16 MARINE ECOLOGY

16.1 Introduction

16.1.1 This chapter of the Environmental Appraisal describes the baseline environment in terms of marine ecology; identifies the potential pressures associated with the Proposed Marine Works on the receptors; and presents the findings of the environmental appraisal and any proposed mitigation measures where applicable.

16.1.2 The boundary of the Marine Environment Area which nominally follows mean high-water springs (MHWS) within the wider project Area of Search for Permanent and Temporary Works (see Figure 1.1), has been agreed in consultation with Natural Resources Wales (NRW). The Proposed Marine Works are defined as the components of the Proposed Project that fall below MHWS and includes the following:

- Removal and dismantling of two pylons and their foundations (4ZC030R and 4ZC031) and the associated temporary access tracks to these locations;
- Removal of the foundations of the previously dismantled pylon 4ZC030; and
- Installation of the tunnel and cables within the tunnel (with respect to effects from underwater noise and vibration only; the tunnel itself is 15m below ground level and will not have any other effects on marine ecology).

16.2 Data Sources

16.2.1 This chapter has been informed by baseline data compiled from publicly available sources. The main information sources include:

- VIP Snowdonia Marine Habitats Regulations Assessment (Intertek 2019)[1];
- Saltmarsh Botanical Survey Visual Impact Provision (VIP) Snowdonia Project (Appendix 16B) (RSK 2016)[2];
- Ecological Baseline Report (Animal) Visual Impact Provision (VIP) Snowdonia Project (RSK 2016)[3];
- VIP Snowdonia Project Underwater Noise Assessment (ABPmer 2019)[4]; and
- Citation data from Joint Nature Conservation Committee (JNCC)[5] and NRW6 websites.

[1] Intertek (2019), Habitats Regulations Assessment Stage 1 Screening and Stage 2 Information to Inform Appropriate Assessment.
[2] RSK 2016 'Saltmarsh Botanical Survey. Visual Impact Provision (VIP) Snowdonia Scheme' Report No.660952
[3] RSK 2016 'Ecological Baseline Report (Animal) Visual Impact Scheme (VIP) Snowdonia Scheme' Report No.660952
[4] ABPmer (2019) Visual Impact Provision (VIP) Snowdonia Project: Underwater Noise Assessment Draft Note May 2019.
[5] Joint Nature Conservation Committee Website for designated site citations: http://jncc.defra.gov.uk/protectedsites/sacselection
[6] Natural Resources Wales Website for designated sites citations: https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/find-protected-areas-of-land-and-seas/designated-sites/?lang=en

16.3 Scope and Methodology

Scoping

16.3.1 This chapter of the Environmental Appraisal has been prepared in accordance with the VIP Snowdonia Screening and Scoping Report (National Grid 2018)[7] and subsequent Screening/Scoping Opinion issued by NRW Marine Licensing (on 10 December 2018).

16.3.2 The aspects of the Proposed Marine Works and the pressures which have been scoped out from further assessment within the Environmental Appraisal and the justifications for this are presented in Table 16.1.

Table 16.1: Scoping conclusions summary

Pressure scoped out	Receptor	Justification for exclusion
Changes in suspended solids (water clarity)	Estuary Mudflats and sandflats Fish	During excavations at 4ZC030 minimal sediments will be disturbed because the foundations are exposed by the scour holes to approximately 2m below ordnance datum Newlyn (ODN). A small, localised and temporary increase in turbidity is expected which has the potential to briefly reduce the feeding capability of fish species relying on sight to locate their prey. Brief increases in turbidity will not be noticeable against background levels of disturbance experienced during periods when the estuary sandflats are mobilised. This pressure has been scoped out from further assessment.
Pollution and other chemical changes - Transition elements and organo-metal contamination	Estuary	There is no evidence for any contaminated sediments within the estuary and the site has no association with any industrial activity of any scale. The upstream catchment is mainly forest and agricultural. This pressure has been scoped out from further assessment.

[7] National Grid (2018), *'Visual Impact Provision Snowdonia National Park, Overhead Line 4ZC Screening and Scoping Report'* October 2018.

Pressure scoped out	Receptor	Justification for exclusion
Changes in water quality	Estuary	There is some potential for disturbed sediments in the marine environment to impact on water quality through releasing retained contaminants or anoxic sediments that impact on levels of dissolved oxygen within the waterbody. In a confined channel this could present a problem for fish as the deoxygenated water may act as a plug in the channel which the fish cannot circumnavigate. However, the understanding of the baseline derived from site-specific data e.g. Pont Briwet, show that local sediments are clean, have no associated contaminants, have low levels of organics (and therefore have limited potential to be anoxic) (Norwest Holst 2009)[8]. In addition, no water quality issues arose during the construction of Pont Briwet, a period of construction works which would have involved greater volumes of disturbed sediment. For these reasons this pressure has been scoped out from further assessment.
Siltation rate changes, including smothering (depth of vertical sediment overburden)	Fish	The re-deposition of suspended sediments has the potential to smother fish species during the excavation works. Fish species listed on Annex I of the European Commission (EC) Habitats Directive are present in the estuary but not in sufficient numbers to be a qualifying feature of the Pen Llyn a'r Sarnau/ Lleyn Peninsula and the Sarnau Special Area of Conservation (SAC). The impact would depend on the quantities of excavated material released into the estuary. However, as with the changes in suspended solids (water quality) pressure, suspended sediments are not predicted to be above background levels and will therefore not change the rate of siltation. This pressure has been scoped out from further assessment.

[8] Norwest Holst. (2009), '*Report on a Ground Investigation at Pont Briwet, North Wales*'

Pressure scoped out	Receptor	Justification for exclusion
Physical damage (reversible change) - Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion.	Benthic species (mudflat and sandflat habitat)	The construction of a temporary platform to access the foundations at 4ZC030 in the estuary channel will damage / disturb benthic species present directly within the footprint of the platform through smothering, crushing, or abrasion; and within the wider footprint of the activities through smothering. Intertidal sandflats are characterised by communities of burrowing invertebrates such as polychaetes[9], crustaceans[10] and molluscs[11]. These species have low sensitivity to smothering and National Grid was advised by NRW that a benthic survey was not required to inform the Marine Licence application for geotechnical investigations in 2017. Given the short term and localised impacts of the Proposed Marine Works, any effects on benthic species will be minor and the habitat will quickly recover from the temporary disturbance. As such, the pressure has been scoped out for further assessment.

16.3.3 The pressures which were scoped in for further assessment within the Environmental Appraisal are:

- Waterflow (tidal current) changes, including sediment transport considerations;
- Physical damage (reversible change) - Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion;
- Visual disturbance; and
- Underwater noise and vibration changes.

Appraisal Methodology

16.3.4 The Environmental Appraisal has been undertaken by assessing the potential adverse and beneficial effects of the Proposed Marine Works on marine ecology. The receptors applicable to marine ecology have been identified as protected sites for the conservation of habitats and species.

16.3.5 The Proposed Marine Works are located within and close to European and nationally protected sites. To ensure that the Proposed Marine Works do not have a significant effect on a European site, either alone or in combination with other plans or projects, a Habitats Regulations Assessment (HRA) has been undertaken.

16.3.6 The HRA also includes an assessment of one nationally protected site, a Site of Special Scientific Interest (SSSI) because the Proposed Marine Works are located

[9] Marine worms

[10] Animal with a hard shell and several pairs of legs which usually live in in water e.g. crabs, lobsters, shrimps etc

[11] Invertebrate with a soft unsegmented body usually enclosed in a calcareous shell e.g. gastropods (snails), bivalves (clams, mussels, etc) and cephalopods (cuttlefish, octopus, squid etc)

within the site and Consent under Section 28E of the Wildlife and Countryside Act 1981 and in accordance with Regulation 24 of the Conservation of Habitats and Species Regulations 2017 will be required.

16.3.7 The VIP Snowdonia Marine HRA therefore provides a detailed examination of the potential for any adverse effects on European sites and the SSSI (see Appendix 16A for full details). The appraisal in this chapter draws on the conclusions of the HRA and provides a summary of the findings.

16.3.8 Additional detail is provided for nationally protected sites not covered by the HRA.

The Study Area

16.3.9 The study area (or zone of influence) is the spatial extent over which the Proposed Marine Works are predicted to have an effect on the receiving environment. The main activities and their predicted zones of influence assessed in the HRA are as follows:

- Excavation activities during the partial removal of structures at sites 4ZC031 and 4ZC030R will directly affect the Atlantic salt meadows / saltmarsh within the footprint of the excavation works.
- Excavation activities during the partial removal of the foundations at site 4ZC030 will directly affect the mudflats and sandflats within the footprint of the excavation works and temporary platform.
- Full or partial removal of the pylon structures at site 4ZC030R and 4ZC030 is predicted to affect the functioning of the estuary channel locally within approximately 200m of the foundations.
- Temporary access tracks and watercourse crossings (ramp, bridges and culverts) to access the pylon sites (4ZC030, 4ZC030R and 4ZC031) will directly affect the Atlantic salt meadows / saltmarsh within the footprint of the tracks / crossings. Working areas associated with pylon dismantling (4CZ030R and 4CZ031), conductor removal (one either side of 4CZ031) and one backstay (4CZ031), will directly affect the Atlantic salt meadows / saltmarsh within the footprint of the working areas.

16.3.10 The HRA and therefore the marine ecology assessment is largely qualitative, developed by expert judgement and supported by available data and information. By the time of the Proposed Marine Works project specific data such as saltmarsh habitat / animal surveys will be over five years old.

16.4 Consultation Undertaken

16.4.1 Consultation and stakeholder engagement have been integral to the design and development of the project. For full details of screening and scoping consultations undertaken in relation to the Proposed Project please refer to Sections 3.1 and 3.2 of Chapter 3 - Environmental Appraisal Process.

16.4.2 Consultation undertaken to inform the Snowdonia VIP Geotechnical Investigation Marine Licence (reference RML1725) provided valuable information on the existing ecological environment and was used to inform this Environmental Appraisal.

16.4.3 Table 16.2 summarises the consultation responses relevant to marine ecology.

Table 16.2: Consultation responses

Stakeholder	Summary of consultation response	How response has been addressed
NRW Technical Experts (TE)	NRW TE noted the intention to split the ecology assessment into separate 'ecology' and 'marine ecology' chapters and commented that it will be important to clearly define what each chapter is assessing. There will be some features of the below sites e.g. mobile species that will be relevant to both terrestrial and marine environments: • Pen Llŷn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC • Morfa Harlech Site of Special Scientific Interest (SSSI) • Morfa Harlech National Nature Reserve (NNR)	All marine qualifying features of protected sites which could be affected by the Proposed Marine Works have been assessed in this chapter.
NRW TE	Recommended that the Environmental Appraisal includes a statement to inform the Habitats Regulations Assessment (HRA) that NRW is required to undertake.	A stand-alone Marine HRA has been prepared and is provided as Appendix 16A. The HRA has been used to inform this chapter.
NRW TE	NRW TE welcome the complete removal of the pylons and pylon foundations in the marine environment, however noted inconsistencies within the Screening and Scoping Report. Certain pressures have been scoped out of the Environmental Appraisal on the basis that full removal of the structures related to the pylons will be undertaken. However, the report also states that complete removal may not be feasible. The incomplete removal of foundations may present the worst-case scenario when assessing certain impacts as they could lead to scour within the estuary and should be considered. NRW noted significant scour has been experienced in the estuary from anthropogenic activity. NRW recommended that the foundations should, at least, be removed to a sufficient depth so as to not become exposed.	As discussed in Chapter 15, NRW has advised that removal of the piles and cofferdam sheets to a level sufficient to prevent scour would be the next best option if full removal cannot be achieved. This would allow the estuary to naturally migrate northwards unimpeded by the structures and without subsequent exposure of the remains of the piles and cofferdam. In response, some pressures have been scoped back into the Environmental Appraisal and realistic scenarios for removal of structures has been assessed.

Stakeholder	Summary of consultation response	How response has been addressed
NRW TE	NRW TE note that a working platform is proposed to be constructed for pylon 4ZC030. They commented they would need assurance that all material could be removed successfully from the estuary.	All working materials including that associated with the working platform will be removed from the estuary.
NRW TE	NRW noted that the Screening and Scoping Report does not mention *Eleocharis parvula* - dwarf spike rush. This species has been recorded in some of the adjacent salt pans (depressions) on the saltmarsh and would be very vulnerable to any infilling/blocking (temporary or long term) and erosion associated with vehicle movements. NRW TE would require verification of any vehicle routes on the ground and avoidance of affecting populations of this species. If the areas in question have been surveyed but no occurrence of the species found this should be made clear in the Environmental Appraisal.	This species was not identified during the baseline saltmarsh surveys undertaken in 2016 however, the access routes were not confirmed at this time. National Grid will commit to a saltmarsh survey covering the access routes ahead of construction and the provision of an ecological clerk of works for the construction works (see Section 16.11).
NRW TE	*Ruppia maritima* which has restricted distribution has also been recorded at this location. We would therefore like to request a copy of the vegetation survey(s).	A link to the online consultation documents has been sent 04 February 2020 to NRW TE. The saltmarsh survey is Appendix 16B.
NRW TE	The source of any imported material needs to be agreed well in advance of any work taking place. Material should be marine in origin and of similar grade to ensure suitability. Completely backfilling the excavation may not be necessary, as the creation of a shallow pan could potentially provide a suitable area for *Eleochoris parvula*.	National Grid are in ongoing consultation with NRW with regards to this response.

Stakeholder	Summary of consultation response	How response has been addressed
NRW TE	Underwater noise and vibrations: NRW noted that external technical advice relating to impact of underwater noise was not sought at the scoping stage. However, they advise that the impact of underwater noise and vibration is considered in respect of works, including but not limited to, use of percussive breakers in removing piles, and use of explosives on either the pylons or in tunnelling. Bespoke pre-application advice can be sought from the Marine Licensing team relating to this.	National Grid sought advice from Marine Licensing and consequently commissioned ABPMer to undertake an underwater noise and vibration assessment to inform the Environmental Appraisal. See Appendix 16A.
NRW marine licensing	During engineering design planning for the tunnel alignment, NRW was consulted (2017) ahead of a marine licence application for geophysical and geotechnical surveys across the Dwyryd Estuary. It was identified that the works could disturb the over wintering waders which are a designating feature of the Morfa Harlech SSSI and avoidance of disturbance should be managed through seasonal restrictions i.e. avoid works during the wintering bird season.	National Grid are committed to avoiding the Proposed Marine Works on the saltmarsh during the wintering bird season (see embedded mitigation in Appendix 3C).
Landowner	The owners of the cottage which is located along the existing track opposite pylon site 4ZC031, have requested that access onto the saltmarsh from the track is undertaken away from their cottage.	National Grid met with the owners of the cottage (on 10 January 2020) and have agreed to access the saltmarsh approximately 8m north of the cottage. New plans have been drawn up which include widening the existing track for approximately 40m at this location which will act as a turning point for vehicles.

Stakeholder	Summary of consultation response	How response has been addressed
National Trust (NT)	The NT own land on the estuary (forming part of the access) that will be subject to the removal of pylons 4ZC030, 4ZC030R and 4ZC031. The NT support the commitment to employ an ecological clerk of works. Further discussion on the longevity of input to ecological restoration works on the estuary would be welcome. A commitment to post completion survey and reinstatement provision should be included within the outline CEMP.	Mitigation has been proposed in the marine HRA to employ the use of an ecological clerk of works to ensure Atlantic salt meadow rare species are not disturbed during the marine pylon removal works. The HRA includes mitigation for re-instatement of habitat at 4ZC031. A post construction botanical saltmarsh survey will be undertaken at this location one year post construction.

16.5 Statutory and Planning Context

16.5.1 The legislation and planning policy relevant to marine ecology includes:

- European Council Directive 92/43/EC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive) (as amended);
- European Council Directive 2009/147/EC on the conservation of wild birds (Birds Directive);
- The Conservation of Habitats and Species Regulations 2017 transpose the Habitats Directive into law on land and in territorial waters (up to 12 nautical miles - nm limit) of England and Wales;
- Marine and Coastal Access Act 2009;
- The Wildlife and Countryside Act 1981 (as amended);
- The Countryside and Rights of Way Act 2000; and
- Welsh National Marine Plan.

16.6 Existing Environment

16.6.1 Sites considered by the HRA Stage 1 Screening are illustrated in Figure 16.1. Table 16.3 lists the marine habitats and species which are qualifying features of these sites and are therefore applicable receptors.

16.6.2 Morfa Harlech National Nature Reserve (NNR) which is located approximately 1.5km from the Proposed Marine Works, is also a relevant nature conservation site. The marine features it is designated for are saltmarsh and wintering birds.

16.6.3 Full details of the existing environment for the sites listed in Table 16.3 can be found in the VIP Snowdonia Marine HRA in Appendix 16A.

Table 16.3: European and national sites screened in HRA Stage 1

Site name	Qualifying habitat or species
Pen Llyn a 'r Sarnau / Lleyn Peninsula and the Sarnau SAC. Site code: UK0013117	Annex I Habitat that are a primary reason for selection of site • Estuaries
	Annex I Habitat present as qualifying feature, but not a primary reason for selection of site • Mudflats and sandflats not covered by seawater at low tide • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) Annex II Species present as qualifying feature, but not a primary reason for selection of site • Bottlenose dolphin (*Tursiops truncates*) • Otter (*Lutra lutra*) • Grey seal (*Halichoerus grypus*)
Afon Eden - Cors Goch Trawsfynydd SAC Site code: UK0030075	Annex II Species present as qualifying feature, but not a primary reason for selection of site • Atlantic salmon (*Salmo salar*) • Otter (*Lutra lutra*)
Afon Gwyrfai a Llyn Cwellyn SAC Site code: UK0030046	Annex II Species that are a primary reason for selection of site • Atlantic salmon (*Salmo salar*)
	Annex II Species present as qualifying feature, but not a primary reason for selection of site • Otter (*Lutra lutra*)
Northern Cardigan Bay / Gogledd Bae Ceredigion Special Protection Area (SPA) Site code: UK9020327	Annex I Species that are a primary reason for selection of site • Red-throated diver (*Gavia stellata*) wintering
Morfa Harlech SSSI Site code 0516	Habitat • Estuaries • Saltmarsh Species • Breeding birds • Wintering pintail (*Anas acuta*) • Otter (*Lutra lutra*) • Water vole

16.7 Key Parameters for Appraisal

16.7.1 Removal of the marine pylon foundations on the estuary is anticipated to be difficult due to the surrounding environment and in the case of 4ZC031 and 4ZC030 due to the age and type of foundation used. These pylons and associated foundations have been in the ground since the 1960s and the foundations are in non-continuous sections driven into the ground one on top of the other.

16.7.2 NRW requested that there be enough time in the works programme and the appropriate machinery to be present for full removal of structures. National Grid is committed to removing as much as is feasible and practicable and this will be reflected in the contractor specifications.

16.7.3 The saltmarsh level is around 2.5m above ODN. National Grid engineers have estimated the realistic minimum achievable depth of extraction (i.e. the worst-case scenarios) for each pylon in comparison to this level. These parameters are presented in Table 16.4 and have been used in the assessment.

16.7.4 All practicable attempts to remove additional lower sections will be made for pylons 4ZC031 and 4ZC030; however, the assessment in this chapter is based on the worst-case scenario.

16.7.5 National Grid plans to schedule the 4ZC031 pylon works first so that an understanding of the ground conditions can be gained ahead of attempting 4ZC030 and 4ZC030R.

Table 16.3: Parameters for assessment

Pylon site	Scenario	Method of extraction	Minimum depth of removal
4ZC030	Partial removal Worst case	Construction of temporary platform to access foundations, excavator with hydraulic breaker	3.75m below ground level (-1.25m ODN)
4ZC030R	Scenario 1 Full removal Best case	Excavate sand to 2m, collars removed by hydraulic breakers, steel tube piles & cofferdam removed by leader pile rig	Full removal
	Scenario 2 Partial removal Worst case	Excavate sand to 2m, collars removed by hydraulic breakers, steel tube piles and cofferdam cut at 2m depth	2m below ground level (+0.5m ODN)
4ZC031	Partial removal Worst case	Excavate sand around foundations and then mechanically break up pile caps and remove piles to depth excavator arm can reach	3.75m below ground level (-1.25m ODN)

Note: Ground level refers to the saltmarsh level which has been estimated to be 2.5m above ODN.

16.8 Predicted Impacts During Construction

Removal of Existing Infrastructure (VIP subsection)

16.8.1 The Morfa Harlech NNR is designated for two marine features; wintering birds and saltmarsh. National Grid has committed to avoiding works on the saltmarsh during the wintering bird season therefore there will be no impact on this feature. The saltmarsh lies outside of the Proposed Marine Works zone of influence and there is no pressure-receptor pathway for effect. Therefore, there will be no adverse effects on the NNR.

16.8.2 The HRA Stage 1 Screening assessed four European sites and one SSSI as listed above in Table 16.3.

16.8.3 A review of the Proposed Marine Works identified four pressures which could affect the qualifying features of these sites. These were:

- Waterflow (tidal current) changes, including sediment transport considerations;
- Physical damage (reversible change) - Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion;
- Visual disturbance; and
- Underwater noise and vibration changes.

16.8.4 Gwynedd Council and Snowdonia National Park Authority have confirmed (02 September 2019) that there are no cumulative developments to be assessed with VIP Snowdonia. A search of applications on the NRW marine licensing portal for plans and projects within 10km of the Proposed Marine Works was undertaken in November 2019 however, no plans and projects within this area were found.

16.8.5 The initial HRA screening looked at the baseline data to determine if the qualifying features of the identified sites could spatially and temporarily overlap with the activities of the Proposed Marine Works. The initial HRA screening is provided in Table 16.5 below.

16.8.6 It identified that the Proposed Marine Works could interact with three qualifying features of the Pen Llyn a 'r Sarnau / Lleyn Peninsula and the Sarnau SAC (estuaries, mudflats and sandflats and Atlantic salt meadows) and two qualifying features of Morfa Harlech SSSI (estuaries and saltmarsh) with potential for a pressure-receptor pathway for two pressures: Waterflow changes, including sediment transport considerations; and physical damage (reversible change) - Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion. The pressures and the corresponding receptors taken forward for further assessment have been summarised in Table 16.6 below.

16.8.7 All other qualifying features of the Pen Llyn a 'r Sarnau / Lleyn Peninsula and the Sarnau SAC, the Morfa Harlech SSSI and the other European sites were screened out because no pressure-receptor pathway was identified or there was no physical overlap between the qualifying feature and pressure (see Table 16.5 below).

Table 16.5: Initial screening of relevant European and national sites

Site name & code & distance*	Qualifying Interest Features	Potential Pressure	Potential for Pressure-Receptor Pathway	Conclusion
Pen Llyn a'r Sarnau/ Lleyn Peninsula and the Sarnau SAC UK0013117 Within	**Primary feature - Annex I habitats**: Estuaries	Waterflow changes, including sediment transport considerations	**Yes** – there is potential for a pressure-receptor pathway between this feature and the Proposed Marine Works. 4ZC030R removal of foundations and cofferdam and 4ZC030 removal of foundations	Screened **IN**
	Primary feature - Annex I habitats: Sandbanks which are slightly covered by seawater all the time; Coastal Lagoons; Large Shallow inlets and bays; Reefs	No pressure – receptor pathway identified	**No** – the Proposed Marine Works will not interact with these features of the SAC	Screened **OUT**
	Qualifying feature - Annex I habitats: Mudflats and sandflats not covered by sea water at low tide	Physical damage (reversible change) - Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion.	**No** - Construction of a temporary platform at 4ZC030 will damage / disturb benthic species present directly within the footprint of the platform through smothering, crushing, or abrasion. Intertidal sandflats are characterised by communities of low sensitivity burrowing invertebrates. Any effects on benthic species will be minor and the habitat will quickly recover from the temporary disturbance.	Screened **OUT**
	Atlantic Salt meadows (*Glauco-Puccinellietalia maritimae*)	Physical damage (reversible change) - Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion.	**Yes** – there is potential for a pressure-receptor pathway between this feature and the Proposed Marine Works during removal of the pylon structures at 4ZC031 and 4ZC030R.	Screened **IN**
	Qualifying feature - Annex I habitats: Salicornia and other annuals colonizing mud	No pressure – receptor pathway	**No** – the Proposed Marine Works will not interact with these features of the SAC	Screened **OUT**

Site name & code & distance*	Qualifying Interest Features	Potential Pressure	Potential for Pressure-Receptor Pathway	Conclusion
	and sand; Submerged or partially submerged sea caves	identified		
	Qualifying feature - Annex II species: Bottlenose dolphin (*Tursiops truncates*); Otter (*Lutra lutra*); Grey seal (*Halichoerus grypus*)	Underwater noise changes / Visual disturbance	**No** – the Proposed Marine Works will not interact with these features of the SAC.	Screened **OUT**
	Qualifying feature - Annex II species: sea lamprey (*Petromyzon marinus*), twaite shad (*Alosa fallax*)	Underwater noise changes / Visual disturbance	**No –** a separate noise and vibration assessment on the potential effects of the Proposed Marine Works (ABPMer 2019) and the construction of the cable tunnel under the estuary concluded any effects on fish would be negligible to minor. Assessment is provided in Appendix 16A.	Screened **OUT**
Northern Cardigan Bay / Gogledd Bae Ceredigion SPA UK9020327 7.9km	**Primary feature - Annex I species** Red-throated diver (*Gavia stellata*) over winter	Visual disturbance	**No** - It is possible that red-throated diver could forage as far as the Proposed Marine Works, however, as the SPA site boundary represents the area most important to the red-throated diver and the proposed works will avoid the winter months it is unlikely that they would be present in significant numbers.	Screened **OUT**
Afon Eden - Cors Goch Trawsfynydd SAC UK0030075 8.4km	**Qualifying feature - Annex I habitats**: Active raised bogs	No pressure – receptor pathway identified	**No** – terrestrial feature which will not interact with the Proposed Marine Works.	Screened **OUT**
	Primary feature - Annex II species: Freshwater pearl mussel, Floating water-plantain	No pressure – receptor pathway identified	**No** – freshwater features which will not interact with the Proposed Marine Works	Screened **OUT**
	Qualifying feature - Annex II species: Atlantic salmon (*Salmo salar*),	Underwater noise / visual disturbance	**No** – these features will not interact with the Proposed Marine Works	Screened **OUT**

Site name & code & distance*	Qualifying Interest Features	Potential Pressure	Potential for Pressure-Receptor Pathway	Conclusion
	Otter (*Lutra lutra*)			
Afon Gwyrfai a Llyn Cwellyn SAC UK0030046 14.3km	**Primary feature - Annex I habitats:** Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the Isoëto-Nanojuncetea, Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	No pressure – receptor pathway identified	**No** – terrestrial features which will not interact with the Proposed Marine Works	Screened **OUT**
	Primary feature - Annex II species: Atlantic salmon (*Salmo salar*)	Underwater noise	**No** – there is no connectivity between the Afon Gwyrfai and the Afon Dwyryd therefore Atlantic Salmon from this SAC won't interact with the Proposed Marine Works.	Screened **OUT**
	Primary feature - Annex II species: Floating water-plantain	No pressure – receptor pathway identified	**No** - Floating water-plantain is a freshwater feature which will not interact with the Proposed Marine Works.	Screened **OUT**
	Qualifying feature - Annex II species: Otter (*Lutra lutra*)	Visual disturbance	**No** – there is no connectivity between this feature and the Proposed Marine Works	Screened **OUT**
Morfa Harlech SSSI SSSI_0516 Within	Estuaries	Waterflow changes, including sediment transport considerations	**Yes** – there is potential for a pressure-receptor pathway between this feature and the Proposed Marine Works. 4ZC030R removal of foundations and cofferdam and 4ZC030 removal of foundations	Screened **IN**
	Saltmarsh	Physical damage (reversible change) - Penetration and/or disturbance of the substrate below the surface of the	**Yes** – there is potential for a pressure-receptor pathway between this feature and the Proposed Marine Works. There is potential for a pathway for effect on the saltmarsh habitat during removal of the pylon structures at 4ZC031 and	Screened **IN**

Site name & code & distance*	Qualifying Interest Features	Potential Pressure	Potential for Pressure-Receptor Pathway	Conclusion
		seabed, including abrasion.	4ZC030R	
	Otter Water vole	Visual disturbance	**No** – Survey results indicated that otter and water voles are not resident or noted as present within the area of the Proposed Marine Works.	Screened **OUT**
	Wintering birds (Pintail)	Visual disturbance	**No –** The Proposed Marine Works will not take place on the saltmarsh/estuary during the winter months.	Screened **OUT**
	Breeding birds	Visual disturbance	**No** – Survey results (RSK 2016a) indicated that the saltmarsh within the Proposed Marine Works area for breeding birds is low quality and breeding activities in this area are noted as infrequent or absent.	Screened **OUT**
	Sand lizard	No pressure – receptor pathway identified	**No** - terrestrial feature which will not interact with the Proposed Marine Works	Screened **OUT**

*The distance from the Proposed Marine Works to the designated site in km

Table 16.6: Potential pressures on the qualifying features of the Pen Llyn a 'r Sarnau / Lleyn Peninsula and the Sarnau SAC & Morfa Harlech SSSI

Pressure	Project activity	Qualifying feature
Waterflow changes, including sediment transport considerations	4ZC030R full or partial removal of foundations and cofferdam to 2m depth below ground level	Estuaries
	4ZC030 partial removal of foundations to 3.75m depth below ground level	
Physical damage (reversible change) - Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion	4ZC030R full and partial removal of foundations and cofferdam structures to 2m depth below ground level	Atlantic salt meadows / saltmarsh
	4ZC031 partial removal of foundations to 3.75m below ground level	
	Temporary access tracks and watercourse crossings	
	Working areas for pylon dismantling, conductor removal and backstay	

16.8.8 The pressure 'waterflow changes, including sediment transport considerations' has been assessed in Chapter 15 Marine Physical Environment and full details of the assessment can be found in Section 15.8. Chapter 15 concluded that the Proposed Marine Works will result in beneficial effects on the qualifying feature estuaries, in helping to restore the estuary to it natural status at this location.

16.8.9 This section therefore focuses on the assessment of potential effects from the pressure physical damage (reversible change) on the receptors, and Atlantic salt meadows / saltmarsh.

Physical damage (reversible change) - Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion - assessment on Atlantic salt meadows / saltmarsh

Site 4ZC030R - Full removal

16.8.10 For the best-case scenario, full removal of all the pylon structures will cause minimal disturbance to the Atlantic salt meadows / saltmarsh sediments. The removal will be undertaken in two steps; breaking up the concrete pile collars; and removing the piles and cofferdam sheet piles using a pile rig to vibrate and pull the structures from the ground. Minimal excavation works (disturbing minimal sediments at each of the four legs) will be required to complete step 1 as two of the pile collars are above ground level and the other two appear to be just below the surface. Excavation is not required during step 2.

16.8.11 In the short-term, there will be minimal temporary and localised disturbance to the Atlantic salt meadows / saltmarsh. In the long-term the Atlantic salt meadows / saltmarsh within the footprint of the Proposed Marine Works will be lost through natural erosion due to estuary channel migration.

16.8.12 National Grid shoreline monitoring data between 2013 and 2017 for 4ZC030R indicates that the shoreline is retreating on the northern side of the estuary and the Atlantic salt meadows / saltmarsh is eroding. The cofferdam is currently acting as an artificial barrier to this migration and erosion. Following full removal

of the pylon structures, should the estuary channel continue to migrate north, the channel at this location has the potential to migrate over the 4ZC030R site resulting in Atlantic salt meadows / saltmarsh habitat loss through natural processes. Since the loss is by natural processes it is still compatible with the conservation objectives of the site as it represents a return to more natural processes of the estuary qualifying feature; in-line with the conservation objective to restore the structure and function of primary qualifying feature of the SAC, the estuary.

Site 4ZC030R - Partial removal

16.8.13 Atlantic salt meadows / saltmarsh has a crust of vegetation and soil bound together by roots, but below the surface the substrate is very sandy (Appendix 16B) (RSK 2016)[12]. The Proposed Marine Works at site 4ZC030R will result in the direct loss of the Atlantic salt meadow qualifying feature, due to displacement of substrate within the excavation area (approximately 32m x 32m). Should full removal of the foundations and cofferdam not succeed, then sediments around the four foundation legs and the inner side of the cofferdam will be excavated to 2m below ground level to cut and remove the structures at this depth. During this process water is likely to egress into the cofferdam and the whole area within the excavation area is likely to be disturbed through movements of plant. All the excavated sediment will be set aside for backfill following completion of the removal works. Although there will be a small net loss of material (approximately 38m^3 over a 1024m^2 area) due to the removal of the concrete and metal, backfill of the excavated sediment will initially result in the formation of a mound over the site. This will flatten out as the sediments settle out.

16.8.14 It is expected that initially the Atlantic salt meadows / saltmarsh will show signs of regeneration and recovery following the disturbance. However, in the long-term the Atlantic salt meadows / saltmarsh within the footprint of the Proposed Marine Works will be lost through natural erosion due to estuary channel migration. The evidence for this conclusion is presented below.

16.8.15 Evidence for the potential of Atlantic salt meadows / saltmarsh regeneration over the affected area is provided by the current baseline in 2019 which shows that since the replacement pylon was installed in 2013 (and Atlantic salt meadows / saltmarsh habitat within the footprint of the works was lost), Atlantic salt meadows / saltmarsh vegetation has re-generated and covers much of the area again as shown in Plate 16.1. Atlantic salt meadows / saltmarsh habitat will therefore recover within 5 to 10 years, i.e. over the short to medium term, following disturbance. This is in-line with the conservation objectives to maintain the qualifying features range in the long term. Additionally, the physical and biological structure and function of the Atlantic salt meadows / saltmarsh will be maintained.

[12] RSK (2016). Saltmarsh Botanical Survey. Visual Impact Protection (VIP) Snowdonia Scheme Report No: 660952

Plate 16.1: 4ZC030R Atlantic salt meadows / saltmarsh cover in 2019

16.8.16 As discussed in Section 16.8.12 the channel at this location has the potential to migrate over the 4ZC030R site. Partial removal of the cofferdam and foundations will still allow this migration albeit at a slower rate than with full removal, resulting in Atlantic salt meadows / saltmarsh habitat loss through natural processes. Since the loss is by natural processes it is still compatible with the conservation objectives of the site as it represents a return to more natural processes of the estuary qualifying feature; again in-line with the conservation objective to restore the structure and function of primary qualifying feature of the SAC, the estuary.

16.8.17 The main vegetation present in the vicinity of pylon 4ZC030R is low grade sheep-grazed saltmarsh classified as the NVC type SM18 *Juncus maritimus* salt-marsh community, *Oenanthe lachenalii* sub-community[2]. Following the Proposed Marine Works, regeneration of Atlantic salt meadows / saltmarsh over the short to medium term would not change the type of species found at this location and therefore the conservation objective to maintain the typical species will be met.

16.8.18 Partial removal will therefore result in a temporary adverse effect to the qualifying feature. However, Atlantic salt meadows / saltmarsh habitat will recover, and the partial removal of the anthropogenic influence will allow slow estuary migration at this location. This is in-line with the restoration conservation objective for the estuaries primary qualifying feature, of which Atlantic salt meadows is a component.

Site 4ZC031 - Partial removal

16.8.19 The excavation works at site 4ZC031 will involve the excavation of relatively large holes (32m^2 in area) around each foundation leg within a 1024m^2 excavation area which will be subject to ground level disturbance from plant movements throughout the area. Although excavated sediment (approximately 377m^3) will be

used to backfill the holes, there will be a significant net loss of material from the removal of the concrete pile caps and piles (approximately 110m^3). Following backfill of the excavated sediments an indicative calculated depth of the residual holes is 0.85m.

16.8.20 The Proposed Marine Works at this site will result in the direct loss of Atlantic salt meadows / saltmarsh habitat and the creation of mud holes. This would have an adverse effect on the range of the Atlantic salt meadows / saltmarsh but would not necessarily affect the structure and function of the habitat. Some Atlantic salt meadows / saltmarshes have pronounced areas of higher ground with varying densities of water-filled depressions (salt pans) or bare areas of mud (mud basins) which are connected to the creek system and which drain at low tide (Defra 2007)[13]. The findings of the saltmarsh survey are stated in Appendix 16B (RSK 2016)[14]. The findings indicate that throughout the undisturbed grassland there are discrete pools and depressions formed by the natural erosion of the sandy sediment. Once the vegetation crust of the Atlantic salt meadows / saltmarsh is broken, the sandy sediment is easily eroded, and the pools can be undercut around the edges leading to gradual expansion. This process can be reversed when vegetation can establish and stabilise sediment (Appendix 16B) (RSK 2016)[15]. The depth of the depression appears to be a key factor as illustrated in Plate 16.2; although hydrology is likely to be key to determining if these pools become permanent features or re-vegetate (Appendix 16B) (RSK 2016)[16].

[13] Defra (2007) Joint Defra / Environmental Agency Flood and Coastal Erosion Risk Management RD Programme. Saltmarsh management manual. March 2007.

[14] RSK (2016). Saltmarsh Botanical Survey. Visual Impact Protection (VIP) Snowdonia Scheme Report No: 660952

[15] *Ibid*

[16] *Ibid*

Plate 16.2: Examples of depressions within the Marine Environment Area (RSK 2016a)

Plate 6. A deep depression with no vegetation.

Plate 7. A shallow depression with some growth of *Glaux maritima* (Sea-milkwort) and some surface algae.

16.8.21 It is possible the excavation holes would fill in with sediment over the long term and Atlantic salt meadows / saltmarsh would regenerate. This would maintain the range of the habitat in the long-term however, it is uncertain whether this would occur and there remains the potential that the depressions would represent a loss of habitat (a negative effect), which would have an adverse effect on meeting the conservation objective for the site. For this reason, mitigation measures will be implemented to restore the habitat in the short-term; ensuring that there is no loss of range.

Access tracks and watercourse crossings

16.8.22 *Juncus acutus* - sharp rush has been identified at five locations within the Marine Environment Area; including one location with three plants which were translocated during the 2013-2014 emergency works at 4ZCO30R. One location is already beyond the eroding edge of the Atlantic salt meadows / saltmarsh and two more are within 10m and at risk of being lost through natural processes (Appendix 16B) (RSK 2016)[17].

16.8.23 *Eleocharis parvula* - dwarf spike rush has been recorded in some of the adjacent salt pans (depressions) on the Atlantic salt meadows / saltmarsh (NRW 2019)[18].

[17] RSK (2016). Saltmarsh Botanical Survey. Visual Impact Protection (VIP) Snowdonia Scheme Report No: 660952

[18] NRW (2019). Ref SC1815 - Screening under the marine works (environmental impact assessment) regulations 2007 (as amended)

However, it was not identified in the 2016 saltmarsh survey (Appendix 16B) (RSK 2016)[19].

16.8.24 Additionally, *Ruppia maritima* – beaked tasselweed which has restricted distribution has also been recorded at this location (NRW 2020)[20]. This species was recorded in the 2016 survey within pools and creeks in the southern part of the saltmarsh survey (Appendix 16B) (RSK 2016)[21].

16.8.25 A survey of the Atlantic salt meadows / saltmarsh has not been undertaken since 2016 and it is therefore possible that sharp rush, dwarf spike rush and beaked tasselweed are now present in other areas of the Marine Environment Area. In addition, the Proposed Marine Works will not be carried out until 2026, sufficient time for plants to become established.

16.8.26 As it is uncertain whether sharp rush, dwarf spike rush or beaked tasselweed will be present along the planned temporary access tracks or in the watercourses which are to be crossed, there is the potential for a negative adverse effect. Mitigation measures will be implemented to ensure that effects on rare plant species are avoided.

Working areas for pylon dismantling, conductor removal and backstay

16.8.27 The working areas for dismantling the pylons in the Marine Environment Area and the two Equipotential Zones (areas for conductor removal) will be constructed of plastic or aluminium panels which will help to spread the load of plant and reduce any compaction impacts to the Atlantic salt meadows / saltmarsh feature.

16.8.28 Additionally, a temporary bridge or culvert will be required to cross a watercourse in front of pylon 4ZC031 for the duration of the works. It may leave a depression each side of the watercourse but this will be a localised temporary effect with recovery to the saltmarsh over the short-term.

16.8.29 Temporary, localised compaction of the Atlantic salt meadows / saltmarsh will occur as a result of the weight of the backstay. Small depressions (1.8m by 1.2m) could be created where each backstay sledge is used due to the weight of the blocks (4.2 tonnes).

16.8.30 As discussed in Section 16.8.24 above, it is possible that sharp rush and dwarf spike rush could be present within the working areas for pylon dismantling, conductor removal and the backstay when the Proposed Marine Works are carried out. Given the uncertainty surrounding the presence or absence of rare plant species, there is the potential for a negative adverse effect. Mitigation measures will be implemented to ensure that effects on rare plant species are avoided.

16.9 Predicted Impacts During Operation

Removal of Existing Infrastructure (VIP subsection)

16.9.1 The scope of the Proposed Marine Works is limited to works as part of the construction phase only. There will be no impacts during operation.

[19] *Ibid*

[20] NRW (2020). NRW Response received 24 January 2020 on the marine HRA under a DAS agreement

[21] RSK (2016). Saltmarsh Botanical Survey. Visual Impact Protection (VIP) Snowdonia Scheme Report No: 660952

16.10 Predicted Impacts During Decommissioning

16.10.1 The scope of the Proposed Marine Works is limited to works as part of the construction phase only. There will be no impacts during decommissioning.

16.11 Mitigation and Summary of Residual Effects

During Construction

16.11.1 The following mitigation measures will be implemented by National Grid to avoid or reduce negative effects:

- Prior to commencing excavation works at Site 4ZC031 the top layer of Atlantic salt meadows / saltmarsh will be temporarily translocated and maintained. Locally sourced sediment (source to be agreed with NRW) will be used to backfill the depressions. The translocated Atlantic salt meadows / saltmarsh turf will be replaced to restore the habitat. A post construction botanical saltmarsh survey will be undertaken at this location one year post construction.
- Within 1-year prior to the Proposed Marine Works the access routes and work areas will be surveyed to confirm the locations of rare species such as sharp rush, dwarf spike rush and beaked tasselweed. Any plants identified as at risk from the access tracks, watercourse crossings and work areas will be relocated, or an exclusion area established around them. An Ecological Clerk of Works will be appointed to ensure works do not disturb rare plants.

16.11.2 The HRA Stage 2 Appropriate Assessment (AA) concluded that with the implementation of the above mitigation measures there will be no effect on the integrity of the Pen Llyn a'r Sarnau/ Lleyn Peninsula and the Sarnau SAC and the conservation objectives for the Morfa Harlech SSSI will not be hindered.

During Operation

16.11.3 No impacts predicted therefore no mitigation required.

During Decommissioning

16.12 No impacts predicted therefore no mitigation required.

16.13 Cumulative Effects

16.13.1 Gwynedd Council and Snowdonia National Park Authority have confirmed (September 2019) that there are no current or future developments to be assessed cumulatively with VIP Snowdonia. A search of applications on the NRW marine licensing portal for plans and projects within 10km of the Proposed Marine Works was undertaken in November 2019 however, no plans and projects within this area were found. Given the Proposed Marine Works are planned for 2026 it is unlikely that information on any projects which could overlap spatially and temporarily with the Proposed Marine Works will be in the public domain yet. Should any future projects have the potential to overlap cumulatively with the Proposed Marine Works, they would need to consider the Snowdonia VIP project in their cumulative effect assessment.

16.13.2 Given the Proposed Marine Works are geographically separated from the terrestrial elements of the wider project and all predicted effects are confined to the marine environment, no intra-project effects on the marine physical environment are anticipated.