Elevated levels of SSCs and associated sediment deposition;
- Accidental release of pollutants; and
- Changes to physical processes.

6.2.8.3 With consideration that the magnitude of potential impacts is influenced by distance from the site of works for all three potential impact pathways to Annex I Habitats, and that, as reported in Section 6.2.1 (see Figure 6.2 to Figure 6.11), it is not anticipated that sediment plumes will extend to the Blackwater Bank SAC under the most precautionary scenario, no impact pathways exist for increased SSCs and associated deposition. Any accidental pollution would be minor, subject to rapid dispersal and dilution and would be mitigated through the best practice measures outlined in Table 6.2. As such, no impact pathway exists for accidental pollution. The morphodynamic modelling presented in Section 6.2.1 (paragraphs 6.2.1.49 to 6.2.1.60) indicates that there will be no changes to the nearshore wave climate, and sediment transport processes that support nearby designated sites will remain unaffected; therefore, no adverse impact pathway exists for changes to physical processes.

6.2.8.4 **Therefore, no AEoI of the Annex I Marine Habitat QIs of Blackwater Bank SAC, as defined by the COs of the site, are identified as a result of any of the impacts considered above affecting intertidal and subtidal benthic habitats from Project Design Option 1.**

6.2.8.5 **Based on the representative potential risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.2.9 Summary of Stage 2 Appraisal for Sites Screened in for Annex I Coastal and Marine Habitat QIs

6.2.9.1 Three potential impacts were assessed for impacts on Annex I Coastal and Marine Habitats resulting from construction, operational and maintenance and decommissioning of the Proposed Development, the results of this assessment can be seen in Table 6.4.

Table 6.4: Conclusion for the assessment of potential impacts on Sites Screened in for Annex I Coastal and Marine Habitat QIs

Potential impact	Differences between Project Design Option 1 and 2	Conclusion
Elevated levels of SSCs and associated deposition	For Project Design Option 1, there is a higher number of monopile foundations requiring installation however, there is not anticipated to be a higher risk of elevated levels of SSCs and associated deposition for Project Design Option 2. Therefore, Project Design Option 1 is considered representative of Project Design Option 2 in respect to elevated SSCs and associated deposition.	The suspended sediment plumes associated with Project Design Option 1 and Project Design Option 2 are predicted to disperse out with all SAC boundaries. It is concluded that neither Project Design Option would result in an AEoI for any SAC in relation to increased SSCs and associated deposition.

Potential impact	Differences between Project Design Option 1 and 2	Conclusion
Accidental release of pollutants	For Project Design Option 1, there is a slightly higher number of monopile foundations requiring construction, operational and maintenance and decommissioning activities and therefore, there is a marginally higher risk of accidental pollution. Both Project Design options consider the same Factored in Measures (Table 6.2). Therefore, Project Design Option 1 is considered conservatively representative of Project Design Option 2 in respect to potential for accidental pollution.	As both Project Design Option 1 and 2 present avoidance by design and management measures which will be implemented to reduce the likelihood of accidental pollution events, it is concluded that no AEoI would occur for any SAC for both Project Design Option 1 and 2 in relation to accidental pollution.
Changes to physical processes	Project Design Option 1 consists of a larger number of foundations to be installed – 55 monopile foundations in total (53 for WTGs and 2 for OSPs), whilst Project Design Option 2 comprises of 49 foundations in total (47 for WTGs and 2 for OSPs). Therefore, Project Design Option 1 is considered representative of Project Design Option 2 for assessing potential influences on habitat change in relation to tidal currents, wave climate, sediment transport and seabed morphology.	As both Project Design Option 1 and Project Design Option 2 are considered to have no measurable effect on the any of the SACs considered for Annex I Coastal or Marine Habitats, a conclusion of no AEoI is applicable for both Project Design Options for changes to physical processes

6.3 Baseline information to inform Stage 2 AA for Annex II Marine Mammal Species QIs

6.3.1.1 As outlined in Section 5.1, 40 European sites with corresponding Annex II marine mammal QIs have been screened in for Stage 2 AA, as a LSE could not be ruled out at Stage 1 (NIS Volume I: Supporting Information for Screening for Appropriate Assessment (Revised March 2026)). These sites are presented in Figure 6.12 and comprise SACs designated for harbour porpoise (*Phocoena phocoena*), bottlenose dolphin (*Tursiops truncatus*), grey seal (*Halichoerus grypus*), and harbour seal (*Phoca vitulina*).

6.3.1.2 The boundary for the Proposed Development does not overlap any designated sites with marine mammal QIs, with the closest site comprising Blackwater Bank SAC, located approximately 19.13 km from the Proposed Development. However, given the high mobility of Annex II marine mammal species and their use of wide-ranging marine habitats beyond SAC boundaries, functional connectivity between the Proposed Development area and designated sites cannot be excluded. On this basis, the following SACs have been taken forward for assessment at Stage 2:

- Within Ireland:
  - Blackwater Bank SAC – harbour porpoise;
  - Rockabill to Dalkey Island SAC – harbour porpoise;
  - Codling Fault Zone SAC – harbour porpoise;
  - Slaney River Valley SAC – harbour seal;
  - Carnsore Point SAC – harbour porpoise;

  - Lambay Island SAC – grey seal and harbour porpoise;
  - Saltee Islands SAC – grey seal;
  - Hook Head SAC - harbour porpoise and bottlenose dolphin;
  - Roaringwater Bay and Islands SAC – harbour porpoise;
  - Kenmare River SAC – harbour porpoise;
  - Blasket Islands SAC – harbour porpoise;
  - Belgica Mound Province SAC – harbour porpoise;
  - Bunduff Lough and Machair / Trawalua / Mullaghmore SAC – harbour porpoise;
  - Inishmore Island SAC – harbour porpoise and bottlenose dolphin;
  - Kilkieran Bay and Islands SAC – harbour porpoise; and
  - West Connacht Coast SAC – harbour porpoise.

- Transboundary sites within the UK:
  - West Wales Marine / Gorllewin Cymru Forol SAC – harbour porpoise;
  - North Anglesey Marine / Gogledd Môn Forol SAC – harbour porpoise;
  - Lleyn Peninsula and the Sarnau / Pen Llyn a'r Sarnau SAC – grey seal and bottlenose dolphin;
  - Cardigan Bay / Bae Ceredigion SAC – grey seal and bottlenose dolphin;
  - Pembrokeshire Marine / Sir Benfro Forol SAC – grey seal;
  - North Channel SAC – harbour porpoise; and
  - Bristol Channel Approaches / Dynesfeydd Môr Hafren SAC – harbour porpoise.

- Transboundary sites within mainland Europe:
  - Abers – Côtes des legends – harbour porpoise;
  - Nord Bretagne DH – harbour porpoise;
  - Baie de Morlaix – harbour porpoise;
  - Ouessant-Molène – harbour porpoise;
  - Côte de Granit rose-Sept-Iles – harbour porpoise;
  - Côtes de Crozon – harbour porpoise;
  - Chaussée de Sein – harbour porpoise;
  - Tregor Goëlo – harbour porpoise;
  - Mers Celtiques – Talus du golfe de Gascogne – harbour porpoise;
  - Récifs et Lands de la Hague – harbour porpoise;
  - Baie de Saint-Brieuc – Est – harbour porpoise;
  - Anse de Vauville – harbour porpoise;
  - Cap d'Erquy-Cap Fréhel – harbour porpoise;
  - Banc et récifs de Surtainville – harbour porpoise;
  - Baie de Lancieux, Baie de l'Arguenon, Archipel de Saint Malo et Dinard – harbour porpoise;
  - Chausey – harbour porpoise;
  - Estuaire de le Rance – harbour porpoise; and
  - Baie du Mont Saint-Michel – harbour porpoise.

6.3.1.3 NIS Volume I: Supporting Information for Screening for Appropriate Assessment (Revised March 2026) identified a number of pathways by which the Proposed Development construction, operational and maintenance and decommissioning activities could potentially result in LSE on Annex II marine mammal QIs of the SACs, which could not be excluded from further consideration on a precautionary basis (Table 5.1). Given the high mobility of marine mammals and their sensitivity to anthropogenic pressures, potential effects may occur through both direct interaction with project activities and indirect pathways, including changes to prey availability or habitat use.

6.3.1.4 Underwater noise will be generated by the Proposed Development primarily through piling activities during construction, with additional contributions from UXO clearance, confirmatory site surveys, other seabed disturbance activities (i.e. dredging and trenching), and increased vessel movements. Underwater noise has the potential to result in physical injury, auditory damage and behavioural effects (including disturbance or displacement), and represents a key pathway by which the Proposed Development may interact with Annex II marine mammal species.

6.3.1.5 Potential injury from vessel activities is associated with construction, operational and maintenance, and decommissioning of the Proposed Development, which will involve increased vessel movements within the wider area and may increase the likelihood of interaction between vessels and marine mammals.

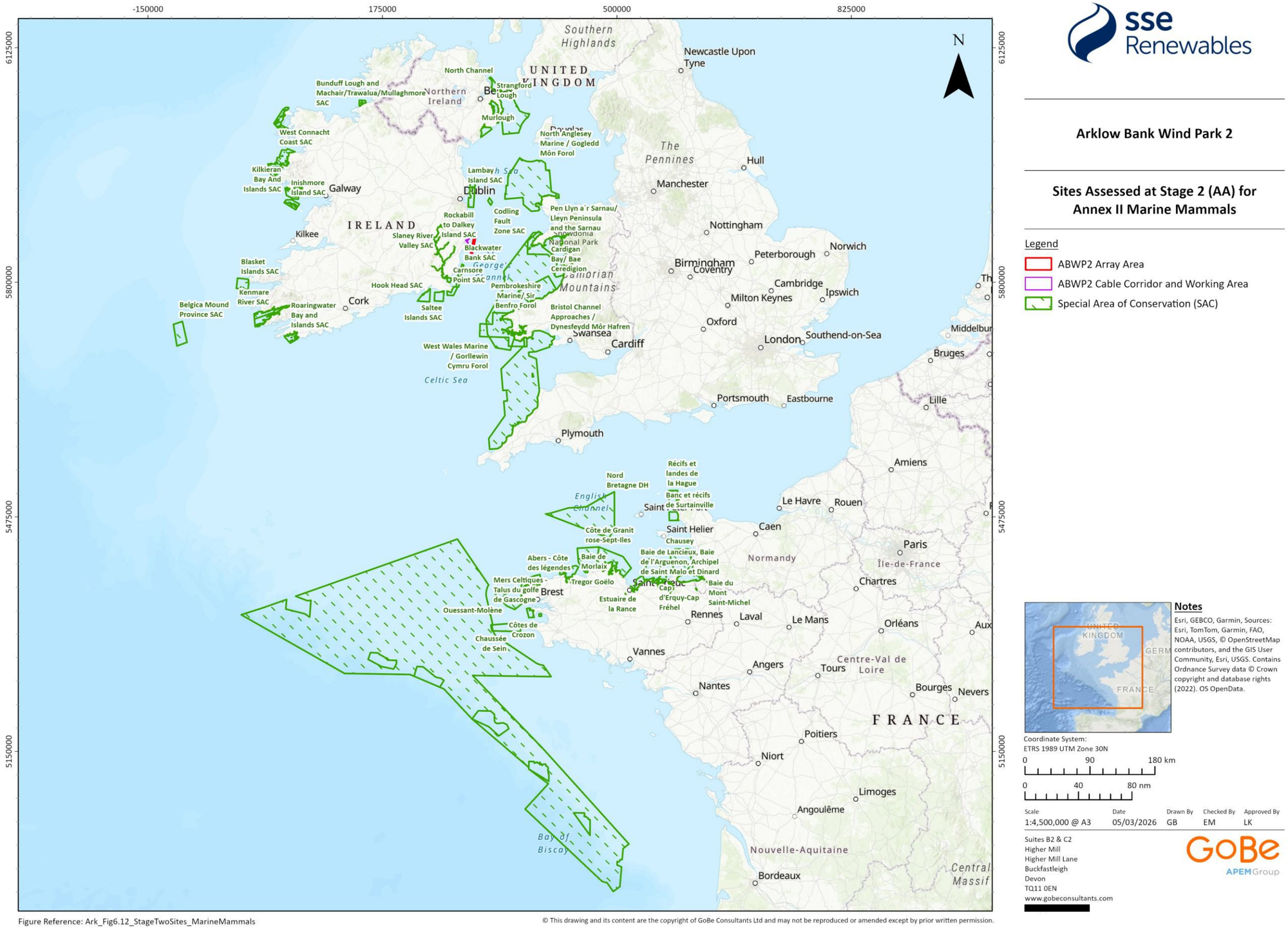
6.3.1.6 There is potential for accidental release of pollutants to occur from vessels and equipment associated with the construction, operational and maintenance and decommissioning phases of the Proposed Development, which could result in adverse effects on marine mammals. Pollutants may include diesel fuel, bentonite (from drilling activities), lubricants, grease and oils, anti-fouling biocides, and grout.

6.3.1.7 EMF associated with subsea export, inter-array and interconnector cables may be generated during the operational and maintenance phase of the Proposed Development. EMF is considered as a potential pressure pathway for Annex II cetaceans species, reflecting ongoing scientific discussion regarding the ability of some cetaceans to detect variations in magnetic fields (Normandeau *et al.,* 2011). While evidence of population-level effects remains limited, this pathway is retained on a precautionary basis for cetaceans and is not considered a relevant pressure pathway for Annex II seal species (Hanke *et al.*, 2013). Further justification and detail supporting species-specific marine mammal sensitivities for EMF is provided in Section 6.3.3 of the NIS Volume I: Supporting Information for Screening for Appropriate Assessment (Revised March 2026).

6.3.1.8 Indirect effects on marine mammals may occur as a result of changes in prey species distribution and abundance, potentially arising from underwater noise, vessel activity, EMF, accidental pollution or deterioration in habitat or water quality.

6.3.1.9 Overall, for the Annex II marine mammal QIs screened into the NIS, the following potential impact pathways are considered in relation to the COs of the relevant SACs and are evaluated through detailed Stage 2 assessment, either alone (Section 6.4) or in-combination (Section 7.4.2):

- Underwater noise from piling activities;
- Underwater noise from other activities (including UXO clearance, site surveys, dredging and trenching, and vessels);
- Injury from vessel activities;
- Accidental pollution;
- EMF (only for sites with harbour porpoise and bottlenose dolphin QIs); and
- Changes in prey.



sse Renewables

Arklow Bank Wind Park 2

Sites Assessed at Stage 2 (AA) for Annex II Marine Mammals

Legend

- ABWP2 Array Area
- ABWP2 Cable Corridor and Working Area
- Special Area of Conservation (SAC)

Notes

Esri, GEBCO, Garmin, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Esri, USGS. Contains Ordnance Survey data © Crown copyright and database rights (2022). OS OpenData.

Coordinate System:
ETRS 1989 UTM Zone 30N

0 90 180 km

0 40 80 nm

Scale	Date	Drawn By	Checked By	Approved By
1:4,500,000 @ A3	05/03/2026	GB	EM	LK

Suites B2 & C2
Higher Mill
Higher Mill Lane
Buckfastleigh
Devon
TQ11 0EN
www.gobeconsultants.com

Figure Reference: Ark_Fig6.12_StageTwoSites_MarineMammals

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Figure 6.12: Sites assessed at Stage 2 AA for Marine Mammals

6.3.2 Baseline Environment

Site-specific surveys summary

6.3.2.1 The marine mammal baseline for the Proposed Development is informed by a comprehensive body of existing and site-specific survey data. A summary of the site-specific surveys used to inform the Annex II marine mammal baseline for this NIS is provided in Table 6.5. Detailed survey methodologies are presented in the monitoring reports referenced therein and in the Marine Mammal Technical Report (NIS Volume III, Appendix 11.2: Marine Mammal Technical Report (Revised March 2026)).

6.3.2.2 The baseline evidence includes historical boat-based visual surveys (2000-2009), a Passive Acoustic Monitoring (PAM) campaign (2002), and multiple phases of Digital Aerial Surveys (DAS; 2018 to 2020), together with Marine Mammal Observer (MMO) records collected during geophysical and geotechnical campaigns (2019 to 2020). These data underpin the characterisation of marine mammal presence, distribution, and relative abundance within and surrounding the Proposed Development area.

6.3.2.3 Since submission of the planning application in June 2024, additional site-specific data have since been collected to support updates to the EIAR and NIS in response to RFIs 9c and 9d. These include extended DAS covering during 2023 to 2025, and targeted land-based seal vantage point surveys undertaken between June to November 2025 to address limitations in aerial survey coverage of seal haul-out sites (Table 6.5). Additional nearshore and offshore geotechnical survey campaigns were undertaken in 2023 and 2024 including MMO coverage, with sighting reported by Gavin & Doherty Geosolutions Ltd (2023a; 2023b), Mizen Archaeology (2024) and XOcean (2024; Table 6.5).

Table 6.5: Summary of site-specific survey data for Marine Mammals

Data source	Overview of survey	Survey contractor	Date(s) of survey	Reference to further information
Acoustic monitoring	Static acoustic data logger	Coveney Wildlife Consulting Ltd (CWC)	August to September 2002	Coveney Wildlife Consulting Ltd (CWC) (2002); Appended to NIS Volume III, Appendix 11.2: Marine Mammal Technical Report (Revised March 2026).
Historical boat-based visual survey	Visual boat-based survey	CWC	July 2000 to June 2005	CWC (2003; 2004; 2005); Appended to NIS Volume III, Appendix 11.2: Marine Mammals Technical Report (Revised March 2026).
Historical boat-based visual survey	Visual boat-based survey	Fulmar Ecological Services	July 2005 to June 2006	Fulmar Ecological Services (2006); Appended to NIS Volume III, Appendix 11.2: Marine Mammals Technical Report (Revised March 2026).
Historical boat-based visual survey	Visual boat-based survey	Cork Ecology	July 2006 to June 2009	Cork Ecology (2007; 2009; 2010); Appended to NIS Volume III, Appendix 11.2: Marine Mammals Technical Report (Revised March 2026).
Baseline digital aerial survey (DAS)	DAS	HiDef Aerial Surveying Limited	March 2018 to February 2020 (excluding April 2019 plus April 2020)	HiDef (2020a; 2020b); Appended to NIS Volume III, Appendix 11.2: Marine Mammals Technical Report (Revised March 2026).

Data source	Overview of survey	Survey contractor	Date(s) of survey	Reference to further information
Baseline DAS	DAS	HiDef Aerial Surveying Limited	August 2023 to June 2024	NIS Volume III, Appendix 11.2: Marine Mammals Technical Report (Revised March 2026).
Baseline DAS	DAS	HiDef Aerial Surveying Limited	February 2025 to July 2025	NIS Volume III, Appendix 11.2: Marine Mammals Technical Report (Revised March 2026).
Marine Mammal Observer (MMO) Daily sightings data	Boat-based sightings during mitigation for geophysical survey campaign	Irish Whale and Dolphin Group (IWDG) Consulting	July to August 2019	IWDG Consulting (2019); Appended to NIS Volume III Appendix 11.2: Marine Mammals Technical Report (Revised March 2026).
MMO Daily sightings data	Boat-based sightings during mitigation for geophysical survey campaign	Gavin & Doherty Geosolutions Ltd	July to August 2020	Gavin & Doherty Geosolutions Ltd (2020a); Appended to NIS Volume III, Appendix 11.2: Marine Mammals Technical Report (Revised March 2026).
MMO Daily sightings data	Boat-based sightings during mitigation for geotechnical survey campaign	Gavin & Doherty Geosolutions Ltd	October to November 2020	Gavin & Doherty Geosolutions Ltd (2020b); Appended to NIS Volume III, Appendix 11.2: Marine Mammals Technical Report (Revised March 2026).
MMO Daily sightings data	Boat-based sightings during mitigation for geotechnical nearshore and offshore survey campaigns	Gavin & Doherty Geosolutions Ltd	July to August 2023	Gavin & Doherty Geosolutions Ltd (2023a; 2023b); Appended to NIS Volume III, Appendix 11.2: Marine Mammals Technical Report (Revised March 2026).
MMO Daily sightings data	Boat-based sightings during mitigation for survey campaigns	Mizen Archaeology and XOcean	June to August 2024	Mizen Archaeology, (2024); XOcean, (2024); Appended to NIS Volume III, Appendix 11.2: Marine Mammals Technical Report (Revised March 2026).
Seal Vantage Point (VP) surveys	Land-based surveys from vantage points overlooking the proposed landfall and the surrounding 500 m buffer zone	APEM Group	June 2025 to November 2025	NIS Volume III, Appendix 11.4: Seal Survey – 2025 Survey Report (RFI March 2026); NIS Volume III, Appendix 11.2: Marine Mammals Technical Report (Revised March 2026).

Annex II Marine Mammal Species

6.3.2.4 A detailed characterisation of the receiving marine mammal environment is provided in the Marine Mammal Technical Report (NIS Volume III, Appendix 11.2: Marine Mammals Technical Report). This NIS draws on the key findings of that technical report and of NIS Volume I: Supporting Information for Screening for Appropriate Assessment (Revised March 2026), presenting only the information necessary to inform the Stage 2 AA of Annex II marine mammal QIs.

6.3.2.5 Based on the available existing and site-specific data, seven marine mammal species are considered likely to occur regularly in the vicinity of the Proposed Development. Of these, four Annex II species are relevant to this NIS and are considered further:

- Harbour porpoise;
- Bottlenose dolphin;
- Grey seal; and
- Harbour seal.

6.3.2.6 Table 6.6 presents density estimates and reference population information for the Annex II marine mammal species considered in this NIS. Site-specific density estimates are used to characterise local occurrence within the Proposed Development area; however, these are not considered representative of animal densities at the wider spatial scale relevant to certain impact pathways, such as underwater noise during piling or UXO detonation. Assessments therefore draw on appropriate Management Unit (MU) or regional population estimates to quantify potential exposure to impacts. This approach is precautionary and consistent with standard practice for highly mobile species, recognising that SACs are part of broader connected populations, with the Proposed Development being located within the following for each species:

- Harbour porpoise – Celtic and Irish Sea MU;
- Bottlenose dolphin – Irish Sea MU;
- Grey seal and harbour seal – East region of Republic of Ireland (RoI).

Table 6.6: Marine mammal density (animals/km^2) and population estimates

Species	Density (animals/km^2)	Density source	Reference population	Reference population estimate	Reference population source
Harbour porpoise	0.38	Site-specific DAS	Celtic and Irish Seas Management Unit (MU)	62,517	Inter-Agency Marine Mammal Working Group (IAMMWG) (2023)
	0.2803	Gilles *et al.* (2023)			
	Grid-cell specific	Derived from SCANS-IV density surfaces (Gilles *et al.*, 2025)			
Bottlenose dolphin	0.0201	Rogan *et al.* (2018)	Irish Sea MU	293	IAMMWG (2023)
	0.2352	Gilles *et al.* (2023)			
	Grid-cell specific	Derived from SCANS-IV density			

Species	Density (animals/km²)	Density source	Reference population	Reference population estimate	Reference population source
		surfaces (Gilles *et al.*, 2025)			
Grey seal	0.08	Grid cell-specific average across the Array Area and Cable Corridor and Working Area extracted from Carter *et al.* (2020)	East region of Republic of Ireland (RoI)	1,662	Scaled count data (Morris and Duck, 2019)
Harbour seal	0.0003	Grid cell-specific average across the Array Area and Cable Corridor and Working Area extracted from Carter *et al.* (2020)	East region of RoI	182	Scaled count data (Morris and Duck, 2019)

HARBOUR PORPOISE

6.3.2.7 Harbour porpoise is listed under Annex II of the Habitats Directive and is a qualifying interest of several SACs screened in for Stage 2 AA (Table 5.1). It is the most abundant and widely distributed cetacean species in Irish waters (Gilles *et al.*, 2023; Rogan *et al.*, 2018). Within the Celtic and Irish Seas MU, abundance is estimated at 62,517 individuals (95% confidence interval (CI): 48,324 – 80,877; coefficient of variation (CV): 0.13) (Inter-Agency Marine Mammal Working Group (IAMMWG), 2023; Table 6.6). At a national scale, the species has an 'Inadequate (U1)' conservation status and considered to have a 'stable' population trend in Ireland, based on the most recent national assessment (NPWS, 2025f).

6.3.2.8 Harbour porpoise was regularly recorded during the site-specific surveys, occurring year-round, with higher relative occurrence and density recorded during the summer months (April to September) (see NIS Volume III, Appendix 11.2: Marine Mammal Technical Report for further detail). Whilst site-specific density estimates provide valuable fine-scale information on local habitat use, the most recent large-scale density estimate derived from the Small Cetaceans in European Atlantic waters and the North Sea survey (SCANS-IV; Gilles *et al.,* 2023) of 0.2803 animals/km^2 is considered more appropriate for assessing potential effects that may extend beyond the boundary of the Proposed Development (Table 6.6).

6.3.2.9 In 2024, the harbour porpoise QI was incorporated into the designation of several existing SACs in Ireland. At the time of assessment, some of these sites have been assigned site-specific COs for harbour porpoise; however, such site-specific COs are not yet published for Bunduff Lough and Machait / Trawalua / Mullaghmore SAC (Table 5.1). In this case, a precautionary approach has been applied, whereby site integrity is assessed in functional terms, based on the maintenance of access to suitable habitat, avoidance of disturbance, and the conditions supporting species' use of the site (see Section 6.4.13 for site-specific rationale and application). A similar approach has been applied to the 18 transboundary European sites also designated for

harbour porpoise where site-specific COs are not known or available, based on information provided within Natura 2000 Standard Data Forms (see Section 6.4.24; Table 5.1).

BOTTLENOSE DOLPHIN

6.3.2.10 Bottlenose dolphins are listed under Annex II of the Habitats Directive and are a qualifying interest of three SACs screened in for Stage 2 AA, including Hook Head SAC within Irish waters and two transboundary Welsh SACs (Table 5.1). The species is widespread and abundant in Irish waters (Gilles *et al.*, 2023; Rogan *et al.*, 2018). Within the Irish Sea MU, abundance is estimated as 293 individuals (95% CI: 108 – 793; CV: 0.54) (IAMMWG, 2023; Table 6.6). At a national scale, the species has a 'favourable' conservation status and a 'stable' population trend in Ireland, based on the most recent national assessments (NPWS, 2025).

6.3.2.11 A single group of bottlenose dolphin was recorded during the site-specific surveys, confirming occasional use of the Proposed Development area (HiDef, 2020a; NIS Volume III, Appendix 11.2: Marine Mammal Technical Report). Encounter rates were low and insufficient to derive a robust site-specific density estimate. Similarly, ObSERVE surveys recorded limited occurrences within the relevant stratum (stratum 5), with greater abundance recorded elsewhere around Ireland (particularly on the south and west coasts of Ireland; Rogan *et al.*, 2018). Consequently, the highest large-scale density estimate derived from SCANS-IV (Gilles *et al.*, 2023) of 0.2352 animals/km² is applied for assessment purposes (Table 6.6).

GREY SEAL

6.3.2.12 Grey seal is listed under Annex II of the Habitats Directive and is a qualifying interest of two Irish SACs (Lambay Island SAC and Saltee Islands SAC), as well as three transboundary Welsh SACs (Lleyn Peninsula and the Sarnau SAC; Pembrokeshire Marine SAC, and Cardigan Bay SAC) screened in for Stage AA assessment (Table 5.1). Grey seals are widely distributed around Ireland and occur year-round (Morris and Duck, 2019). At a national scale, the species has a 'favourable' conservation status and an 'increasing' population trend in Ireland (NPWS, 2025f).

6.3.2.13 Telemetry data indicate connectivity of grey seals between east coast haul-outs and other regions, including Wales, southwest England, and southwest Scotland, supporting the potential for regional movement of individuals across the wider Irish and UK marine environment (Carter *et al.*, 2020; 2022). On this basis, all SACs within typical foraging ranges of 100 km from the Proposed Development have been included in the assessment.

6.3.2.14 As formal MUs have not been defined for seals in Irish waters, the relevant reference populations for this assessment are derived from the most recent national and regional aerial surveys of seals in Ireland conducted during the harbour seal moulting season in August 2017 and 2018 (Morris and Duck, 2019). This estimated a total of 3,698 grey seals nationally, of which 418 occurred at haul-outs in the east region of Ireland (western Irish Sea) (Morris and Duck, 2019). Applying correction factors for the proportion of the population hauled-out at the time of survey (up to 23.9%; Russell *et al.*, 2016), and scaling by the average observed proportion (25.15%; 95% CI: 25.45 – 29.07%; SCOS, 2022), results in an estimate of 1,662 individuals, which is used as the reference population for grey seals in this assessment (Table 6.6).

6.3.2.15 During site-specific surveys, grey seals were recorded infrequently within the Proposed Development area, with estimated abundance per survey ranging from a minimum of eight individuals to a maximum of 40 individuals across the survey period (see Marine Mammal Technical Report (NIS Volume III, Appendix 11.2: Marine Mammal Technical Report) for further detail). However, the application of site-specific density estimates are limited by high inter-survey variability, low consistency in seal detections and the exclusion of sightings that could not be attributed to species level. Therefore, the average modelled density derived from grid cells within

the Array Area and Cable Corridor and Working Area is applied for assessment purposes and is estimated at 0.08 animals/km^2 (extracted from Carter *et al.*, 2020; Table 6.6).

HARBOUR SEAL

6.3.2.16 Harbour seal is listed under Annex II of the Habitats Directive and is a qualifying interest of one Irish SAC screened in for Stage 2 AA (Slaney River Valley SAC; Table 5.1). Harbour seals occur at lower abundance than grey seals along the east coast of Ireland and have a more restricted distribution and foraging range (Morris and Duck, 2019; Carter *et al.*, 2022). At a national scale, the species have a 'favourable' conservation status and a 'stable' population trend in Ireland (NPWS, 2025f).

6.3.2.17 Harbour seals favour inshore bays, coves, islands, and estuaries for haul-out. Known haul-out locations include Lambay Island to the north of the Proposed Development and Wexford Harbour to the south (Duck and Morris, 2013; Morris and Duck, 2019). The closest known harbour seal haul-out site to the Proposed Development is at North Bull Island, north of Dublin Bay (Duck and Morris, 2013). Harbour seals typically forage within 50 km of haul-out sites (Carter *et al.*, 2022), and the Proposed Development lies beyond this typical foraging range, indicating that the area is likely used only infrequently.

6.3.2.18 The harbour seal population size of the East region of the Republic of Ireland has been scaled by using an estimated average proportion of harbour seals hauled-out at the time of survey of 72% (95% CI: 0.54 – 0.88) (Lonergan *et al.,* 2013), resulting in a reference population of 182 individuals for the assessment (Table 6.6).

6.3.2.19 Site-specific data indicate very low levels of harbour seal occurrence within the Proposed Development area, with two individuals recorded in August 2018 and a single individual in April 2024 during site-specific DAS. Therefore, encounter rates were insufficient to derive site-specific density estimate for harbour seal. The average modelled harbour seal density across grid cells within the Array Area and Cable Corridor and Working Area is applied for assessment purposes and is 0.0003 animals/km^2 (extracted from Carter *et al.*, 2020; Table 6.6).

6.3.3 Avoidance through Design and Standard Project Environmental Protection Measures of the Proposed Development

6.3.3.1 The design of the Proposed Development incorporates a range of avoidance and management measures to reduce potential impacts on Annex II marine mammal QIs. These include standard project environmental protection measures and procedural controls based on industry best practice, applied across the construction, operational and maintenance, and decommissioning phases.

6.3.3.2 The factored-in measures relevant to Annex II marine mammals are presented in Table 6.7. These measures have been assumed to be implemented, and the assessment of potential effects on Annex II marine mammal QIs takes them into account (Section 6.4). Accordingly, the determination of magnitude and significance of potential impacts reflects the reduced risk these measures provide.

Table 6.7: Project design and environmental protection measures relevant for Annex II marine mammal receptors

Factored In Measure	Justification
Environmental Management Plan (EMP) providing the overarching framework for environment management during construction, operational and maintenance, and decommissioning phases of the Proposed Development. The EMP includes mitigation/monitoring measures and commitments made within the NIS and a Marine Pollution Contingency Plan (MPCP) which will include key emergency contact details (e.g. EPA, Irish Coast Guard (IRCG)). An EMP is included in NIS Volume III, Appendix 25.1: Environmental Management Plan (Revised March 2026).	Measures will be adopted to ensure that the potential for release of pollutants from construction, operational and maintenance, and decommissioning is minimised. These mitigation measures are: Storage of chemicals in secure designated areas in line with appropriate regulations and guidelines, specifically: • The Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001 (as amended) (Schedule 4, Part 5); • International Convention for the Prevention of Pollution from Ships (MARPOL) 1973 (as amended) (Annex II, and Annex III regulations); • International Convention for the Safety of Life at Sea (SOLAS) (Chapter VII); and • OSPAR Annex III: On the Prevention and Elimination of Pollution from Offshore Sources. Double skinning and labelling (direction of flow and contents) of pipes and clearly labelled storage tanks containing hazardous substances: • Storage of these substances in impenetrable bunds; • Working vessels shall handle all wastes in accordance with International Maritime Organisation (IMO) requirements and in accordance with the requirements of national legislation (i.e. Sea Pollution Acts 1991 to 1999; Sea Pollution (Miscellaneous Provisions) Act 2006) as applicable; • All waste and/or litter, including potential pollutants produced during construction, operational and maintenance, and decommissioning of the Proposed Development shall be stored and returned to shore for authorised disposal at suitable facilities; and • Vessel refuelling to take place in port or under permit from the IRCG. In this manner, accidental release of contaminants from vessels will be strictly controlled, thus providing protection for marine life across all phases of the Proposed Development. Any accidental pollution of the marine environment shall be immediately reported to the IRCG and to any other local authorities who are likely to be affected by such pollution.
Cables will be buried where possible and protected where not possible as set out in Section 4 of the NIS Volume I: Supporting Information for Screening for Appropriate Assessment (Revised March 2026).	Commitment to the burial of cables where possible and protected where not possible, as set out in Section 4 of NIS Volume I: Supporting Information for Screening for Appropriate Assessment (Revised March 2026). While burial of cables will not reduce the strength of potential EMF, it does increase the distance between the

Factored In Measure	Justification
	source of EMF (i.e. the operational cables) and marine mammal receptors, thereby potentially reducing the potential effect on those receptors.
Marine Mammal Mitigation Plan (MMMP) detailing the piling methodology, duration of piling, soft-start procedures, maximum piling energy and details of mitigation and monitoring parameters (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan).	The implementation of a piling MMMP will mitigate for the risk of permanent auditory injury to marine mammals within a 'mitigation zone'. The mitigation zone is determined considering the potential for instantaneous auditory injury based on the initial hammer strike energy of 825 kJ (i.e. soft start hammer energy). The ramp-up and soft-start will provide an audible cue to allow marine mammals to flee the area before piling at increased hammer energy commences. These measures will help to mitigate any potential for auditory injury. Acoustic Deterrent Devices (ADDs) will be used prior to the ramp-up and soft-start to ensure marine mammals are deterred.
MMMP for UXO clearance detailing the clearance methodologies, and details of the mitigation and monitoring parameters (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan).	A UXO MMMP will be implemented during any UXO clearance required. The MMMP will include measures to ensure the risk of instantaneous Permanent Threshold Shift (PTS) to marine mammals is negligible. The exact mitigation measures contained with the UXO MMMP are yet to be determined because the number, size, condition, and location of UXO that may require clearance are currently unknown, but measures will be in line with the latest relevant guidance. Multiple measures are available and have been implemented elsewhere for UXO clearance, such as the use of ADDs and scarer charges to displace animals to beyond the instantaneous PTS impact range, or noise abatement techniques where appropriate.
The MMMP, details the survey equipment to be deployed, details of mitigation and monitoring parameters (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan).	Proposed mitigation has been described in the MMMP, and will be implemented during site surveys and will include measures to ensure the risk of PTS to marine mammals is negligible.
Rehabilitation Schedule (NIS Volume III, Appendix 4.1: Rehabilitation Schedule).	The Rehabilitation Schedule sets out the methodology and schedule for decommissioning of the Proposed Development. The Rehabilitation Schedule confirms that there will be no piling operations during decommissioning of the monopiles.
Environmental Vessel Management Plan (VMP) is informed by best practice guidance to minimise the risk to marine mammals from vessel activities (NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan).	Implementation of an Environmental VMP sets out mandatory requirements for all contractors and vessels operating on behalf of the Developer, in order to: • Minimise the risk of collision and injury to marine wildlife; • Minimise the risk of disturbance to marine wildlife;

Factored In Measure	Justification
	• Define the operational procedures contractors must follow when undertaking activities in proximity to wildlife; and • Establish the procedures for reporting any vessel collisions with marine wildlife.
The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence for Site Investigations (FS007339) being carried out.	The Developer was granted a Foreshore Licence (FS007339) for Site Investigations (associated with the Proposed Development) from the Minister for Housing, Local Government and Heritage in May 2022. This Foreshore Licence expires in 2027. The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence for Site Investigations (FS007339) being carried out. As such there is no temporal overlap between the activities consented in this Foreshore Licence and the Proposed Development and there will be no potential for cumulative effects.
The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence Application for Site Surveys FS007555 are being carried out.	The Developer submitted a Foreshore Licence Application for Site Surveys to the Minister for Housing, Local Government and Heritage in April 2023 (FS007555). This application was determined and granted on 04 July 2024 and is valid until 04 June 2029. The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence Application for Site Surveys FS007555 (should a licence be granted) are being carried out. As such there is no temporal overlap between the activities proposed in the Foreshore Licence Application and the Proposed Development.

6.3.4 Impacts and Parameters Assessed

6.3.4.1 Both Project Design Options identified in Table 6.8 have the potential to result in AEoI on European Sites screened in for Annex II marine mammal QIs.

Table 6.8: Project Design Options 1 and 2 considered for the assessment of potential impacts on European Sites Screened in for Annex II marine mammal QIs

Potential impact	Phase			Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
	C	O	D		
Injury and/or disturbance to marine mammals from underwater noise during piling	✓	X	X	Project Design Option 1 **Construction Phase:** Foundation installation: WTGs installed on monopile foundations: • Installation of 53 WTGs with a pile diameter between 7 m and a maximum diameter of 11 m within the Array Area; • Maximum of one foundation installed at any one time (within any 24 hour period); • Maximum hammer energy up to 3,500 kJ and a strike rate of 30 strikes per minute; • Soft start energy of 825 kJ modelled with slow ramp up of energy for 40 minutes; • Anticipated maximum duration of piling at 3 hours and 40 minutes; • Total of 71 days when piling may occur over a maximum construction period of 4 years. OSP installed on monopile foundations: • Installation of 2 OSPs with a pile diameter between 7 m and a maximum pile diameter of 14 m within the Array Area; • Maximum of one foundation installed at any one time (within any 24 hour period); • Maximum hammer energy up to 3,500 kJ; • Soft start energy of 825 kJ modelled with slow ramp up of energy for 40 minutes; • Average maximum duration of 3 hours and 40 minutes per pile; and • Total of 4 days when piling may occur over a maximum construction period of 4 years.	Within the construction phase Project Design Option 1 consists of a larger number of foundations to be installed - 55 monopile foundations in total (53 for WTGs and 2 for OSPs), whilst Project Design Option 2 comprises of 49 foundations in total (47 for WTGs and 2 for OSPs). Therefore, Project Design Option 1 will have a marginally greater potential for UWN from piling activities. Therefore, overall Project Design Option 1 is considered conservatively representative of Project Design Option 2 in respect of the potential for injury and/or disturbance to marine mammals from underwater noise during piling.

Potential impact	Phase C O D	Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
		Project Design Option 2 **Construction Phase:** Foundation installation: WTGs installed on monopile foundations: • Installation of 47 WTGs with a pile diameter between 7 m and a maximum of 11 m within the Array Area; • Maximum of one foundation installed at any one time (within any 24 hour period); • Maximum hammer energy up to 3,500 kJ and a strike rate of 30 strikes per minute; • Soft start energy of 825 kJ modelled with slow ramp up of energy for 40 minutes; • Anticipated maximum duration of piling at 3 hours 40 minutes; and • Total of 63 days when piling may occur over a maximum construction period of 4 years. OSPs installed on monopile foundations: • Installation of 2 OSPs with a pile diameter between 7 m and a maximum of 14 m within the Array Area; • Maximum of one foundation installed at any one time (within any 24 hour period); • Maximum hammer energy up to 3,500 kJ; • Soft start energy of 825 kJ modelled with slow ramp up of energy for 40 minutes; • Maximum duration of 3 hours 40 minutes per pile; and Total of 4 days when piling may occur over a maximum construction period of 4 years.	
Injury and/or disturbance to marine mammals from underwater	✓ X X	Project Design Option 1 and 2 **Construction phase:** • The type, size, and number of possible UXO that may require clearance is currently unknown.	The parameters assessed are the same between Project Design Option 1 and 2. Therefore, Project Design Option 1 is considered representative of Project Design Option 2 in respect of the potential for injury and/or disturbance to marine mammals from underwater noise during UXO clearance.

Potential impact	Phase C O D	Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
noise during UXO clearance		• An illustrative assessment is presented using charge weights (TNT equivalent) ranging from 25 to 800 kg, with an additional donor weight of 0.5 kg, for high order detonation. A charge weight of 0.5 kg is used to provide an illustrative assessment of a low order (deflagration) detonation.	
Injury and/or disturbance to marine mammals from underwater noise during site surveys	✓ ✓ X	Project Design Option 1 and 2 **Construction phase:** As the exact survey equipment to be deployed during confirmatory surveys has not yet been confirmed, the assessment has been based on equipment types and source levels anticipated to be used and considered representative of the range of available options. Injury and/or disturbance to marine mammals from underwater noise during site surveys: • Geophysical (non-impulsive sonar based) surveys including Multibeam Echosounder (MBES), Side scan sonar (SSS), Sub-bottom Profiler (SBP) and Ultra-short Baseline (USBL); • Geophysical surveys including seismic refraction and sparker; and • Geotechnical surveys including seismic cone penetration test (CPT), vibrocore, and grab sampling. **Operational and maintenance phase:** Injury and/or disturbance to marine mammals from underwater noise during site surveys: • Geophysical surveys (inter-array cables) every six months for the first two years and annually thereafter; • Geophysical surveys (inter-connector cables) every six months for the first two years and annually thereafter; and • Geophysical surveys (export cables) every six months for the first two years and annually thereafter.	The parameters assessed are the same between Project Design Option 1 and 2. Therefore, Project Design Option 1 is considered representative of Project Design Option 2 in respect of the potential for injury and/or disturbance to marine mammals from underwater noise during site surveys.

Potential impact	Phase C O D	Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
		The exact equipment to be deployed during the geophysical site surveys has not yet been confirmed. Therefore, the assessment has been based on the equipment types and source levels assessed for the construction phase, which are considered representative of the range of equipment likely to be used. Injury and/or disturbance during operational and maintenance phase is anticipated to be similar in nature to the construction phase.	
Injury and/or disturbance to marine mammals from dredging and trenching	✓ ✓ X	<u>Project Design Option 1 and 2</u> **Construction phase:** Injury and/or disturbance to marine mammals form dredging and trenching: • Backhoe dredging, grab or clamshell dredging for seabed lowering and feature clearance; • Mass/Controlled Flow Excavation or water injection dredging for seabed lowering and feature clearance; • Suction hopper dredging for seabed lowering and feature clearance; • Exit pits for horizontal directional drilling will be achieved with dredging and use of excavators; and • Burial of offshore export cables with the use of jet trenching, mechanical trenching and vertical injector. **Operational and maintenance phase:** Injury and/or disturbance to marine mammals form dredging and trenching: • Scour protection repair and maintenance for WTG and OSP foundations at all assets every five years will require specialist dredging vessel; • Removal of excess seabed sediment and reburial of exposed cables; and • Trenching for cable repair and reburial once every five years.	The parameters assessed are the same between Project Design Option 1 and 2. Therefore, Project Design Option 1 is considered representative of Project Design Option 2 in respect of the potential for injury and/or disturbance to marine mammals from dredging and trenching.

Injury and/or disturbance to marine mammals from vessel activities	✓	✓	✓	<u>Project Design Option 1 and 2</u> **Construction Phase:** Injury and/or disturbance to marine mammals from vessel activities during construction: • Maximum of 69 installation vessels in the Array Area at any one time (including 12 installation vessels along the Cable Corridor and Working Area at any one time, and maximum of 7 installation vessels in the vicinity of the landfall at any one time); • A maximum of 4,150 vessel return trips over the construction phase and a maximum of 1,797 vessel return trips per year during the construction phase, comprised of jack-up vessels, tug/anchor handlers, cable installation vessels, guard vessels, survey vessels, crew transfer vessels, scour/cable protection installation vessels, pre-installation boulder clearance vessels, sandwave clearance vessels, UXO clearance vessels and other support vessels; and • Maximum construction schedule of 24 hours a day, 7 days a week for a maximum construction period of 4 years. Within this period, offshore export cable installation may take place over a period of 12 months. **Operational and Maintenance phase:** Injury and/or disturbance to marine mammals from vessel activities during the operational and maintenance phase: • Maximum of 1,359 vessel round trips per year comprised of crew transfer vessels, jack-up vessels, cable repair vessels and other vessels, from local ports or transiting from a previously operational location; • Up to 30 operational and maintenance vessels on site at any one time; and • Operational phase up to 36.5 years. **Decommissioning Phase:** Injury and/or disturbance during the decommissioning phase is anticipated to be similar in nature, but of lower magnitude, to the construction phase.	The parameters assessed are the same between Project Design Option 1 and 2. Therefore, Project Design Option 1 is considered representative of Project Design Option 2 in respect of the potential for injury and/or disturbance to marine mammals from vessel activities.

Potential impact	Phase			Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
	C	O	D		
Changes in EMF from subsea electrical cabling	X	✓	X	Project Design Option 1 and 2 **Operational and Maintenance phase:** Presence of inter-array, OSP interconnector, and offshore export cables: • 66 kV inter-array cables between 110 – 122 km in length; • 0 kV (Fibre optic only) / 66 kV / 220 kV OSP interconnector cables between 25 – 28 km in length; • 220 kV offshore export cables between 35 – 40 km in length; • Burial depth between 0 - 1.5 m for inter-array cables and 0 - 2.5 m for OSP interconnector and offshore export cables; • Up to 15% of inter-array cable routes, up to 50% of OSP interconnector cable routes, and 20% of Cable Corridor and Working Area requiring protection; • Maximum three third party export cable crossings; and • Operational phase up to 36.5 years.	The parameters assessed are the same between Project Design Option 1 and 2. Therefore, Project Design Option 1 is considered representative of Project Design Option 2 in respect of the potential for changes in EMF from subsea electrical cabling.

Potential impact	Phase C O D	Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
Changes in fish and shellfish community affecting prey resources	✓ ✓ ✓	Project Design Option 1 and 2 **Construction Phase:** • Temporary subtidal habitat loss/disturbance; • Increased SSC and associated deposition; • Injury and/or disturbance to fish and shellfish from underwater noise and vibration during pile driving and cable installation; and • Accidental pollution. **Operational and maintenance phase:** • Temporary subtidal habitat loss/disturbance; • Increased SSC and associated sediment deposition; • Accidental pollution; • Long-term habitat loss as a result of the presence of foundation structures, scour protection, and cable protection; • Alteration of seabed habitats arising from changes in physical processes as a result of the presence of foundation structures, scour protection, and cable protection; and • Changes in EMF from subsea cabling. **Decommissioning Phase:** • Temporary subtidal habitat loss/disturbance; • Increased SSC and associated deposition; and • Accidental pollution.	Within the construction phase Project Design Option 1 consists of a larger number of foundations to be installed – 55 monopile foundations in total (53 for WTGs and 2 for OSPs), whilst Project Design Option 2 comprises of 49 foundations in total (47 for WTGs and 2 for OSPs). Therefore, Project Design Option 1 will have a marginally greater potential for changes in fish and shellfish community affecting prey resource and is considered conservatively representative of Project Design Option 2. Within the Decommissioning Phase Project Design Option 1 will result in the deconstruction and removal of all 53 WTG topsides and 2 OSP topsides, with both to be cut at seabed level, whilst Project Design Option 2 consists of the deconstruction and removal of all 47 WTG topsides and 2 OSP topsides , with both to be cut at seabed level. Therefore, Project Design Option 1 will have a marginally greater potential for changes in fish and shellfish community affecting prey resource and is considered conservatively representative of Project Design Option 2. Therefore, overall Project Design Option 1 is considered conservatively representative of Project Design Option 2 in respect of the potential for changes in fish and shellfish community affecting prey resources.
Accidental pollution	✓ ✓ ✓	Project Design Option 1 **Construction phase:** Accidental pollution in the Array Area during construction from: • Installation of 53 WTGs and 2 OSPs within the Array Area; • Installation of inter-array cables between 110 – 122 km in length, OSP interconnector cables between 25 – 28 km in	Within the construction phase Project Design Option 1 consists of a larger number of foundations to be installed – 55 monopile foundations in total (53 for WTGs and 2 for OSPs), whilst Project Design Option 2 comprises of 49 foundations in total (47 for WTGs and 2 for OSPs). Therefore, Project Design Option 1 will have a marginally greater potential for accidental pollution.

Potential impact	Phase C O D	Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
		length, and offshore export cables between 35 – 40 km in length; • Maximum of 69 installation vessels in the Array Area at any one time (including 12 installation vessels along the offshore Cable Corridor and Working Area at any one time, and maximum of 7 installation vessels in the vicinity of the landfall at any one time; • A maximum of 4,150 vessel return trips over the construction phase and a maximum of 1,797 vessel return trips per year during the construction phase, comprised of jack-up vessels, tug/anchor handlers, cable installation vessels, guard vessels, survey vessels, crew transfer vessels, scour/cable protection installation vessels, pre-installation boulder clearance vessels, sandwave clearance vessels, UXO clearance vessels and other support vessels; and • A maximum of 294 helicopter return trips over the construction phase and a maximum of 118 helicopter return trips per year. **Operational and maintenance phase:** Accidental pollution in the Array Area during operational and maintenance from: • Up to 30 operational and maintenance vessels on site at any one time; • Up to 1,359 vessel round trips per year comprised of crew transfer vessels, jack-up vessels, cable repair vessels and other vessels, from local ports or transiting from a previously operational location; • A maximum of 485 helicopter return trips per year; • Presence of 53 WTGs and 2 OSPs; and • Maintenance activities of 53 WTGs and 2 OSPs. **Decommissioning phase:**	Within the Decommissioning Phase Project Design Option 1 will result in the deconstruction and removal of all 53 WTG topsides and 2 OSP topsides, with both to be cut at seabed level, whilst Project Design Option 2 consists of the deconstruction and removal of all 47 WTG topsides and 2 OSP topsides, with both to be cut at seabed level. Therefore, Project Design Option 1 will have a marginally greater potential for accidental pollution. Therefore, overall Project Design Option 1 is considered conservatively of Project Design Option 2 in respect of the potential for accidental pollution.

Potential impact	Phase C O D	Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
		Accidental pollution in the Array Area during decommissioning from: • Decommissioning of 53 WTGs and 2 OSPs.	
		<u>Project Design Option 2</u> **Construction phase:** Accidental pollution in the Array Area during construction from: • Installation of 47 WTGs and 2 OSPs within the Array Area; • Installation of inter-array cables between 110 – 122 km in length, OSP interconnector cables between 25 – 28 km in length, and offshore export cables between 35 – 40 km in length; and • Maximum of 69 installation vessels in the Array Area at any one time (including 12 installation vessels along the offshore Cable Corridor and Working Area at any one time, and maximum of 7 installation vessels in the vicinity of the landfall at any one time. • A maximum of 4,150 vessel return trips over the construction phase and a maximum of 1,797 vessel return trips per year during the construction phase, comprised of jack-up vessels, tug/anchor handlers, cable installation vessels, guard vessels, survey vessels, crew transfer vessels, scour/cable protection installation vessels, pre-installation boulder clearance vessels, sandwave clearance vessels, UXO clearance vessels and other support vessels; and • A maximum of 294 helicopter return trips over the construction phase and a maximum of 118 helicopter return trips per year. **Operational and maintenance phase:** Accidental pollution in the Array Area during operational and maintenance from: • Up to 30 operational and maintenance vessels on site at any one time;	

Potential impact	Phase C O D	Project Design Option Assessed (1 and 2)	Parameter Differences Between Project Design Option 1 and 2 (if any)
		• Maximum of 1,359 vessel round trips per year comprised of crew transfer vessels, jack-up vessels, cable repair vessels and other vessels, from local ports or transiting from a previously operational location; • Presence of 47 WTGs and 2 OSPs; and • Maintenance activities of 47 WTGs and 2 OSPs. **Decommissioning phase:** Accidental pollution in the Array Area during decommissioning from: • Decommissioning of 47 WTGs and 2 OSPs.	

6.4 Assessment of Proposed Development alone for Annex II Marine Mammal QIs

Sites within Ireland

6.4.1 Blackwater Bank SAC

Harbour porpoise

6.4.1.1 The relevant Annex II marine mammal QI site-specific COs at Blackwater Bank SAC is to maintain the favourable conservation condition of the harbour porpoise QI, as defined by the following list of attributes, targets and technical clarifications (NPWS, 2024a):

- *Access to suitable habitat:* Species range within the site should not be restricted by artificial barriers to site use:
  - This target may be considered relevant to proposed activities or operations that will result in the permanent exclusion of harbour porpoise from part of its range within the site, or will permanently prevent access for the species to suitable habitat therein; and
  - It does not refer to short-term or temporary restriction of access or range.
- *Disturbance:* Human activities should occur at levels that do not adversely affect the harbour porpoise community at the site:
  - Proposed activities or operations should not introduce man-made energy (e.g. aerial or underwater noise, light or thermal energy) at levels that could result in a significant negative impact on individuals and/or the community of harbour porpoise within the site. This refers to the aquatic habitats used by the species in addition to important natural behaviours during the species' annual cycle;
  - This target also relates to proposed activities or operations that may result in the deterioration of key resources (e.g. water quality, feeding, etc.) upon which harbour porpoise depend. In the absence of complete knowledge on the species ecological requirements at this site, such considerations should be assessed where appropriate on a case-by-case basis; and
  - Proposed activities or operations should not cause death or injury to individuals to an extent that may ultimately affect the harbour porpoise community at the site.

6.4.1.2 There are eight potential impact pathways relevant to harbour porpoise associated with the construction, operational and maintenance, and decommissioning of the Proposed Development, as identified in Table 6.8 and assessed below for each phase of the Proposed Development.

INJURY AND/OR DISTURBANCE FROM UNDERWATER NOISE FROM PILING

6.4.1.3 Underwater noise has the potential to impact marine mammals if the sound frequency falls within their hearing range, and in particular, if the sound levels exceed the relevant thresholds for the Functional Hearing Group (FHG) for which the species is categorised. With consideration of harbour porpoise, they are within the Very High Frequency (VHF) FHG, with an estimated hearing range of 275 Hz to 160 kHz (Southall *et al.*, 2019).

6.4.1.4 Exposure to impulsive underwater noise, such as pile driving, can result in a range of effects, from a reduction in hearing sensitivity which may be temporary (Temporary Threshold Shift; TTS) or permanent (PTS), to behavioural disturbance and displacement.

6.4.1.5 Underwater noise levels generated during pile driving were predicted by Subacoustech Environmental Ltd using their Impulse Noise Sound Propagation and Impact Range Estimator (INSPIRE) model. Full details of the underwater noise modelling methodology and the resulting impact areas and ranges are provided in the Underwater Noise Assessment (NIS Volume III, Appendix 11.1: Underwater Noise Assessment (Revised March 2026)).

6.4.1.6 Where two Project Design Options are considered, Project Design Option 1 represents the scenario with the greatest potential for underwater noise generation, principally due to the greater number of monopile foundations and associated piling activity during the construction phase (Table 6.8). For all other effects on marine mammals, Project Design Option 1 and Project Design Option 2 have the same parameters. Accordingly, Project Design Option 1 parameters are used as the basis for the assessment. The assessment of Project Design Option 1 is conservatively representative of Project Design Option 2, and the conclusions of the assessment would not change, as Project Design Option 2 would not give rise to greater underwater noise or other effects.

6.4.1.7 Modelling included the prediction of impacts across five representative locations: WTG monopiles at three locations (North (N), Central (C), and Southwest (SW)) and two OSP monopile locations (North OSP (N-OSP), and South (S-OSP). All underwater noise modelling assumed maximum pile diameters to provide a conservative estimate of potential effects.

6.4.1.8 Two foundation scenarios were modelled across these locations:

- 11 m monopile foundations at the N, C and SW WTG locations, installed with a maximum blow energy of 3,500 kJ; and
- 14 m monopile foundations at the N-OSP and S-OSP location, installed with a maximum blow energy of 3,500 kJ.

6.4.1.9 For each foundation scenario, two mitigation scenarios were considered:

- Ramp-up mitigation scenario, commencing at 825 kJ and considered the base-case; and
- Extended ramp-up mitigation scenario, commencing at 400 kJ.

6.4.1.10 Both scenarios assume the same maximum hammer energy (3,500 kJ), but differ in soft-start energy levels. Further details of these mitigation scenarios are provided in the Marine Mammal Mitigation Plan (MMMP; NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan).

6.4.1.11 The ramp-up mitigation scenario (the base-case) is presented for comparative purposes, to illustrate the base level of effect and therefore highlight the reduction in effect achieved through the extended ramp-up mitigation scenario. The extended ramp-up scenario represents additional mitigation committed by the Applicant in order to further reduce the potential significance of effects. As the extended ramp-up mitigation scenario has been committed to, all conclusions of this assessment are based on this scenario.

6.4.1.12 For each combination of location, foundation scenario, and mitigation scenario, predicted impacts were calculated using three density estimates (Table 6.6), including both site-specific and regional values. The broader regional density estimate was applied as the primary precautionary metric to evaluate potential exposure of Annex II marine mammal QIs.

6.4.1.13 There are no site-specific abundance estimates for the Blackwater Bank SAC. Therefore, quantitative assessments have been undertaken against the wider reference population. Similarly, the number of animals that may be impacted is representative of animals across the reference population scale, rather than the number of animals within Blackwater Bank SAC specifically. Using wider species reference populations (such as species-specific MU or other regional populations; Table 6.6) allows the assessment to quantify potential exposure while avoiding or relying on unsupported assumptions about discrete SAC-specific populations. The potential impact on individual SACs is further contextualised through spatial analysis,

comparing the predicted impact ranges from activities such as underwater noise sources with the SAC boundary. This ensures that the assessment provides information on the proportion of animals likely to be affected within the SAC.

APPROACH TO PTS- AND TTS-ONSET

6.4.1.14 The PTS- and TTS-onset thresholds used to assess the potential for auditory impacts during pile driving are those presented in Southall *et al.* (2019) for impulsive noise, applied relative to each marine mammal QI FHG (Table 6.9). These thresholds form the basis for calculating impact ranges, defined as the areas around piling locations where noise levels exceed the PTS or TTS thresholds.

6.4.1.15 Two metrics were applied to quantify potential auditory impacts in accordance with current best practice; peak sound pressure level (SPL_{peak}) and cumulative sound exposure level (SEL_{cum}):

- Unweighted SPL_{peak} values were used to assess the potential for instantaneous PTS and, for context TTS (Table 6.9), as peak sound pressure-related damage is not frequency dependent and is therefore restricted to the audible frequency range of a species;
- SEL_{cum} thresholds were applied to account for accumulated sound exposure over the duration of a piling event, with sound energy weighted using species-specific auditory weighting curves (Southall *et al.*, 2019).

6.4.1.16 PTS-onset, applied using these metrics, represent the exposure level at which auditory injury may occur. PTS is therefore used in this assessment as the indicator of potential auditory injury, with calculated impact ranges showing the area around piling locations where PTS is predicted to occur. The number of individuals potentially exposed to auditory injury (PTS-onset) was estimated by combining modelled impact ranges with species density estimates, allowing the proportion of the relevant MU (Irish and Celtic Sea MU; Table 6.6) reference population impacted to be quantified. These estimates are precautionary, as they assume that all animals present within the PTS-onset impact ranges are affected, whereas empirical dose-response data (Donovan *et al.*, 2017) suggest that only approximately 18–19% of animals are likely to experience PTS at these exposure levels.

6.4.1.17 The TTS-onset thresholds presented in Southall *et al.* (2019) define the minimum exposure at which a temporary reduction in hearing sensitivity of approximately 6 dB is expected to occur. These thresholds are based on limited empirical data for impulsive noise sources such as pile driving, reflecting ethical constraints on inducing permanent auditory injury in experimental studies on marine mammals. For this reason, TTS-onset have been used primarily as a precautionary indictor to inform understanding of PTS-onset risk, with higher levels of TTS (e.g. 40 dB) considered indicative of possible PTS (Southall *et al.*, 2007).

6.4.1.18 As TTS-onset thresholds were developed principally as a means of predicting potential PTS, there is currently no established threshold at which TTS-onset would indicate biological significance, and their use is therefore likely to overestimate the spatial extent of ecologically relevant impacts. Consequently, it is not possible to undertake a quantitative assessment of TTS impacts for Annex II marine mammal QIs.

6.4.1.19 It is important to note that whilst TTS-onset thresholds are presented in Table 6.9 for context, TTS is not considered an auditory injury due to its temporary nature. Any potential effects associated with TTS are considered to be captured within the quantitative assessment of disturbance. Further reasoning and details are presented in NIS Volume III, Appendix 11.5: Temporary Threshold Shift (TTS) Position Paper - SMRU Consulting (RFI March 2026).

Table 6.9: Marine mammal PTS and TTS-onset thresholds for impulsive noise (Southall *et al.*, 2019)

Species	FHG	Cumulative PTS (SEL_{cum} dB re 1 μPa^2s weighted)	Instantaneous PTS (SPL_{peak} dB re 1 µPa unweighted)	Cumulative TTS (SEL_{cum} dB re 1 μPa^2s weighted)	Instantaneous TTS (SPL_{peak} dB re 1 µPa unweighted)
Harbour porpoise	Very High Frequency (VHF) cetacean	155	202	140	196
Dolphin species (bottlenose dolphin)	High Frequency (HF) cetacean	185	230	170	224
Seal species (in water) (grey seal, harbour seal)	Phocid (in water) (PCW)	185	218	170	212

BEHAVIOURAL DISTURBANCE FROM PILING ASSESSMENT METHODOLOGY

6.4.1.20 Disturbance from underwater noise during pile driving was assessed using a species-specific dose-response approach, consistent with current best practice. This method quantifies the probability of a behavioural response to a stressor or stimulus as a function of received sound exposure (Dunlop *et al.*, 2017), recognising that not all animals within an impact area will respond, unlike traditional methods of threshold-based assessments.

6.4.1.21 For the purpose of this assessment, the dose was defined as the received single-strike exposure level (SEL_{SS}; Southall, 2021). Modelled SEL_{SS} contours at 5 dB intervals generated by underwater noise modelling (see NIS Volume III, Appendix 11.1: Underwater Noise Assessment) were overlain on marine mammal species-specific density surfaces to quantify the number of individuals exposed to each sound level, and subsequently the number likely to experience behavioural disturbance based on the dose-response curve.

6.4.1.22 The predictions for the two foundation scenarios across the five modelling locations (N WTG, C WTG, SW WTG, N-OSP, and S-OSP) were presented separately in the Underwater Noise Assessment (NIS Volume III, Appendix 11.1: Underwater Noise Assessment). Disturbance from concurrent piling within the Proposed Development alone has not been assessed, as piling is limited to one installation per day (see Table 6.8). A precautionary approach has been taken in this impact assessment by using the regional population value density estimate where multiple estimates were available.

6.4.1.23 The dose-response function applied was developed by Graham *et al.* (2017b) for harbour porpoise, based on empirical data collected during the first six weeks of piling during Phase 1 of the Beatrice offshore windfarm. Following the development of this dose-response curve, additional data from the remaining piling events have been processed and showed that the responses of harbour porpoises to piling noise diminishes over the construction period (Graham *et al.*, 2019). Therefore, the application of the dose-response curve from the initial piling event in this assessment can be considered precautionary.

AUDITORY INJURY (PTS)

6.4.1.24 Predicted impact areas and maximum ranges for auditory injury (PTS-onset) to harbour porpoise from pile driving during construction from the Proposed Development, under both mitigation piling scenarios (ramp-up (base-case) and extended ramp-up), are presented in Table 6.10.

6.4.1.25 For the ramp-up mitigation scenario, the maximum instantaneous PTS-onset impact range was 580 m for the installation of a 11 m monopile at the SW WTG location, which represents the piling location closest to Blackwater Bank SAC (Table 6.10). This equates to a maximum of one individual potentially experiencing auditory injury, representing <0.01% of the reference population of 62,517 within the Celtic and Irish Sea MU (IAMMWG, 2023), based on the SCANS-IV density estimate.

6.4.1.26 Using the cumulative PTS-onset thresholds, the maximum predicted impact range for the same installation was 1.5 km, equating to a maximum of one individual (<0.01% of the MU reference population; Table 6.10) based on both the site-specific DAS density estimate and SCANS-IV density estimate. Application of the modelled grid-specific SCANS-IV density estimate similarly predicted a maximum of one individual (<0.01% of the MU reference population) for both instantaneous and cumulative PTS-onset (Table 6.10).

6.4.1.27 In addition to the ramp-up mitigation scenario, the Applicant has committed to the implementation of an extended ramp-up mitigation scenario (see Section 6.4.1.10). With this additional mitigation in place, the maximum instantaneous PTS-onset impact range remained at 580 m at the SW WTG location, corresponding to a maximum of one individual (<0.01% of the MU reference population) across all density estimates (Table 6.10). Predicted cumulative PTS-onset impact ranges were reduced to <50 m at all piling locations, equating to a maximum of one individual experiencing auditory injury (<0.01% of the MU reference population) for all density estimates (Table 6.10).

6.4.1.28 Importantly, the maximum PTS-onset ranges under all modelling scenarios for harbour porpoise fall entirely within the 1,000 m R_{safe} distance to be implemented through the project-specific MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan). As a result, the extended ramp-up procedure and implemented mitigation measures will ensure that all marine mammals are displaced from the injury risk area prior to the onset of full piling energy. Consequently, no animals are expected to be exposed to sound levels capable of causing auditory injury (PTS).

6.4.1.29 Overall, predicted auditory injury to harbour porpoise from pile driving during construction is extremely limited in spatial extent and scale, with the SW WTG location representing the most precautionary and most relevant piling location in relation to Blackwater Bank SAC.

Table 6.10: Predicted impact range of PTS-onset from pile driving at the SW WTG array location with harbour porpoise densities estimates. For further information on densities used; see Table 6.6.

Piling Scenario	Piling location and Monopile diameter (m)		Density (animals/km²)	Area (km²)	Maximum range (m)	Number of animals[1,2]	Percentage of reference population[2] (%)
Instantaneous PTS-onset (unweighted SPL_{peak})							
Ramp-up mitigation scenario	SW WTG	11 m	0.38	0.89	580	<1	<0.01
			0.2803			<1	<0.01
			0.116527			<1	<0.01
Extended ramp-up mitigation scenario	SW WTG	11 m	0.38	0.9	580	<1	<0.01
			0.2803			<1	<0.01
			0.116527			<1	<0.01
Cumulative PTS-onset (weighted SEL_{cum})							
Ramp-up mitigation scenario	SW WTG	11 m	0.38	2.8	1,500	1	<0.01
			0.2803			1	<0.01

Piling Scenario	Piling location and Monopile diameter (m)		Density (animals/km²)	Area (km²)	Maximum range (m)	Number of animals[1,2]	Percentage of reference population[2] (%)
			0.116527			<1	<0.01
Extended ramp-up mitigation scenario	SW WTG	11 m	0.38	<0.01	<50	<1	<0.01
			0.2803			<1	<0.01
			0.116527			<1	<0.01

[1]*The predicted number of individuals exposed to PTS-onset (both instantaneous and cumulative) from pile driving is fewer than one animal across all density scenarios. Importantly, the maximum PTS-onset impact range falls entirely within the 1,000 m Rsafe mitigation distance. With the implementation of the extended ramp-up mitigation procedure and associated MMMP measures (monitoring and soft-start procedures), marine mammals are expected to be displaced from the impact area prior to the onset of full hammer energy. Consequently, no animals are expected to be exposed to sound levels capable of causing auditory injury (PTS).*

[2]*The number of animals disturbed and the reference population are representative of the Celtic and Irish Sea MU population (IAMMWG, 2023). The number of animals disturbed is not representative of the numbers disturbed within the Blackwater Bank SAC.*

6.4.1.30 Impact pile driving generates impulsive underwater noise, with most acoustic energy occurring between 30 – 500 Hz, peaking between 100 - 300 Hz, and with energy extending above 2 kHz (Kastelein *et al.*, 2015; Kastelein *et al.*, 2016). Studies indicate that auditory injury in harbour porpoise arising from piling noise is most likely to occur where the source frequencies overlap with species' peak hearing sensitivity, rather than across the whole hearing spectrum (Kastelein *et al.*, 2013a).

6.4.1.31 With consideration of the risk and impacts of auditory injury, all species of cetaceans rely on acoustic cues for navigation, prey detection and communication (Southall *et al.*, 2007). The ecological consequences of PTS (a permanent and irreversible hearing impairment) are uncertain; however, potential effects could include impairment of key life functions such as communication, predator detection, foraging, mating and maternal fitness, potentially influencing an individual's health or vital rates and potentially lead to reduced birth rate in females and mortality of individuals (Erbe *et al.*, 2018). Linking hearing impairment directly to biologically significant population-level effects remains challenging due to a paucity of empirical evidence.

6.4.1.32 Despite harbour porpoises' potential sensitivity to auditory injury, a UK Department of Business, Energy, and Industrial Strategy (BEIS)-funded expert elicitation workshop concluded that PTS, when confined to a narrow frequency band, does not equate to deafness and is unlikely to result in biologically significant effects on survival and reproduction recognising that both the magnitude and frequency range of any threshold shift are critical when assessing potential effects on vital rates (Booth *et al.*, 2019; Kastelein *et al.*, 2017). With consideration that TTS, by definition is temporary and reversible, therefore this is considered to pose a negligible risk to individual survivability or reproductive success.

6.4.1.33 Experimental and field studies demonstrate that exposure to impulsive pile driving noise may induce TTS in harbour porpoise within a relatively narrow frequency band (Finneran, 2015), with statistically significant effects occurring at 4 and 8 kHz (Kastelein *et al.*, 2016) and centred at 4 kHz (Kastelein *et al.*, 2012a; Kastelein *et al.*, 2012b; Kastelein *et al.*, 2013b; Kastelein *et al.*, 2017). Drawing on the same expert elicitation workshop, it was concluded that any pile-driving-related threshold shifts would manifest primarily within the 2 – 10 kHz range, and that a PTS of 6 – 18 dB within this band is unlikely to significantly affect an individual's ability to survive and reproduce (Kastelein *et al.*, 2017).

6.4.1.34 Furthermore, the Developer has committed to the implementation of the project-specific MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan) during piling activities in accordance best practice, including DAHG (2014) guidance, to minimise the risk of auditory injury (PTS) to marine mammals (Table 6.7).

6.4.1.35 In relation to the site-specific COs for Blackwater Bank SAC (Table 5.1), the potential effects of underwater noise associated with pile driving on harbour porpoise have been assessed with respect to the attributes of access to suitable habitat and disturbance.

6.4.1.36 Regarding access to suitable habitat attribute, pile driving activities and the associated underwater noise (which could potentially cause auditory injury) will be short-term and temporary in nature and will not result in permanent habitat exclusion. Predicted PTS-onset impact ranges (maximum of 1.5 km) are substantially smaller than the distance to Blackwater Bank SAC, which is located approximately 20.03 km from the closest piling location (WT43; Project Design Option 2), and therefore do not overlap the SAC boundary. As such, harbour porpoises within the SAC will not be exposed to levels of underwater noise capable of resulting in auditory injury. Any highly unlikely auditory injury to individuals occurring outside the SAC would not impede access to suitable habitat within the site.

6.4.1.37 Regarding the disturbance attribute, even in the highly unlikely event that an individual experienced PTS-onset, available evidence indicates that would be unlikely to significantly affect individual fitness (i.e. its ability to survive and reproduce; Kastelein *et al.*, 2017). Therefore, pile

driving activities are not expected to introduce man-made energy at levels capable of causing significant negative effects on individual harbour porpoises or the wider community associated with, or connected to, Blackwater Bank SAC, nor is it expected to cause injury or mortality at levels capable of affecting site integrity.

6.4.1.38 **With consideration of the implementation of the extended ramp-up scenario and project-specific MMMP measures ensuring that no animals are within the area of predicted auditory injury (PTS-onset) ranges, the absence of overlap with the SAC (with the greatest predicted impact range of up to 580 m), and the negligible proportion of the wider MU potentially affected (<0.01%), it is therefore concluded there will be no AEoI of the harbour porpoise QI of the Blackwater Bank SAC, as defined by its site-specific COs, as a result of auditory injury due to underwater noise associated with piling for Project Design Option 1.**

6.4.1.39 **Based on the representative risk of effect of Project Design Option 1, it can be is concluded that no AEoI would also apply to Project Design Option 2.**

BEHAVIOURAL DISTURBANCE

6.4.1.40 The number of harbour porpoise predicted to experience behavioural disturbance as a result of pile driving during construction is presented in Table 6.11. Disturbance was quantified using the dose-response relationship for impulsive noise developed by Graham *et al.* (2019) and expressed as a proportion of the relevant reference population (Table 6.6) for individual piling events at representative locations within the Proposed Development.

6.4.1.41 As the dose-response assessment is based on SEL_{ss}, only the maximum hammer energy has been considered in the disturbance assessment. SEL_{ss} applies to a single strike rather than cumulative exposure over time, and therefore is calculated using the highest energy strike. As the maximum hammer energy (3,500 kJ) is identical for both the ramp-up mitigation and extended ramp-up mitigation scenarios, therefore, predicted behavioural disturbance under the extended ramp-up mitigation scenario is equivalent to that of the ramp-up mitigation scenario assessment. For avoidance of doubt, the conclusion of the behavioural disturbance assessment is based on the extended ramp-up mitigation scenario, as it has been committed to by the Applicant.

6.4.1.42 Using the uniform density estimate of 0.2803 animals/km^2 from the wider SCANS-IV surveys, a maximum of 1,293 harbour porpoise (2.07% of the reference MU population) may experience behavioural disturbance as a result of pile driving of an 11 m monopile at the SW WTG location, which represents the piling location closest to Blackwater Bank SAC (Table 6.11). While this density estimate is considered more appropriate for large spatial scales than the site-specific DAS density, it assumes a uniform distribution of animals across the Irish Sea and is therefore precautionary.

Table 6.11: Predicted impact of disturbance to harbour porpoise from pile driving at SW WTG location using dose-response curves. For further information on densities used; see Table 6.6

Piling Scenario	Piling location and Monopile diameter (m)	Density (animals/km^2)	Number of animals disturbed[1]	Percentage of reference population[1] (%)
Ramp-up mitigation		0.38	1,753	2.80

Piling Scenario	Piling location and Monopile diameter (m)	Density (animals/km²)	Number of animals disturbed[1]	Percentage of reference population[1] (%)
and extended ramp-up mitigation scenario	SW WTG 11 m	0.2803	1,293	2.07
		0.116527	538	0.86

[1]The number of animals disturbed and the reference population are representative of the Celtic and Irish Sea MU population (IAMMWG, 2023). The number of animals disturbed is not representative of the numbers disturbed within the Blackwater Bank SAC.

6.4.1.43 The 120 dB SEL_{ss} re 1 μPa^2s to 150 dB SEL_{ss} re 1 μPa^2s disturbance contours are predicted to overlap with the Blackwater Bank SAC (Figure 6.13). However, the probability of an individual responding at these outer contours is relatively low, of 1.2-50.9%, indicating that at least half of the animals within the SAC would not respond to noise levels predicted within the site.

6.4.1.44 An additional approach for the assessment of potential behavioural disturbance of harbour porpoise from piling is the Effective Deterrence Range (EDR) (JNCC, 2025). EDRs provide an empirically-derived estimate of the spatial extent over which the bulk of the disturbance response by harbour porpoises will occur, though they do not correspond to complete avoidance and may overestimate the distances at which effects are consistently observed (JNCC, 2025; JNCC, 2020). For monopile installation without noise abatement systems, reported EDRs vary, with most studies indicating ranges of 15–20 km, with a weighted average of 17.4 km based on 14 studies (Brown *et al.,* 2025). A recent study included in the Brown *et al.* (2025) review was from Moray West, which observed an EDR of 9.4 km, highlighting that the 20 km EDR recommended by JNCC is precautionary. To note, the approach taken by JNCC (2025) to calculating EDRs is precautionary as they represent the maximum disturbance response typically recorded at the start of the piling campaign. The disturbance distance of harbour porpoise is predicted to decrease over the duration of the piling campaign, as evidence by Graham *et al.* (2019).

6.4.1.45 Blackwater Bank SAC is 19.70 km from the Proposed Development at its closest point to the Array Area, however the minimum distances to the nearest indicative piling locations are 20.11 km (WT53; Project Design Option 1) or 20.03 km (WT43; Project Design Option 2). These distances fall beyond the upper limit of published EDRs for unabated monopile installation (20 km; JNCC, 2025). As such, there is no overlap between the SAC and the EDR or the range over which the bulk of the harbour porpoise disturbance response is expected. Therefore, disturbance to harbour porpoise within the SAC is likely to be minimal as a result of foundation installation for the Proposed Development.

6.4.1.46 For a comparison across modelled piling locations, the highest predicted level of behavioural disturbance corresponds to the C WTG location, with a precautionary maximum of 1,908 harbour porpoises (3.05% of the reference MU population) predicted to experience behavioural disturbance under the highest population density assumptions. This estimate represents a conservative upper-bound and is therefore taken forward for the in-combination quantitative assessment (see Section 7.4.2).

6.4.1.47 Potential behavioural disturbance to Annex II marine mammal QIs arising from pile driving has been considered within the project-specific MMMP (NIS Volume III, Appendix 25.2: Marine

Mammal Mitigation Plan). While primarily designed to minimise the risk of auditory injury (PTS) to cetaceans from piling-related underwater noise, the MMMP will also act to reduce the magnitude and spatial extent of behavioural disturbance. Measures such as pre-piling monitoring, controlled ramp-up of piling activities and adherence to recognised best-practice noise management protocols will limit exposure of cetaceans to the highest sound levels and reduce the likelihood of strong avoidance or displacement responses. The implementation of the MMMP therefore provides an additional layer of precaution in relation to disturbance effects, ensuring that any behavioural responses that do occur are temporary and reversible in nature and do not undermine the relevant site-specific COs (Table 6.7).

6.4.1.48 Furthermore, iPCoD modelling was conducted to determine whether the level of disturbance is expected to result in population level impacts under either Project Design Option 1 or 2. The results of the iPCoD modelling show that there is no significant effect of disturbance resulting from pile driving at the Proposed Development to harbour porpoise, with the impacted population predicted to continue at a stable trajectory at 99.90-99.93% of the un-impacted population up to 24 years after piling has ceased. The outputs of the iPCoD modelling are considered precautionary and applicable to the revised Project Design Options, as the original assessment was based on a greater number of WTGs and greater piling parameters (e.g. maximum hammer energy of 6,000 kJ was modelled in iPCoD while 3,500 kJ is now the maximum). Consequently, the iPCoD modelling provides a representative and precautionary basis for evaluating population-level effects of pile driving under the current design (see NIS, Volume III, Appendix 11.3: Phase 1 Irish Offshore Windfarms: Cumulative iPCoD Modelling for full list of modelling limitations and assumptions).

6.4.1.49 With consideration of the risks and impacts of disturbance and behavioural change, harbour porpoises are particularly vulnerable to disturbance due to their small body size, high metabolic rate and limited capacity for energy storage, requiring frequent foraging to meet energetic demands (Rojano-Doñate *et al.*, 2018; Wisniewska *et al.*, 2016). As such, displacement from high-quality foraging habitat or reduced foraging efficiency has the potential to affect an individuals fitness if animals are unable to compensate. However, studies using Digital Acoustic Recording Tags (DTAGs) suggest that harbour porpoises may exhibit some resilience to short-term reductions in food intake and are capable of compensatory behavioural responses (Wisniewska *et al.*, 2016).

6.4.1.50 Monitoring data collected during the construction of offshore windfarms have shown that harbour porpoise detections around the pile driving area often decline for several hours prior to the commencement of pile driving, likely due to increased other construction-related activity and the presence of vessels in advance of pile driving (Benhemma-Le Gall *et al.*, 2021; Benhemma-Le Gall *et al.*, 2023; Brandt *et al.*, 2018; Graham *et al.*, 2019). For example, during the installation campaigns of both Beatrice and Moray East offshore windfarms, acoustic detections gradually declined by up to 33% in the 48-hours preceding pile driving (Benhemma-Le Gall *et al.*, 2023). This pre-emptive displacement reduces the likelihood of harbour porpoise being present in the immediate vicinity of the piling location at the onset of the activity and therefore reducing the risk of auditory injury (Benhemma-Le Gall *et al.*, 2023).

6.4.1.51 While pile driving may result in temporary behavioural disturbance and displacement, evidence indicates that the magnitude of response typically diminishes over the construction period (Graham *et al.*, 2019), supporting the conclusion that disturbance effects are short-term and reversible. Furthermore, studies at two offshore windfarms in Scotland showed that detections of echolocation clicks and buzzing associated with prey capture continued within the short range (2 km) of piling locations, suggesting that harbour porpoises were not completely displaced from the affected area (Benhemma-Le Gall *et al.*, 2021). Furthermore, the study suggests that animals that experience displacement may be able to compensate for missed foraging opportunities and increased energy expenditure of fleeing the piling area as detections of both clicks and buzzing were positively related to the distance from the piling activity (Benhemma-Le Gall *et al.*, 2021)

which could be due to an increase in foraging activities beyond the piling impact range. Expert elicitation further concluded that juvenile and adult survival is unlikely to be significantly affected by missed foraging opportunities as a result of piling-related disturbance (Booth *et al.*, 2019).

6.4.1.52 In relation to the site-specific COs for Blackwater Bank SAC (Table 5.1), the potential effects of underwater noise associated with pile driving on harbour porpoise have been assessed with respect to the attributes of access to suitable habitat and maintain human activities below levels which would adversely affect the harbour porpoise community at the site (disturbance).

6.4.1.53 While underwater noise generated from piling may result in temporary displacement of harbour porpoise, any behavioural response is expected to be limited to the period of piling, with individuals returning to affected areas within one to two days (Brandt *et al.*, 2016). In line with NPWS guidance (2024a), such temporary disturbance does not constitute a permanent barrier to habitat use of the site (due to the temporary nature of the activity) and will not permanently prevent harbour porpoises accessing suitable habitat within the SAC.

6.4.1.54 Some individuals within or associated to Blackwater Bank SAC may experience disturbance and temporary displacement as a result of pile driving. However, this is not predicted to result in mortality, injury, or significant negative effects on individual fitness or reproductive success for any life stage, nor is it expected to ultimately affect the harbour porpoise community at the site.

6.4.1.55 **With consideration of the precautionary nature of the assessment, the low proportion of the population predicted to exhibit a behavioural response (based on dose-response curves), the small overlap between published disturbance ranges (Brown *et al.,* 2025) and the SAC, the inclusion of mitigation measures, and the recoverable and temporary (although repeated) nature of behavioural disturbance, it is therefore concluded there will be no AEoI of the harbour porpoise QI of the Blackwater Bank SAC, as defined by its COs, as a result of behavioural disturbance due to underwater noise during pile driving for Project Design Option 1.**

6.4.1.56 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

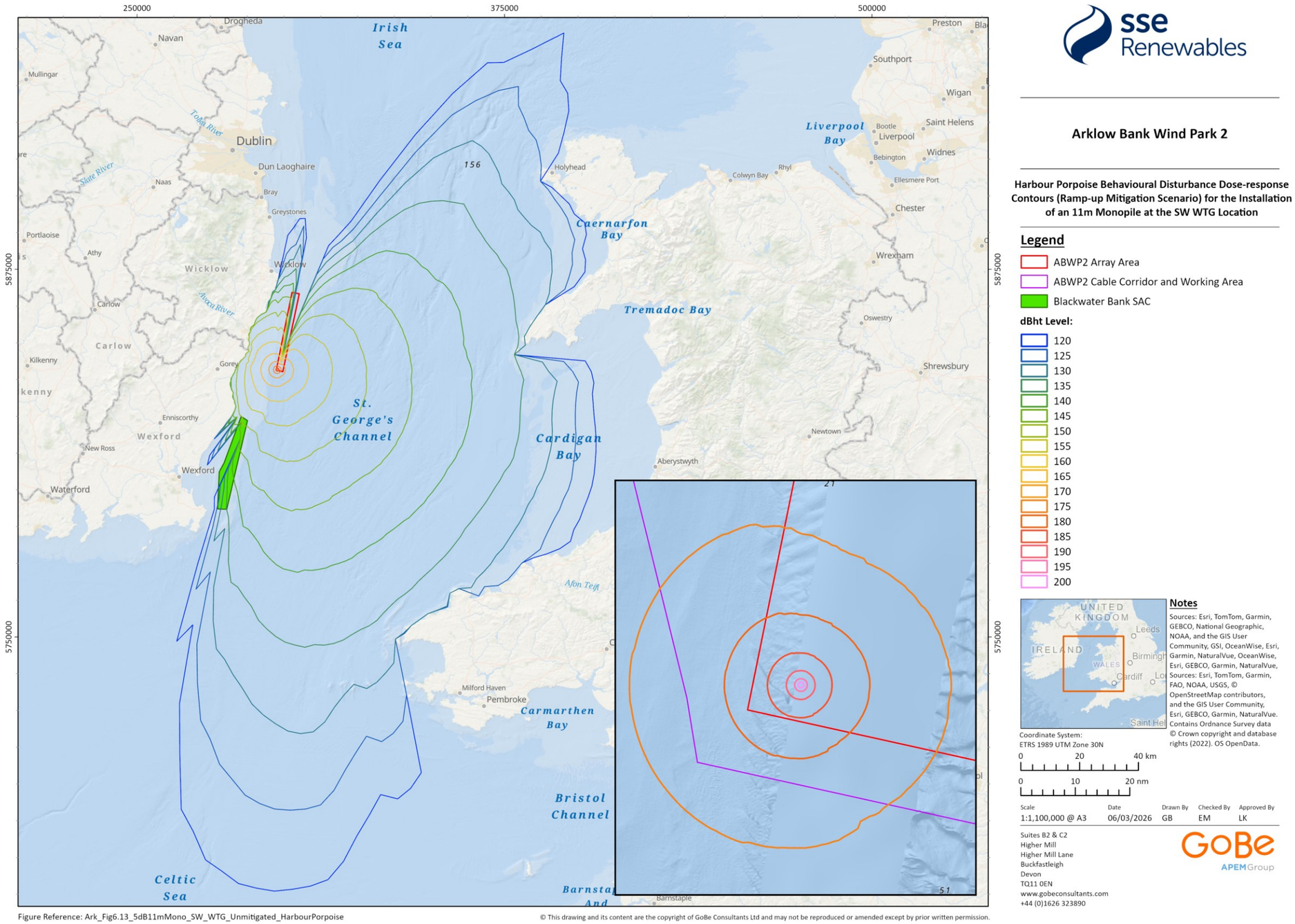

Figure Reference: Ark_Fig6.13_5dB11mMono_SW_WTG_Unmitigated_HarbourPorpoise

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sse Renewables

Arklow Bank Wind Park 2

Harbour Porpoise Behavioural Disturbance Dose-response Contours (Ramp-up Mitigation Scenario) for the Installation of an 11m Monopile at the SW WTG Location

Legend

- ABWP2 Array Area
- ABWP2 Cable Corridor and Working Area
- Blackwater Bank SAC

dBht Level:

- 120
- 125
- 130
- 135
- 140
- 145
- 150
- 155
- 160
- 165
- 170
- 175
- 180
- 185
- 190
- 195
- 200

Notes

Sources: Esri, TomTom, Garmin, GEBCO, National Geographic, NOAA, and the GIS User Community, GSI, OceanWise, Esri, Garmin, NaturalVue, OceanWise, Esri, GEBCO, Garmin, NaturalVue, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Esri, GEBCO, Garmin, NaturalVue. Contains Ordnance Survey data © Crown copyright and database rights (2022). OS OpenData.

Coordinate System:
ETRS 1989 UTM Zone 30N

0 20 40 km

0 10 20 nm

Scale	Date	Drawn By	Checked By	Approved By
1:1,100,000 @ A3	06/03/2026	GB	EM	LK

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Figure 6.13: Behavioural disturbance dose-response contours (ramp-up mitigation scenario) for the installation of an 11 m monopile at the SW WTG location and Blackwater Bank SAC for harbour porpoise QI

INJURY AND/OR DISTURBANCE FROM UNDERWATER NOISE FROM UXO CLEARANCE

6.4.1.57 UXO items with a range of charge weights (or quantity of contained explosive) may be present within the boundaries of the Proposed Development. As such, there is potential for UXO clearance to be required prior to construction. Where UXO is identified, clearance may involve avoidance, relocation, or removal. However, in some cases, underwater detonation may be required where it is deemed unsafe or impracticable to remove or relocate the UXO.

6.4.1.58 UXO clearance can generate underwater noise through either high order detonation, whereby the main explosive charge detonates, or low order clearance (deflagration), whereby a donor or shaped charge initiates partial combustion of the explosive without full detonation. At the time of this assessment, the presence, type, location, and clearance method of any UXO within the Proposed Development are unknown. Therefore, this assessment considers high order detonation, as it represents the scenario with the greatest potential for underwater noise generation.

6.4.1.59 The number of UXO items that may require clearance and the duration of UXO clearance operations are currently unknown. Therefore, the UXO-related assessments presented herein are illustrative and precautionary, ensuring that the potential range of effects on Annex II marine mammal QIs during the construction phase of the Proposed Development is fully considered. If clearance is required, activities are expected to consist of a limited number of discrete, short-duration events.

6.4.1.60 The severity of the potential consequences of UXO detonation depends on several variables, including, but not limited to, the explosive charge weight and its proximity to the receptor. Potential effects of underwater detonation of UXOs on marine mammals include auditory injury from exposure to the acoustic shock wave, resulting in permanent auditory injury or loss in hearing sensitivity (PTS), or temporary loss in hearing sensitivity (TTS); and behavioural disturbance which could impact on feeding, mating, breeding, and/or resting activities (Ketten, 2004; Richardson *et al.,* 1995; von Benda-Beckmann *et al.*, 2015).

6.4.1.61 Underwater noise levels generated from UXO clearance were predicted by Subacoustech Environmental Ltd for the Underwater Noise Assessment (NIS Volume III, Appendix 11.1: Underwater Noise Assessment). Full details of the underwater noise modelling and resulting impact ranges are detailed in NIS Volume III, Appendix 11.1: Underwater Noise Assessment.

UXO ASSESSMENT METHODOLOGY

6.4.1.62 A range of potential UXO explosive sizes was modelled to reflect the types of ordnance that could plausibly be encountered. Charge weights (TNT equivalent) of 25, 55, 120, 240, 525, 700, and 800 kg were assessed. In each case, it was assumed that maximum explosive charge was present and detonated, with an additional donor charge of 0.5 kg being included to initiate detonation.

6.4.1.63 Low order deflagration has also been assessed, which assumes that the donor or shaped charge (charge weight of 0.5 kg) detonates fully to initiate a burnout of the explosive but without the follow-up detonation of the UXO. No mitigation has been considered within the modelling.

6.4.1.64 UXO detonation was modelled as a single impulsive noise event, with SEL_{cum} equivalent to SEL_{ss}. Estimation of the source noise level for each charge weight has been carried out in accordance with the methodology of Soloway and Dahl (2014) and are presented in Table 6.12.

Table 6.12: Unweighted SPL_{peak} and SEL_{ss} source levels used for UXO modelling

Charge weight (kg; TNT equivalent)	SPL_{peak} source level (dB re 1 µPa at 1 m)	SEL_{ss} source level (dB re 1 $\mu Pa^2{}_s$ at 1 m)
0.5 (low order)	272.1	217.1
25 + donor	284.9	228.0
55 + donor	287.5	230.1
120 + donor	290.0	232.3
240 + donor	292.3	234.2
525 + donor	294.8	236.4
700 + donor	295.8	237.2
800 + donor	296.2	237.5

APPROACH TO PTS AND TTS-ONSET

6.4.1.65 The PTS-onset thresholds used to assess the potential for auditory injury to marine mammals during UXO clearance are those presented in Southall *et al.* (2019) for impulsive noise (Table 6.9) as it is currently advised by UK SNCBs (Natural England and the Marine Management Organisation) that these thresholds should be used for impact assessment from UXO detonation on marine mammals. This has been followed within this assessment as the most appropriate alternative given that Irish-specific guidance on UXO detonation does not exist. However, the suitability of these criteria is currently being discussed because there a lack of empirical evidence regarding UXO detonations using these metrics, particularly, the range-dependent characteristics of the peak sounds, and whether current propagation models can accurately predict the range at which these thresholds are reached.

6.4.1.66 Although TTS-onset thresholds for impulsive noise are also presented in Table 6.9, TTS is not considered as injury given its temporary nature. Therefore, any potential effects associated with TTS are considered to be captured within the quantitative assessment of disturbance.

BEHAVIOURAL DISTRUBANCE FROM UXO CLEARANCE ASSESSMENT METHODOLOGY

6.4.1.67 Both pile driving and explosive sound sources are categorised as impulsive noise; however, the number of pulses and overall duration of noise emission that drive behavioural response differ drastically between the two activities. Behavioural responses to a single UXO detonation are expected to comprise a brief startle response or short-term aversive behaviour, whereas pile driving involves a prolonged series of impulses that can result in sustained displacement from an area, enabling a dose-response to be quantified. As such, the empirically-derived dose-response curves used for assessment of behavioural disturbance for pile driving are not applicable to the assessment of UXO clearance.

6.4.1.68 There is currently no national guidance available on the appropriate methodology for assessing behavioural disturbance arising from UXO clearance. In the absence of Irish-specific guidance, available guidance from England, Wales, and Northern Ireland on assessing the significance of noise disturbance from UXO detonation in relation to the COs of SACs with harbour porpoise as QIs has been applied (JNCC, 2025). This guidance recommends the use of an EDR of 20 km for high-order detonations and an EDR of 5 km for low order UXO clearance.

HIGH ORDER CLEARANCE

6.4.1.69 The 20 km EDR assumes that all animals within this radius are potentially disturbed and has been applied to all marine mammal species for high order UXO detonations. This precautionary radius reflects the absence of species-specific quantitative disturbance metrics and limited empirical data on likelihood of behavioural responses to underwater explosions.

6.4.1.70 It is important to note that the behavioural disturbance from a single UXO detonation is expected to be brief and localised, reflecting the highly limited duration and frequency of the event (JNCC, 2020). Furthermore, there is no direct evidence to support the assumption that all marine mammal species will respond in the same way to a high order UXO clearance (Dähne *et al.*, 2013).

6.4.1.71 The recommended 20 km EDR is derived from the literature review by Majewska *et al.* (2025) and using data from van Geel *et al.* (2024) based on UXO detonations during construction of the East Anglia ONE OWF where a total of 81 high order UXO detonations recorded reduced harbour porpoise presence and acoustic activity up to a distance of 20 km from UXOs weighing between 101 and 250 kg NEQ. Majewska *et al.* (2025) recommended a high order UXO clearance EDR of 15-20 km, based on charge weights up to 263 kg, as that is the maximum charge weight cleared in the unpinning evidence base. However, given the remaining uncertainties in the empirical evidence, the UK SNCB's advice is to use the upper end of that range (i.e. 20 km).

6.4.1.72 In this assessment, the area encompassed by the 20 km EDR was reviewed with respect to the location of land relative to the Proposed Development. The 20 km EDR represents a radial distance at-sea, therefore, land mass within the radius is not considered in the calculation of area of potential disturbance. Assuming a high order detonation in the southeastern sector of the Array Area provides a precautionary scenario with minimal land overlap. Accounting for this, the maximum at-sea area within the 20 km EDR is 1,159.98 km², representing a slight reduction compared to the total area within the 20 km EDR if fully at-sea. This 1,159.98 km² area has been used in the quantitative assessment of high order UXO clearance.

LOW ORDER CLEARANCE

6.4.1.73 For low order clearances, available guidance recommends the use of a reduced EDR of 5 km to define the area of potential disturbance around the source location (JNCC, 2025). This assumes that all marine mammal species within a radius of 78.54 km^2 are disturbed and reflects the substantially lower acoustic energy associated with low order clearance compared to high order detonation.

6.4.1.74 This recommended 5 km EDR is well-supported by evidence from sound measurement studies, which includes six studies comprising of 166 clearance events (Majewska *et al.,* 2025).

CONSTRUCTION PHASE ASSESSMENT

AUDITORY INJURY (PTS)

6.4.1.75 Based on the modelling results presented in Table 6.13, the maximum PTS-onset range for harbour porpoise resulting from high order UXO clearance is 14 km, based on the unweighted SPL_{peak} criterion and the largest charge weight modelled (800 kg plus donor). Using the regional SCANS-IV density estimate, this would result in up to 173 harbour porpoise, (representing 0.28% of the MU reference population) being within PTS-onset range under the most precautionary scenario.

6.4.1.76 For low order clearance, the predicted PTS-onset ranges are substantially smaller, with a maximum range of 1.2 km (Table 6.13). At this range, the number of harbour porpoises predicted to experience PTS is one individual (<0.01% of the MU reference population).

Table 6.13: PTS-onset ranges and numbers of harbour porpoise modelled to be within range for all potential charge weights

Charge Weight (kg)	Maximum range (km)	Density (animals/km²)	Number of animals[1]	Percentage of reference population[1] (%)
PTS-onset (unweighted SPL_{peak})				
0.5 (low order)	1.2	0.38	2	<0.01
		0.2803	2	<0.01
		0.116527	1	<0.01
25 + donor	4.6	0.38	26	0.04
		0.2803	19	0.03
		0.116527	8	0.01
55 + donor	6.0	0.38	43	0.07
		0.2803	32	0.05
		0.116527	14	0.02
120 +donor	7.8	0.38	73	0.12
		0.2803	54	0.09
		0.116527	23	0.04
240 + donor	9.8	0.38	115	0.18
		0.2803	85	0.14
		0.116527	36	0.06
525 + donor	12.0	0.38	172	0.28

Charge Weight (kg)	Maximum range (km)	Density (animals/km²)	Number of animals[1]	Percentage of reference population[1] (%)
		0.2803	127	0.20
		0.116527	53	0.08
700 + donor	14.0	0.38	234	0.37
		0.2803	173	0.28
		0.116527	72	0.11
800 + donor	14.0	0.38	234	0.37
		0.2803	173	0.28
		0.116527	72	0.11
PTS-onset (weighted SELss)				
0.5 (low order)	0.11	0.38	<1	<0.01
		0.2803	<1	<0.01
		0.116527	<1	<0.01
25 + donor	0.57	0.38	<1	<0.01
		0.2803	<1	<0.01
		0.116527	<1	<0.01
55 + donor	0.74	0.38	1	<0.01
		0.2803	<1	<0.01
		0.116527	<1	<0.01

Charge Weight (kg)	Maximum range (km)	Density (animals/km²)	Number of animals[1]	Percentage of reference population[1] (%)
120 +donor	0.95	0.38	2	<0.01
		0.2803	1	<0.01
		0.116527	1	<0.01
240 + donor	1.1	0.38	2	<0.01
		0.2803	2	<0.01
		0.116527	1	<0.01
525 + donor	1.4	0.38	3	<0.01
		0.2803	2	<0.01
		0.116527	1	<0.01
700 + donor	1.5	0.38	3	<0.01
		0.2803	2	<0.01
		0.116527	1	<0.01
800 + donor	1.6	0.38	4	<0.01
		0.2803	3	<0.01
		0.116527	1	<0.01

[1]*The number of animals disturbed and the reference population are representative of the Celtic and Irish Sea MU population (IAMMWG, 2023). The number of animals disturbed is not representative of the numbers disturbed within the Blackwater Bank SAC.*

6.4.1.77 The nearest boundary of the Blackwater Bank SAC is located approximately 19.13 km from the Proposed Development. As such, even under the largest charge weight modelled, the predicted PTS-onset ranges for both high-order and low-order UXO clearance do not overlap

with the SAC. Therefore, no harbour porpoise within the SAC are predicted to experience auditory injury as a result of UXO clearance activities associated with the Proposed Development.

6.4.1.78 Interpretation of the modelling results should take account of the frequency characteristics of high-order UXO detonation. The dominant energy produced by high-order detonation occurs at low frequencies, which is outside the region of greatest hearing sensitivity for harbour porpoise (Southall *et al.,* 2019), with a pronounced reduction in energy levels above approximately 5-10 kHz (von Benda-Beckmann *et al.,* 2015; Salomons *et al.,* 2021). On this basis, harbour porpoise are considered to have a relatively low sensitivity to auditory injury from UXO detonation compared to low- and mid-frequency cetaceans.

6.4.1.79 Furthermore, the Developer has committed to the implementation of project-specific mitigation measures for UXO clearance activities, as set out within the MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan). These measures are designed to minimise the risk of auditory injury (PTS) to cetaceans arising from UXO-related noise, and will, as a minimum, adhere to relevant international best practice, including DAHG (2014) guidance (Table 6.7).

6.4.1.80 In relation to the site-specific COs for Blackwater Bank SAC (Table 5.1), the potential effects of underwater noise associated with UXO clearance on harbour porpoise have been assessed with respect to the attributes of access to suitable habitat and disturbance.

6.4.1.81 As UXO clearance and the associated underwater noise (which could potentially cause auditory injury) will be a short-term and temporary event (i.e. a one-off explosion), it would not permanently prevent harbour porpoises from accessing suitable habitat within, or functionally connected to, the Blackwater Bank SAC site. Any potential effects would be limited in duration and would not result in long-term exclusion from the SAC or the wider supporting habitat.

6.4.1.82 Regarding the disturbance attribute, even in the highly unlikely event that an individual experienced PTS-onset, available evidence indicates that it would be unlikely to significantly affect individual fitness (i.e. its ability to survive and reproduce; Kastelein *et al.*, 2017). Therefore, any UXO clearance activities are not expected to introduce man-made energy at levels capable of causing significant negative effects on individual harbour porpoises or the wider community associated within, or connected to, Blackwater Bank SAC, nor is it expected to cause injury or mortality at levels capable of affecting site integrity.

6.4.1.83 **With consideration of the limited spatial extent of predicted auditory injury (PTS-onset) ranges, the absence of overlap with the SAC (with the greatest predicted impact range of up to 14 km), the implementation of mitigation measures, and the negligible proportion of the wider MU potentially affected (<0.05%) even under the most precautionary scenario, it is concluded there will be no AEoI of the harbour porpoise QI of the Blackwater Bank SAC, as defined by its COs, as a result of auditory injury due to underwater noise associated with UXO clearance for Project Design Options 1 and 2.**

BEHAVIOURAL DISTURBANCE

6.4.1.84 The number of harbour porpoises predicted to experience behavioural disturbance as a result of high order UXO detonation, based on the application of a 20 km EDR, is presented in Table 6.14. Using the uniform SCANS-IV density estimate of 0.2803 animals/km^2, it is estimated that up to 325 animals (0.52% of the MU reference population) could be disturbed under this highly precautionary scenario.

6.4.1.85 For low order clearance, application of the 5 km EDR results in an estimated 23 harbour porpoises potentially disturbed (representing 0.04% of the MU reference population) when using the SCANS-IV density (Table 6.14).

Table 6.14: Predicted impact of disturbance to harbour porpoise from UXO for both high order (20 km) and low order clearance (5 km) EDRs. For further information on densities used, see Table 6.6.

UXO Scenario	EDR	Density (animals/km^2)	Number of animals disturbed[1]	Percentage of the reference population[1] (%)
High Order Clearance	20 km^2	0.38	441	0.71
		0.2803	325	0.52
		0.116527	135	0.22
Low Order Clearance	5 km	0.38	30	0.05
		0.2803	23	0.04
		0.116527	10	0.02

[1]The number of animals disturbed and the reference population are representative of the Celtic and Irish Sea MU population (IAMMWG, 2023). The number of animals disturbed is not representative of the numbers disturbed within the Blackwater Bank SAC.

[2]Reduced EDR to account for land overlap within the nominal 20 km radius (effective area 1,159.98 km^2 rather than 1,256.31 km^2)

6.4.1.86 The nearest boundary of Blackwater Bank SAC is located approximately 19.13 km southwest from the Proposed Development Cable Corridor and Working Area. As such, the precautionary 20 km EDR for high-order UXO clearance only marginally overlaps with the outer edge of the SAC if clearance was to occur at this southernmost outer edge point. At the majority of other locations within the Array Area or Cable Corridor and Working Area, the SAC lies outside the EDR and would not be expected to experience any behavioural response. Notwithstanding this potential spatial overlap, behavioural responses to UXO clearance are expected to be limited to a brief startle reaction, with any displacement with any displacement occurring over a very short duration (e.g. minutes to hours) (JNCC, 2020). There is no empirical evidence indicating that single explosive events result in prolonged exclusion from habitat or sustained disruption to foraging behaviour in harbour porpoise.

6.4.1.87 Potential behavioural disturbance to marine mammals arising from UXO clearance activities has been considered within the project-specific MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan). While primarily designed to minimise the risk of auditory injury (PTS) to cetaceans from UXO clearance underwater noise, the MMMP will also act to reduce the magnitude and spatial extent of behavioural disturbance. The application of mitigation measures, informed by international best practice including DAHG (2014), will reduce the likelihood, spatial extent and duration of any behavioural responses, such that any disturbance would be temporary, localised and not of a nature that could affect population-level processes (Table 6.7).

6.4.1.88 Any behavioural disturbance associated with UXO clearance is therefore expected to affect a small proportion of the MU population (≤1%), be highly localised in time, recoverable, and infrequent during the construction phase. Given the single-pulse nature of the activity, it is concluded that harbour porpoise are not sensitive to UXO clearance behavioural disturbance effects when considering the integrity of the designated site.

6.4.1.89 In relation to the COs for Blackwater Bank SAC (Table 5.1), the potential effects of underwater noise associated with UXO clearance on harbour porpoise have been assessed with respect

to the attributes of access to suitable habitat and maintain human activities below levels which would adversely affect the harbour porpoise community at the site (disturbance).

6.4.1.90 Whilst underwater noise generated from UXO clearance may result in a short-term startle response and temporary displacement of some individuals within or associated with the SAC, such disturbance would be brief in duration and would not constitute a permanent barrier to habitat use of the site.

6.4.1.91 Any individuals disturbed by UXO clearance are not predicted to experience significant negative effects on fitness, survival, or reproductive success for any life stage, nor is the activity expected to result in injury or mortality at a scale capable of affecting the harbour porpoise community associated with Blackwater Bank SAC.

6.4.1.92 **With consideration of the precautionary nature of the assessment, the low proportion of the population predicted to be affected, the implementation of mitigation measures, the extremely short-term and recoverable nature of behavioural disturbance, and the limited frequency of UXO clearance events, it is concluded there will be no AEoI of the harbour porpoise QI of the Blackwater Bank SAC, as defined by its COs, as a result of behavioural disturbance due to underwater noise during UXO clearance for Project Design Options 1 and 2.**

INJURY AND/OR DISTURBANCE FROM UNDERWATER NOISE DURING SITE SURVEYS

6.4.1.93 To support each phase of the Proposed Development, a number of confirmatory site surveys will be undertaken ahead of offshore infrastructure installation, and at intervals throughout the operational and maintenance phase (see Section 4.3.2 and Table 4.16 in NIS Volume I, Supporting Information for Screening for Appropriate Assessment Report).

6.4.1.94 As the precise scope and specification of survey activities has not yet been finalised, a precautionary approach has been adopted. This assessment therefore considers a representative range of geophysical and geotechnical survey equipment that may be reasonably employed, encompassing both impulsive and non-impulsive sound sources.

6.4.1.95 Geophysical survey techniques may include: multibeam echosounder (MBES), side scan sonar (SSS), sub-bottom profilers (SBP), ultra-short baseline (USBL) positioning systems, seismic refraction and sparker surveys that typically produce sonar-based or non-impulsive sound sources. Geotechnical surveys may include composite borehole drilling with associated down-hole testing (including seismic cone penetration testing (CPT)), vibrocore sampling and grab sampling, noting that some activities (e.g. grab sampling) are not expected to generate measurable underwater noise.

6.4.1.96 Indicative source levels for representative geophysical and geotechnical survey equipment are presented in Table 6.15 and Table 6.16. Predicted underwater noise propagation and associated impact ranges generated from site surveys were modelled by Seiche Ltd., with full details of methodology, assumptions, and outputs provided in the Subsea Noise Assessment (Seiche Ltd., 2022).

Table 6.15: Expected geophysical survey and equipment, with indicative source levels

Survey type	Equipment type	SEL (unweighted) (dB re 1µPa²s @1 m)	SPL_{rms} T90 (dB re 1µPa at 1 m)	SPL_{pk} (dB re 1µPa at 1 m)
Non-impulsive sonar-based surveys / equipment				
Multibeam echosounder (MBES)	Konsberg EM2040 or Reason Seabat 7125	N/A	213	N/A
Side scan sonar (SSS)	Edgetech FS4200 or Klein 5000	N/A	210	N/A
Sub-bottom profiler (SBP)	Innomar SES Standard / Medium or Applied Acoustics AA251 or Edgetech 6205S	N/A	245	N/A
Ultra-short baseline (USBL) positioning equipment	Sonardyne Compatt 6 8300-3111	202	184	202
Impulsive surveys / equipment				
Seismic refraction	TI sleeve 10CU	195	214	224
Sparker (2DUHRS and 3DUHRS)	Geosource 200 – 400	182	214	219

Table 6.16: Expected geotechnical survey techniques and source levels

Survey type	Source level (dB re 1µPa at 1 m (peak)	Source SEL (dB re 1 µPa²s at 1 m) (unweighted)	SPL_{rms} T90 (dB re 1µPa at 1 m)
Seismic Cone Penetration Test (CPT)[1]	220	189	203
Vibrocore	190	223[2]	187
Grab sample	N/A	N/A	N/A

[1]Equipment is pushed into the seabed and therefore would not result in a measurable noise source.
[2]Based on one hour of operation for a single core sample.

CONSTRUCTION PHASE ASSESSMENT

6.4.1.97 The Subsea Noise Assessment (Seiche Ltd., 2022) concluded that PTS-onset ranges from site surveys are limited to relatively small distances from the sound source and vary by survey type and marine mammal FHG, with harbour porpoise (VHF cetaceans) representing the most sensitive receptor.

6.4.1.98 While PTS is a permanent effect which cannot be recovered from, the most likely response of a marine mammal to noise levels that could induce TTS is to flee the area (Southall *et al.,* 2007). Therefore, animals exposed to these noise levels that could induce TTS are likely to actively avoid hearing damage by moving away from the source. Like the other underwater noise assessments, whilst the TTS impact ranges are presented here, the implications of TTS are considered alongside behavioural disturbance, reflecting its temporary and recoverable nature and its relevance to short-term changes in behaviour rather than long-term population level effects.

6.4.1.99 Predicted maximum PTS- and TTS-onset distances are summarised in Table 6.17. The largest predicted cumulative PTS-onset range for harbour porpoise is 517 m for SBP surveys. Other survey activities have smaller ranges, mostly tens of metres or less. The largest predicted cumulative TTS range for harbour porpoise is 3.15 km for SBP surveys, with all other survey activities associated with substantially smaller TTS-onset ranges (Table 6.17; Seiche Ltd., 2022).

Table 6.17: Predicted maximum impact ranges for harbour porpoise from proposed site surveys (Seiche Ltd., 2022)

Survey category	Equipment type	Noise type	Effect	PTS Maximum predicted range (m)	TTS Maximum predicted range (m)
Geophysical	MBES	Non-impulsive	Cumulative	25	33
Geophysical	SSS	Non-impulsive	Cumulative	25	97
Geophysical	SBP	Non-impulsive	Cumulative	517	3,150
Geophysical	USBL positioning equipment	Non-impulsive	Cumulative	1.7[1]	50[2]
Geophysical	Seismic refraction	Impulsive	Instantaneous	22	40
			Cumulative	130	1,524
Geophysical	Sparker (2DUHRS and 3DUHRS)	Impulsive	Instantaneous	N/A[3]	32
			Cumulative	14	68
Geotechnical	Seismic CPT	Impulsive	Instantaneous	15	33
			Cumulative	62	856
Geotechnical	Vibrocore	Non-impulsive	Cumulative	2	607

[1]USBL was not included in the Subsea Noise Assessment (Seiche Ltd., 2022) however, CSA Ocean Sciences Inc. (2020) estimated that the maximum distance to the weighted Level A threshold (cumulative PTS) is 1.7 m for VHF cetaceans (harbour porpoise).

[2]Based on maximum distance to all FHG Level B threshold (SPL_{rms}; CSA Ocen Sciences Inc., 2020).

[3]Instaneous PTS thresholds are not exceeded for any FHG for the sparker surveys.

6.4.1.100 The closest distance between the Proposed Development and Blackwater Bank SAC is approximately 19.13 km, substantially greater than all predicted PTS- and TTS-onset ranges

for all survey activities (Table 6.17). As such, no risk of auditory injury to harbour porpoise within the SAC is predicted.

6.4.1.101 Furthermore, the Developer has committed to the implementation of project-specific mitigation measures for site surveys, as set out within the MMMP (NIS Volume III, Appendix 25.5 (Revised March 2026)). These measures are designed to minimise the risk of auditory injury (PTS; and in turn disturbance) to cetaceans arising from site survey noise. The mitigation strategy will, as a minimum, adhere to international best practice, including DAHG (2014) guidance (Table 6.7).

6.4.1.102 A study by Lucke *et al.* (2009) indicated that TTS could be induced in harbour porpoise at 350 m when exposed to an airgun impulse at a peak pressure of 200 dB_{pk-pk} re 1 µPa with corresponding SEL of 164.5 dB re $\mu Pa^2{}_s$) in shallow waters (~4 m), however this study is highly conservative as it assumes that the animal would remain stationary throughout the exposure. Evidence from other studies suggests that harbour porpoises exposed to such noise sources would likely move away from the source, and therefore leave the impact range of PTS-onset (Hermannsen *et al.,* 2015). Furthermore, it is expected that vessel presence will act as a deterrent to harbour porpoise, reducing the risk of auditory injury (Benhemma-Le Gall *et al.*, 2023). Therefore, it is highly unlikely that harbour porpoise will be present in the immediate vicinity at the start of any survey activity.

6.4.1.103 Behavioural disturbance thresholds applied in the Subsea Noise Assessment (Seiche Ltd., 2022) are 140 dB re 1 µPa (rms) for mild disturbance and 160 dB re 1 µPa (rms) for strong disturbance from impulsive sound sources, and 120 dB re 1 µPa (rms) for disturbance from non-impulsive sound sources.

6.4.1.104 Predicted behavioural disturbance ranges vary by survey type and sound source. For non-impulsive geophysical survey sound sources (MBES, SSS, SBP), disturbance could occur at distances of up to approximately 4.95 km for SBP sources for all marine mammal FHG. USBL were not included in the Subsea Noise Assessment (Seiche Ltd., 2022) however, CSA Ocean Sciences Inc. (2020) estimated that the maximum distance to the Level B threshold (disturbance) is 50 m for all marine mammal FHG. For impulsive geophysical sound sources, disturbance could occur out to 700 m for a sparker and out to 1.32 km for seismic refraction were predicted (Seiche Ltd., 2022). For geotechnical surveys, the predicted disturbance could occur out to 10 km for vibrocore surveys and 1.5 km for seismic CPT surveys for strong disturbance (Seiche Ltd., 2022).

6.4.1.105 While some predicted disturbance ranges extend beyond the boundary of the Proposed Development, the closest distance to the Blackwater Bank SAC (19.13 km away) remains substantially greater than predicted disturbance ranges, and any behavioural responses are expected to be short-term and reversible in nature.

6.4.1.106 In relation to the Blackwater Bank SAC site-specific COs (Table 5.1), site surveys will not result in permanent or long-term restriction of access to suitable habitat, nor introduce underwater noise at levels that would cause injury or sustained disturbance to the harbour porpoise community.

6.4.1.107 **With consideration of the very limited spatial extent of predicted auditory injury and behavioural disturbance ranges, the absence of overlap with the SAC (with the greatest predicted impact range up to 4.95 km), and the implementation of mitigation measures, it is concluded there will be no AEoI of the harbour porpoise QI of the Blackwater Bank SAC, as defined by its COs, as a result of auditory injury or behavioural disturbance due to underwater noise associated with site surveys during the construction phase for Project Design Options 1 and 2.**

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.1.108 Routine geophysical surveys of inter-array, inter-connector, and export cables will occur every six months during the first two years and annually thereafter throughout the operational and maintenance phase of the Proposed Development (Table 6.8).

6.4.1.109 As the exact equipment is not yet confirmed, an assessment has been undertaken for the site survey equipment and source levels as per Table 6.15 and Table 6.16. Therefore, the predicted impact ranges of auditory injury (PTS), TTS and behavioural disturbance from site surveys during the operational and maintenance phase are expected to be similar to the results of the Subsea Noise Assessment (Seiche Ltd., 2022; CSA Ocean Sciences Inc, 2020) conducted for confirmatory site surveys during the pre-construction phase. as part of the FLA.

6.4.1.110 **With consideration of the limited spatial extent of predicted auditory injury and behavioural disturbance, the absence of overlap with Blackwater Bank SAC, the implementation of mitigation measures, and the temporary nature of any effects, it is concluded that there will be no AEoI of the harbour porpoise QI of the Blackwater Bank SAC, as defined by its COs, from underwater noise arising from site surveys during the operational and maintenance phase for Project Design Option 1 and 2.**

INJURY AND/OR DISTURBANCE FROM UNDERWATER NOISE DURING DREDGING AND TRENCHING

6.4.1.111 As part of seabed preparation for construction, seabed lowering and feature clearance may be required through dredging activities (Table 6.8). Additional dredging may also be required during the operational and maintenance phase for scour protection repair and maintenance of WTG and OSP foundations, and for maintenance of inter-array cables, interconnector cables and offshore export cables. Trenching will also be required during the offshore export cable installation; with the majority of the cable route expected to be buried using jet trenching techniques.

6.4.1.112 Activities of relevance are those that generate underwater non-impulsive noise, including backhoe dredging, grab or clamshell dredging, mass flow excavation, water injection dredging, suction hopper dredging, jet trenching, mechanical trenching and vertical injector tools.

6.4.1.113 Underwater noise levels generated from non-impulsive construction activities, including dredging and trenching, were predicted by Subacoustech Environmental Ltd. The assessment draws on the source levels assumed for the relevant equipment, as presented in Table 6.18. Source levels for TSHD are taken from McQueen *et al.* (2019). Full details of the modelling methodology, assumptions and resulting impact ranges are detailed in the Underwater Noise Assessment (NIS Volume III, Appendix 11.1: Underwater Noise Assessment).

Table 6.18: Estimated source levels for dredging and trenching

Activity	SPL_{pk} (dB re 1µPa at 1 m)
Dredging (backhoe)	165
Dredging (suction)	186
TSHD	186
Trenching	172

CONSTRUCTION PHASE ASSESSMENT

6.4.1.114 NIS Volume III, Appendix 11.1: Underwater Noise Assessment (Revised March 2026) concluded that for non-impulsive construction activities, including dredging and trenching,

cumulative PTS could only occur at very short distances from the sound source. For trenching, backhoe dredging and suction dredging, predicted cumulative PTS-onset ranges for harbour porpoise (VHF cetacean FHG; Southall *et al.*, 2019) are less than 50 m. The same assessment concluded that cumulative TTS could occur at distances of up to 250 m from the source for suction dredging, with TTS-onset ranges for trenching up to 820 m and backhoe dredging remaining below 50 m for harbour porpoise.

6.4.1.115 Dredging and trenching activities produce continuous, non-impulsive underwater noise and are not expected to result in auditory injury (PTS) in marine mammals, based on observed thresholds for exposure to continuous noise. The dominant energy from these activities typically occurs below 1 kHz (Todd *et al.*, 2015), which lies outside the peak hearing sensitivity range of harbour porpoise (VHF cetaceans). As a result, the potential for PTS (or TTS) to occur from these construction activities is expected to have little relevance to individual fitness, survival or reproductive success, as the hearing sensitivity of these receptors is relatively poor below 1 kHz (Southall *et al.,* 2019).

6.4.1.116 The presence of vessels associated with non-piling related construction activities is expected to act as a deterrent to harbour porpoise prior to the commencement of dredging or trenching activities (Brandt *et al.*, 2018), further reducing the likelihood that individuals would remain in close proximity to the sound source at the onset of dredging or trenching. In combination with the very limited spatial extent of predicted PTS-onset ranges and the relatively low sensitivity of harbour porpoise to low-frequency noise, dredging and trenching are therefore considered unlikely to result in auditory effects of relevance to individual fitness or population-level parameters.

6.4.1.117 Information on marine mammal sensitivity to dredging and trenching noise is limited, with available studies focusing primarily on the impact of behavioural disturbance from dredging. These studies have confirmed that dredging activities can result in short-term displacement and avoidance behaviour in marine mammals (e.g. Culloch *et al.*, 2016; Pirotta *et al.*, 2013). However, it is often difficult to distinguish the effects of underwater noise from disturbance associated with vessel presence required to undertake the activity (Todd *et al.*, 2015).

6.4.1.118 Dredging activities have been shown to result in temporary displacement of harbour porpoise within a radius of up to 5 km around the dredging location (Verboom, 2014). Diederichs *et al.* (2010) noted there was short term avoidance (around 3 hours) at distances of up to 600 m from a TSHD, with no evidence of long-term displacement. Modelling of dredging associated with port expansion predicted disturbance ranges of approximately 400 m, with more precautionary assumptions extending avoidance of harbour porpoise up to 5 km (McQueen *et al.* 2020).

6.4.1.119 There are currently no empirical data describing harbour porpoise responses specifically to trenching activities. In the absence of such data, it is assumed that behavioural responses and deterrence distances would be similar to those associated with dredging, and therefore limited to within 5 km. Should behavioural disturbance occur, it is expected to be short-term and reversible, with animals returning to the area following cessation of activities.

6.4.1.120 The closest distance between dredging and trenching activities and the boundary of the Blackwater Bank SAC is approximately 19.13 km. This distance substantially exceeds the maximum predicted ranges for PTS-onset, TTS-onset and behavioural disturbance (5 km) associated with dredging and trenching.

6.4.1.121 In relation to the Blackwater Bank SAC COs (Table 5.1), dredging and trenching during construction will not result in permanent or long-term restriction of access to suitable habitat within the SAC, nor introduce underwater noise at levels that would cause injury or sustained disturbance to the harbour porpoise community associated with the site.

6.4.1.122 **With consideration of the very limited spatial extent of predicted auditory injury and behavioural disturbance associated with dredging and trenching activities, the absence**

of overlap with the Blackwater Bank SAC (with the greatest predicted disturbance impact range of up to 5 km), and the temporary, localised and reversible nature of any behavioural disturbance, it is concluded that there will be no AEoI of the harbour porpoise QI of the Blackwater Bank SAC, as defined by its COs, as a result of underwater noise arising from dredging and trenching activities during the construction phase for Project Design Options 1 and 2.

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.1.123 During the operational and maintenance phase, dredging and trenching may be required intermittently for scour protection repair and maintenance of foundations and cables. These activities are expected to be localised, short-term and less frequent than those undertaken during the construction phase.

6.4.1.124 Based on the predicted underwater noise modelling presented in the Underwater Noise Assessment (NIS Volume III, Appendix 11.1: Underwater Noise Assessment (Revised March 2026)), the predicted ranges for PTS-onset, TTS-onset and behavioural disturbance during operation and maintenance are expected to be comparable to those assessed for the construction phase, assuming similar equipment and methods are anticipated to be used.

6.4.1.125 The closest distance between dredging and trenching activities during the operational and maintenance phase and the boundary of the Blackwater Bank SAC is approximately 19.13 km. This distance substantially exceeds the maximum predicted ranges for auditory injury (PTS), TTS, and behavioural disturbance associated with dredging and trenching activities.

6.4.1.126 In relation to the Blackwater Bank SAC COs (Table 5.1), dredging and trenching during the operational and maintenance phase will not result in permanent or long-term restriction of access to suitable habitat within the SAC, nor introduce underwater noise at levels that would cause injury or sustained disturbance to the harbour porpoise community.

6.4.1.127 **With consideration of the limited, infrequent and localised nature of dredging and trenching during the operational and maintenance phase, the very limited spatial extent of predicted auditory injury and disturbance ranges, and the absence of any overlap with the Blackwater Bank SAC, it is concluded that there will be no AEoI of the harbour porpoise QI of the Blackwater Bank SAC, as defined by its COs, as a result of underwater noise arising from dredging and trenching during the operational and maintenance phase for Project Design Options 1 and 2.**

INJURY AND / OR DISTURBANCE FROM VESSEL MOVEMENTS

6.4.1.128 Increased vessel movement compared to baseline levels during all phases of the Proposed Development has the potential to result in a range of impacts such as, injury and/ or mortality from vessel activities, or disturbance though presence and the generation of associated underwater noise.

6.4.1.129 Project-related vessel numbers and movements used as inputs to this assessment are derived from Section 4.2.9 of the SISAA (NIS Volume I: Supporting Information for Screening for Appropriate Assessment (Revised March 2026)). This includes the anticipated vessel types, maximum concurrent vessel presence, and indicative return trip estimates, which form the basis for evaluating potential injury and disturbance risks to Annex II marine mammal QIs from vessel activities across the relevant phases of the Proposed Development.

6.4.1.130 The area surrounding the Proposed Development experiences a relatively low level of vessel traffic due to the presence of the shallow Arklow Bank sandbank, with higher traffic in the coastal areas and immediate surrounding waters (see EIAR Volume II, Chapter 15: Shipping and Navigation (Revised March 2026)).

6.4.1.131 The shipping and navigation baseline study (NIS Volume III, Appendix 15.1: Navigational Risk Assessment (Revised March 2026)) recorded vessel traffic over 29 days between 7 July and 14 August 2023. On average, 36 to 37 unique vessels per day were recorded within the shipping and navigation Study Area (which is defined as the Array Area and a 10 nm buffer), with a maximum of 59 vessels on the busiest day. Vessel types were predominantly cargo (40%), recreational (31%) and fishing (10%).

INJURY FROM VESSEL ACTIVITIES

6.4.1.132 During construction of the Proposed Development, a potential source of impact from increased vessel activity is physical trauma from collision with a boat or ship. In general, three consequences of injury from vessel activities are defined:

- Direct effects: injuries or mortality to the individual that are the immediate result of collision;
- Long-term effects: decrease in the fitness of the animal over time; and
- Population-level consequences: depending on mortality rates (Schoeman *et al*., 2020).

6.4.1.133 Direct injuries from vessel strikes, both fatal and non-fatal, between marine mammals and vessels have been documented (Laist *et al*., 2001; Vanderlaan *et al*., 2008; Cates *et al*., 2017; Peltier *et al*., 2019). Evidence of ship strike includes propeller cuts, significant bruising, oedema, internal bleeding radiating from a specific impact site, fractures and ship paint marks (Jensen and Silber, 2003; Douglas *et al*., 2008). Fatalities from ship strikes are likely underreported (Authier *et al.,* 2014), while non-fatal injuries are widely observed in animals that survive collisions with propellers has been widely documented (Wells *et al.,* 2008; Luksenburg, 2014).

6.4.1.134 Although many marine mammals can detect and avoid approaching vessels, it is unclear why some individuals do not always move out of the vessel's path (Schoeman *et al*., 2020). This may occur because animals are engaged in behaviours such as resting, foraging, nursing, or socialising, which can reduce vigilance (Dukas, 2002) or because animals near the surface are unable to hear the vessel approaching. As a result, collisions do not occur, or are not necessarily lethal, in all occasions where vessels are present.

6.4.1.135 Whilst a broad range of vessel types have been involved in collisions with marine mammals (Laist *et al*., 2001), larger vessels travelling at higher speeds generate stronger strike impacts and therefore pose a greater risk of serious injury or death to marine mammals (Schoeman *et al*., 2020). For example, a study by Laist *et al.* (2001) found that in 89% of collisions in which the whale was killed or seriously injured vessels were travelling at speeds above 7 m/s or more, and the vessel exceeded a length of 80 m. Conversely, smaller vessels with greater manoeuvrability, or larger vessels travelling at lower speeds, present a much lower collision risk of death or serious injury to marine mammals (Laist *et al*., 2001).

6.4.1.136 Harbour porpoises are relatively small, highly mobile, and given observed responses to noise, are expected to detect vessels in close proximity and largely avoid collision (Benhemma-Le Gall *et al.,* 2021; 2023; Brandt *et al*., 2018; Heinänen and Skov, 2015). However, there is a lack of information on the frequency of marine mammal vessel collisions and stranding data in Irish waters to suggest that injury from vessel activities is a significant cause of marine mammal mortality in this region. For example, the Cetacean Strandings Investigation Programme (CSIP) reported that of the 532 harbour porpoise strandings in the UK in 2018 only one individual was confirmed to have died from physical trauma due to vessel strike out of 60 examined post mortems (CSIP, 2019).

CONSTRUCTION AND DECOMMISSIONING PHASE ASSESSMENT

6.4.1.137 During the construction phase, up to 69 installation vessels may be present within the Proposed Development at any one time, resulting in a maximum of 4,150 vessel return trips

over the four-year construction period, and a maximum of 1,797 vessel return trips per year. A similar number of vessels are anticipated for the decommissioning phase.

6.4.1.138 The majority of vessels used during the construction and decommissioning phases are likely to be large vessels that will either be travelling considerably slower than 7 m/s or will be stationary for significant periods of time. Therefore, the actual increase in vessel traffic moving within the Proposed Development and to/from port will be intermittent over short periods of the offshore construction activity.

6.4.1.139 Smaller vessels involved in construction and decommissioning activities (i.e. tug/anchor handlers, guard vessels, survey vessels, and crew transfer vessels) are able to move to avoid marine mammals (when detected), even when an animal is close and the vessel is going at high speed, due to better manoeuvrability compared to larger vessels (Schoeman *et al.*, 2020). In contrast, large vessels, such as jack-up vessels, have low manoeuvrability and may require larger distances to avoid an animal, but travel at slower speeds.

6.4.1.140 In addition, the mitigation measures (see Table 6.7) which includes an Environmental VMP (NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan), will ensure that vessel traffic will move along predictable routes, which is known to be a key aspect in minimising the potential risks imposed by vessel traffic (Nowacek *et al.*, 2001; Lusseau, 2003; 2006). The Environmental VMP also sets out a Code of Conduct to minimise interactions with marine mammals and to define how vessels should behave in the presence of them.

6.4.1.141 It is also likely that the noise emissions from vessels involved in the construction and decommissioning phases will be detectable by marine mammals and therefore will deter animals from the areas of potential impact. Whilst construction and decommissioning of the Proposed Development will lead to an uplift in vessel activity, vessel movements will be largely restricted to within the Array Area or along the Cable Corridor and Working Area and will follow existing shipping routes to/from ports. Due to the volume of pre-existing vessel traffic around the Irish Sea, the introduction of additional vessels during the construction and decommissioning phases of the Proposed Development is not considered to be a novel impact for marine mammals present within the vicinity of the Proposed Development. Therefore, it is not expected that vessel activities during the construction or decommissioning phase would increase the risk of injury due to vessel activities. It is also anticipated that noise produced by the vessels will be detectable by harbour porpoise and therefore enable avoidance.

6.4.1.142 With consideration of the mobility of harbour porpoises, the nature of construction and decommissioning vessel traffic, and the implementation of Environmental VMP measures, vessel movements are not expected to result in permanent exclusion from suitable habitat, injury, or population-level effects**. It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the Blackwater Bank SAC, as defined by its COs, as a result of injury from vessel activities associated with the construction and decommissioning phase for Project Design Options 1 and 2.**

OPERARTIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.1.143 During the operational and maintenance phase, a maximum of 30 vessels will be present within the Proposed Development at any one time, resulting in a maximum of 1,359 vessel return trips per year. Vessels that will be used during the operational and maintenance phase (up to 36.5 years) include crew transfer vessels, jack-up vessels, cable repair vessels.

6.4.1.144 As with construction activities, most vessels associated with the Proposed Development during the operational and maintenance phase are expected to travel at relatively low speeds within the Proposed Development, with larger vessels either stationary or operating at slow speeds during maintenance activities. Smaller, more manoeuvrable vessels (e.g. crew transfer vessels) will be able to alter course to avoid marine mammals when detected. For the

reasons outlined in the section above, harbour porpoise are, therefore, expected to detect and avoid vessels, resulting in a low likelihood of collision.

6.4.1.145 The continued implementation of mitigation measures, including the Environmental VMP (NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan; Table 6.7), will ensure predictable vessel routing and adherence to appropriate vessel management procedures, further reducing collision risk. Given the lower vessel numbers relative to construction, the absence of novel vessel activity, and the high baseline levels of vessel traffic in the Irish Sea, vessel movements during operational and maintenance are not expected to materially increase collision risk for harbour porpoise.

6.4.1.146 In relation to the site-specific COs for Blackwater Bank SAC (Table 5.1), vessel movements during the operational and maintenance phase will not result in permanent or long-term restriction of access to suitable habitat within the SAC, as vessel activity will be intermittent, transitory, and of lower intensity than during construction.

6.4.1.147 Given the relatively low vessel numbers, slow vessel speeds and continued application of Environmental VMP measures, vessel movements during operational and maintenance phase will not result in permanent habitat exclusion, injury, or population-level effects. **It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the Blackwater Bank SAC, as defined by its COs, as a result of injury from vessel activities associated with the operational and maintenance phase for Project Design Options 1 and 2.**

VESSEL DISTURBANCE

6.4.1.148 With consideration to behavioural impacts from the presence of underwater noise generated by vessel movements, harbour porpoises are particularly sensitive to high frequency noise and typically avoid vessels (Culloch *et al.*, 2016; Benhemma-Le Gall *et al.*, 2021). Several studies have also evidenced reduced harbour porpoise occurrence with increasing vessel presence (Benhemma-Le Gall *et al.*, 2021; 2023; Brandt *et al.*, 2018; Heinänen and Skov, 2015). Evidence also shows some changes in harbour porpoise foraging behaviour as a result of high vessel traffic in coastal waters including increased fluking, altered vocalisations, prolonged dives (Wisniewska *et al.*, 2018) and directed movement away from the sound source (Oakley *et al.*, 2017).

6.4.1.149 Displacement and reduced foraging near vessels are considered generally to be short-term and reversible. Harbour porpoises occur widely across the Irish Sea (Berrow *et al.,* 2010; Rogan *et al.,* 2018; Wall *et al.,* 2013), suggesting suitable foraging habitat remains available across their range (since they have a requirement to feed regularly). Behavioural disturbance from occasional vessels is therefore unlikely to result in population-level effects.

CONSTRUCTION AND DECOMMISSIONING PHASE ASSESSMENT

6.4.1.150 During the construction phase, up to 69 installation vessels may be present within the Proposed Development at any one time, resulting in a maximum of 4,150 vessel return trips over the four-year construction period, and a maximum of 1,797 vessel return trips per year. A similar number of vessels are anticipated for the decommissioning phase.

6.4.1.151 With consideration of disturbance and displacement, the coastal areas and immediate surrounding waters of the Proposed Development are already subject to high levels of vessel traffic. Therefore, it is concluded that it is unlikely there will be a significant change in the level of disturbance that harbour porpoise naturally present are subject to.

6.4.1.152 Heinänen and Skov (2015) suggested that harbour porpoise density was significantly lower in areas with vessel transit rates of greater than 20,000 vessels/year (80 per day within an area of 5 km^2). Comparatively, construction and decommissioning traffic will be intermittent, with vessel traffic in the Proposed Development Array Area plus a 10 nautical mile (nm) buffer

averaging 36 vessels per day. It is concluded that any disturbance above current baseline levels of activity will only result in a short-term and temporary effect on behaviour.

6.4.1.153 The implementation of Environmental VMP (NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan; Table 6.7) measures will ensure that vessels follow predictable routes and controlled speeds, resulting in slower moving vessels travelling more predictable routes which are less likely to cause disturbance. Vessel simulation modelling shows that slowing vessels by 20-50% reduces source noise (by 5 dB for 20% and 18 dB for 50%) and reducing the number of animals exposed, therefore decreasing the likelihood of animals that are likely to be disturbed (Findlay *et al*., 2023).

6.4.1.154 In relation to the site-specific COs for Blackwater Bank SAC (Table 5.1), vessel movements associated with the construction and decommissioning phase will not result in long-term displacement or interference with key behaviours that will lead to any population-level effects on harbour porpoise.

6.4.1.155 **With consideration of the temporary and reversible nature of behavioural responses, the localised extent of the disturbance expected, and the implementation of Environmental VMP measures to reduce risk, it is therefore concluded that there will be no AEoI of the harbour porpoise QI of the Blackwater Bank SAC, as defined by its COs, as a result of disturbance from vessel activities associated with the construction and decommissioning phase for Project Design Options 1 and 2.**

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.1.156 During the operational and maintenance phase, a maximum of 30 vessels will be present within the Proposed Development at any one time, resulting in a maximum of 1,359 vessel return trips per year.

6.4.1.157 Vessel activity during the operational and maintenance phase represents a reduction in both vessel numbers and intensity compared to the construction and decommissioning phases. As during construction, vessel movements will be subject to the Environmental VMP (NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan; Table 6.7), ensuring predictable routing, controlled speeds and adherence to mitigation measures designed to minimise disturbance to marine mammals.

6.4.1.158 With consideration of the relatively low vessel numbers, and similarly mitigated with the implementation of Environmental VMP measures, and evidence that behavioural responses to vessel presence are temporary and localised, any disturbance to harbour porpoise during the operational and maintenance phase is expected to be short-term and fully reversible, with animals returning to the area following any displacement from vessel passage.

6.4.1.159 In relation to the site-specific COs for Blackwater Bank SAC (Table 5.1), vessel movements associated with the operational and maintenance phase will not result in long-term displacement, restriction of access to supporting habitat, or effects on the harbour porpoise community. **It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the Blackwater Bank SAC, as defined by its COs, as a result of disturbance from vessel activities associated with the operational and maintenance phase for Project Design Options 1 and 2.**

CHANGES IN EMF FROM SUBSEA CABLING

6.4.1.160 The operation of subsea power cables generates localised EMF, which are strongest immediately adjacent to the inter-array, export, and OSP interconnector cables and attenuate rapidly with distance from the buried cable (CMACS, 2003; Normandeau *et al.,* 2011). Any EMF generation occurs during the operational and maintenance phase of the Proposed Development when power is being transmitted (Table 6.8).

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.1.161 There is evidence to suggest that some species of cetacean may be able to detect variations in magnetic fields, therefore it is plausible that they are magneto-sensitive (Normandeau *et al.*, 2011). Kirschvink *et al.* (1986) suggested that species that were sensitive to changes in the Earth's magnetic field and that are likely to be present within the Proposed Development include harbour porpoise. However, the majority of these have had a theoretical evidence base, coming to differing conclusions regarding species' sensitivity to changes in electric and magnetic fields (Normandeau *et al.*, 2011). The only evidence of electro-sensitivity in marine mammals to date is reported in Guiana dolphin (*Sotalia guianensis*) as they have been shown to possess an electroreceptive system which is used to detect electrical stimuli (Czech-Damal *et al.*, 2013).

6.4.1.162 Potential responses of cetaceans from EMF could include avoidance behaviour, disruption in orientation, and effects on feeding or social interaction (Normandeau *et al.*, 2011), although it is important to note that these responses are all currently hypothetical. Whilst subsea cables could create a very localised change in the geomagnetic field (Taormina *et al.*, 2018), modelling studies of EMF from cables suggests that the likelihood of such a change affecting a large enough area to elicit a significant behavioural alteration would be low (Normandeau *et al.*, 2011).

6.4.1.163 Given there is no overlap of the Array Area and Cable Corridor and Working Area with the Blackwater Bank SAC, any EMF generated from subsea cables is far beyond the range that could affect harbour porpoise at the designated site, and unlikely to result in meaningful population-level impacts on the community at this site.

6.4.1.164 **Considering the highly localised, theoretical nature of the impact, and the recoverable behaviour of marine mammals, it is therefore concluded that there will be no AEoI of the harbour porpoise QI of the Blackwater Bank SAC, as defined by its COs, as a result of EMF from subsea cables for Project Design Options 1 and 2.**

CHANGES IN FISH AND SHELLFISH COMMUNITY AFFECTING PREY RESOURCES

6.4.1.165 Potential impacts to prey resources arising from the Proposed Development are expected to be largely restricted to the boundaries of the Proposed Development due to the localised footprint of seabed disturbance, the temporary nature of construction activities, and the limited spatial extent of predicted underwater noise and sediment dispersion effects. As such, any indirect effects on harbour porpoise via changes in prey availability would be limited to individuals foraging within, or close proximity to the Proposed Development.

6.4.1.166 Harbour porpoise are generalist feeders, with a diet primarily comprising whiting (*Merlangius merlangus*), Atlantic herring (*Clupea harengus*) and poor cod (*Trisopterus minutus*; Hernandez-Milian *et al.*, 2011). This dietary flexibility allows harbour porpoise to adapt to localised or temporary changes in prey availability, reducing the likelihood that small-scale changes in prey abundance would affect the species at a site level. Annex II migratory fish QIs that may also contribute to Annex II marine mammal QI prey resources are assessed separately in Section 6.6, which provides an overview of relevant receptor groups, their ecological characteristics, and applicable noise sensitivity thresholds.

CONSTRUCTION AND DECOMMISSIONING PHASE ASSESSMENT

6.4.1.167 As detailed within the EIAR Volume II, Chapter 10: Fish, Shellfish and Sea Turtle Ecology (Revised March 2026), potential impacts on marine mammal prey species during the construction and decommissioning phase of the Proposed Development include (Table 6.8):

- Temporary habitat loss / disturbance;
- Increased SSC and associated deposition;

- Injury and/ or disturbance as a result of underwater noise and vibration during pile driving and cable installation activities; and
- Accidental pollution.

6.4.1.168 Potential impacts on prey species during the decommissioning phase are expected to be similar to, or less than, those during the construction phase.

6.4.1.169 With regard to temporary habitat loss and increased SSC and associated deposition, only a subset of harbour porpoises prey species (particularly sedentary species or those reliant on spawning grounds) may be vulnerable to these effects. Where vulnerable species may be affected, any impacts are expected to be highly localised, affecting only a small proportion of their wider nursery grounds (<0.01% of the habitats present within the Western Irish Fish, Shellfish and Sea Turtle Ecology Study Area covering an area of 13,748 km^2 from Co. Wexford to Co. Down), and therefore considered to be fully recoverable following cessation of construction and decommissioning activities. Baseline assessments indicate that the key spawning areas for fish and shellfish within the vicinity of the Proposed Development do not overlap with the ZoI relevant to harbour porpoise. As a result, the effects on mobile prey species (which comprise the majority of the harbour porpoise diet) are considered negligible, and no meaningful impact on harbour porpoise foraging ability is anticipated.

6.4.1.170 Harbour porpoise are wide-ranging, mobile predators capable of adjusting their foraging effort over tens to hundreds of kilometres. Their generalist diet and flexible foraging ecology mean that small-scale, short-term reductions in local prey abundance are well within their natural capacity to accommodate. Accordingly, such impacts are not considered capable of influencing the site-specific COs relating to prey availability or habitat quality for the harbour porpoise QI.

6.4.1.171 With regards to underwater noise and vibration, this impact can have a range of effects on prey ranging from behavioural changes to recoverable injury or mortality, with the extent of impact dependent on the prey species group. Underwater noise modelling from the Underwater Noise Assessment (NIS Volume III, Appendix 11.1: Underwater Noise Assessment (Revised March 2026)) shows the following distances (i.e. using unweighted SPL_{peak} criteria (Popper *et al.,* 2014); see Table 6.38 and Table 6.39 for full details):

- Fish species without swim bladders (threshold 213 dB): 120 m away from the sound source at the SW site, covering an area of up to 0.04 km^2; and
- Fish species with swim bladders both involved and not involved in hearing (threshold 207 dB): 280 m away from the sound source at the SW site, covering an area of 0.22 km^2.

6.4.1.172 These distances represent the maximum extent of potential recoverable injury or mortality to prey species and are highly localised relative to the wider foraging area available to harbour porpoise. As such, these effects are not expected to result in a meaningful reduction in prey availability or accessibility for harbour porpoise.

6.4.1.173 With regard to accidental pollution, the risk is considered negligible due to avoidance through design and implementation of mitigation measures, including the Environmental VMP (NIS Volume III, Appendix 25.10: Environmental Vessel Management Plan), EMP and MPCP (Table 6.7). These measures reduce the likelihood of accidental pollution such that any effects, if they were to occur, would be entirely negligible.

6.4.1.174 **With consideration of the highly localised and temporary nature of the impacts described above, the implementation of mitigation measures and resulting limited spatial extent of potential effects on prey species, and the generalist foraging strategy of harbour porpoise, it is concluded there will be no AEoI of the harbour porpoise QI of the Blackwater Bank SAC, as defined its COs, as a result of changes in prey resources during the construction and decommissioning phase for Project Design Option 1.**

6.4.1.175 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.1.176 During the operational and maintenance phase, the majority of potential effects on fish and shellfish communities that may influence harbour porpoise prey resources (including temporary habitat disturbance, increased SSC and associated deposition, and accidental pollution) have already been assessed for the construction phase (see Sections 6.4.1.169 to 6.4.1.173). These effects are temporary, localised and reversible, and are not predicted to result in any meaningful change in prey availability or accessibility for harbour porpoise.

6.4.1.177 Therefore, the operational and maintenance phase assessment focuses on those pathways that differ from those listed in the construction phase, namely (Table 6.8):

- Long-term habitat loss as a result of the presence of foundation structures, scour protection, and cable protection;
- Alteration of seabed habitats arising from changes in physical processes as a result of the presence of foundation structures, scour protection, and cable protection; and
- Changes in EMF from subsea cabling.

6.4.1.178 In regards to long-term habitat change, the presence of wind turbine foundations, OSP structures, scour protection and cable protection will result in small-scale and permanent alteration of seabed habitats within the footprint of the structures. These changes will be highly localised and will affect only a very small proportion of the available benthic habitat within the wider foraging range of harbour porpoise.

6.4.1.179 Habitat alteration associated with these structures may result in localised changes in fish and shellfish assemblages, however, any loss of soft sediment habitat will be minimal in extent and is not predicted to result in a net reduction in prey availability at a scale relevant to harbour porpoise.

6.4.1.180 Subsea power cables associated with the Proposed Development will emit localised EMF during operation. The range over which fish and shellfish species can detect electric or magnetic fields from offshore windfarm subsea cables is very limited and is likely to be restricted to distances of metres from the cable (CSA, 2019).

6.4.1.181 EMF exposure may result in minor behavioural responses in some prey species, such as short-term avoidance or changes in swimming behaviour; however, there is little evidence to suggest that EMF results in injury, mortality, or reduced survival of fish or shellfish (CSA, 2019). Pelagic prey species are considered unlikely to be exposed to EMF due to their position in the water column, while demersal species would only be affected in close proximity to the cable route. Any EMF-related effects on prey species are therefore expected to be highly localised and confined to the immediate vicinity of subsea cables, with no measurable effect on prey availability or distribution at a scale relevant to harbour porpoise foraging.

6.4.1.182 With consideration that operational-phase effects on prey resources are limited to highly localised habitat change and very small-scale, theoretical EMF-related behavioural responses, and that the majority of prey-related impact pathways have already been assessed as not giving rise to AEoI during construction, it is concluded that there will be no reduction in prey availability, prey accessibility or prey distribution relevant to harbour porpoise. **Therefore, there will be no AEoI on the harbour porpoise QI of the Blackwater Bank SAC, as defined by its COs, as a result of changes in prey resources associated with the operational and maintenance phase for Project Design Option 1.**

6.4.1.183 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

ACCIDENTAL POLLUTION

6.4.1.184 There is potential for accidental release of pollutants from vessels and equipment associated with the construction, operational and maintenance, and decommissioning phases of the Proposed Development. Pollutants may include diesel fuel, bentonite (from drilling activities), lubricants, grease and oils, anti-fouling biocides, and grout.

6.4.1.185 In the event of an accidental spill, harbour porpoise could be exposed to contaminants through either direct or indirect pathways:

- Direct impacts include ingestion, inhalation, and absorption. All of which may result in physiological responses with health and long-term survival and/or reproduction consequences, the most serious of which could be damage to the respiratory system (Helm *et al.*, 2015); and
- Indirect impacts include short- and long-term reductions in food availability, disruption to social bonds, reduced reproduction, and/or cumulative effects on individuals, populations, and the ecosystem (Helm *et al.*, 2015).

6.4.1.186 However, harbour porpoise are highly mobile and wide ranging, therefore any contact with a spill would be expected to be brief. Cetaceans are also capable of detecting and avoiding surface oil slicks, as demonstrated in experimental studies (Geraci and St. Aubin, 1984). While harbour porpoise must surface periodically to breathe, potentially bringing them into contact with surface pollutants, the likelihood of sustained exposure is dependent on spill magnitude, extent and duration (Geraci and St. Aubin, 1980; Helm *et al.*, 2015).

CONSTRUCTION AND DECOMMISSIONING PHASE ASSESSMENT

6.4.1.187 The installation and removal of offshore infrastructure for the Proposed Development may lead to the accidental release of pollutants through spills and leaks from vessels and equipment (Table 6.8). Potential impacts during the decommissioning phase are expected to be similar to, or less than, those during the construction phase.

6.4.1.188 The magnitude of any accidental pollution event would depend on the type and quantity of material released, with the release of fuel from a construction vessel considered to represent the largest potential spill scenario during installation activities. In the event of an accidental spill from vessels, equipment or from construction and decommissioning activities, pollutants would be subject to immediate dilution and rapid dispersion within the marine environment (Marappan *et al.,* 2022).

6.4.1.189 The likelihood of accidental pollution is considered extremely low due to avoidance through design and management measures (Table 6.7). These include the secure storage and handling of chemicals and hazardous material, double-skinned tanks and pipework where appropriate, chemical risk assessments, and the implementation of an EMP and MPCP. The MPCP sets out emergency response procedures to minimise the scale and duration of any spill should one occur.

6.4.1.190 **Given the inherent low likelihood of an accidental pollution event from vessel activity and other activities, the highly localised nature of any potential exposure, and the mitigation measures (as set out in Table 6.7), it is concluded that there will be no AEoI of the harbour porpoise QI of the Blackwater Bank SAC, as defined by its COs, as a result of accidental pollution associated with the construction and decommissioning phase for Project Design Option 1.**

6.4.1.191 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.1.192 During the operational and maintenance phase, there remains a potential for accidental release of pollutants as a result of the presence of offshore infrastructure, associated equipment, and vessel movements (Table 6.8).

6.4.1.193 The pathways, likelihood and consequences of accidental pollution during this phase are consistent with those assessed for the construction phase. The same avoidance through design and management measures, including the EMP and MPCP (Table 6.7), will be implemented throughout operation and maintenance.

6.4.1.194 **On this basis, it is concluded that there will be no AEoI of the harbour porpoise QI of the Blackwater Bank SAC, as defined by its COs, as a result of accidental pollution during the operational and maintenance phase for Project Design Option 1.**

6.4.1.195 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.2 Rockabill to Dalkey Island SAC

Harbour porpoise

6.4.2.1 The relevant Annex II marine mammal QI site-specific COs at Rockabill to Dalkey Island SAC is to maintain the favourable conservation condition of the harbour porpoise QI, as defined by the list of attributes and targets set out in Table 5.1 (NPWS, 2013c).

6.4.2.2 Eight potential impacts pathways relevant to harbour porpoise have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed Development (Table 6.8). These pathways have been assessed in detail for Blackwater Bank SAC which is also designated for the same Annex II marine mammal QI and is located approximately 19.13 km from the Proposed Development, compared to approximately 35.66 km for Rockabill to Dalkey Island SAC.

6.4.2.3 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Blackwater Bank SAC represents the closest designated site for harbour porpoise from the Proposed Development. The assessment presented in Section 6.4.1 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Blackwater Bank SAC, with respect to the harbour porpoise QI.

6.4.2.4 Given that the Rockabill to Dalkey Island SAC supports the same Annex II marine mammal QI and lies substantially further from the Proposed Development, the magnitude of effects at Rockabill to Dalkey Island SAC is concluded to be no greater than, and in practice less than, those associated for Blackwater Bank SAC. **It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the Rockabill to Dalkey Island SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.2.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.3 Codling Fault Zone SAC

Harbour porpoise

6.4.3.1 The relevant Annex II marine mammal QI site-specific COs at Codling Fault Zone SAC is to maintain the favourable conservation condition of the harbour porpoise QI, as defined by the list of attributes and targets set out in Table 5.1 (NPWS, 2025a).

6.4.3.2 Eight potential impact pathways relevant to harbour porpoise have been identified in relation to the construction, operation and maintenance, and decommissioning of the Proposed

Development (Table 6.8). These pathways have been assessed in detail for Blackwater Bank SAC which is also designated for the same Annex II marine mammal QI and is located approximately 19.13 km from the Proposed Development, compared to approximately 43.90 km for Codling Fault Zone SAC.

6.4.3.3 As the severity and likelihood of all relevant impact pathways are intrinsically distance-dependent, Blackwater Bank SAC represents the closest designated site for harbour porpoise from the Proposed Development. The assessment presented in Section 6.4.1 therefore provides a conservative basis for evaluation and concluded that none of the identified impact pathways would result in an AEoI of Blackwater Bank SAC, with respect to the harbour porpoise QI.

6.4.3.4 Given that the Codling Fault Zone SAC supports the same Annex II marine mammal QI and lies substantially further from the Proposed Development, the magnitude of effects at Codling Fault Zone SAC is concluded to be no greater than, and in practice less than, those assessed for Blackwater Bank SAC. **It is therefore concluded that there will be no AEoI of the harbour porpoise QI of the Codling Fault Zone SAC, as defined by its COs, as a result of any of the impacts considered for Project Design Option 1 across any phase.**

6.4.3.5 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

6.4.4 Slaney River Valley SAC

Harbour seal

6.4.4.1 The relevant Annex II marine mammal QI site-specific COs at Slaney River SAC is to maintain the favourable conservation condition of the harbour seal, as defined by the following list of attributes and targets (NPWS, 2011a):

- *Access to suitable habitat:* Species range within the site should not be restricted by artificial barriers to site use;
  - This target may be considered relevant to proposed activities or operations that will result in the permanent exclusion of harbour seal from part of its range within the site, or will permanently prevent access for the species to suitable habitat therein; and
  - It does not refer to short-term or temporary restriction of access or range.
- *Breeding behaviour:* The breeding sites should be maintained in a natural condition;
  - This target is relevant to proposed activities or operations that will result in significant interference with or disturbance of (a) breeding behaviour by harbour seal within the site and/or (b) aquatic/terrestrial/intertidal habitat used during the annual breeding season.
  - Operations or activities that cause displacement of individuals from a breeding site or alteration of natural breeding behaviour, and that may result in higher mortality or reduced reproductive success, would be regarded as significant and should therefore be avoided.
- *Moulting behaviour:* The moult haul-out sites should be maintained in a natural condition;
  - This target is relevant to proposed activities or operations that will result in significant interference with or disturbance of (a) moulting behaviour by harbour seal within the site and/or (b) aquatic/terrestrial/intertidal habitat used during the annual moult.
  - Operations or activities that cause displacement of individuals from a moult haul-out site or alteration of natural moulting behaviour to an extent that may ultimately

interfere with key ecological functions would be regarded as significant and should therefore be avoided.

- *Resting behaviour:* The resting haul-out sites should be maintained in a natural condition;
  - This target is to proposed activities or operations that will result in significant interference with or disturbance of (a) resting behaviour by harbour seal within the site and/or (b) aquatic/terrestrial/intertidal habitat used for resting.
  - Operations or activities that cause displacement of individuals from a resting haul-out site to an extent that may ultimately interfere with key ecological functions would be regarded as significant and should therefore be avoided.
- *Disturbance:* Human activities should occur at levels that do not adversely affect the harbour seal population at the site:
  - Proposed activities or operations should not introduce man-made energy (e.g. aerial or underwater noise, light or thermal energy) at levels that could result in a significant negative impact on individuals and/or the population of harbour seal within the site. This refers to the aquatic habitats used by the species in addition to important natural behaviours during the species' annual cycle;
  - This target also relates to proposed activities or operations that may result in the deterioration of key resources (e.g. water quality, feeding, etc.) upon which harbour seals depend. In the absence of complete knowledge on the species ecological requirements at this site, such considerations should be assessed where appropriate on a case-by-case basis.

6.4.4.2 There are seven potential impacts pathways relevant to harbour seal associated with the construction, operational and maintenance, and decommissioning of the Proposed Development, as identified in Table 6.8 and are assessed below for each phase of the Proposed Development.

INJURY AND/OR DISTURBANCE FROM UNDERWATER NOISE FROM PILING

6.4.4.3 Seals use sound both in air and water for communication, predator avoidance, and reproductive interactions, and are less dependent on hearing for foraging than cetaceans (Deecke *et al.*, 2002). Seals have very well developed tactile sensory systems that are used for foraging, but in certain conditions they may also listen to sounds produced by vocalising fish whilst hunting for prey (Dehnhardt *et al.,* 2001; Shulte-Pelkum *et al.*, 2007).

6.4.4.4 With consideration of harbour seals, they are within the Phocid Carnivore in Water (PCW) FHG with a hearing range of 50 Hz to 86 kHz (Southall *et al.*, 2019). Underwater noise-generating activities associated with the Proposed Development therefore have the potential to result in auditory injury, behavioural disturbance or temporary displacement, depending on noise level, duration and proximity.

6.4.4.5 For each mitigated piling scenario (see Section 6.4.1.12), predicted impacts were informed by a single modelled average at-sea density estimate across the Array Area and Cable Corridor and Working Area (0.0003 animals/km^2; Table 6.6) and using the thresholds for impulsive noise outlined in Table 6.9. Full details of the underwater noise modelling methodology and the resulting impact areas and ranges are detailed in the Underwater Noise Assessment (NIS Volume III, Appendix 11.1: Underwater Noise Assessment (Revised March 2026)).

AUDITORY INJURY (PTS)

6.4.4.6 Predicted impact areas and maximum ranges for auditory injury (PTS-onset) to harbour seals from pile driving during construction from the Proposed Development, across both mitigated piling scenarios (ramp-up mitigation scenario and extended ramp-up mitigation scenario), are presented in Table 6.19Table 6.19: Predicted impact range of PTS-onset from pile driving at the SW WTG array location with harbour seal density estimates. For further information on densities used; see .

6.4.4.7 For the ramp-up mitigation scenario, the maximum instantaneous PTS-onset impact range was 60 m for the installation of a 11 m monopile at the SW WTG location, which represents the piling location closest to Slaney River Valley SAC (Table 6.19). This equates to a maximum of one individual potentially experiencing auditory injury, representing <0.01% of the reference population of 182 within the East region of RoI (Morris and Duck, 2019).

6.4.4.8 Using the cumulative PTS-onset thresholds, the maximum impact range at the SW WTG location was predicted to be <50 m, equating to a maximum of one individual (<0.01% of the reference population; Table 6.19).

6.4.4.9 With the implementation of the extended ramp-up mitigation scenario, the maximum instantaneous PTS-onset impact range remained at 60 m at the SW WTG location, corresponding to a maximum of one individual (<0.01% of the reference population; Table 6.19: Predicted impact range of PTS-onset from pile driving at the SW WTG array location with harbour seal density estimates. For further information on densities used; see). Predicted cumulative PTS-onset impact ranges also remained at <50 m at the SW WTG location, equating to a maximum of one individual experiencing auditory injury (<0.01% of the reference population; Table 6.19).

6.4.4.10 Overall, predicted auditory injury to harbour seals from pile driving during construction is extremely limited in spatial extent and scale, with the SW WTG location representing the most precautionary and most relevant piling location in relation to Slaney River Valley SAC.

Table 6.19: Predicted impact range of PTS-onset from pile driving at the SW WTG array location with harbour seal density estimates. For further information on densities used; see Table 6.6.

Piling Scenario	Piling location and Monopile diameter (m)		Density (animals/km²)	Area (km²)	Maximum range (m)	Number of animals[1,2]	Percentage of reference population[2] (%)
Instantaneous PTS-onset (unweighted SPL_{peak})							
Ramp-up mitigation scenario	SW WTG	11 m	0.0003	0.01	60	<1	<0.01
Extended ramp-up mitigation scenario	SW WTG	11 m	0.0003	0.01	60	<1	<0.01
Cumulative PTS-onset (weighted SEL_{cum})							
Ramp-up mitigation scenario	SW WTG	11 m	0.0003	<0.01	<50	<1	<0.01
Extended ramp-up mitigation scenario	SW WTG	11 m	0.0003	<0.01	<50	<1	<0.01

Piling Scenario	Piling location and Monopile diameter (m)	Density (animals/km²)	Area (km²)	Maximum range (m)	Number of animals[1,2]	Percentage of reference population[2] (%)

[1]The predicted number of individuals exposed to PTS-onset (both instantaneous and cumulative) from pile driving is fewer than one animal across all density scenarios. Importantly, the maximum PTS-onset impact range falls entirely within the 1,000 m Rsafe mitigation distance. With the implementation of the extended ramp-up mitigation procedure and associated MMMP measures (monitoring and soft-start procedures), marine mammals are expected to be displaced from the impact area prior to the onset of full hammer energy. Consequently, no animals are expected to be exposed to sound levels capable of causing auditory injury (PTS).

[2]The number of animals disturbed and the reference population are representative of the scaled East region of RoI population (Morris and Duck, 2019). The number of animals disturbed is not representative of the numbers disturbed within the Slaney River Valley SAC.

6.4.4.11 Any threshold shifts in hearing caused by pile driving would manifest in the range of 2 – 10 kHz (Kastelein *et al.*, 2017). At a UK BEIS-funded export elicitation workshop in 2018, experts concluded that the probability of PTS significantly affecting the survival and reproduction of grey and harbour seals was very low, assuming a 6 dB PTS in the 2 – 10 kHz range (Booth *et al.*,, 2019).

6.4.4.12 Calculations of SEL_{ss} of tagged seals during the construction of the Lincs offshore windfarm (which is located in the Southern North Sea, UK) estimated that at least 50% of tagged seals would have received sound exposure exceeding published thresholds for PTS (Hastie *et al.*, 2015). However, these thresholds have since been updated in Southall *et al.* (2019), and therefore the proportion predicted to exceed current PTS-onset thresholds would now be expected to be lower. For example, Whyte *et al.* (2020) found that the percentage of tagged harbour seals predicted to experience PTS-onset varied from 0 to 17% depending on the onset threshold applied.

6.4.4.13 The extensive offshore windfarm construction that has occurred in the southern North Sea over the past decade, and the degree of overlap between these developments and the foraging ranges of harbour seals from The Wash and North Norfolk Coast SAC, indicate that a large number of individuals from this SAC population have likely been exposed to levels of sound with the potential to exceed PTS-onset thresholds (Russell *et al.*, 2016). However, the continued increase in the harbour seal population at the Wash and North Norfolk SAC during this period suggests that either the survival and fitness of individuals have not been measurably affected, or that seals did not develop PTS despite predictions of exposure, supporting the conclusion that population-level effects at SAC scale are unlikely.

6.4.4.14 In addition, the Developer has committed to the implementation of project-specific mitigation measures during piling activities, as set out within the MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan (Revised March 2026)), which are applicable to both cetacean and pinniped receptors. These measures are designed to minimise the risk of auditory injury (PTS) to seals arising from piling-related underwater noise to a negligible level and will, as a minimum, adhere to relevant international best practice, including DAHG (2014) guidance (Table 6.7).

6.4.4.15 In relation to the site-specific COs for Slaney River Valley SAC (Table 5.1), the potential effects of underwater noise associated with pile driving on harbour seals have been assessed with respect to the attributes of access to suitable habitat and disturbance. The breeding, moulting and resting behaviour attributes relate specifically to disturbance or physical alteration of haul-out sites within the SAC boundary. As the Proposed Development is located approximately 47.55 km from the Slaney River Valley SAC and will not result in any direct or indirect effects on haul-out habitats within the site, these attributes are not considered further within this assessment.

6.4.4.16 Regarding access to suitable habitat attribute, pile driving activities and the associated underwater noise (which could potentially cause auditory injury) will be short-term and temporary in nature and will not result in permanent habitat exclusion or create an artificial barrier to site use. Predicted PTS-onset impact ranges (maximum of 60 m) are smaller than the distance to Slaney River Valley SAC, which is located approximately 47.55 km from the closest piling location, and therefore do not overlap the SAC boundary. As such, harbour seals within the SAC will not be exposed to levels of underwater noise capable of resulting in auditory injury. Any highly unlikely auditory injury to individuals occurring outside the SAC would not impede access to suitable habitat within the site.

6.4.4.17 Regarding the disturbance attribute, even in the highly unlikely event that an individual experienced PTS-onset, available evidence indicates that would be unlikely to significantly affect individual fitness (i.e. its ability to survive and reproduce; Kastelein *et al.*, 2017). Therefore, pile driving activities are not expected to introduce man-made energy at levels capable of causing significant negative effects on individual harbour seals or the wider population associated within,

or connected to, Slaney River Valley SAC, nor is it expected to cause injury or mortality at levels capable of affecting site integrity.

6.4.4.18 **With consideration of the implementation of the extended ramp-up scenario and project-specific MMMP measures ensuring that no animals are within the area of predicted auditory injury (PTS-onset) ranges, the absence of overlap with the SAC (with the greatest predicted impact range of up to 60 m), and the negligible proportion of the wider population potentially affected (<0.01%), it is concluded there will be no AEoI of the harbour seal QI of the Slaney River Valley SAC, as defined by its COs, as a result of auditory injury due to underwater noise associated with piling for Project Design Option 1.**

6.4.4.19 **Based on the representative risk of effect of Project Design Option 1, it is considered that the same conclusion of no AEoI would apply to Project Design Option 2.**

BEHAVIOURAL DISTURBANCE

6.4.4.20 The number of harbour seals predicted to experience behavioural disturbance as a result of pile driving during construction is presented in Table 6.20. Disturbance was quantified using the dose-response relationship for impulsive noise for harbour seals developed by Whyte *et al.* (2020) and expressed as a proportion of the relevant reference population (Table 6.6).

6.4.4.21 The dose-response function used is derived from harbour seal telemetry data collected during pile driving activities at the Lincs offshore windfarm in 2011 and 2012, which documented the percentage change in harbour seal density in response to pile driving. For the purposes of this assessment, a precautionary approach has been applied, whereby all harbour seals exposed to SEL_{SS} exceeding 180 dB re 1 μPa^2s are assumed to experience behavioural disturbance (Whyte *et al.*, 2020).

6.4.4.22 For the both the ramp-up mitigation and extended ramp-up mitigation scenarios, using the uniform density estimate of 0.0003 animals/km^2 extracted from Carter *et al.* (2020), it is estimated that a maximum of one harbour seal (0.55% of the reference population of 182 within the East region of RoI (Morris and Duck, 2019) may experience behavioural disturbance as a result of pile driving at all piling locations (Table 6.20Table 6.11).

6.4.4.23 At its maximum extent, the predicted 145 dB SEL_{ss} re 1 μPa^2s disturbance contour does not intersect the boundary of Slaney River SAC (Figure 6.14). The closest point of the SAC is located approximately 16.55 km beyond the outer edge of the disturbance contour generated by piling at the closest point (SW WTG).

Table 6.20: Predicted impact of disturbance to harbour seal from pile driving at SW WTG location using dose-response curves. For further information on densities used; see Table 6.6

Piling Scenario	Piling location and Monopile diameter (m)		Density (animals/km^2)	Number of animals disturbed[1]	Percentage of reference population[1] (%)
Ramp-up and extended ramp-up mitigation scenarios	SW WTG	11 m	0.0003	1	0.55

[1]The number of animals disturbed and the reference population are representative of the scaled East region of RoI population (Morris and Duck, 2019). The number of animals disturbed is not representative of the numbers disturbed within the Slaney River Valley SAC.

6.4.4.24 Furthermore, the results of the iPCoD modelling show that there is no significant effect of disturbance resulting from pile driving at the Proposed Development to harbour seal populations, with the impacted population predicted to continue at a stable trajectory at exactly the same size (100%) as the un-impacted population up to 24 years after piling has ceased.

6.4.4.25 With consideration of disturbance and displacement caused by activities such as piling, empirical studies indicate that 19-83% of tagged harbour seals may exhibit temporary displacement during piling activities, with significant reductions in local abundance reported up to 25 km from the piling location (Russell *et al.,* 2016). However, these effects are short-term, with seals typically returning to affected areas in similar densities within approximately two hours of cessation of piling. This supports the conclusion that displacement effects are temporary and reversible.

6.4.4.26 Harbour seals are also considered capable of compensating for short-term disturbance due to their generalist diet, high mobility and physiological capacity to tolerate temporary reductions in foraging opportunities. Individuals may range to up to 273 km from a haul-out to forage (Carter *et al.,* 2022, Booth *et al.,* 2019). Expert elicitation further concluded that harbour seals are unlikely to experience adverse effects on survival and reproduction as a result of intermittent disturbance from exposure to low-frequency broadband impulsive noise, such as piling driving (Booth *et al.*, 2019). However, behavioural disturbance of harbour seals could have an effect on both survival (if it results in the separation of a pup from its mother), and reproduction via body condition (if it results in the animal spending less time feeding or conserving energy by resting; Booth *et al.*, 2019).

6.4.4.27 For harbour seals, the project-specific mitigation measures set out within the MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan (Revised March 2026)), although primarily designed to minimise the risk of auditory injury (PTS) arising from piling-related underwater noise, will also act to reduce the magnitude and spatial extent of behavioural disturbance. Measures including pre-activity monitoring and controlled initiation of piling will reduce the likelihood of seals being exposed to the highest sound levels, thereby limiting the potential for strong avoidance or displacement responses. As a result, any behavioural disturbance experienced by seals is expected to be temporary and reversible and not of a scale or duration that would undermine the relevant COs.

6.4.4.28 In relation to the site-specific COs for Slaney River Valley SAC (Table 5.1), the potential effects of underwater noise associated with pile driving on harbour seals have been assessed with

respect to the attributes of access to suitable habitat and maintain human activities below levels which would adversely affect the harbour seal population at the site (disturbance). The COs relating to breeding, moulting, and resting behaviour are not considered further in this assessment, as pile driving activities will occur entirely outside the SAC and will not affect haul-out sites or habitats used for these behaviours. This conclusion is based on the spatial separation between piling activities and the SAC, and the absence of any pathway by which underwater noise could affect haul-out-dependent behaviours.

6.4.4.29 While underwater noise generated from piling may result in temporary behavioural responses and short-term displacement of harbour seals, such effects are restricted to the duration of the piling activity and do not constitute permanent barriers to site use. In line with the latest supporting guidance for the Slaney River Valley SAC (NPWS, 2011a), short-term and reversible disturbance does not represent a restriction of species range or access to suitable habitat within the SAC.

6.4.4.30 Some individuals associated with the Slaney River Valley SAC (but none within the Slaney River Valley SAC itself) may experience temporary behavioural disturbance as a result of pile driving; however, this is not predicted to result in mortality, injury, or significant negative effects on individual fitness or reproductive success for any life stage, nor is it expected to affect the harbour seal population at the site.

6.4.4.31 **With consideration of the precautionary nature of the assessment, the low proportion of the population predicted to be exhibit a behavioural response, the implementation of mitigation measures, and the recoverable and temporary (although repeated) nature of behavioural disturbance, it is concluded there will be no AEoI of the harbour seal QI of the Slaney River Valley SAC, as defined by its COs, as a result of behavioural disturbance due to underwater noise during pile driving for Project Design Option 1.**

6.4.4.32 **Based on the representative risk of effect of Project Design Option 1, it is concluded that no AEoI would also apply to Project Design Option 2.**

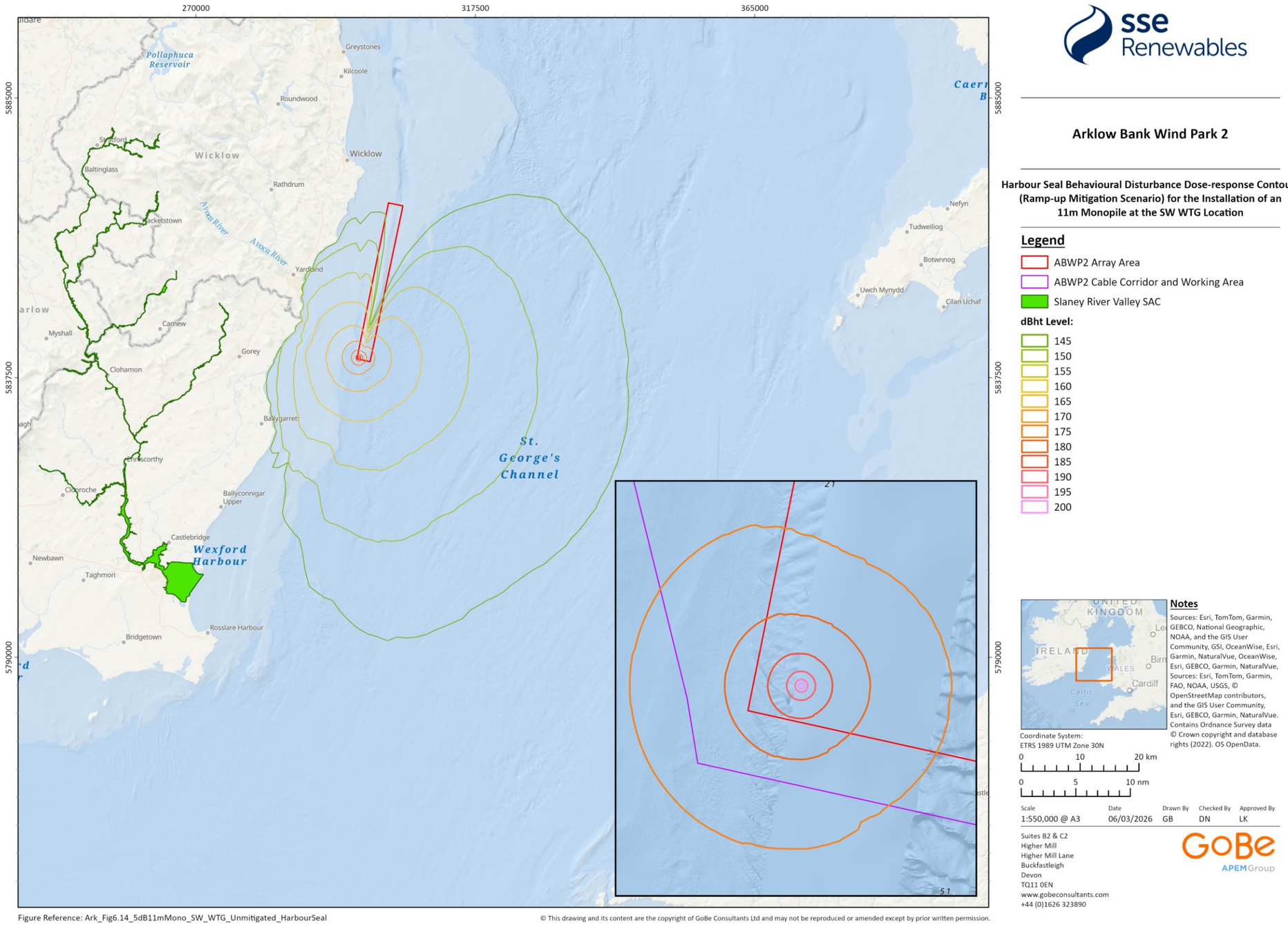

Figure Reference: Ark_Fig6.14_5dB11mMono_SW_WTG_Unmitigated_HarbourSeal

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Arklow Bank Wind Park 2

Harbour Seal Behavioural Disturbance Dose-response Contours (Ramp-up Mitigation Scenario) for the Installation of an 11m Monopile at the SW WTG Location

Legend

- ABWP2 Array Area
- ABWP2 Cable Corridor and Working Area
- Slaney River Valley SAC

dBht Level:

- 145
- 150
- 155
- 160
- 165
- 170
- 175
- 180
- 185
- 190
- 195
- 200

Notes

Sources: Esri, TomTom, Garmin, GEBCO, National Geographic, NOAA, and the GIS User Community, GSI, OceanWise, Esri, Garmin, NaturalVue, OceanWise, Esri, GEBCO, Garmin, NaturalVue, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Esri, GEBCO, Garmin, NaturalVue. Contains Ordnance Survey data © Crown copyright and database rights (2022). OS OpenData.

Coordinate System:
ETRS 1989 UTM Zone 30N

0 10 20 km

0 5 10 nm

Scale	Date	Drawn By	Checked By	Approved By
1:550,000 @ A3	06/03/2026	GB	DN	LK

Suites B2 & C2
Higher Mill
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Figure 6.14: Behavioural disturbance dose-response contours (ramp-up mitigation scenario) for the installation of an 11 m monopile at the SW WTG location and Slaney River Valley SAC for harbour seal QI

CONSTRUCTION PHASE ASSESSMENT

AUDITORY INJURY (PTS)

6.4.4.33 Based on the modelling results presented in Table 6.21, the maximum PTS-onset range for harbour seals resulting from high order UXO clearance is 2.8 km, based on the unweighted SPL_{peak} criterion and the largest charge weight modelled (800 kg plus donor). Using the average density estimate scaled from count data (Carter *et al.*, 2020), this would result in up to one harbour seal, representing <0.01% of the reference population of 182 within the East region of RoI (Morris and Duck, 2019), being within PTS-onset range under the most precautionary scenario.

6.4.4.34 For low order clearance, the predicted PTS-onset ranges are substantially smaller, with a maximum range of 0.24 km (Table 6.21). At this range, no harbour seals are predicted to experience PTS.

Table 6.21: PTS-onset ranges and numbers of harbour seal modelled to be within range for all potential charge weights

Charge Weight (kg)	Maximum range (km)	Density (animals/km²)	Number of animals[1]	Percentage of reference population[1] (%)
PTS-onset (unweighted SPL_{peak})				
0.5 (low order)	0.24	0.0003	0	0.00
25 + donor	0.91	0.0003	0	0.00
55 + donor	1.1	0.0003	0	0.00
120 +donor	1.5	0.0003	0	0.00

Charge Weight (kg)	Maximum range (km)	Density (animals/km²)	Number of animals[1]	Percentage of reference population[1] (%)
240 + donor	1.9	0.0003	0	0.00
525 + donor	2.5	0.0003	<1	<0.01
700 + donor	2.7	0.0003	<1	<0.01
800 + donor	2.8	0.0003	<1	<0.01
PTS-onset (weighted SELss)				
0.5 (low order)	0.06	0.0003	0	0.00
25 + donor	0.39	0.0003	0	0.00
55 + donor	0.57	0.0003	0	0.00
120 +donor	0.83	0.0003	0	0.00

Charge Weight (kg)	Maximum range (km)	Density (animals/km²)	Number of animals[1]	Percentage of reference population[1] (%)
240 + donor	1.1	0.0003	0	0.00
525 + donor	1.6	0.0003	0	0.00
700 + donor	1.9	0.0003	0	0.00
800 + donor	2.0	0.0003	0	0.00

[1]The number of animals disturbed and the reference population are representative of the scaled East region of RoI population (Morris and Duck, 2019). The number of animals disturbed is not representative of the numbers disturbed within the Slaney River Valley SAC.

6.4.4.35 The nearest boundary of the Slaney River Valley SAC is located approximately 47.55 km from the Proposed Development. As such, even under the largest charge weight modelled, the predicted PTS-onset ranges for both high-order and low-order UXO clearance do not overlap with the SAC. Therefore, no harbour seals within the SAC are predicted to experience auditory injury as a result of UXO clearance activities associated with the Proposed Development.

6.4.4.36 Interpretation of the modelling results should take account of the frequency characteristics of high-order UXO detonation. The main underwater noise produced by high-order detonation is outside of the region of greatest sensitivity for seal species (Southall *et al.,* 2019), with a pronounced reduction in energy levels above approximately 5-10 kHz (von Benda-Beckmann *et al.,* 2015; Salomons *et al.,* 2021). On this basis, harbour seals are considered to have a relatively low sensitivity to PTS-onset from UXO clearance.

6.4.4.37 Furthermore, the Developer has committed to the implementation of project-specific mitigation measures for UXO clearance activities, as set out within the MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan (Revised 2026)). These are designed to minimise the risk of auditory injury (PTS) to marine mammals arising from UXO-related noise. The mitigation strategy will, as a minimum, adhere to relevant international best practice, including DAHG (2014) guidance (Table 6.7).

6.4.4.38 In relation to the site-specific COs for Slaney River Valley SAC (Table 5.1), the potential effects of underwater noise associated with UXO clearance on harbour seals have been assessed with respect to the attributes of access to suitable habitat and maintaining human activities below levels which would adversely affect the harbour seal population (disturbance). The

breeding, moulting and resting behaviour attributes are not considered relevant to the assessment of UXO clearance, as the proposed activities will occur outside of the SAC, with impacts 47.55 km from the SAC boundary and therefore at greater distances from any haul-out or breeding sites within the Slaney River SAC and will not result in any direct or indirect effects on haul-out habitats within the site. Consequently, these attributes are not considered further within this assessment.

6.4.4.39 UXO clearance events and the associated underwater noise capable of causing auditory injury, would be short-term and highly localised, typically comprising a single, one-off detonation at any given location. As such, UXO clearance would not create a permanent or long-term barrier to the use of suitable habitat within or connected to the SAC, nor would it result in any sustained exclusion of harbour seals from the wider area.

6.4.4.40 Regarding the disturbance attribute, even in the highly unlikely event that an individual experienced PTS-onset, available evidence indicates that would be unlikely to significantly affect individual fitness (i.e. its ability to survive and reproduce; Kastelein *et al.*, 2017). Therefore, any UXO clearance activities are not expected to introduce man-made energy at levels capable of causing significant negative effects on individual harbour seals or the wider population associated within, or connected to, Slaney River Valley SAC, nor is it expected to cause injury or mortality at levels capable of affecting site integrity.

6.4.4.41 **With consideration of the very limited spatial extent of predicted auditory injury (PTS-onset) ranges, the absence of overlap with the SAC (with the greatest predicted impact range of up to 2.8 km), the implementation of mitigation measures, and the negligible proportion of the wider population potentially affected (<0.01%) even under the most precautionary scenario, it is concluded there will be no AEoI of the harbour seal QI of the Slaney River Valley SAC, as defined by its COs, as a result of auditory injury due to underwater noise associated with UXO clearance for Project Design Options 1 and 2.**

BEHAVIOURAL DISTURBANCE

6.4.4.42 The number of harbour seals predicted to experience behavioural disturbance as a result of high order UXO detonation, based on the application of a 20 km EDR, is presented in Table 6.22. Using the density estimate of 0.0003 animals/km^2, it is estimated that up to one individual (<1% of the East region of the RoI reference population of 182 animals; Morris and Duck (2019)) could be disturbed under this highly precautionary scenario.

6.4.4.43 For low order clearance, application of the 5 km EDR results in up to 1 animal potentially disturbed, representing <1% of the reference population (Table 6.22). It should be noted that this estimate is illustrative only, as there is only limited empirical evidence to support a defined disturbance range for low order UXO clearance.

Table 6.22: Predicted impact of disturbance to harbour seals from UXO for both high order (20 km) and low order clearance (5 km) EDRs. For further information on densities used, see Table 6.6.

UXO Scenario	EDR	Density (animals/km^2)	Number of animals disturbed[1]	Percentage of the reference population[1] (%)
High Order Clearance	20 km^2	0.0003	<1	0.19
Low Order Clearance	5 km	0.0003	1	0.55

[1]The number of animals disturbed and the reference population are representative of the scaled East region of RoI population (Morris and Duck, 2019). The number of animals disturbed is not representative of the numbers disturbed within the Slaney River Valley SAC.

[2]Reduced EDR to account for land overlap within the nominal 20 km radius (effective area 1,159.98 km^2 rather than 1,256.31 km^2)

6.4.4.44 The nearest boundary of Slaney River Valley SAC is located approximately 47.55 km from the Proposed Development. As such, the EDRs for UXO clearance do not overlap with the SAC. Therefore, no harbour seals within the SAC are predicted to experience behavioural disturbance as a result of UXO clearance activities associated with the Proposed Development.

6.4.4.45 Potential behavioural disturbance to marine mammals arising from UXO clearance activities has been considered through the implementation of the project-specific MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan (Revised March 2026)). The application of mitigation measures, informed by international best practice including DAHG (2014), to reduce the likelihood, spatial extent and duration of any behavioural responses, such that any disturbance would be temporary, localised and not of a nature that could affect population-level processes (Table 6.7).

6.4.4.46 Any behavioural disturbance associated with UXO clearance is therefore expected to affect a negligible proportion of the population (<1%), be highly localised in time, recoverable, and infrequent during the construction phase. Given the single-pulse nature of UXO clearance, it is concluded that harbour seals are not sensitive to UXO clearance behavioural disturbance effects when considering the integrity of the designated site.

6.4.4.47 In relation to the site-specific COs for Slaney River Valley SAC (Table 5.1), the potential effects of underwater noise associated with UXO clearance on harbour seals have been assessed with respect to the attributes of access to suitable habitat and maintain human activities below levels which would adversely affect the harbour seal population at the site (disturbance). Breeding, moulting, and resting haul-out targets are not relevant as these activities occur inside the SAC and would not be impacted by UXO clearance.

6.4.4.48 Whilst underwater noise generated from UXO clearance may result in a short-term startle response and temporary displacement of some individuals outside of, but associated with the SAC, such disturbance would be brief in duration and would not constitute a permanent barrier to habitat use of the site.

6.4.4.49 Any individuals disturbed by UXO clearance are not predicted to experience significant negative effects on fitness, survival, or reproductive success for any life stage, nor is the activity expected to result in disturbance at a scale capable of affecting the harbour seal population associated with Slaney River Valley SAC.

6.4.4.50 **With consideration of the precautionary nature of the assessment, the absence of overlap with the SAC, the low proportion of the population predicted to be affected, the extremely short-term and recoverable nature of behavioural disturbance, the implementation of mitigation measures, and the limited frequency of UXO clearance events, it is therefore concluded there will be no AEoI of the harbour seal QI of the Slaney River Valley SAC, as defined by its COs, as a result of behavioural disturbance due to underwater noise associated with UXO clearance for Project Design Options 1 and 2.**

INJURY AND/OR DISTURBANCE FROM UNDERWATER NOISE DURING SITE SURVEYS

CONSTRUCTION PHASE ASSESSMENT

6.4.4.51 The Subsea Noise Assessment (Seiche Ltd., 2022) concluded that PTS-onset ranges from confirmatory site surveys are limited to relatively small distances from the sound source and vary by survey type and marine mammal FHG, with harbour seals considered under Phocid pinnipeds (PW).

6.4.4.52 While PTS is a permanent effect which cannot be recovered from, the most likely response of a marine mammal to noise levels that could induce TTS is to flee the area (Southall *et al.,* 2007). Therefore, animals exposed to these noise levels that could induce TTS are likely to actively avoid hearing damage by moving away from the source. As previously mentioned, whilst the TTS impact ranges are presented, the implications of TTS are considered alongside behavioural disturbance, reflecting its temporary and recoverable nature and its relevance to short-term changes in behaviour rather than long-term population level effects.

6.4.4.53 Predicted impact ranges for auditory (PTS-onset) and TTS-onset to harbour seals from site surveys (geophysical and geotechnical surveys) are summarised in Table 6.23. The largest cumulative PTS-onset range is 71 m for SBP surveys, while the largest cumulative TTS-onset range is 255 m. Other survey activities have smaller ranges (Table 6.23; Seiche Ltd., 2022).

Table 6.23: Predicted maximum impact ranges for harbour seals from proposed site surveys (Seiche Ltd., 2022)

Survey category	Equipment type	Noise type	Effect	PTS Maximum predicted range (m)	TTS Maximum predicted range (m)
Geophysical	MBES	Non-impulsive	Cumulative	2	22
Geophysical	SSS	Non-impulsive	Cumulative	23	26
Geophysical	SBP	Non-impulsive	Cumulative	71	255
Geophysical	USBL positioning equipment	Non-impulsive	Cumulative	0[1]	50[2]
Geophysical	Seismic refraction	Impulsive	Instantaneous	3	6
			Cumulative	2	29
Geophysical	Sparker (2DUHRS and 3DUHRS)	Impulsive	Instantaneous	N/A[3]	3
			Cumulative	1	10
Geotechnical	Seismic CPT	Impulsive	Instantaneous	N/E	4
			Cumulative	3	45
Geotechnical	Vibrocore	Non-impulsive	Cumulative	N/E	4

[1]USBL was not included in the Subsea Noise Assessment (Seiche Ltd., 2022) however, CSA Ocean Sciences Inc. (2020) estimated that the maximum distance to the weighted Level A threshold (cumulative PTS) is 0 m for PW (harbour seals).

[2]Based on maximum distance to all FHG Level B threshold (SPL_{rms}; CSA Ocen Sciences Inc., 2020).

[3]Instaneous PTS thresholds are not exceeded for any FHG for the sparker surveys.

6.4.4.54 The nearest boundary of the Slaney River Valley SAC is approximately 47.55 km from the Proposed Development, which is substantially greater than the maximum predicted PTS- or TTS-onset ranges for all survey activities (Table 6.17). As such, no harbour seals within the SAC are predicted to experience auditory injury (PTS) or TTS as a result of the site surveys.

6.4.4.55 The implementation of mitigation measures (Table 6.7), including a project-specific MMMP (NIS Volume III, Appendix 25.2: Marine Mammal Mitigation Plan (Revised March 2026)) during site surveys and adherence to DAHG (2014) guidance, is designed to address exposure under the most precautionary scenario for harbour porpoise, the most noise-sensitive species. As harbour seals have a lower sensitivity to underwater noise compared to harbour porpoise, these measures provide a precautionary buffer, and the actual likelihood and spatial extent of PTS-onset (and by design TTS and behavioural disturbance) for harbour seals will be further reduced.

6.4.4.56 Predicted behavioural disturbance ranges are greater than PTS/TTS distances, with maximum distances of up to 4.95 km for non-impulsive geophysical survey sound sources (SBP), 700 m for sparker, 1.32 km for seismic refraction, 10 km for vibrocore and 1.5 km for seismic CPT for all marine mammal FHGs (Seiche Ltd., 2022). USBL were not included in the Subsea Noise Assessment (Seiche Ltd., 2022) however, CSA Ocean Sciences Inc. (2020) estimated that the maximum distance to the Level B threshold (disturbance) is 50 m for all marine mammal hearing groups.

6.4.4.57 While some predicted disturbance ranges extend beyond the Proposed Development boundary, the closest distance to the Slaney River Valley SAC (47.55 km away) remains greater than the predicted disturbance ranges, and any behavioural responses are expected to be short-term and reversible in nature.

6.4.4.58 In relation to the Slaney River Valley SAC site-specific COs (Table 5.1), site survey activities are temporary, intermittent and spatially limited, and are not expected to result in sustained displacement, or permanent habitat exclusion from the site. Any behavioural responses would be brief and limited to very few individuals outside of the SAC, without causing significant effects on individual fitness or population integrity. Furthermore, breeding, moulting, and resting haul-out targets are not relevant for this impact because these activities occur outside the SAC and individuals within the SAC would not be affected by survey noise.

6.4.4.59 **With consideration of the limited spatial extent of predicted impact ranges, the absence of overlap with the SAC (with the greatest predicted impact range of up to 10 km), and the implementation of mitigation measures, it is therefore concluded there will be no AEoI of the harbour seal QI of the Slaney River Valley SAC, as defined by its COs, as a result of auditory injury and disturbance due to underwater noise associated with site surveys associated with the construction phase for Project Designs Option 1 and 2.**

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.4.60 Routine geophysical surveys of inter-array, inter-connector, and export cables will occur every six months during the first two years and annually thereafter throughout the operational and maintenance phase of the Proposed Development (Table 6.8).

6.4.4.61 As the exact equipment is not yet confirmed, an assessment has been undertaken assuming the same survey equipment and source levels types as that proposed during the pre-construction surveys (Table 6.15 and Table 6.16). Therefore, the impact ranges of auditory injury (PTS), TTS and behavioural disturbance from site surveys during the operational and maintenance phase are expected to be similar to the results of the Subsea Noise Assessment (Seiche Ltd., 2022; CSA Ocean Sciences Inc, 2020) conducted for site surveys during the pre-construction phase.

6.4.4.62 **With consideration of the limited spatial extent of predicted impact ranges, the absence of overlap with Slaney River Valley SAC (with the greatest predicted impact range of up to 10 km), and the implementation of mitigation measures, it is therefore concluded there will be no AEoI of the harbour seal QI of the Slaney River Valley SAC, as defined by its COs, from underwater noise arising from site surveys associated with the operational and maintenance phase for Project Design Options 1 and 2.**

INJURY AND/OR DISTURBANCE FROM UNDERWATER NOISE DURING DREDGING AND TRENCHING

CONSTRUCTION PHASE ASSESSMENT

6.4.4.63 The Underwater Noise Assessment (NIS Volume III, Appendix 11.1: Underwater Noise Assessment (Revised March 2026)) concluded that for non-impulsive construction activities, including dredging and trenching, cumulative PTS could only occur at very short distances from the sound source. For trenching, backhoe dredging and suction dredging, predicted cumulative PTS- and TTS-onset ranges for harbour seal (PCW FHG; Southall *et al.*, 2019) are less than <50 m.

6.4.4.64 Dredging and trenching activities produce continuous, non-impulsive underwater noise and are not expected to result In auditory injury (PTS) in marine mammals. The dominant energy from these activities typically occurs below 1 kHz (Todd *et al.*, 2015), which lies outside the peak hearing sensitivity range of harbour seals (PCW; Southall *et al.*, 2019). As a result, the

potential for PTS (or TTS) to occur from these construction activities is expected to have little relevance to individual fitness, survival or reproductive success, as the hearing sensitivity of these receptors is relatively poor below 1 kHz (Southall *et al.,* 2019).

6.4.4.65 Although PTS is a permanent effect, the very limited spatial extent of predicted PTS-onset ranges, combined with the low sensitivity of harbour seals to low-frequency noise, indicates that dredging and trenching will not result in auditory injury (PTS) at levels that would affect population-level parameters.

6.4.4.66 Information on marine mammal sensitivity to dredging and trenching noise is limited, with available studies focusing primarily on the impact of behavioural disturbance from dredging. These studies have confirmed that dredging activities can result in short-term displacement and avoidance behaviour in marine mammals (e.g. Culloch *et al.*, 2016; Pirotta *et al.*, 2013). However, it is often difficult to distinguish the effects of underwater noise from disturbance associated with vessel presence required to undertake the activity (Todd *et al.*, 2015).

6.4.4.67 There are currently no empirical data describing harbour seal responses specifically to dredging or trenching activities. In the absence of such data, it is assumed that behavioural responses and deterrence distances would be similar to those associated with dredging for harbour porpoise, and therefore limited to within 5 km, which is considered a precautionary upper bound for behavioural disturbance (McQueen *et al.*, 2020). Should behavioural disturbance occur, it is expected to be short-term and reversible, with animals returning to the area following cessation of activities.

6.4.4.68 The closest distance between dredging and trenching activities and the boundary of the Slaney River Valley SAC is approximately 47.55 km. This distance substantially exceeds the maximum predicted ranges for PTS-onset, TTS-onset and behavioural disturbance associated with dredging and trenching.

6.4.4.69 In relation to the site-specific COs for Slaney River Valley SAC (Table 5.1), dredging and trenching during construction will not result in permanent or long-term restriction of access to suitable habitat within the SAC, nor introduce underwater noise at levels that would adversely affect the harbour seal population through injury or sustained disturbance. Given the location of the activities well beyond the SAC boundary, breeding, moulting and resting haul-out sites within the SAC will not be affected.

6.4.4.70 **With consideration of the very limited spatial extent of predicted auditory injury (PTS-onset) and disturbance ranges associated with dredging and trenching activities, the absence of overlap with the Slaney River Valley SAC (with the greatest predicted disturbance impact range of up to 5 km), and the temporary, localised and reversible nature of any behavioural disturbance, it is therefore concluded there will be no AEoI of the harbour seal QI of the Slaney River Valley SAC, as defined by its COs, as a result of underwater noise arising from dredging and trenching activities associated with the construction phase for Project Design Options 1 and 2.**

OPERATIONAL AND MAINTENANCE PHASE ASSESSMENT

6.4.4.71 During the operational and maintenance phase, dredging and trenching may be required intermittently for scour protection repair and maintenance of foundations and cables. These activities are expected to be localised, short-term and less frequent than those undertaken during the construction phase.

6.4.4.72 Based on the underwater noise modelling presented in the Underwater Noise Assessment (NIS Volume III, Appendix 11.1: Underwater Noise Assessment (Revised March 2026)), the precited ranges for auditory injury (PTS-onset), TTS-onset and behavioural disturbance during operation and maintenance are expected to be comparable to those assessed for the construction phase, as similar equipment and methods are anticipated to be used.