GREENLINK INTERCONNECTOR LIMITED

CML1929 - Response to Consultee Comments

Marine Licence Application for the Greenlink Interconnector

Greenlink - an interconnector between GB and the Republic of Ireland

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Greenlink Interconnector Limited

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Marine Licence Application for the Greenlink Interconnector

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1. Introduction

1.1 Project background

The Proposed Development comprises the Welsh Marine components of Greenlink from mean high-water springs (MHWS) at the Welsh landfall at Freshwater West, Pembrokeshire to the UK / Republic of Ireland median line. It comprises:

- Two high voltage direct current (HVDC) electricity power cables;
- A smaller fibre-optic cable for control and communication purposes;
- All associated works required to install, test, commission and complete the aforementioned cables; and
- All associated works required to operate, maintain, repair and decommission the aforementioned cables, including five repair events over the 40-year lifetime of Greenlink.

The Proposed Development includes the following phases:

- Installation;
- Operation (including repair and maintenance activities); and
- Decommissioning

Kilometre points (KPs) have been assigned to the route to aid with the description; running from KP0 at MHWS, Freshwater West to KP73.8 at the UK/Ireland median line.

1.2 Objective of this report

Greenlink Interconnector Limited (GIL) submitted a Marine Licence Application (MLA) (ref: CML1929) on the 24 June 2019 to Natural Resources Wales (NRW). The MLA was accompanied by the following documents:

- Greenlink Marine Habitats Regulations Assessment
- Greenlink Summary of Offshore & Onshore Environmental Effects
- Greenlink Marine Environmental Statement
- Volume 1 – Non Technical Summary
- Volume 2 – Environmental Statement
- Volume 3 – Appendices
  - Appendix A – WMP Objectives
  - Appendix B – Scoping Meetings
  - Appendix C – HRA
  - Appendix D – Underwater Sound Modelling
  - Appendix E – Herring and Sandeel Assessment

- Appendix F – Commercial Fisheries Assessment
- Appendix G – Marine Archaeology
- Appendix H – WFD Scoping
- Appendix I – Cable Route Survey
- Appendix J – Environmental Survey Report
- Appendix K – Intertidal Habitat Survey Report
- Appendix L – UXO Risk Assessment
- Appendix M – WSI
- Appendix N – Landfall Selection
- Appendix O – Competent experts table

The statutory consultation period on the MLA commenced on 13 November 2019 and finished on 08 January 2020. On completion of the consultation period, NRW provided GIL with comments received from consultees. This report provides a full response to the comments received on 24 February 2020 from the following stakeholders:

- Natural Resources Wales (NRW) Technical Experts (TE)
- Joint Nature Conservation Committee (JNCC)
- Centre for Environment, Fisheries and Aquaculture Science (Cefas)
- Maritime and Coastguard Agency (MCA)
- Trinity House
- Welsh Government
- Ministry of Defence – Safeguarding

In addition, the following supporting documents have been submitted:

- Greenlink Marine Habitats Regulations Assessment Revision F2 (reference P1975_R4710_RevF2).
- Greenlink Habitat Compensation Plan (reference P1975_R5029_Rev0) (appended to HRA).
- Greenlink Marine Environmental Statement Technical Appendix D – Underwater Sound Modelling Revision F2 (reference P1975_R4484_RevF2) (appended to HRA).
- Greenlink Marine Mammal Mitigation Plan (reference P1975_R5028_Rev0) (appended to HRA).

GIL have agreed with NRW Marine Licensing that the ES and additional Technical Appendices e.g. WFD Scoping, do not require updating and that this clarification document can act as an Addendum to the ES.

2. Response to Comments

2.1 NRW TE Coastal Processes

NRW TE Coastal Processes Comment 1

Section 6.6.3 Change to suspended solids (water clarity) - We advise that the applicant should provide further justification on the likely amount of, and distribution of, increased sedimentation arising from disturbance plumes in a spatial context to support the conclusion of this assessment. This will provide greater clarification to the potential magnitude of this effect in a spatial context and provide information for other topic assessments.

Response

Cable burial will be a continuous process which is likely to generate a sediment plume as the seabed is disturbed. The spatial extent of the sediment plume will depend on factors such as the type of installation tool used, sediment characteristics (e.g. fraction of fines in comparison to coarse grains), the state and direction of the tide, current velocities and wave conditions.

The creation of the sediment plume is typically a one-off event. It is acknowledged that certain areas may experience more than one occasion of increased suspended sediment e.g. if a certain section needs multiple passes with the jetting-machine to achieve target burial or if pre-sweeping is required between KP25.8 and KP26.4 and KP64 to KP69 - the use of a mass flow excavator or trail suction hopper dredger will also create a localized sediment plume. However, the effects from sediment plumes are localised in nature, and effects are temporary. Once the sediment is lifted into suspension it will disperse under the action of the tidal flows. Due to their higher density sands and gravels settle back to the seabed very rapidly. Silt and clay particles remain in suspension for longer periods and can therefore be dispersed over much wider distances. However, once they settle out of suspension the depth of the deposition is very small as the volume disturbed is spread over such a large area and is typically undiscernible from background sediment suspension and deposition levels. Previous studies (Gooding et al. 2012) have shown that turbidity levels would fall to ambient levels within 66m of a trencher in hard ground areas and 70m in sandy areas with fine deposition occurring out to a maximum of 2 km from the trench (Gooding et al. 2012).

Section 6.6.3 presented calculations for the increased sedimentation arising from disturbance plumes, based on a metre long section of the trench. These were based on relatively simple dispersion and deposition calculations to inform the assessment of the magnitude of the effect i.e. to determine how far sediment will travel before dropping out of suspension. Although more extensive modelling to define the exact spatial extent of the sediment plume can be undertaken this is generally only required if there a specific concern regarding the effects a sediment plume will have on an environmental receptor. For example, if the suspended sediment is

contaminated or the sediment plume has the potential to spatially overlap with shellfish beds.

Sediment samples taken during the cable route survey were tested for metal and polycyclic aromatic hydrocarbons (PAH) concentrations. Metal concentrations were low across all grab sample sites and rarely exceeded any threshold values with the exception of Arsenic (As). Threshold values for Arsenic were exceeded in all, but two samples tested in the Proposed Development. Arsenic is a natural component of seawater and rocks and given the lack of variability between samples it is expected that the values are of a natural origin rather than anthropogenic contamination. PAH concentrations also varied greatly between sites but did not exceed Cefas or OSPAR thresholds.

As there is no risk of the spread of sediment contamination and no sensitive shellfish beds have been identified in close proximity, extensive modelling has not been undertaken for the Proposed Development.

Tidal currents in the region are nearly rectilinear, they have very little deviation from their main direction of flow which is generally in a northwest-southeast direction. Sediments suspended by burial operations will travel with the tide and therefore will head generally northwest or southeast depending on the state of the tide at any given time. The calculations presented in Section 6.6.3 indicate sand and gravel will fall out of suspension within three minutes reaching a distance up approximately 27m from the centreline. Silt particles will travel further and may remain in suspension for up to 14 hours before settling out. In this time, they could travel 7.6km from the centreline assuming that the water direction and speed was constant. However, as the tidal cycle off Pembrokeshire is 12-hourly it is likely that particles will not travel as far, instead being transported back in the general direction of the centreline as the tide turns. Conservatively, it can be assumed that sediment suspended by the burial process could settle up to 7.6km either side of the centreline.

With respect to volumes, it has been calculated that 16,628m^3 of sediment will be suspended in Welsh waters by cable burial based on the following assumptions:

- 1.5m burial depth is achieved across the Proposed Development – the Greenlink Cable Burial Risk Assessment (CBRA) concluded that the cables should be buried to at least 0.6m, increasing to 0.75m for certain sections to ensure protection from anchor and fishing risks. However, it has been recommended that the target depth of lowering to be achieved by the Installation Contractor is between 1.0m and 1.5m. 1.5m is therefore a conservative estimate as this is unlikely to be burial depth across the entire route;
- The sediment fraction released into the water column by jetting has been assumed to be 20%, with 80% being returned to the trench. This sediment fraction is generally accepted for jetting (Jiang, Fissel and Borg 2008; RPS 2015; Epsilon Associates 2018; Jacobs 2018).

- Trench width was assumed to be 0.75m wide (based on two 0.13m cables bundled together).
- The Proposed Development is 73.9km long.

PSA data is available for 19 samples in Welsh waters. The maximum percentage of silt identified in the samples was 12% (average 5.8%). Using the maximum percentage, it has been calculated that up to 1,995m^3 of silt could be suspended by the burial operations. Assuming that the silt settles out evenly over the 15.2km wide footprint of the plume it will be deposited in a thickness of <1mm which would be almost imperceptible against natural variations. Even if it is assumed that the footprint is only 7.6km wide the thickness of sediment settlement is still <1mm. The silt would have to settle out of suspension within 25m of the centreline for the thickness of deposit to reach 1mm. This supports the conclusion that the volume of sediment dispersed within the sediment plume will not have any significant effects.

NRW TE Coastal Processes Comment 2

Section 6.6.4 Water flow (tidal currents) changes-local: On some bed substrates scour of sediment around the structure could destabilise the protection potentially causing cable exposure and requirement for maintenance works. As a result, a negligible assessment is not justified in all instances. We advise that the applicant should specifically assess the likely stability of the seabed sediments at locations where rock protection works are required.

Response

The preference is to bury the cables in the seabed. However, the choice of burial technique or protection method depends on location specific seabed conditions and is largely dependent on the shear strength of the soil present. Where underlying bedrock is close to the surface; ground conditions comprise of cobbles and boulders; and / or sediments have a very high shear strength (e.g. stiff clays), it is possible that cutting/trenching or a jetting system would not be capable of achieving cable burial. In these instances, external cable protection is considered.

The indicative locations of external cable protection were defined based on initial interpretation of the Greenlink cable route survey geophysical and geotechnical data. The assessment took into consideration soil conditions; sediment movement; depth of bedrock; the target depth of lowering; and the capabilities of burial equipment, to identify locations where burial may not be achieved. A precautionary approach was taken to ensure the EIA presented the worst-case requirement for external cable protection.

The tender process for an Installation Contractor is currently underway. All tenderers have indicated (in their Cable Burial Assessments) that burial in sediment could potentially be achievable for all locations where the Greenlink ES has precautionarily indicated that external cable protection may be required. However, until the Installation Contractor undertakes the planned trenching, it cannot be confirmed that external cable protection will not be required at any or

all of the locations. It is feasible that not all locations indicated in the EIA will require external cable protection.

Scour around external cable protection generally occurs where it is located in soft sediments e.g. sand; where bottom current either already exceed the critical bedload parting velocity; or where external cable protection results in an increase in current velocity to above the critical bedload parting velocity.

Locations potentially requiring the deposit of external cable protection have been identified where bedrock is either outcropping or is close to the surface or where the sediment has a high shear strength e.g. clay. None of the locations are in soft sediments. Therefore, scour is not likely to be an issue.

The deposit of external cable protection for the crossing of the Pan European Crossing 1 telecommunications cable at KP59.8 is the only location in a sand environment. The use of external cable protection at this location cannot be avoided. It is plausible that scour could occur at this location. However, the design of external cable protection takes into consideration the local hydrodynamic conditions. The rock berm is designed in layers and will typically have a filter layer at the bottom and up to the top of the cable covered by rock armouring. The rock armouring (larger rock sizes) provides the necessary protection from external threats e.g. is designed to absorb an anchor strike or allow a trawl board to cross over the top. It is also designed to prevent movement of the rock armouring by local bottom currents so that stability is maintained through the assets life-time. The filter layer at the base comprises smaller gravel sized particles. This allows water and sand to winnow into the pores decreasing the likelihood of scour.

GIL therefore stand by the conclusion in Section 6.6.4 of the ES that for the Proposed Development the overall significance of the effect is Negligible.

NRW TE Coastal Processes Comment 3

Section 6.6.5 Physical change (to another seabed type): On some bed substrates there is a greater risk of physical changes to another seabed type, particularly if the habitat under/surrounding the rock protection works was relatively fine unconsolidated material. We advise that the applicant should specifically assess the likely stability of the seabed sediments at locations where rock protection works are required.

Response

As outlined in Response to NRW TE Coastal Processes Comment 2, the preference is to bury the cables in sediment. A precautionary approach was taken in the EIA to present the worst-case where burial in sediment may not be achieved and the deposit of external cable protection may be required. The tender process for an Installation Contractor is currently underway. All tenderers have indicated (in their Cable Burial Assessments) that burial in sediment could potentially be achievable for all locations where the Greenlink ES has precautionarily indicated that external cable protection may be required. However, until the Installation Contractor undertakes the planned trenching, it cannot be confirmed that external cable

protection will not be required at any or all of the locations. It is feasible that not all locations indicated in the EIA will require external cable protection.

Locations potentially requiring the deposit of external cable protection have been identified as where either bedrock is either outcropping or close to the surface, or the sediment has a high shear strength e.g. clay. Any unconsolidated sediments at these locations are indicated as forming a thin veneer over the bedrock. Sediments at these locations are therefore stable.

The only area of potentially fine unconsolidated material is at the crossing location of the Pan European Crossing 1 telecommunications cable at KP59.8. The survey identified that the crossing point is in sand. The deposit of the external cable protection at this location will constitute a distinct change in seabed type. However, as outlined in Response to NRW TE Coastal Processes Comment 2, the potential for scour has been assessed as Negligible, which applies to this location and the wider Proposed Development.

It has been agreed with NRW TE that where external cable protection is deposited on the Pembrokeshire Marine / Sir Benfro Forol Special Area of Conservation (SAC) Primary Feature Reef this could have a significant adverse effect on the European Site. The HRA has been updated to reflect this conclusion, provide justification for why Greenlink should proceed on the grounds that there is no feasible alternative and that it meets the Test for Imperative Reasons of Overriding Public Interest (IROPI) and a Habitat Compensation Plan has been proposed.

2.2 *NRW TE Benthic Habitats*

NRW TE Benthic Habitats Comment 1

The summary of impacts document (Table 6-1 Marine Wales – EIA summary) states a 'not significant' effect on the Pembrokeshire marine SAC. NRW cannot agree with this finding and it is not in agreement with the '*minor*' significance of residual effect in Table 7-7 of the main ES. The sensitivity of this habitat should be 'high', the rationale being: what could be a higher sensitivity habitat than that of a primary feature of a SAC.

Response

To determine the sensitivity value used in the assessment a review of the habitats identified within the Proposed Development was conducted using information provided on the Marine Life Information Network (MarLIN). The sensitivity values took into consideration the individual habitats sensitivity to the specific pressures being assessed. Whilst it is recognised that a habitat may contribute to the Primary Feature of the SAC it does not necessarily mean that it is sensitive to the pressure being assessed. For example, cable burial will temporarily disturb the seabed, with habitats able to recover once the cables are installed. There would be no loss of habitat. Justification was provided in Section 7.6.2.1 for the conclusions presented in Table 7-7 and why each sensitivity value was selected.

Acknowledging the above, GIL/Intertek have undertaken further consultation with NRW TE and accept that the deposit of external cable protection (if required) will constitute a loss of habitat for the Primary Feature Reef. As there is no mitigation that can be provided to reduce the significance of the effect, it is accepted that the significance assessment of minor for the pressure 'physical change (to another seabed type)' is not appropriate and that the HRA should conclude a Significant Effect.

Considering the above, the HRA has been updated to conclude at Stage 2 that it cannot be ruled out that if external cable protection is deposited on the Primary Feature Reef the Proposed Development will not have a significant adverse effect on the integrity of the Pembrokeshire Marine SAC. Additional information has been provided in the HRA to support NRWs assessment for proceeding to Stage 3 and Stage 4 in the HRA process. A compensation plan has also been prepared and submitted with the Greenlink Marine HRA.

NRW TE Benthic Habitats Comment 2

The loss of this extent of Annex I reef is considered significant and resulting in an adverse effect on site integrity for the Pembrokeshire Marine SAC. The Conservation Objectives require that the habitat features are maintained or increased; the project represents a loss of Annex I reef, with differing degrees of loss for the different types of reef (bedrock, cobble and biogenic).

The bedrock reef area is diverse and supports a number of sessile reef species. However, this biotope is known to be sand scoured which results in fewer long lived species such as sponges and a higher presence of more ephemeral species. In terms of resilience, Marlin describes the biotope (A4.138) as:

"*Resilience assessment. The available information suggests Molgula manhattensis and Tubularia indivisa are annual species with the potential to rapidly colinize suitable substrates. Alcyonium digtatum and Flustra foliacea are perennial species however can potentially re-colonize new substrates within two years. Urticina felina was also reported to colonize the "Scylla" within two years. Due to the poor dispersal capability of Molgula manhattensis, Tubularia indivisa and Flustra foliacea full removal of the community from the habitat is likely to extend recovery/resilience. If the community is completely removed from the habitat (resistance of none or low) resilience has been assessed as 'Medium', however if resistance has been assessed as medium or high then resilience will be assessed as 'High'.*"

As the cable will result in total loss of habitat for the area affected, it is considered as having medium resilience.

The cobble reef area is the Annex I reef which will be most extensively affected but has lower diversity and consists mainly of fast-growing ephemeral species able to colonise unstable sediments regularly affected by wave and tidal action.

The Sabellaria reef has not been previously recorded in Pembrokeshire Marine SAC and therefore there is no indication of how significant any loss of this habitat would

be. Other recent monitoring has also found Sabellaria reefs north (off St. David's head) of the proposed Greenlink cable (ABPmer/WG bathymetric/DDV surveys). The fact that biogenic reef was not considered present during the designation of the Pembrokeshire Marine SAC and inclusion of the Reef habitat as a feature is of no consequence, the loss of Sabellaria reef is a loss of Annex I reef from the SAC.

Response

The preference is to bury the cables in sediment as far as possible. The HRA has been updated (Section 5.2.1.2) to reflect that in areas where burial in sediment is achieved the Reef sub-types will recover in the short-term (within 1-2 years), maintaining the extent of the habitat in the long-term. Burial in sediment will not have an adverse effect on the long-term achievement of the conservation objectives for the Pembrokeshire Marine / Sir Benfro Forol SAC.

The HRA considered the effects on the Primary Feature Reef from the deposit of 81,700m^2 of external cable protection. A precautionary approach was taken in the EIA and HRA to present the worst-case where burial in sediment may not be achieved and the deposit of external cable protection may be required. The tender process for an Installation Contractor is currently underway. All tenderers have indicated (in their Cable Burial Assessments) that burial in sediment could potentially be achievable for all locations where the Greenlink ES has precautionarily indicated that external cable protection may be required. However, until the Installation Contractor undertakes the planned trenching, it cannot be confirmed that external cable protection will not be required at any or all of the locations. It is feasible that not all locations indicated in the EIA and HRA will require external cable protection.

As outlined in NRW TE Benthic Habitats Response 1, GIL/Intertek have undertaken further consultation with NRW TE, with respect to the use of external cable protection on the Primary Feature Reef sub-types and accept that the deposit of external cable protection (if required) will constitute a loss of habitat for the Primary Feature Reef. As there is no mitigation that can be provided to reduce the significance of the effect, it is accepted that there will be a loss of habitat if external cable protection is used which will represent a Significant Effect.

The HRA has been updated (Revision F2) to conclude at Stage 2 that it cannot be ruled out that if external cable protection is deposited on the Primary Feature Reef the Proposed Development will not have a significant adverse effect on the integrity of the Pembrokeshire Marine SAC. Additional information has been provided in the HRA to support NRWs assessment for Stage 3 and Stage 4 in the HRA process. A compensation plan has also been prepared and submitted with the Greenlink Marine HRA.

NRW TE Benthic Habitats Comment 3

7.6.2.1 in the ES. The magnitude of the effect was assessed as low for the following reasons and NRW have concern with the rationale of this with text given below them:

*"*Disturbance will be brief and is equivalent to a one-off event which will not be repeated."* The speed and one-off nature of the impact is largely irrelevant.

*"*The zone of influence is narrow in comparison to the wider extent of habitats in the Proposed Development and surrounds."* NRW do not consider that the "small" spatial scale of influence necessarily implies a low level of impact, various factors need to be taken into account such as quality and type of habitat affected.

*"*Sediment will not be removed or altered leaving the underlying character of the habitat similar to that pre-development."* Sediment and reef structure will be altered in a negative manner.

Response

Section 7.6.2.1 in the ES provides justification for the conclusion of the effects from the pressure penetration and/or disturbance including abrasion on individual habitats within the Proposed Development. This pressure is associated with activities such as seabed preparation and cable burial. The 'low' magnitude value reflects that there will be a short-term (<1-year) site specific and/or minor shift away from the baseline conditions. This was justified in the ES by three bullets. Further clarity on each bullet is provided below:

Disturbance will be brief and is equivalent to a one-off event which will not be repeated.
It is acknowledged that the use of the word brief applies to the activity and not the effect. The duration of the activity is not relevant as once the seabed is disturbed or damaged then the effect has occurred. However, the fact that the activity is a one-off event is a relevant point. Once the cables are installed the seabed will not be disturbed again allowing recovery of habitats. In comparison, an activity such as scallop fishing returns to the same area of seabed on numerous occasions disturbing the habitat each time. In this situation the habitat may not have sufficient time to recover between each event and could in the long-term lead to degradation.

The zone of influence is narrow in comparison to the wider extent of habitats in the Proposed Development and surrounds.
The 'small' spatial scale of the effect is relevant in determining the magnitude value. The EIA method uses two 'values' to determine the overall significance of an effect; magnitude and sensitivity. The magnitude value considers the spatial scale of the effect (the full area over which the effect occurs), the duration (the period within which the effect is expected to occur prior to recovery starting), frequency of the effect (how often the pressure might occur) and the scale of change (in comparison to the baseline). The quality and type of habitat affected and how sensitive it is to the pressure being assessed is covered by the sensitivity value.

Sediment will not be removed or altered leaving the underlying character of the habitat similar to that pre-development.
Cable installation will create a trench in the seabed into which the cable is laid. The type of installation tool used (e.g. jetter or plough) will depend on the sediment type at a particular location and the potential for successful burial using a particular technique. Sediment will not be removed from the seabed and after trenching occurs the same sediment, although disturbed, will remain. Where sediments are a mix of gravel/cobbles and sand sediment composition within the trench may coarsen, as a small proportion of fines become suspended by trenching. However, in general the seabed composition will remain similar to that pre-development.

NRW TE Benthic Habitats Comment 4

Table 7.5 of the ES. NRW consider it would be useful to separate out the Reef habitats in this table as has been done Table 7.7 rather than just the receptors of 'sand habitats' and 'subtidal habitats'. Also, in Table 7.5, the zone of influence, is confusing due to differing units (e.g. "15m", "100m2", "10m x 16.46km" etc). Please adjust/clarify.

Response

Table 7-5 has been adjusted as requested and is provided below with clarification provided in the zones of influence column.

Table 7-5: Pressure identification and zone of influence – benthic and intertidal ecology

Project Phase	Project Activity	Aspect	Potential Impact	Receptor	Zone of Influence
I	Cable burial	Cable burial	Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion	Intertidal habitats	No zone of influence
		Pre-sweeping		Sandy habitats (A5.142, A5.251, A5.272)	20m wide x approximately 5.6km long (width and length of pre-sweeping required)
I	Cable burial	Pre-lay grapnel run Seabed preparation Cable burial Cable removal	Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion	Annex I Bedrock reef habitat	15m wide* x 73.9km long (width of equipment along entire cable route in Welsh waters)
O	Cable repair and maintenance			Annex I Stony reef habitat	
				Annex I Biogenic reef habitat	
D	Cable removal			Other subtidal habitats	
I	Cable burial	Pre-sweeping Seabed preparation. Cable trenching	Siltation rate changes, including smothering (depth of vertical	Subtidal habitats	200m** wide x 73.9km long (width within which sand particles may be deposited along entire cable route in Welsh waters)
O	Repair and maintenance operations				
D	Cable removal				

Project Phase	Project Activity	Aspect	Potential Impact	Receptor	Zone of Influence
		External cable protection	sediment overburden)		
I	Cable burial	External cable protection	Physical change (to another seabed type)	Reef Habitat	10m wide x approximately 10.17km long (indicative width and length of external cable protection deposits)
				Subtidal habitats	10m wide x 6.2km long (indicative width and length of external cable protection deposits)
O	Repair and maintenance operations	External cable protection	Physical change (to another seabed type)	Subtidal habitats	10m wide x 1km (indicative length of cable repair)***
I	Cable burial	Presence of project vessels Cable burial External cable protection Cable removal	Introduction or spread of non-indigenous species	Subtidal habitats (A5.251, A5.252, A5.261 and A5.451)	15m wide x 73.9km long**** (width of area disturbed by cable burial and length of cable route in Welsh waters)
O	Repair and maintenance operations				
				Other subtidal habitats	15m wide x 73.9km long**** (width of area disturbed by cable burial and length of cable route in Welsh waters)
D	Cable removal				
O	Operation of cables	Emission of EMF	Electromagnetic Field effects	Subtidal species	2m (distance at which EMF attenuates to background levels)

Project Phase I = Installation, O = Operation, D = Decommissioning

* A typical cable excavation tool has a seabed footprint of 15m. In reality the actual cable trench will be <1m wide and the footprint of the equipment will be restricted to two narrow strips either side of the trench where the machine runs along tracks or skids. Following the precautionary principle it has been assumed that the seabed within the entire 15m is affected.

** Chapter 6 concluded that whilst individual silt particles will remain in suspension for extended periods (up to 14 hours), sand particles suspended by installation activities will settle out of the water column quickly. Changes in sediment properties will not be detectable beyond 100m of the trench. The zone if influence considers that sand could be deposited either side of the cable trench within 100m.

*** Applied for as a contingency. Burial in sediment would be the preferred installation for any repair works.

**** Uses 15m as the width although it recognises that the pressure also applies to the use of external cable protection. As the width of external cable protection is 10m the width of the installation tool is the worst-case.

NRW TE Benthic Habitats Comment 5

7.6.4.1 in the ES. "*The magnitude of the effect has been assessed as low given the small, localised footprint of the pressure, the potential for colonisation of the external cable protection, and the wider extent of the habitat within the region*". The potential for colonisation of the external cable protection is a compensatory measure and not mitigation (following case law c-521/12 'Briels') and therefore should not downgrade the overall significance of the impact.

Response

As outlined in NRW TE Benthic Habitats Response 1, GIL/Intertek have undertaken further consultation with NRW TE, with respect to the use of external cable protection on Primary Feature Reef sub-types and accept that the deposit of external cable protection (if required) will constitute a loss of habitat for the Primary Feature Reef. As there is no mitigation that can be provided to reduce the significance of the effect, it is accepted that there will be a loss of habitat if external cable protection is used which will represent a Significant Effect.

The HRA has been updated (Revision 2) to conclude at Stage 2 that it cannot be ruled out that if external cable protection is deposited on the Primary Feature Reef the Proposed Development will not have a significant effect on the conservation objectives of the Pembrokeshire Marine SAC. Additional information has been provided in the HRA to support NRWs assessment for Stage 3 and Stage 4 in the HRA process. A compensation plan has also been prepared and submitted with the Greenlink Marine HRA.

NRW TE Benthic Habitats Comment 6

Page 257 "*Bedrock reef is a qualifying feature of the Pembrokeshire Marine / Sir Benfro Forol SAC*" It is a 'primary feature' rather than a 'qualifying feature'. Please adjust.

Response

Adjusted in the HRA.

NRW TE Benthic Habitats Comment 7

As above, in the HRA Reef is stated as a qualifying feature where it is primary (5.2.1).

Response

Adjusted in the HRA.

NRW TE Benthic Habitats Comment 8

Page 258 7 5-2 (and mitigation tables: Table 7-11, Table 11-3) "It is acknowledged that should the base case being assessed change, the significance of the effect could become more significant. Therefore, to ensure that the Annex I Bedrock Reef remains protected within the Proposed Development, Project Specific Mitigation (PS2) has been proposed, in the form of exclusion zones around the identified Annex

I Bedrock Reef habitat." NRW are unclear about this statement: is this saying that if the cable has to go over Bedrock reef then the mitigation would be to have exclusion zones around the reef? Please clarify.

Response

GIL are applying for an application area that covers nominally a 500m width to allow for positioning of vessels and if necessary, movement of the proposed cable centreline. The EIA assesses the effects of installation, operation and decommissioning should the cable be positioned anywhere within this application area. However, in certain regions of the application area there are environmental constraints that mean that the centreline should not be moved significantly from where it is currently proposed. The main area is between KP2 and KP5 where the cable centreline follows a sediment channel between outcropping Bedrock Reef. From the start of route development, the sensitivity of the Bedrock Reef was established, and a decision was made to avoid where possible a cable route across the feature from an environmental perspective. In addition, it was recognised it would likely be more costly from a technical perspective. Therefore, for assessment purposes it was always assumed that the cable route would follow the sediment channel (i.e. the base case). However, it was recognised that an Installation Contractor may not have a similar understanding of the environmental sensitivities of the site and could propose cutting through areas of Bedrock Reef e.g. to cut through corners of the meandering channel to shorten overall route length. To ensure that this was not done, exclusion zones around the main Bedrock Reef features have been established – Project Specific Mitigation 2 to ensure that cable routeing does not impinge upon the Bedrock Reef Protected Feature.

Small patches of Bedrock Reef are present in the centre of the sediment channel. It is believed that the majority of these can be avoided through micro-routeing but given that the channel is already constrained (limited width) it is not feasible to include these areas in an exclusion zone. Where Bedrock reef cannot be avoided and external cable protection may be required the HRA has concluded a Significant Effect on the Pembrokeshire Marine SAC cannot be ruled out and is proposing compensatory habitat.

NRW TE Benthic Habitats Comment 9

Related to the above comment the text in the mitigation tables (Table 7-11, Table 11-3) refers to exclusion zones shown in "Figure number 7-21, Drawing number: P1976-INST-009". We assume it is P1975-INST-009, but please clarify/adjust.

Response

Correct, the reference should read P1975-INST-009.

NRW TE Benthic Habitats Comment 10

In the HRA 5.2.1.3 "*Exclusion zones have been established around Annex I Bedrock Reef features… No intrusive works (e.g. cable installation, deposit of external cable protection material) will be undertaken within these exclusion zones*". This

sounds like no Annex I Bedrock Reef will be impacted at all and this is contrary to that stated elsewhere in the HRA/ES, please adjust/clarify.

Response

Project Specific Mitigation PS2 has been changed to read:

"Exclusion zones have been established around the majority of Annex I Bedrock Reef features. Exclusion zones are shown on Figure 7-21, Drawing P1976-INST-009. No intrusive works (e.g. cable installation, deposit of external cable protection material) will be undertaken within these exclusion zones."

NRW TE Benthic Habitats Comment 11

There appears to be a discrepancy between the area of Bedrock reef given in Table 5-2 of the HRA (0.0003km2) and in the main ES 7.6.2.1 (450m2). This likely stems from the differences in estimated width of the impact (10m vs 15m). Please clarify.

Response

The difference in the two figures stems from the type of pressure being discussed. In the ES Section 7.6.2.1 the 450m2 relates to the extent of disturbance should cable burial (ploughing or jet trenching) be used at a location between KP2.38 and KP2.41. For cable burial it is assumed that as a worst case a 15m wide strip of seabed will be affected by the installation tool. This effect however will be temporary as the seabed will be able to recover following disturbance.

Table 5-2 of the HRA discusses the footprints of all activities within the Primary Feature Reef. It is acknowledged that for the same section KP2.38 to KP2.41 it focuses on the external cable protection as this will have the more significant effect of the two installation techniques. Table 5-2 has been updated in the HRA to make it clear that for certain sections of the Proposed Development the preferred option is burial in sediment but that there is the potential for external cable protection as well.

NRW TE Benthic Habitats Comment 12

Related to the comment above, there appears to be a discrepancy between the widths of the impact e.g. 10m over bedrock reef and medium grade reef whereas 15m over biogenic and low grade reef (e.g. Table 5-2 in the HRA), please clarify.

Response

See response to NRW TE Benthic Habitats Comment 11. Table 5-2 in the HRA has been updated.

NRW TE Benthic Habitats Comment 13

The "medium grade" stony reef impact 10m wide for 8km, represents a significant area. It should be noted that the SAC jurisdiction (and Habitats Directive legislation) there is no difference between bedrock reef and stony reef.

Response

As outlined in NRW TE Benthic Habitats Response 1, GIL/Intertek have undertaken further consultation with NRW TE, with respect to the use of external cable protection on Primary Feature Reef sub-types and accept that the deposit of external cable protection (if required) will constitute a loss of habitat for the Primary Feature Reef. As there is no mitigation that can be provided to reduce the significance of the effect, it is accepted that there will be a loss of habitat if external cable protection is used which will represent a Significant Effect.

The HRA has been updated (Revision 2) to conclude at Stage 2 that it cannot be ruled out will not have a significant effect on the conservation objectives of the Pembrokeshire Marine SAC. Additional information has been provided in the HRA to support NRWs assessment for Stage 3 and Stage 4 in the HRA process. A compensation plan has also been prepared and submitted with the Greenlink Marine HRA.

NRW TE Benthic Habitats Comment 14

3.7 HRA. "The 'base case' (or "preferred method" [Table 4-2]) is that shore-crossings will be accomplished by horizontal directional drilling (HDD)", NRW seek a clarification on why this 'base case' may not be possible and if intertidal trenching at the landfall is completely ruled out.

Response

It is proposed that the shore-crossing will be accomplished by HDD, as this is the best environmental solution at the site. At the time of ES submission there was some uncertainty around a specific fractured rock sequence identified in the geotechnical boreholes which led to GIL not being able to confidently rule out intertidal trenching. Further engineering studies have confirmed that HDD is feasible. In addition, the Installation Contractor tenders have all indicated that the distance involved is feasible. GIL do not expect that intertidal trenching will be required; however, until the final selected Installation Contractor undertakes their own engineering feasibility studies it cannot categorically be ruled out.

NRW TE Benthic Habitats Comment 15

In the HRA (7.6.2.1) It states: "...*whilst Modiolus modiolus (blue mussel) are large, sessile and shallowly buried individuals..*" *Modiolus modiolus* has the common name of horse mussel not blue mussel (Mytilus edulis). Please correct.

Response

This statement is taken from the Greenlink Marine ES. The error is noted and will be corrected in any future documents. GIL have agreed with NRW Marine Licensing that the ES does not require updating and that this clarification document can act as an Addendum to the ES.

NRW TE Benthic Habitats Comment 16

The summary of impacts document states: "*Using a trenchless technique for installing underground cables called horizontal directional drilling (HDD), ducts will be installed from the TJP to emerge below the low water mark*". NRW considers this 'low water' mark should be the low water mark of spring tides (MLWS) as this is where in practice the lower limit of the shore to which Phase 1 survey is possible and that is what the feature designation is based upon (see Pembrokeshire Marine SAC Reg 37 - 4.6.1. Range). This is also the case in 7.6.2.1 of the main document and elsewhere which states 'low water'. This does seem to be acknowledged in the mitigation table 7-11, but please clarify.

Response

For clarity, it is proposed that the HDD will exit below the mean low water spring (MLWS) mark.

2.3 NRW TE Marine Mammals

NRW TE Marine Mammals Comment 1

Table 10-3 - Seasonal summary of marine mammal and reptile presence within and near the Proposed Development - we disagree with the conclusions presented. All marine mammal species have potential to be present year round.

Response

Table 10-3 highlighted when species were most likely to be present within the protected sites within or near the Proposed Development. It was not intended to reflect the position that these species would only be present at these times. The wording of the summary in Section 10.3.6 should read as

"While marine mammal and reptile species may be present throughout the year in the vicinity of the Proposed Development, densities of individuals present will likely vary over this time. Table 10-3 highlights the periods when marine mammal and reptile species are most likely to be present within or near to the Proposed Development".

NRW TE Marine Mammals Comment 2

Table 10-4 - Legislation protecting marine mammals and reptiles - this is slightly incorrect as pinnipeds are protected under The Conservation of Habitats and Species Regulations 2017 as Annex II species.

"*Harbour porpoise in the West Wales Marine SAC have a current favourable status which is set to continue into the future, providing conservation measures are maintained and further measures are taken (JNCC 2013b).*"

This has now been superseded by the latest Article 17 Habitats Directive Report 2019 which concluded that the population status of harbour porpoise is unknown, but that the future prospects are good partly due to the establishment of Special Areas of Conservation for this species in UK waters (JNCC, 2019).

Response

The Article 17 Habitats Directive Report 2019 was published on the 18 October 2019. The Greenlink Environmental Statement and marine licence application was submitted to NRW on the 24 June 2019, prior to this reports availability. These updated findings will be utilised in any future reports where relevant.

2.4 NRW TE Underwater Noise

NRW TE Underwater Noise Comment 1

The report assumes that noise from geophysical surveys should be considered as continuous rather than impulsive, and therefore suggests using the noise thresholds for continuous noise with which to assess impacts on marine mammals. We disagree with this assumption as geophysical surveys emit pulsed sound, resulting in impulsive noise. In fact, the assessment then goes on to use the peak sound pressure levels for impulsive noise in Table 3-3.

Response

This comment was discussed at a meeting between Intertek, Cefas, JNCC and NRW TE held by conference call on 06 March 2020, due to contradictory advice from the Statutory Nature Bodies. It was agreed that the noise from geophysical survey should be considered as impulsive noise and the modelling has been re-run to reflect this. The Greenlink Marine ES Technical Appendix D – Underwater Noise Modelling has been updated to reflect this and other comments raised by JNCC, NE and Cefas. It has been re-submitted with this response document.

The Greenlink Marine HRA has been updated to Revision F2 to account for the changes to the underwater noise modelling.

NRW TE Underwater Noise Comment 2

NMFS (2018) provide dual thresholds for marine mammal PTS and TTS thresholds, which include both peak sound pressure and sound exposure level for impulsive noise. Predicted noise levels should be compared against whichever metric results in the largest isopleth i.e. the most conservative estimate. The predicted impact ranges would be greater if the sound exposure levels for impulsive noise from NMFS (2018) had been correctly used.

Response

Since submission of the ES, Southall et al (2019) published new thresholds for the onset of PTS and TTS in marine mammals. This generally reflects the thresholds presented in NMFS (2018) but now represents the most recently published peer-reviewed criteria for assessment. The Marine ES Technical Appendix D – Underwater Noise Modelling has been updated to reflect this and other comments raised by JNCC, NE and Cefas.

NRW TE Underwater Noise Comment 3

We note also that the assessment uses a threshold for disturbance of 160 dB rms which is recommended by Southall (2007) as the noise threshold for impulsive sound (SPL). We recommend using the threshold of 140dB (SEL) as a proxy for disturbance for impulsive noise, since this is the threshold for TTS onset in high frequency cetaceans (NMFS 2018). We can therefore assume that disturbance would also occur at this sound level. This would result in a larger disturbance footprint than that predicted in this assessment. The information provided is unclear, and therefore it is difficult to assess the likely noise disturbance ranges from geophysical survey.

Likewise, the information on likely range of noise injury is unclear in the assessment provided. The applicant proposes following the JNCC guidelines for minimising injury from geophysical surveys - most geophysical surveys do not produce sound loud enough to cause injury to marine mammals beyond the mitigation zone recommended in the guidelines, so it is likely that mitigation will be possible. However, we cannot be confident on likely impact ranges until the modelling is clearer.

Response

Following consultation between Intertek, Cefas, JNCC and NRW TE the Greenlink Marine ES Technical Appendix D – Underwater Noise Modelling has been updated to reflect this and other comments raised by JNCC, NE and Cefas. It has been re-submitted with this response document. In addition, the Greenlink Marine HRA has been updated (Revision 2) to reflect the changes to the noise assessment.

The threshold for the onset of disturbance has been changed to 140 dB (SEL) for impulsive noise.

For geophysical survey, given the sensitivity of receptors in the region and the high source levels, a more complex assessment has been undertaken; using the BOUNCE & BELLHOP models, implemented through AcTUP v 2.2L (Maggi & Duncan 2006).

The assessment concludes that noise levels generated by the chirper (sub-bottom profiler) will have a negligible effect on marine mammals, with most values not exceeding the thresholds for injury. Cetaceans in the auditory group 'Very high frequency' e.g. harbour porpoise, may experience noise levels sufficient to cause TTS within 2m of the vessel, but will be able to flee the area in a few seconds to avoid injurious noise levels.

The largest zone of influence will be generated by the MBES. Very high frequency cetaceans may experience noise levels sufficient to cause TTS within 85m of the source level and disturbance within 756m.

For geophysical survey it is best practice to follow the JNCC guidelines for minimising the risk of injury and disturbance to marine mammals from seismic surveys' (JNCC 2017). Adherence to the guidelines constitutes best practice and will, in most cases, reduce the risk of deliberate injury to marine mammals to

negligible levels. Adherence to the guidelines has been incorporated into the Proposed Development as embedded mitigation EM20.

A Marine Mammal Mitigation Plan has been drafted and has been submitted with this report which outlines all mitigation measures to be implemented by GIL.

NRW TE Underwater Noise Comment 4

Table 17-1 EM 20 states that the JNCC guidelines for minimising the risk of injury and disturbance to marine mammals from seismic surveys (JNCC 2017) will be used but that they will "*Provide non-dedicated marine mammal observers to implement the JNCC guidelines within the Pembrokeshire Marine / Sir Benfro Forol SAC and West Wales Marine / Gorllewin Cymru Forol SAC*". JNCC guidelines should be followed across entire survey route to minimise risk of injury and disturbance to marine mammals. This does not only apply within the SACs, as the guidance is designed to protect European Protected Species wherever they may be.

Response

Noted. EM20 should read "*Provide non-dedicated marine mammal observers to implement the JNCC guidelines within UK waters*".

NRW TE Underwater Noise Comment 5

Assessment of UXO risk

We understand that the UXO survey has identified several potential UXO within the Castlemartin range, but that there is sufficient space to avoid them. Does this also apply to the high risk area in St George's Channel where there is a high risk of larger WW II sea mines? We strongly encourage the applicant to update the risk assessment when the proposed UXO survey work has been completed, and to discuss this further with NRW.

Response

Following consultation between Intertek, Cefas, JNCC and NRW TE the UXO assessment has been revisited and more likely scenarios have been modelled for two locations. Location 1 is representative of the range of environments (i.e. bathymetry and water depth) present along the Proposed Development and is close to both the Pembrokeshire Marine / Sir Benfro Forol Special Area of Conservation (SAC) and West Wales Marine / Gorllewin Cymru Forol SAC. Location 2 is within the Castlemartin Firing Range. As the bathymetry within and near to where the Proposed Development crosses the European Marine Sites gently varies, it is reasonable to assume that the extent of sound propagation throughout the remainder of the area will be similar to that modelled. The Castlemartin Firing Range location (location 2) was selected as the most likely place to find small UXO along the cable route. Whilst the bathymetry at this inshore location varies more significantly than at location 1, the modelled bathymetry still captures the range of environments well. At the locations, two underwater sound propagation models were run; one to represent summer; and one to represent winter.

Three sizes of UXO were modelled; 1.54kg, 50kg and 794kg. The Greenlink UXO desk-based assessment (1st Line Defence 2018) identified 3lb shells (1.54kg charges) as the most likely UXO to be encountered in the Castlemartin Firing Range, based on current and historical use of the area. This weight of charge is also representative of the low order detonation charges used to neutralise UXO greater than 50kg. A 50kg charge was modelled as representative of the likely maximum size charge that could be detonated directly without a neutralisation charge. The 794kg charge represents the worst case size of UXO that could be found within the Proposed Development - a World War Two (WW2) sea mine. This has been modelled principally to demonstrate the effect mitigation (in the form of a neutralisation charge) will have in reducing the zone of influence for injury. A UXO greater than 50kg will not be detonated directly without the mitigation of a neutralisation charge.

The Greenlink Marine ES Technical Appendix D – Underwater Noise Modelling has been updated to reflect this and other comments raised by JNCC, NE and Cefas. It has been re-submitted with this response document. In addition, the Greenlink Marine HRA has been updated (Revision F2) to reflect the changes to the noise assessment.

A Marine Mammal Mitigation Plan has been drafted and has been submitted with this report which outlines all mitigation measures to be implemented by GIL.

NRW TE Underwater Noise Comment 6

Potential for physical injury

We appreciate the difficulty of assessing the likely impact ranges when the exact nature and quantity of UXO is unknown. A worst-case scenario of a single 794kg explosive (equivalent to a sea mine) is used, however the potential for multiple detonations of smaller explosives, causing disturbance over a longer time period and wider geographical area, has not been considered.

The assessment is based on a worst-case scenario using the largest possible explosive potentially found in the area (794kg). However, we also note that Von Benda-Beckmann et al (2015) showed that a detonation of 263kg of explosive could result in blast trauma to the ears of harbour porpoise within 500m of the explosion. There is no assessment of the range of physical trauma potential from the 794kg explosive, but it is possible the proposed mitigation would not be sufficient to mitigate physical blast trauma.

Response

Please see response to NRW TE Underwater Noise Comment 5 above. The UXO scenarios being assessed have been revised following consultation between Intertek, Cefas, JNCC and NRW TE.

The Greenlink Marine ES Technical Appendix D – Underwater Noise Modelling has been updated to reflect this and other comments raised by JNCC, NE and Cefas. It has been re-submitted with this response document. In addition, the Greenlink

Marine HRA has been updated (Revision F2) to reflect the changes to the noise assessment.

A Marine Mammal Mitigation Plan has been drafted and has been submitted with this report which outlines all mitigation measures to be implemented by GIL.

NRW TE Underwater Noise Comment 7

The underwater noise modelling predicts extremely large impact ranges for auditory injury (permanent threshold shift – PTS) in marine mammals. We question the validity of the noise modelling, since the impact ranges seem large in comparison to other assessments of similarly sized UXO. As such, we encourage the applicant to reconsider their noise modelling.

The noise modelling presented predicts the following PTS ranges from source:

Harbour porpoise - 23km

Dolphin species including Bottlenose dolphin – 5.8km

Minke whale – 13km

Grey seals – 13km.

Response

The Greenlink Marine ES Technical Appendix D – Underwater Noise Modelling has been updated to reflect this and other comments raised by JNCC, NE and Cefas. It has been re-submitted with this response document. In addition, the Greenlink Marine HRA has been updated (Revision F2) to reflect the changes to the noise assessment.

The refinement of the noise modelling has reduced the predicted ranges for the onset of PTS significantly as follows:

Table 2-1 Zones of influence used in EIA process for impulsive sound – UXO detonation offshore (Location 1)

Species	1.54kg			50kg		
	PTS	TTS	Disturbance	PTS	TTS	Disturbance
Low frequency cetacean (LF)	3.0 km	4.4 km	24km	6.4 km	8.8 km	24km
High frequency cetacean (HF)	0.9 km	2.0 km	24km	2.1 km	4.5 km	24km
Very high frequency cetacean (VHF)	8.6 km	11.2 km	24km	13.4 km	16.2 km	24km
PCW (phocid carnivores in water)	3.2 km	4.8 km	24km	6.7 km	9.2 km	24km
OCW (other carnivores in water)	0.7 km	1.5 km	24km	2.8 km	3.4 km	24km
Fish	-	1 km	-	-	3.2 km	-
Sea turtles	1 km	-	-	3.2 km	-	-

Species	1.54kg			50kg		
	PTS	TTS	Disturbance	PTS	TTS	Disturbance
Zooplankton	-	-	-	-	-	-
Crustaceans	-	-	-	-	-	-

Table 2-2 Zones of influence used in EIA process for impulsive sound – UXO detonation Castlemartin Firing Range (Location 2)

Species	1.54kg			50kg		
	PTS	TTS	Disturbance	PTS	TTS	Disturbance
LF	4.2 km	5.8 km	40km	7.9 km	10.7 km	64km
HF	1.6 km	3.0 km	40km	4.2 km	5.9 km	64km
VHF	10.6 km	14.0 km	40km	17.1 km	20.6 km	64km
PCW	4.4 km	6.2 km	40km	8.4 km	11.2 km	64km
OCW	1.1 km	5.5 km	40km	3.8 km	5.2 km	64km
Fish	-	1.8 km	-	-	4.4 km	-
Sea turtles	1.8 km	-	-	4.4 km	-	-
Zooplankton	-	-	-	-	-	-
Crustaceans	-	-	-	-	-	-

A Marine Mammal Mitigation Plan has been drafted and has been submitted with this report which outlines all mitigation measures to be implemented by GIL.

NRW TE Underwater Noise Comment 8

The proposed mitigation in EM23 follows JNCC guidelines on minimising the risk of injury to marine mammals from explosives using a mitigation zone of 1km. It is not possible to effectively monitor beyond this distance, through either MMO or PAM, therefore animals outside of this zone would be vulnerable to injury. It is not possible to mitigate injury using the proposed mitigation at these ranges.

The ES itself acknowledges this, noting that "*Whilst this range [at which mitigation is effective] is not beyond the predicted range of effect for injury, it must be noted that the predicted ranges are based on highly conservative assumptions. No consideration has been given to the effects bathymetry, seabed sediments and temperature and salinity profiles will have on propagation; all which will attenuate sound, reducing the range of effect.*" This may be true, and further underlines the need for improved modelling to take account of the conditions at the site. We cannot make an assessment based purely on the assumption that the mitigation would probably work because the range of impact might be lower.

Response

The Greenlink Marine ES Technical Appendix D – Underwater Noise Modelling has been updated to reflect this and other comments raised by JNCC, NE and Cefas. It has been re-submitted with this response document. In addition, the Greenlink

Marine HRA has been updated (Revision F2) to reflect the changes to the noise assessment.

A Marine Mammal Mitigation Plan has been drafted and has been submitted with this report which outlines all mitigation measures to be implemented by GIL.

NRW TE Underwater Noise Comment 9

Disturbance

The assessment uses a disturbance noise threshold of 160 dB rms which is recommended by Southall (2007) as for impulsive sound (SPL). The predicted disturbance range from a single UXO detonation using this threshold is 54km. This seems large and we question the validity of the noise modelling.

However, in the absence of other information, even if we consider the TTS noise threshold for impulsive noise as a proxy for disturbance (see above justification) – the noise modelling predicts that a single UXO detonation could cause TTS and therefore disturbance to harbour porpoise over a distance of 27km.

The proposed mitigation to minimise injury does not mitigate noise disturbance. Put simply, the mitigation helps to ensure no animals are within the injury zone prior to detonation. It does nothing to minimise the sound level and thus does nothing to mitigate noise disturbance.

We recommend that additional noise modelling is undertaken to give more realistic impact zones. We also strongly recommend that noise abatement mitigation is used such as low-order detonation to reduce the noise at source, and/or noise abatement to attenuate the noise at close range to significantly reduce the noise injury and disturbance footprints. The timing of UXO detonation should also be considered and discussed further with NRW to potentially avoid sensitive periods for marine mammals.

Response

UXO detonation in the Proposed Development is deemed plausible and GIL is applying for consent to detonate one UXO. This is as a precaution rather than a known requirement.

Please see response to NRW TE Underwater Noise Comment 5 above. The UXO scenarios being assessed have been revised following consultation between Intertek, Cefas, JNCC and NRW TE. The threshold for the onset of disturbance has been changed to 140 dB (SEL).

The Greenlink Marine ES Technical Appendix D – Underwater Noise Modelling has been updated to reflect this and other comments raised by JNCC, NE and Cefas. It has been re-submitted with this response document. In addition, the Greenlink Marine HRA has been updated (Revision F2) to reflect the changes to the noise assessment.

The noise assessment concludes that a single UXO detonation of 50kg could cause TTS to harbour porpoise over a radius of 20.6km.

The most effective mitigation is to avoid the need for detonation completely. Mitigation embedded into the design of the project (embedded mitigation EM21) seeks to do this by establishing a decision-making strategy in which UXO detonation is the last option.

This decision-making strategy will be supported by a UXO survey, to be carried out by the Installation Contractor prior to installation. The survey typically covers an area of seabed 50m either side of the proposed centreline, although this may be refined by specific constraints. The survey will identify magnetic anomalies within the corridor which will be categorised depending on their attributes as likely or potential UXO. If anomalies cannot be avoided by routeing, a visual inspection of the anomaly will be made.

Visual inspections will be made by a suitably qualified survey contractor and Explosives Ordnance Detonation (EOD) expert. For each confirmed UXO a disposal strategy will be agreed. Detonation will only be considered as the last resort.

If UXO detonation is the only feasible option, the target could either be detonated in-situ (typically the preferred option for health and safety reasons); or relocated on the seabed and then detonated. Relocation to another area could occur when detonating in-situ would compromise the integrity of Greenlink, third party assets or the safety of the public, or where one UXO is relocated close to another to allow a single detonation to take place.

If a UXO detonation is required, the Greenlink Marine Mammal Mitigation Plan will be used as guidance considering the exact UXO size and location to confirm the real risk.

If a UXO is identified that is over 50kg in weight a low order detonation will be used to neutralise the UXO rather than detonate the full charge. In order to do this a small approximately 1.5kg charge will be attached to the UXO and detonated. No charges over 50kg will be detonated without the use of neutralisation.

This will be particularly effective in reducing the effects from large UXOs. For example, should a 794kg UXO be identified within the Proposed Development (the maximum charge size that, based on historical data, was used in the area), underwater noise modelling presented in Appendix A demonstrates that the detonation of this size charge is predicted to have the potential to cause injurious effects up to 16.6km from the detonation point. However, by using a neutralisation detonation (1.54kg), the zone of effect is significantly reduced to 6.2km from the detonation point.

A Marine Mammal Mitigation Plan has been drafted and has been submitted with this report which outlines all mitigation measures to be implemented by GIL. These include:

- Following the JNCC guidelines for guidelines for minimising the risk of injury to marine mammals from using explosives (JNCC 2010, or as updated) including:

- Establishing a default 1km mitigation zone for marine mammal observation, measured from the explosive source and with a circular coverage of 360 degrees.
- Providing two trained marine mammal observers to implement the guidelines outlined in Section 2.1 to 2.4 e.g. pre-detonation search of mitigation zone.
- Only commence explosive detonations during daylight hours and good visibility.
- Accurately determine the amount of explosive required for the operation, so that the amount is proportionate to the activity and not excessive.

- Activation of a Lofitech AS seal scarer, an acoustic deterrent device prior to UXO detonation.
- Use of Passive Acoustic Monitoring to support visual observations by a Marine Mammal Observer
- If the UXO identified is great than 10kg than a soft-start procedure will also be used in combination with the ADDs.

Consultation with NRW, JNCC and Cefas indicated that GIL should consider whether the use of bubble curtains would be appropriate mitigation if UXO detonation was required. Bubble curtains will not be proposed as suitable mitigation for Greenlink for the reasons outlined below.

A bubble curtain consists of walls of bubbles rising from a nozzle or porous pipe that is secured to the seabed and connected to an air compressor. Bubble curtains can consist of one or two hoses lined up parallel to each other. When utilised as a noise abatement technique, the principle is for the bubbles to change the physical condition of the water and the outward propagation of the acoustic/shock waves.

An online literature search undertaken by Intertek indicates limited information of how successfully bubble curtains have been utilised to mitigate noise and sound pressures released during UXO detonations. An assessment of the technical applicability of bubble curtains in the MMMP for UXO Clearance for the Moray East Offshore Windfarm (MOWL 2018) highlights that although commonly used within Europe to mitigate long lasting operations such as percussive piling, the high frequency pulse of noise and pressure released from a UXO detonation has not been shown to be sufficiently reduced by bubble curtain technology (Ordtek 208 in MOWL 2018).

For Greenlink it is considered that the proposed mitigation outlined in the MMMP, including the use of ADDs, low order detonation and 'soft-start' detonation along with MMO/PAM monitoring will be effective and sufficient in displacing marine mammals from the vicinity of any UXO detonations, without having to also implement bubble curtain technologies, which are not proven and may be of limited use. The deployment of bubble curtains is also expensive, due to the requirement for an additional vessel, and is also highly influenced by the prevailing metocean conditions at the UXO detonation site. Correspondence with JNCC (Sarah Canning

pers comm) has indicated that for recent marine licence applications to the Marine Management Organisation, where the use of bubble curtains has been proposed, the following environmental conditions have been applied:

- For UXO detonations larger than 50kg charge weight;
- Between 5 and 40m water depth;
- Where significant wave heights are less than 0.8m (Hmax);
- Where the maximum wind speed is less than 13m/s; and
- Where there is a deployment window of current speeds less than 1.5 m/s

A review of the baseline description provided in Chapter 6 – Physical Conditions and Marine Processes of the Greenlink Marine Environmental Statement – Wales (Document Ref: P1975_R4484_RevF1, June 2019) indicates that spring tidal currents reach peak speeds of 1.0m/s to 1.5m/s generally in a northwest-southeast direction past the Pembrokeshire coast. Currents during neap tides peak at around 0.75m/s (Barne et al 2005). The average wave height for the Proposed Development ranges from 1.75m to 2m at the UK/Irish median line increasing to between 2.5m to 4m at the Freshwater West landfall (Barne et al 2205). Data for South Wales Wave Resource Area (Fairley 2014) which although not located in the Proposed Development provides a good indication of the likely wave climate and indicates mean significant wave height of 1.63m.

Applying the outlined environmental conditions for bubble curtain deployment for UXO detonation for Greenlink may therefore be challenging and it is considered that the proposed mitigation outlined in the MMMP without the use of bubble curtains is sufficient.

The mitigation proposed is in line with Industry Best Practice and have proven successful for similar projects in UK waters e.g. NEMO Link, Moray East Offshore Wind Farm, Rampion Offshore Windfarm, Beatrice Offshore Windfarm.

NRW TE Underwater Noise Comment 10

From the information presented however, we cannot agree with the conclusion that the overall significance of UXO detonation will be minor / not significant. There is no attempt to quantify the number of animals that may be affected within the impact zone. The proposed mitigation would not be sufficient to mitigate injury at the ranges predicted, and will do nothing to mitigate disturbance.

There is an assumption that there would be only one UXO detonation, with the ES stating that Greenlink will apply for an EPS Licence for permission to detonate one 794kg charge, but there is no information to support this. In fact, the UXO Risk Assessment in Appendix L concludes that there is a risk from a range of munitions across the development area, including a high risk of sea mines.

Response

UXO detonation in the Proposed Development is deemed plausible, based on the historic use of the region, and GIL is applying for consent to detonate one UXO. This is as a precaution rather than a known requirement.

The UXO scenarios being assessed have been revised following consultation between Intertek, Cefas, JNCC and NRW TE. As outlined in previous responses above, no charges over 50kg will be detonated without the use of neutralisation. The Greenlink Marine ES Technical Appendix D – Underwater Noise Modelling has been updated to reflect this and other comments raised by JNCC, NE and Cefas. It has been re-submitted with this response document. In addition, the Greenlink Marine HRA has been updated (Revision F2) to reflect the changes to the noise assessment and an estimated has been made of the number of animals potentially affected in each European Marine Site. Additional mitigation has been proposed and is outlined in the Greenlink Marine Mammal Mitigation Plan, submitted with this report.

The Proposed Development crosses the Castlemartin Firing Range, and it is extremely likely that UXO's will be found here, making this a high-risk area. Due to this risk, a UXO survey was undertaken of the cable route within the Castlemartin Firing Range between KP0.00 and KP12.65.

The survey covered a corridor of 100 m centred on the route centre line. A total of 1109 magnetic anomalies were identified; 1058 of these were unclassified, while 51 correlated with four possible cables.

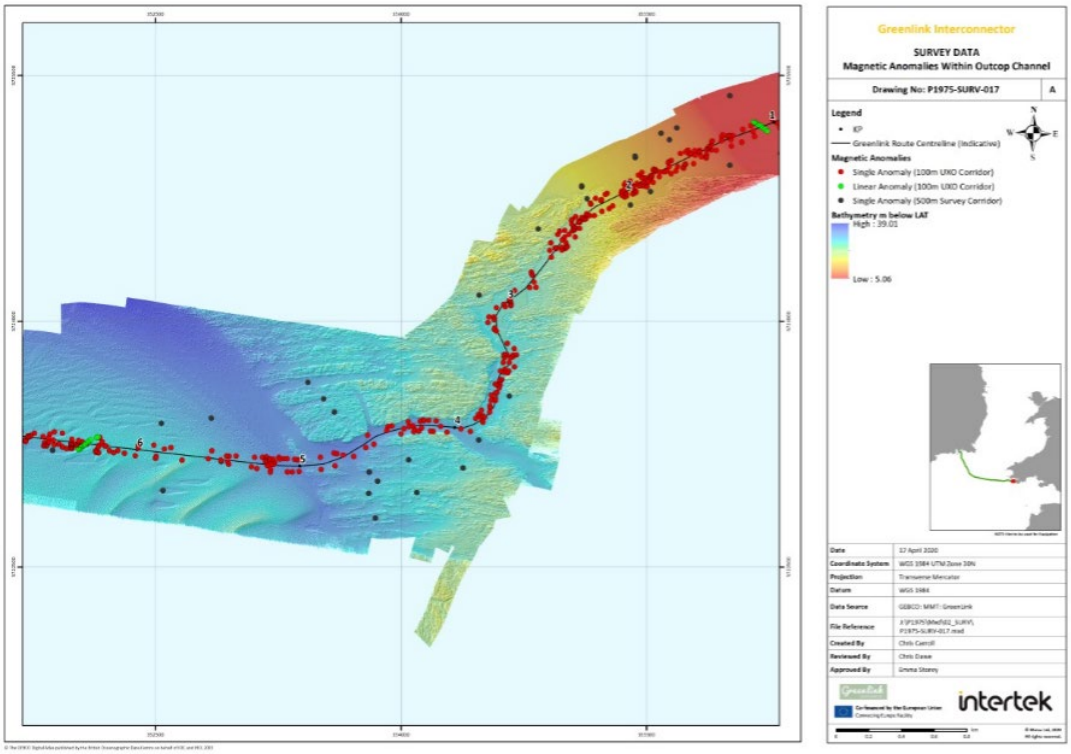
For the majority of the cable route through Castlemartin Firing Range, there is sufficient room to manoeuvre in the cable corridor such that magnetic anomalies can be avoided. However, between KP2 and KP5 the route passes through a sediment channel in outcropping Bedrock Reef. This has confined the route and therefore the capability to micro-route in this area is restricted. The objective of the UXO survey was therefore to confirm that a route though the sand channel was feasible and that the level of UXO within the sand channel (an unknown at that stage) would not hinder installation.

Positions of magnetic anomalies within this area are shown in Drawing P1975-SURV-017. Intertek undertook a high-level review of the positions of the magnetic anomalies and concluded that some were likely to be related to geological features, others were debris e.g. linear cable features, and that none were equivalent to the maximum size UXO (a WW2 seamine) identified as potentially occurring in the region. Further, there was sufficient space within the channel to micro-route around anomalies. As this is the highest risk area of the Proposed Development the assumption was made that offshore, where the route is not physically constrained micro-routeing to avoid anomalies will also be feasible.

As outlined in response to NRW TE Underwater Noise Comment 9 above the most effective mitigation is to avoid the need for detonation completely. However, GIL recognise that this is not always feasible and other significant infrastructure

projects have had to detonate UXO during the installation phase. Therefore, as a precaution GIL have applied to detonate one UXO.

The mitigation proposed is in line with Industry Best Practice and have proven successful for similar projects in UK waters e.g. NEMO Link, Moray East Offshore Wind Farm, Rampion Offshore Windfarm, Beatrice Offshore Windfarm.



2.5 NRW TE Water Framework Directive (WFD)

NRW TE WFD Comment 1

Milford Haven Inner WFD water body should also be included in the assessment as there may be effects on migratory fish species that utilise the estuary arising from EMFs. The assessment has correctly scoped in fish for further assessment, however this has been done for Pembrokeshire South water body; in the context of the WFD, fish are not an assessed biological quality element in coastal water bodies, we advise this is done for Milford Haven Inner water body instead.

Response

The effects of EMFs on fish were assessed in Section 8.6.5 of the ES. The results of this assessment concluded that while the effects of EMF will be present along the cable route for its entire lifespan, due to the mitigating factors of the cable being buried to a minimum depth of 0.6m, the bundling of cables further reducing the generation of EMF and the fact that the maximum distance at which any EMF effect is detectable is 2m with migratory fish species able to use the remainder of the water column the overall significance of the effect was assessed as negligible and not significant. As such, there will not be any significant adverse effects to migratory fish species transiting from the Milford Haven Inner WFD Water Body to within the vicinity of the Proposed Development. As the Proposed Development only routes through the Pembrokeshire South WFD Water Body and is located approximately 14.5km at its' nearest point (around the coast) from Milford Haven Inner, there is no pathway for effect for any other effects to the Milford Haven Inner WFD Water Body.

NRW TE WFD Comment 2

There are issues with the information provided within the scoping table. The information provided relating to the footprint of the proposed activity is confusing. There appears to be an error as to how the footprint of the activity in relation to the WFD water body has been calculated. Most of the cable route within Welsh waters falls outside of Pembrokeshire South water body. However, the entire cable route length within Welsh waters (73.9km) has been included in the calculations, which is incorrect. The actual figure would be far less than this given the limited offshore extent of the WFD water bodies. Additionally, with consideration of inbuilt mitigation, i.e. no works being undertaken between mean high water spring (MHWS) and the low water mark (LWM) because horizontal directional drilling (HDD) being used for the cable route in order to avoid impacting the intertidal area (and sand dune features), this figure would be further reduced.

Response

The figure of 73.9km was incorrect, the correct approximate distance the route passes through the Pembrokeshire South Water Body is 6.7km. The total area of the Proposed Development within the Pembrokeshire South Water Body is therefore

approximately 335 hectares rather than 3776 hectares; assuming a 500m wide application area for the 6.7km.

It is important to note that cable installation will not require the entire 500m width of the application area. Assuming a 15m wide area of disturbance, associated with the installation machinery, the total footprint on the seabed within the Pembrokeshire South Water Body is 10.05 hectares (6.7km x 15m).

NRW TE WFD Comment 3

It is initially stated that the "width of the corridor is nominally 500m although it does very in places" and that the exact area has been calculated in GIS, however there is no figure provided to support this. This section then goes on to state that the activity which will result in the largest footprint in relation to potential effects on the water body will be the installation of the submarine cable resulting in disturbance to seabed sediments. We would agree with this statement however the calculation of this impact in the context of the water body seems to be incorrect. Again, the entire cable length that falls within Welsh waters has been used (73.9km), which is erroneous. Clarification is required in relation to how the footprint has been calculated using the distance at which SSC arising from cable burial will fall within background levels (100m, as per the model outputs - the cable length has been multiplied by 100m to calculate the footprint). In this regard, we request clarification as to whether this would represent the true footprint - i.e. would the 100m represent a reasonable worst case under all tidal conditions and is it representative of elevated SSCs in all directions from the cable?

Response

The "exact figure has been calculated in GIS" statement refers to the (incorrect) figure of 3776 ha mentioned previously. This figure has now been corrected in response to NRW TE WFD Comment 3 above.

In addressing NRW TE Water Quality Comment 2 the SSC calculations were revisited and checked. It was concluded that the 100m does not represent the true footprint; within 100m suspended silt concentrations could still be significantly above natural background levels of SPM.

Water depth, dilution and dispersion will all play an important role in determining the extent of the sediment plume. At 500m distance from the centerline SSC will reduce to 112mg/l at a water depth of 10m and 22mg/l at 50m water depth. 500m is a more realistic footprint where changes in SSC will be detectable from cable burial under all tidal conditions and is representative of elevated SSCs in all directions from the location of cable burial.

NRW TE WFD Comment 4

Section 1 - Hydromorphology – Pembrokeshire South WFD water body is not at high status therefore the information in the first row of this section has been incorrectly applied.

Response

Noted, Pembrokeshire South WFD Water Body is at 'Good' status. Row 1 should state

"No – The Proposed Development will not impact the hydromorphology of and water body of 'High' status, as the route does not pass within or in the vicinity of any water bodies of 'High' status".

NRW TE WFD Comment 5

Section 2 – Biology – it does not appear that the footprint of cable installation activities within the Pembrokeshire South water body has been correctly calculated, therefore this will have an effect on the information provided in this section regarding the footprint of the activity. Notwithstanding this, we agree that Biology should be scoped in for further assessment.

Response

Section 2 – Biology should be updated to read as follows:

Row 1 – Yes - the footprint of the Proposed Development within the water body is 0.67km^2. An assessment of the effects on habitats is presented in the Greenlink Marine ES Wales, Chapter 7.

Row 2 – No – The footprint of the activity within the water body's area is 0.16%.

This has not changed the conclusion that Biology was scoped in for further assessment.

NRW TE WFD Comment 6

Section (4) – Fish – we agree that fish have been correctly scoped in for further assessment, however the water body in question should be Milford Haven Inner – see comments above.

Those receptors that have been scoped in for further assessment will require further consideration in the context of potential impacts to the WFD status and/or objectives arising from the Greenlink project (as has been done in NRW MLT's WFD Assessment). Signposting to chapters of the ES, without providing an assessment of the effects of the project in the context of the WFD will not suffice.

Response

See response to NRW TE WFD Comment 1 regarding Milford Haven Inner WFD Water Body.

2.6 *NRW TE Water Quality*

NRW TE Water Quality Comment 1

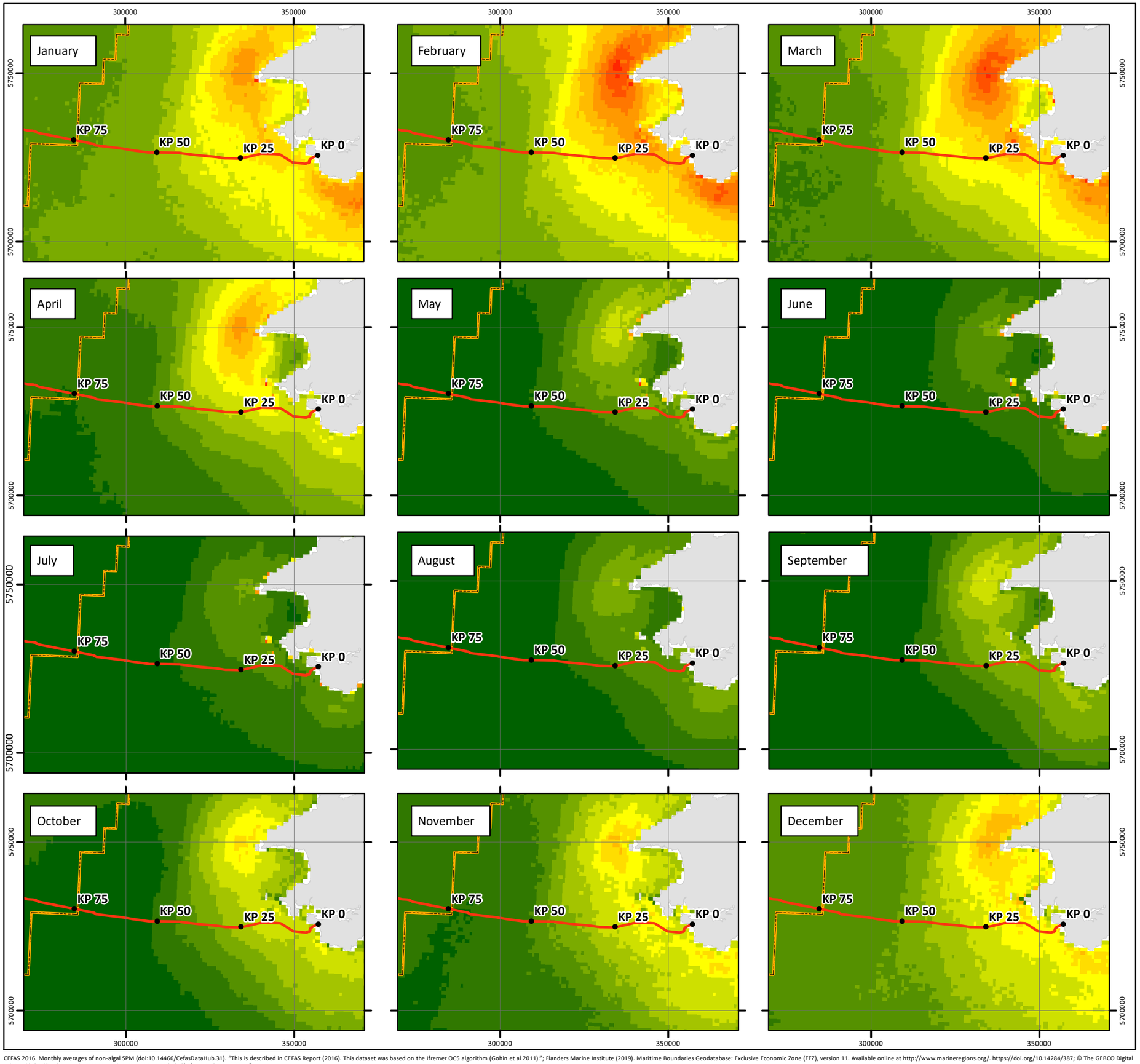
Referring to section 6.3.5.2. (pg 6-26) there is some confusion around the average Suspended Particle Matter (SPM) off the Pembrokeshire coast. First, the average is stated to be 5-10 mg/l for 1998 to 2015 and later the autumn/winter concentrations

are 5 mg/l; storm values are said to be in excess of 10 mg/l. These values suggest 10 mg/l cannot be an average. In section 6.6.3., these values are discussed further, but in terms of the "Proposed development". As the proposed development spans from Pembrokeshire to Ireland (or in the UKs case to the median line) it would be useful to understand the spatial and temporal variability more clearly. Having checked the reference provided, we note that the information provided is from satellite imagery and appears to be spatially averaged to "Western English Channel & Celtic Seas". The average from this huge area does not provide enough information nearshore or offshore to understand background concentrations and potential impacts; further background information should be sought. The applicant should be made aware that NRW hold SPM data within WFD waterbodies which they can access from data distribution.

Response

Intertek approached NRW data distribution for additional information to address this comment. Whilst the information provided did contain SPM data within WFB waterbodies there were no measurements for the coastal waterbodies. Measurements focused on riverine environments.

Intertek therefore revisited the Cefas (2016) data source and were able to obtain GIS layers showing the breakdown of SPM concentrations but at a higher resolution. Drawing P1975-SED-007 illustrates the seasonal variation in SPM concentrations along the Proposed Development (which refers to the Greenlink project from MHWS to the UK median line). Background SPM concentrations are higher over winter months, and can exceed 10mg/l during January, February and March in inshore waters i.e. between KP0 and approximately KP20. From May to September as wave conditions calm, SPM concentrations fall to 5mg/l or less. Further offshore around the UK median line SPM concentrations are consistently lower than inshore, but still show seasonal fluctuations.



GREENLINK INTERCONNECTOR

SEABED SEDIMENTS
Suspended Particulate Matter
Monthly Average 1998-2015

Drawing No: P1975-SED-007 | **A**

Legend

- KP
- Greenlink Route Centreline
- EEZ Boundary

Suspended Particulate Matter
mg/l

- <1
- 1.001 - 2
- 2.001 - 3
- 3.001 - 4
- 4.001 - 5
- 5.001 - 6
- 6.001 - 7
- 7.001 - 8
- 8.001 - 9
- 9.001 - 10
- 10.001 - 11
- 11.001 - 12
- >12

NOTE: Not to be used for Navigation

Date	16 April 2020
Coordinate System	WGS 1984 UTM Zone 30N
Projection	Transverse Mercator
Datum	WGS 1984
Data Source	CEFAS; MarineRegions; GEBCO; ESRI;
File Reference	J:\P1975\Mxd\05_SED\ P1975-SED-007.mxd
Created By	Chris Dawe
Reviewed By	Emma Langley
Approved By	Emma Storey

Co-financed by the European Union Connecting Europe Facility

0 10 20 30 40 km

CEFAS 2016. Monthly averages of non-algal SPM (doi:10.14466/CefasDataHub.31). "This is described in CEFAS Report (2016). This dataset was based on the Ifremer OC5 algorithm (Gohin et al 2011)."; Flanders Marine Institute (2019). Maritime Boundaries Geodatabase: Exclusive Economic Zone (EEZ), version 11. Available online at http://www.marineregions.org/. https://doi.org/10.14284/387; © The GEBCO Digital Atlas published by the British Oceanographic Data Centre on behalf of IOC and IHO, 2003; © ESRI

NRW TE Water Quality Comment 2

Water quality is said to only be impacted over 100 m around the cable burial corridor (Table 6-5). Further in the document, discussion indicates that calculations indicate SPM will *"reach 300 mg/l within 100m of the trench, but will rapidly dissipate with distance and time"*; we request that the applicant provides their calculations and assumptions in order to understand where these values originate from. The text further states that silt will travel 7.6 km in the 14 hours it is suspended for under a constant current of 1 m/s. There are a few issues with this approach: a) dilution and dispersion have not been taken into account (the tides may, in fact, disperse the SSC quicker than 14 hours) and b) the tidal current does not vary which means currents may in fact deposit sediment more quickly (when the flow reduces) or resuspend it if they become energetic enough. However, it is likely 14 hours is a conservative estimate for elevated SSC given that dispersion has not been accounted for; the event is a short timescale event, over a relatively small area and not likely to have a discernible impact.

Response

The calculation used is intended to give an indication of the potential worst-case impact area. As such, it does not consider second order processes such as plume dispersal or particle aggregation.

The calculation is based on theoretical settling rates for particles in different size fractions, with an assumed injection height into the water column. The use of the maximum currents is intended to give the worst-case distance of travel. Dispersion is not considered, as it is assumed that there will be overlap of plumes arising from adjacent sections. It is acknowledged that this may not fully reflect boundaries between different sediment types and that, for fine particles, vertical dispersion will become increasingly important as turbulence in the water column increases.

Where tidal currents (or other near bottom disturbances such as those arising from storms) are sufficiently energetic to resuspend bottom sediment this will be a large area process resulting in a general increase in turbidity in the water column.

In responding to this comment Intertek have reviewed the assumptions that the calculation the statement SPM "will reach 300mg/l within 100m of the trench" was based on assumptions for a plough technique rather than a jetting technique which could generate higher SPM concentrations. Also, we believe that there was an error in the calculation which had not previously been picked up. The calculations have therefore been revisited.

SPM concentrations (related to suspended silt) are predicted to increase to 2813mg/l within 100m of the trench from jetting based on the following assumptions:

- Trench width is 0.75m
- Trench depth is 1.5m (worst case burial depth)

- The sediment fraction released into the water column by jetting has been assumed to be 20%, with 80% being returned to the trench. This sediment fraction is generally accepted for jetting (Jiang, Fissel and Borg 2008; RPS 2015; Epsilon Associates 2018; Jacobs 2018).
- Maximum fraction of sand is 12%. Particle size distribution taken from grab samples along the Proposed Development show that at Stations 24 and 35 the maximum percentage of sand in sediments is 12%.

This is a highly conservative estimate as it does not take into consideration the water depth at any given location which will further dilute the plume. For example, at 10m water depth the value reduces to 562mg/l and at 50m water depth it reduces to 112mg/l within 100m of the centreline. Dilution with distance will also play a role so that at 500m from the centreline (assuming an omni-directional plume following the tide) the concentration would be 562mg/l assuming 2m water depth dilution, 112mg/l at a water depth of 10m and 22mg/l at 50m water depth.

With respect to the distance silt will travel please refer to response to NRW TE Coastal Processes Comment 1 which further discusses the sediment plume and the quantity of silt that could become suspended in the water column because of cable burial activities.

Sediments within the Proposed Development are not contaminated and therefore the changes in water quality are visual changes rather than toxic. Particle size data acquired along the Proposed Development indicates the proportion of fines in sediments is small (range 0% - 12%, average 5%) i.e. the fraction which could stay suspended for longer. Calculations based on particle settling rates indicate sand and gravel will settle out of suspension quickly. Therefore, the area affected by the change in water will be relatively small. Changes will be transient in any one location as the cable installation progresses along the route.

In conclusion, the creation of the sediment plume is localised in nature and effects are temporary. There will be no medium or long-term change in water quality.

2.7 *NRW TE Bathing Waters*

NRW TE Bathing Waters Comment 1

We agree with the recognition of Freshwater West designated Bathing Water (BW). The applicant has also missed Freshwater West Bathing Water from Section 4: WFD Protected areas. Freshwater West is < 500 m from the development. Freshwater West may be subject to a) SSC changes (during commissioning and decommissioning – temporary elevations – and during operation – potential permanent alterations nearshore as a result of the HHD exit). Elevated suspended sediment concentrations arising from construction phase activities have the potential to impact upon the bathing water and therefore must be adequately considered in the ES and the WFD Assessment.

It should be noted that the bathing water is currently achieving “Excellent” status.

The bathing season runs from 15 May to 30th September, and West Angle and Freshwater West are designated bathing waters. Any activity on the proposed development must not affect bathing water quality.

Bacterial thresholds are set out in the 2006 Bathing Waters Directive. The project will be constructed offshore from the bathing waters and would need to be able demonstrate that their activities will not have an impact; this includes the installation of any cable running ashore (e.g. bathers safety, water quality during the Bathing Season).

We do not consider that the project has the potential to introduce bacteria to the environment, but disturbance of the seabed and beach can release bacteria stored in sediments.

The risk is likely to be low, but we advise that the developer demonstrates how this has been considered and discounted with a reasoning. In absence of this information, we advise that mitigation around the Bathing Water could include not working during the Bathing Season (15th May to 30th September) to avoid disturbance to bathers and potential water quality issues at the Bathing Water.

Response

It is proposed that the shore-crossing will be accomplished by HDD, as this is the best environmental solution at the site. At the time of ES submission there was some uncertainty around a specific fractured rock sequence identified in the geotechnical boreholes which led to GIL not being able to confidently rule out intertidal trenching. Further engineering studies have confirmed that HDD is feasible. In addition, the Installation Contractor tenders have all indicated that the distance involved is feasible. GIL doubt that intertidal trenching will be required; however, until the final selected Installation Contractor undertakes their own engineering feasibility studies it cannot categorically be ruled out.

With respect to the potential for cable burial to release bacteria stored in sediments, Intertek has undertaken bathing waters impacts assessments across the UK and has found compelling evidence for bacterial survival in only one case. This case was characterised by muddy sediments, exposed to warming in summer (in the intertidal zone) and subject to a regular source of bacterial contamination from a stream receiving CSO discharges. Intertek has not found any significant evidence of sand sized sediments as reservoirs of bacteria in other UK studies. Intertek works closely with Professor David Kay of Aberystwyth University, a leading academic in the field of bathing water quality and bacterial contamination. Professor Kay provided much of the research for the World Health Organization (WHO) position on bacteria and bathing waters contamination, with the WHO recommended standards being the basis of the 2006 Bathing Waters Directive standards. Professor Kay is a recognised world expert in these matters. Professor Kay's opinion on the risk from sediments is as follows:

"My experience, based on sediment sampling in the Severn system and off Lancashire/Cumbria and Yorkshire is that:

(i) Coastal sands sized marine sediments generally have low faecal indicator organism (FIO) concentrations and I have not seen evidence that sand entrainment as a potential contamination source in such environments:

(ii) Fine sediments, particularly cohesive muds, have high FIO concentrations 10^3-10^5 /100g and may even support re-growth in the intertidal zone where the sediments are warmed as they are uncovered in lower tidal conditions.

In the Severn system, an elevation in the marine sediment's FIO concentrations were observed around the river mouths or in dredged shipping channels which are also associated with deposition of silt and mud and it is likely that the FIOs are associated with this material where they find both attachment sites and a carbon source which could lengthen survival in the dark sedimentary environment. If the sands in question do not have associated outfall disposal sites and/or patches (or lenses) of mud and fine sediment I would not expect problems of FIO mobilisation from the sands themselves. These observations derive from multiple studies but they were not specifically designed to define the mathematical relationship between sediment particle size and faecal indicator organism concentration' (Kay, pers. comm., Nov 2016)"

The key elements are therefore a habitat of cohesive muds and a suitable carbon source as a food medium where regrowth is suspected. A review of the sediment in the local area would suggest that the area is dominated by some sands and bedrock, leading to a sandy beach but not clay sized sediments and hence cohesive muds. Indeed, there is no indication of muds in the intertidal zone, where, in other places, evidence has been found to suggest that intertidal muds may be significant sources of bacteria. The muddy sand sediment found close to shore is considered unlikely to be a suitable habitat to act as a potential source of bacteria. The bed and local sediments may well be transitory storage for bacteria, but regrowth in these sediment sizes has not been demonstrated.

Taking into account the key concerns of the ES, as set out in the Bathing Waters profile for Freshwater West, which are diffuse sources, urban run-off and stormwater, the lack of sediment suitable for the long term survival and possible regrowth of bacteria would suggest that there is unlikely to be a significant risk from disturbed sand.

As outlined in response to comment NRW TE Water Quality Comment 2 elevated levels of suspended sediments can be expected, associated with cable burial and potentially the final part of the HDD works where the ducts are excavated to allow cable pull-in. The elevation will be restricted to the period during which the works are undertaken with no medium or long-term effects.

Sediments are not contaminated within the Proposed Development and therefore effects will be aesthetic rather than toxicological.

During any engineering works likely to disturb sediments, it would be sensible to provide warnings at the bathing waters prior to works. The 2006 Bathing Waters Directive places a duty upon beach managers to provide warnings to bathers of poor

water quality. Early warnings, provided prior to the onset of poorer water quality, allows the discounting of any statutory samples which fail the Directive standards (up to a limit of 15% of samples across the 4 year rolling sampling period) during the period of the warning. Such discounting protects the compliance status of the bathing water, and the early warning ensure bathers are aware of poorer water quality, thus delivering the ultimate aim of the Directive, the protection of human health. Past the HDD exit below the low water mark, the released sediment from trenching will have a limited, transient impact on aesthetics, and so it would seem appropriate to provide warnings to users during engineering works. This would seem a reasonable and sufficient mitigation for any potential effects.

A 500m exclusion zone will be established around project vessels during installation. Public notices will be placed at beaches and notice will be given to sea users in the area via Notices to Mariners, Kingfisher Bulletins, NAVTEX, and NAVAREA warnings. Therefore, the proposed works should not pose a significant risk to bathers safety.

The mitigation measures to be implemented by GIL are outlined in Chapter 17 of the ES, and include:

- GIL to liaise with Welsh Surfing Federation 12-months prior to installation works at Freshwater West to ensure nearshore works scheduling is optimised to avoid National Surf Championships if possible.
- No works to be undertaken on beach at Freshwater West during July and August (inclusive).

Based on the justifications above, GIL do not feel additional mitigation will be required.

2.8 NRW TE Welsh National Marine Plan

NRW TE Welsh National Marine Plan Comment 1

Comments on Figure A-1 Compliance with Draft Welsh National Marine Plan:

ECON_01 - It would be useful to have a signpost to the evidence which supports the statement that "Greenlink will provide jobs and tax revenues to the Welsh economy".

SOC_02 - It would be useful to have a signpost to the evidence which supports the statement that "Greenlink will contribute to the well-being of coastal communities by reducing the cost of energy supply."

SOC_12 - The applicant has marked this policy (Support for wider resilience to climate change: Relevant public authorities should support opportunities that contribute towards climate change adaptation and/or mitigation.) as not being applicable to the application, presumably because it places a duty on the decision maker rather than the applicant. In our view, it is still beneficial for applicants to highlight where their proposal complies with this type of policy as it will be a useful signpost for decision makers.

In this instance, the evidence provided in support of policies SOC_10 and 11 is actually more relevant for policy SOC_12.

Response

ECON_01 - The privately financed €400/£350 million project represents valuable investment in Ireland and Wales and will lead to direct jobs. During construction there will be around 250 direct jobs on each side and further knock-on economic benefits in each region. Once the project is operational there are expected to be around 5 permanent jobs in Pembrokeshire and 20 in Ireland, with many of these in the Great Island area of Co.Wexford.

GIL are committed to maximising the use of locally based contractors and personnel during the construction and operational phases of the projects. The significant amount of work due to take place at the landfall, cable and converter station sites will require skills and experience available from contractors in the area, providing services such as transportation, materials (e.g. concrete), electrical connection, hospitality and catering, cleaning and security, fencing, waste disposal etc.

SOC_02 - Ofgem's August 2015 document 'Cap and floor regime: Update on our Initial Project Assessment of the Greenlink interconnector' indicates that Greenlink will generate £183 million in GB consumer benefit (NPV 2013/14 prices, base year 2019) which is equivalent to £199 million (NPV 2018/19 prices, base year 2022. These figures relate to the 25-year Cap and Floor period.

SOC_12 – This policy was marked as not applicable as it places the duty on the decision maker not the applicant but GIL take note of the comment and provide the following commentary on how Greenlink supports the challenge of tackling climate change.

Greenlink successfully qualified as a European Commission Project of Common Interest (PCI) in November 2015.

European Commission (2020) state that "*PCIs are key cross border infrastructure projects that link the energy systems of EU countries. They are intended to help the EU achieve its energy policy and climate objectives: affordable, secure and sustainable energy for all citizens, and the long-term decarbonisation of the economy in accordance with the Paris Agreement.*" *To become a PCI, "the project must have a significant impact on energy markets and market integration in at least two EU countries, boost competition on energy markets and help the EU's energy security by diversifying sources as well as contribute to the EU's climate and energy goals by integrating renewables.*"

The 'Energy Union' launched by the European Commission in February 2015, and endorsed by Member States in October 2015, is driving a fundamental transition towards more innovative ways to produce, transport and consume energy, and to address different approaches to design, implement and, where needed, enforce energy policy. A range of actions will be required to make this happen, including improvements to the physical interconnectedness of energy grids (both gas and electricity) to meet a 10% interconnection target by 2020 and to possibly reach 15%

by 2030. As of November 2017, 17 EU Member States have reached the 10% target, with a further 7 on the path to reach the target by 2020. The UK's expected level of interconnection in 2020 is 8% (European Commission 2017).

Its status as a European PCI means that Greenlink is of strategic importance to Ireland and the UK; is in line with EU policy; aligns with Planning Policy Wales; and supports the UK's commitment to the EU Renewable Energy Directive and the UK target of 15% of energy from renewables by 2020. It also means it is considered imperative infrastructure necessary for Europe to meet its climate objectives; a beneficial consequence of primary importance to the environment. The TEN-E Regulation recognises this importance where it states that:

1. This Regulation lays down rules for the timely development and interoperability of trans-European energy networks in order to achieve the energy policy objectives of the Treaty on the Functioning of the European Union (TFEU) to ensure the functioning of the internal energy market and security of supply in the Union, to promote energy efficiency and energy saving and the development of new and renewable forms of energy, and to promote the interconnection of energy networks; and
2. It is essential for the development of trans-European networks and their effective interoperability to ensure operational coordination between electricity transmission system operators (TSOs).

NRW TE Welsh National Marine Plan Comment 2

In addition to the above comments, the table below outlines a number of plan policies that we consider are either not being complied with based on the information provided in the ES for the application, or that we currently do not have sufficient information to be able to conclude that the policy will be complied with.

Response

The responses to clarification requests from NRW TE within this report address the areas highlighted by the table provided in the NRW TE Welsh National Marine Plan comment 2. The table has been replicated below and references to the appropriate clarification response in this document which address the policy added in red. GIL believe that sufficient information has been provided to ensure compliance with the Welsh National Marine Plan.

Topic	Major issues	WNMP compliance	Response providing clarification
Bathing Waters	Not assessed impact on Fresh West BW	Compliance with policy ENV_06 (Air and Water Quality) not evidenced for this area	NRW TE Bathing Waters Comment 1
Marine Mammals	Underwater Noise Modelling shows disproportionately large impact ranges – possibly incorrect.	Potential conflict with policy ENV_02 (protected areas) and ENV_05 (underwater noise)	Responses to NRW TE Underwater Noise Comments 1, 5, 7 and 9 and NRW TE Marine

Topic	Major issues	WNMP compliance	Response providing clarification
	· It is not possible to mitigate injury or disturbance at the ranges predicted. · There is no information to support the assumption of only one UXO · We cannot rule out adverse effect on several SACs.		Mammals Comments 1 and 2 and JNCC Comment 8 address these concerns. In addition, the Greenlink Marine ES Technical Appendix D – Underwater Noise Modelling has been updated to reflect this and other comments raised by JNCC, NE and Cefas. It has been re-submitted with this response document. The Greenlink Marine HRA has also been updated (Revision F2) to reflect the changes to the noise assessment. A Marine Mammal Mitigation Plan has been drafted and has been submitted with this report which outlines all mitigation measures to be implemented by GIL.
Marine Water & Sediment Quality	Need further info on suspended sediment modelling.		NRW TE Coastal Processes Comment 1 NRW TE Bathing Waters Comment 1
Coastal Processes	No key issues that would affect the determination of the Marine Licence have been identified.		No clarification required
	Need clarification on suspended sediments and sediment stability under cable/rock revetment	Compliance with policy SOC_09 (Coastal Processes) not evidenced unless this clarification is provided and considered	NRW TE Coastal Processes Comments 1, 2 and 3
Marine and Coastal Ecology	Do not consider rock revetment colonisation is mitigation. There is significant loss of Annex I habitat and should go to derogation – rock revetment colonisation is compensation	Conflict with policy ENV_02	NRW TE Benthic Habitats Comment 5 GIL/Intertek have undertaken further consultation with NRW TE and accept that the deposit of external cable protection (if required) will constitute a loss of habitat for the Primary Feature Reef i.e. the deposit cannot be considered mitigation to reduce the significance of the effect. As there is no mitigation that can be provided to reduce the significance of the effect, it is accepted that the

Topic	Major issues	WNMP compliance	Response providing clarification
			significance assessment of minor for the pressure 'physical change (to another seabed type)' is not appropriate and that the EIA should conclude a Significant Effect. Considering the above, the HRA has been updated to conclude at Stage 2 that it cannot be ruled out that if external cable protection is deposited on the Primary Feature Reef the Proposed Development will not have a significant adverse effect on the integrity of the Pembrokeshire Marine SAC. Additional information has been provided in the HRA to support NRWs assessment for Stage 3 and Stage 4 in the HRA process. A compensation plan has also been prepared and submitted with the Greenlink Marine HRA.
WFD	Potential impacts on Freshwater West designated bathing water have not been included under Protected Area provisions within the WFD Scoping Report.	Compliance with policy ENV_06 (Air and Water Quality) not evidenced for this area	NRW TE Bathing Waters Comment 1
	It appears that the area of the proposed development that falls within Pembrokeshire South waterbody has been incorrectly calculated.	Compliance with policy ENV_06 (Air and Water Quality) not evidenced until WFD compliance assessment has been correctly carried out	NRW TE WFD Comment 5
	Some of the key information provided within the screening table has been incorrectly applied.		NRW TE WFD Comments 5 and 6
	A WFD Assessment is now required for those receptors scoped in for further assessment. Signposting to chapters of the ES will not suffice – an assessment must be made as to whether the proposed project may impact upon WFD status and/or objectives.		NRW TE WFD Comments 5 and 6

Topic	Major issues	WNMP compliance	Response providing clarification
	Milford Haven Inner water body is not included in the assessment, but should be, given the potential for effects to migratory fish arising from EMFs.	Compliance with policy ENV_01 (Resilient Marine Ecosystems) and ENV_07 (Fish Species and Habitats) not evidenced for this area	NRW TE WFD Comment 1
Fish and Fisheries	None – minor issue with potential EMF issues on crab		No clarification required
Ornithology	None		No clarification required

2.9 MCA

MCA Comment 1

A study should be undertaken to establish the electromagnetic deviation, affecting ship compasses and other navigating systems, of the high voltage cable route to the satisfaction of the MCA. On receipt of the study, the MCA reserves the right to request a deviation survey of the cable route post installation.

Response

GIL have requested WSP to provide calculations indicating the likely values of compass deviation due to the magnetic fields generated by the Greenlink cables. WSP was appointed by GIL in 2018 as client engineer, responsible for engineering design and technical specifications on the project.

The magnetic field properties have been calculated using Cymcap®. The Technical Note (dated 25 March 2020) is attached as Appendix A and the findings are summarised below:

- WSP have assessed the compass deviation for the following cases:
  - Water depth: 10, 50m and 100m
  - Angle between cable route and earth's magnetic field: 0°, 15°, 30°, 60° and 90°
  - The minimum depth at which the compass deviation would exceed 3° and 5°.
- As a whole the Proposed Development runs approximately 16° north of west and the magnetic deviation, between 'true' north and magnetic north is approximately 3°, so the cable route is at an angle of approximately 13° to the earth's magnetic field.
- For bundled cables installed 1.5m below the seabed, the calculated compass deviation is less than 0.2°, at a water depth of 10m, regardless of the angle between the cable route and magnetic north.
  - The maximum compass deviation is less than that stipulated by the MCA for water depths greater than 1.3m.

- At the landfall, where the cables will be installed in ducts using Horizontal Directional Drilling (HDD) technique, the spacing between cables will increase considerably, resulting in significant increases in the strength of the magnetic field (typically up to 15µT), and therefore the compass deviation, could exceed 10°.
- However, this will only apply to, typically, the last 300-400m at each end of the offshore cable route prior to it entering the HDD duct to make the shore crossing.

The MCA stated in the Greenlink Scoping Opinion that "A three-degree deviation for 95% of the cable route is acceptable. For the remaining 5% of the route no more than five degrees [should] be attained." Although the calculations indicate compass deviation could exceed five degrees the length affected is 0.5% of the cable route in Welsh waters.

- The potential exit point for the HDD (i.e. the point at which the cables will enter) has been defined as between mean low water springs and 968m from mean high water springs. The bathymetry in this area gently slopes to 8m water depth. We would not expect larger vessels to be this close to the landfall, as they are not at ports, and any smaller vessels would probably navigate by sight or using GPS Navigation Systems this close to shore, rather than relying upon ship's magnetic compass bearings. GIL therefore consider that this estimated localised compass deviation will not have a significant effect on navigation.

2.10 JNCC

JNCC Comment 1

Noise Assessment of Geophysical Survey

Page 8 of the Underwater Sound Modelling (Appendix D) states 'Received sound by marine mammals from the geophysical survey are considered as near-continuous, rather than impulsive' and subsequently, potential impacts from these surveys have been assessed against thresholds defined for continuous noise. However, the pulses produced by sub-bottom profilers like boomers and sparkers are considered impulsive. In addition, the NMFS 2018/Southall 2019 injury thresholds consist of a dual criteria for impulsive sounds (SEL frequency weighted and SPL unweighted) and for non-impulsive SEL weighted only. These were not presented in the appendix on sound modelling. Based on our experience however, we would not, expect any new modelling to change the overall conclusion in the ES regarding potential impacts from geophysical surveys associated with the proposed project. Following the JNCC mitigation guidelines during these surveys should ensure that the risk of injury to cetaceans is negligible.

Response

This comment was discussed at a meeting between Intertek, Cefas, JNCC and NRW TE held by conference call on 06 March 2020, due to contradictory advice from the Statutory Nature Conservation Bodies. It was agreed that the noise from

geophysical survey should be considered as impulsive noise and the modelling has been re-run to reflect this.

The Greenlink Marine ES Technical Appendix D – Underwater Noise Modelling has been updated to reflect this and other comments raised by JNCC, NE and Cefas. It has been re-submitted with this response document.

The Greenlink Marine HRA has been updated to Revision F2 to account for the changes to the underwater noise modelling.

JNCC Comment 2

We note that the applicant used the NMFS (2005) disturbance thresholds to estimate the disturbance ranges potentially resulting from the UXO clearance and the geophysical surveys. JNCC favours the use of fixed ranges in assessments based on empirical evidence as opposed to disturbance ranges estimated from noise modelling.

Response

This comment was discussed at a meeting between Intertek, Cefas, JNCC and NRW TE held by conference call on 06 March 2020. It was agreed that as modelling had been provided in the application this should be revised based on more realistic scenarios for UXO detonation, rather than reverting to the use of fixed ranges as favoured by JNCC.

The Greenlink Marine ES Technical Appendix D – Underwater Noise Modelling has been updated to reflect the new modelling and has been re-submitted with this response document.

The Greenlink Marine HRA has been updated to Revision F2 to account for the changes to the underwater noise modelling.

JNCC Comment 3

Potential alternatives should therefore be explored in the assessment, including undertaking detonation using noise abatement systems (e.g. bubble curtains) and the potential to use low-order detonations instead of high order, as there is emergent evidence to show that in most cases of unexploded ordnance this method is a viable alternative for clearance. An option to undertake this activity in the winter months when harbour porpoise densities are lower should also be explored.

Response

Please see response to NRW TE Underwater Noise Comment 9 which provides a detailed explanation of the mitigation considered and proposed for UXO detonation. In addition, a Marine Mammal Mitigation Plan has been drafted and submitted with this response document.

If UXO detonation is required, GIL is not currently proposing a seasonal restriction i.e. only undertake the activity in the winter months. Although it is acknowledged harbour porpoise densities may be lower during winter, animals are present all year round. The underwater noise modelling also indicates that the zone of influence

for injurious effects is larger in winter than summer due to the water temperature. During winter weather conditions may also prevent visual observations being as successful as during summer, although this would be supported by the use of PAM.

JNCC Comment 4

For high resolution geophysical surveys such as those using chirps and boomers we advise a range of 5km, which mean that alone, these surveys are unlikely to exceed the daily or seasonal thresholds but cumulatively with other sources of noise could affect the SAC and therefore will need assessing. A couple of hypothetical scenarios could be explored to identify potential issues in the future arising from cumulative effects.

Response

In response to JNCC comment 1 the geophysical survey has been re-modelled as an impulsive sound rather than a continuous sound as previously assessed. Modelling indicates that in general noise levels generated by the chirper (sub-bottom profiler) will have a negligible effect on marine mammals, with most values not exceeding the thresholds for injury. Cetaceans in the auditory group very high frequency (VHF) cetaceans such as harbour porpoise, may experience noise levels sufficient to cause TTS within 2m of the vessel, but will be able to flee the area in a few seconds to avoid injurious noise levels.

The largest zone of influence will be generated by the multi-beam echosounder. VHF cetaceans may experience noise levels sufficient to cause TTS within 85m of the source level and disturbance within 756m.

For geophysical survey it is best practice to follow the JNCC guidelines for minimising the risk of injury and disturbance to marine mammals from seismic surveys' (JNCC 2017). Adherence to the guidelines constitutes best practice and will, in most cases, reduce the risk of deliberate injury to marine mammals to negligible levels. Adherence to the guidelines has been incorporated into the Proposed Development as embedded mitigation EM20.

Alone the surveys will not exceed the daily or seasonal thresholds for significant effects on the West Wales Marine SAC.

Intertek disagree with exploring hypothetical scenarios to identify potential issues in the future arising from cumulative effects. EIA best practice is to assess the effect of a project with other known and reasonably foreseeable projects and plans. There is no guidance to suggest that an applicant is required to assess hypothetical scenarios and therefore GIL should not be required to stray from best practice.

The Greenlink HRA has concluded (based on the revised modelling) that the Proposed Development will not have a significant effect on a European Site on its own. No projects have been identified that have sufficient information available in the public domain to determine if the Proposed Development will act in combination with another project to have a cumulative effect, particularly as the surveys

discussed for Greenlink will occur over the next eight years[1]. Therefore, we do not see the benefit of running hypothetical scenarios for situations that may not arise. We believe it would be up to the next developer to determine if their proposed project has the potential to interact with Greenlink.

JNCC Comment 5

With regard CO3, supporting habitats and processes relating to the seabed, water column and harbour porpoise prey, and physical impacts to the seabed could cause a likely significant effect on these. Activities associated with this proposal (e.g. seabed clearance, pre-sweeping, dredging, excavation and rock placement) will likely have an effect on the seabed and therefore the potential to result in an adverse effect on site integrity should be considered.

Response

The Greenlink Marine HRA has been updated to include the pressure of changes to supporting habitat and prey availability in the Stage 1 Screening Report Table 4-3 (utilising the herring and sandeel assessment and impact assessment in the ES) for the following European sites: West Wales Marine / Gorllewin Cymru Forol SAC; Bristol Channel Approaches / Dynesfeydd Môr Hafren SAC; North Anglesey Marine / Gogledd Môn Forol SAC; and North Channel SAC. Stage 1 concluded that the pressure can be screened out from further assessment.

The Greenlink Marine HRA has been updated to Revision F2 and has been re-submitted with this response document.

JNCC Comment 6

Noise modelling predicts injury (PTS) out to 23km for the largest potential UXO (794kg). Given the technical difficulties in mitigating at these ranges, we advise the work can only going ahead if undertaken in conjunction with an EPS licence to cover the risk of injury.

The applicant is required to provide sufficient information to enable the project to be assessed against the following tests:

1. Whether the activity fits one of the purposes specified in the Regulations;
2. Whether there are no satisfactory alternatives to the activity proposed (that would not incur the risk of offence); and
3. That licensing the activity will not result in a negative impact on the species'/population's Favourable Conservation Status (FCS).

We advise that insufficient information is provided within the supplied documents to assess against the above tests. We expect the assessment to consider the use of noise abatement systems (e.g. bubble curtains) and the potential to use low-order detonations instead of high order, as there is emergent evidence to show that in

[1] Assumes pre-installation survey occurs 2022, commissioning is 2023 and that post-inspection surveys occur in years 2, 4 and 6 of operation.

most cases of unexploded ordnance this method is a viable alternative for clearance.

Response

GIL is committed to applying for an EPS Licence. We were advised that the consultation with the statutory bodies should be undertaken on the Marine Licence application before the EPS Licence application is submitted to ensure any requests for clarification were captured in the EPS Licence.

Please see response to NRW TE Underwater Noise Comment 9 which provides a detailed explanation of the mitigation considered and proposed for UXO detonation. In addition, a Marine Mammal Mitigation Plan has been drafted and submitted with this response document.

JNCC Comment 7

We request that a condition is contained within any consent issued to ensure that a marine mammal mitigation plan (MMMP) is agreed with JNCC and NRW prior to any detonations being undertaken. We also request a copy of the marine mammal observer report and associated recording forms (excel spreadsheet) are sent to JNCC upon completion of the works. This information is used to ensure compliance with the proposed mitigation plan and will be analysed in conjunction with other reports to help inform future revisions of JNCCs mitigation guidelines. This could also be a condition of any consents issued, and applicants can be advised to send the information to seismic@jncc.gov.uk.

Response

A draft Marine Mammal Mitigation Plan has been submitted for consideration. This includes commitments to undertake the appropriate reporting to JNCC upon completion of works.

JNCC Comment 8

A survey was undertaken within the Castlemartin Firing Range to identify potential UXOs and this information was used to inform route design. It would be beneficial to know how many anomalies were identified, whether the cable route was micro-sited around all of them or if not, what criteria was used to determine which would be avoided. This would help us understand better the potential risk of encountering UXO during installation, especially as the applicant is applying to undertake only a single detonation. We also note that page 371 of the ES states 'It should be noted that this size of magnetic anomaly [794kg explosive] has not been identified in the 2019 UXO data from Castlemartin Firing Range'. We request further detail regarding this conclusion as our understanding is this cannot be confirmed without visual inspection of an anomaly.

Response

Please see response to NRW TE Underwater Noise Comment 10.

JNCC Comment 9

In addition, it would be beneficial if impact ranges for different types/size of UXO were presented in the assessment. The precautionary approach requires the worst-case scenario to be considered. However, given the uncertainty around whether UXOs will be discovered and the size/type of device that may be encountered, it can be beneficial to understand the range of potential impacts as this can help identify which devices pose the greatest risk. It can also help inform mitigation requirements and ensure mitigation is proportional to risk. For some projects a range of mitigation options may be appropriate, tailored to reflect the different types of device that may be encountered.

Response

Following consultation between Intertek, Cefas, JNCC and NRW TE the UXO assessment has been revisited and more realistic scenarios have been modelled for two locations. Three sizes of UXO were modelled; 1.54kg, 50kg and 794kg. Please see response to NRW TE Underwater Noise Comment 5 for further details.

Please see response to NRW TE Underwater Noise Comment 9 which provides a detailed explanation of the mitigation considered and proposed for UXO detonation. In addition, a Marine Mammal Mitigation Plan has been drafted and submitted with this response document.

JNCC Comment 10

The 2010 guidelines for explosive use state that 'As the scale of explosive use will vary for each operation, it is recommended that the generic guidance provided below is customised and incorporated into an Environmental Management Plan (EMP), detailing the actions and responsibilities for a specific activity'.

All JNCC mitigation guidelines should be considered a minimum level of mitigation and any mitigation employed should consider the specifics of the proposed activity, potential risks associated with the activity and any advances/changes in mitigation options available at that time. It is beneficial to applicants and reviewers to consider and include likely options in applications. JNCC are available should advice be required, and we also highlight we plan to update the explosive and piling guidelines in 2020. Further details will be published on our webpage.

Response

The submitted Greenlink Marine Mammal Mitigation Plan (MMMP) will form one of the supporting documents in the Greenlink Environmental Management Plan. The MMMP is based on current JNCC guidance but includes additional mitigation as discussed with JNCC, Cefas and NRW TE. It will be reviewed ahead of any works to ensure it remains current and takes into consideration any new advice published by statutory bodies.

JNCC Comment 12

We highlight that updated Article 17 Species Conservation Status Assessments are now available and can be found here: https://jncc.gov.uk/our-work/article-17-habitats-directive-report-2019-species/. The conservation status for harbour porpoise is 'Unknown'.

Injury thresholds for marine mammals presented in NFMS (2018) and Southall et al 2019 represent an update to those published in Southall et al 2007, subsequently it is not necessary to include the 2007 thresholds in future assessments.

Response

The Article 17 Habitats Directive Report 2019 was published on the 18 October 2019. The Greenlink Environmental Statement and marine licence application was submitted to NRW on the 24 June 2019, prior to this reports availability. These updated findings will be utilised in any future reports where relevant.

2.11 *Trinity House*

No comments required a response.

2.12 *Welsh Government*

No comments required a response

2.13 *Ministry of Defence - Safeguarding*

Defence Infrastructure Organisation Comment 1

As you are probably aware, the proposed activity falls within Danger Area D113 (Castlemartin Ranges). Our Advisor has confirmed that other than the obvious downtime whilst laying these cables, we would have no concerns in regards to this proposal. However, we would expect full transparency of plans from the applicant to enable to minimise disruption to training and this would need to be communicated to the HoE at Castlemartin Ranges accordingly and regularly regarding dates & times of the proposed activities etc. Contact details for the Senior Training Safety Officer are below.

Maj John Poole RL | STSO | Wales & West Training Estate | UK Training |

Defence Infrastructure Organisation | Castlemartin Ranges | Merrion Camp | Pembroke | SA71 5EB |

Tel No: 01646662445 | Mil: 943614225 | Mobile: 07973689909 | Fax: 01646662405

Role Email: John.Poole958@mod.gov.uk

Response

GIL are in regular contact with Major John Poole and have an agreed access and communication protocol in place with Castlemartin Range. This was tested during the cable route surveys and lessons learnt will be taken forward to the Installation

phase. The nature of this agreement will be reviewed to reflect lessons learnt during the surveys and agreed with Castlemartin Range.

2.14 Cefas

Cefas Comment 1

The application states that the dredged material will be deposited within the licence area through bottom dumping. This activity would require a disposal site to be designated. Please note this comment is not related to the HDD or jet/plough dredging which may be utilised.

Response

The Greenlink Marine ES identified two areas with Welsh waters where pre-sweeping may be required. These locations were shown in Drawing P1975-INST-007, were described in Table 4-3 and are:

- Two sand waves at approximately KP26; the eastern sand wave is 7m high and the western sand wave is 3m high. The wave length (distance from crest to crest) is 230m.
- Low level sandwaves between KP64 and KP69.

The Greenlink Marine ES allows flexibility in installation approach and has assessed the use of both dredging and mass flow excavator (MFE).

Burial Assessment Studies provided by tenderers for the Installation Contract have been reviewed and there is no mention of dredging. The intention appears to be either to avoid the sand waves at KP26 or to use jetting. However, it is recognised that the selected Installation Contractor will not conduct a full technical analysis of the route until after contract award. Therefore, as a contingency GIL requires the option for dredging to remain in the licence application; although it is considered unlikely to be required.

Should dredging be required the Greenlink Marine ES commits to the following project Specific Mitigation:

PS5 - Should dredging be employed rather than mass flow excavator for pre-sweeping, sand should be deposited up-current and as close to the disturbed sandwaves as possible so that sand can naturally migrate back onto the sandwaves.

Based on this commitment two proposed disposal sites have been identified within the Marine Licence Application Area; illustrated in Drawing P197-INST-016. The areas are defined by the following coordinates:

Area 1		
ID	Latitude	Longitude
1	51° 38.952' N	5° 22.876' W
2	51° 38.766' N	5° 24.089' W
3	51° 38.707' N	5° 24.851' W
4	51° 38.704' N	5° 25.230' W
5	51° 38.756' N	5° 26.372' W
6	51° 39.026' N	5° 26.368' W
7	51° 39.029' N	5° 25.609' W
8	51° 39.145' N	5° 25.400' W
9	51° 39.160' N	5° 23.332' W
10	51° 39.212' N	5° 22.996' W

Area 2		
ID	Latitude	Longitude
1	51° 40.143' N	5° 57.464' W
2	51° 39.874' N	5° 57.504' W
3	51° 40.126' N	6° 1.495' W
4	51° 40.432' N	6° 4.366' W
5	51° 40.695' N	6° 4.272' W
6	51° 40.393' N	6° 1.435' W

If required, approximately 96,000m^3 (~ 147,000 tonnes) of sediment will be disposed in Area 1 and 400,000m^3 (~612,000 tonnes) of sediment in Area 2[2].

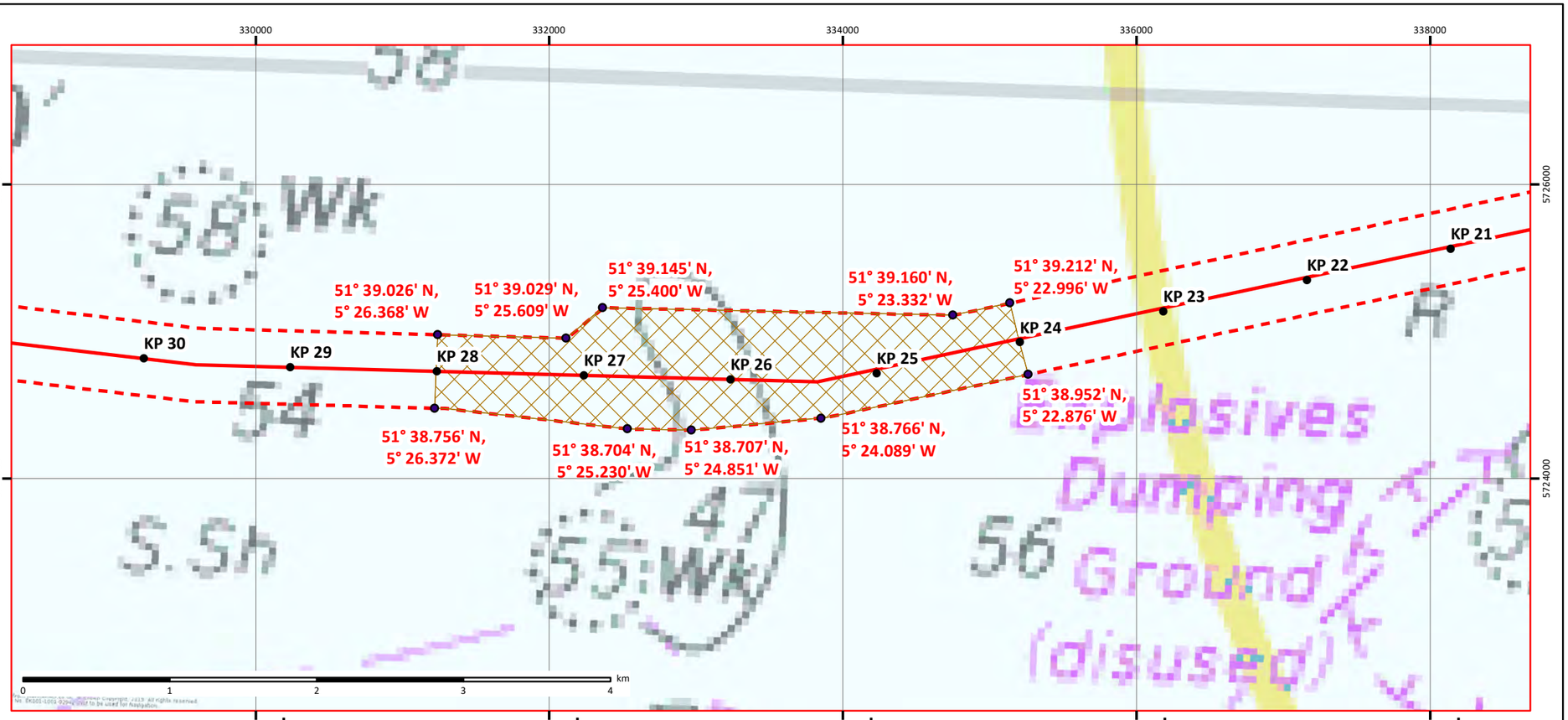
The areas are based on a nominal 2km distance either side of the sandwave feature. As the EPC Stage 2 tender submissions do not contain any detail on dredging requirements this has been assumed to be sufficient for disposal. However, once an Installation Contractor is selected and has conducted their own technical assessments the disposal sites may require alteration.

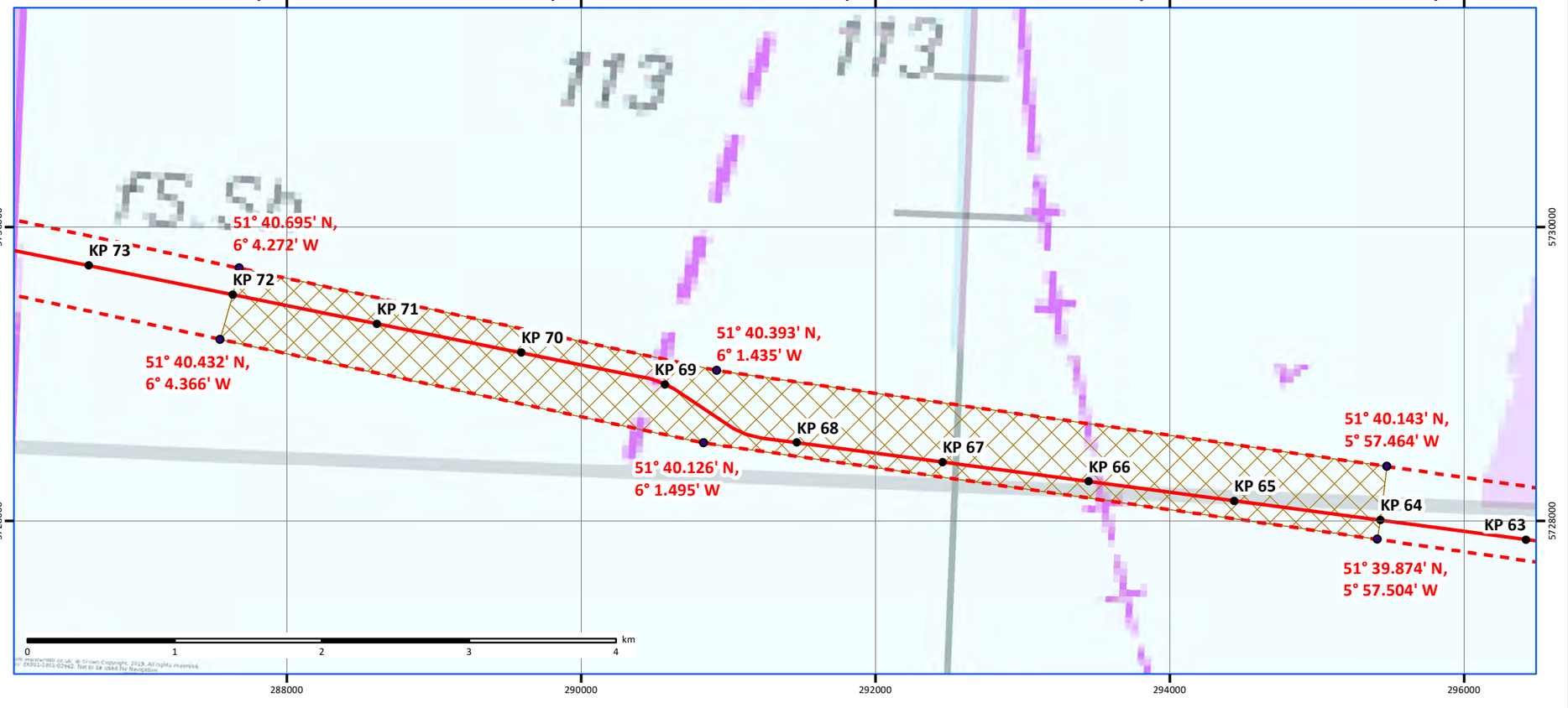
[2] Conversion from m^3 to tonnes based on a specific gravity for sand of 1.53

GREENLINK INTERCONNECTOR

INSTALLATION
Proposed Sandwave Pre-Sweeping Disposal Areas

Drawing No: P1975-INST-016 | **A**

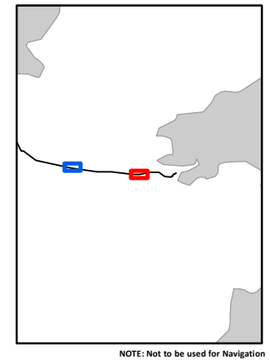




Legend

- KP
- Greenlink Centreline (Indicative)
- Proposed Disposal Area
- Application Area

N
W E
S



NOTE: Not to be used for Navigation

Date	24 March 2020
Coordinate System	WGS 1984 UTM Zone 30N
Projection	Transverse Mercator
Datum	WGS 1984
Data Source	MMT; MarineFind; ESRI;
File Reference	J:\P1975\Mxd\15_INST\ P1975-INST-016.mxd
Created By	Chris Dawe
Reviewed By	Emma Langley
Approved By	Anna Farley

Co-financed by the European Union Connecting Europe Facility

2.15 Cefas Underwater Noise

Please note the Cefas comments have been paraphrased. The original document was a discursive format rather than specific clarification requests.

Cefas Underwater Noise Comment 1

The primary concern with the approach is that, the proposed activities (e.g. cable trenching, DP vessels etc.) are all continuous sources, and the NMFS (2018) guidance for continuous sources (which is based on the SEL over a 24-hour period) should be considered. The cumulative sound exposure to continuous sources is more of a concern for marine mammals, rather than the peak sound pressure (which is used to assess instantaneous effects), and this should be assessed. Thus, information on the duration of the cable laying activities and geophysical surveys over a 24-hour period is required.

Response

The approach to calculating the onset of PTS, TTS and disturbance from continuous noise has been revised and updated following discussions between Intertek and Cefas (06 March 2020) directly related to Greenlink and discussions between Cefas and Intertek related to underwater noise modelling provided by Intertek for the Havhingsten telecommunications marine licence application.

The Greenlink Marine ES Technical Appendix D – Underwater Noise Modelling has been updated to reflect the new modelling and has been re-submitted with this response document.

Cefas Underwater Noise Comment 2

I recommend that the following criteria, according to Popper et al. (2014) for continuous sources (i.e. recoverable injury threshold of 170 dB rms for 48 hours, and TTS threshold of 158 dB rms for 12 hours), are used to make an assessment. The applicant can estimate the distances at which these thresholds would be reached, and then, based on how long the activities are expected to last, make an assessment of how likely recoverable injury and TTS might be to occur.

Response

The Greenlink Marine ES Technical Appendix D – Underwater Noise Modelling has been updated to reflect this comment. It concludes that fish will experience the onset of recoverable injury if they stay within 16m of the rock placement vessel for 24-hours. The onset of temporary injury could occur within 63m, again if fish are present in the area for 24-hours. Given that either the vessels involved in construction activities will move or fish will avoid activity the effects on fish from continuous noise will be negligible.

Cefas Underwater Noise Comment 3

I recommend that if UXO detonations are required as part of the works, then appropriate mitigation is put in place (in consultation with the regulator) to reduce the risk of potential impacts on marine mammals and other sensitive receptors.

Response

Please see response to NRW TE Underwater Noise Comment 9 which provides a detailed explanation of the mitigation considered and proposed for UXO detonation. In addition, a Marine Mammal Mitigation Plan has been drafted and submitted with this response document.

Appendix A

Compass Deviation Technical Note (WSP 2020)

Co-financed by the European Union
Connecting Europe Facility

TECHNICAL NOTE 1

DATE:	25 March 2020	**CONFIDENTIALITY:**	Restricted
SUBJECT:	Greenlink - compass deviation		
PROJECT:	70044124 Greenlink	**AUTHOR:**	Joe Oliver
CHECKED:	Rose Urban	**APPROVED:**	Daniel Abbott

1. INTRODUCTION

WSP have been asked to indicate the likely values of compass deviation due to the magnetic fields that will be generated by the offshore cables that will be installed under the seabed.

The Maritime & Coastguard Agency have described acceptable values for the compass deviation, and we have calculated values for typical installations, to provide confidence that these acceptable values will not be exceeded.

The magnetic field properties have been calculated using Cymcap®.

2. PARAMETERS

2.1. The Maritime & Coastguard Agency "on deflection of the ships magnetic compass by residual EMF at the surface of water" is:

"A three-degree deviation for 95% of the cable route is acceptable. For the remaining 5% of the route no more than five degrees will be attained."

2.2. We have assessed:

2.2.1. The compass deviation for the following cases:

Water depth: 10m, 50m and 100m

Angle between cable route and earth's magnetic field:

0°, 15°, 30°, 60° and 90°

2.2.2. The minimum depth at which the compass deviation would exceed 3° and 5°.

3. ASSUMPTIONS

3.1. Rated current:	797A	(500MW at 320kV, plus allowance for losses)
3.2. Installation depth:	1.5m	to top of cables
3.3. Cable spacing:	120mm	cables bundled
3.4. Earth's magnetic field strength:		
	50μT	(the strength of the Earth's magnetic field varies between approximately 20μT at the magnetic equator and 70μT at the magnetic poles)

TECHNICAL NOTE 1

DATE:	25 March 2020	**CONFIDENTIALITY:**	Restricted
SUBJECT:	Greenlink - compass deviation		
PROJECT:	70044124 Greenlink	**AUTHOR:**	Joe Oliver
CHECKED:	Rose Urban	**APPROVED:**	Daniel Abbott

4. CALCULATIONS

4.1. The compass deviation is a measure of a disruption to the earth's magnetic field, and is a function of:

- The ratio of the strengths of the magnetic fields due to the magnetic fields and of the earth,
- The angle between the cable route and the alignment of the earth's magnetic field.

(Note, as a whole, the offshore route runs approximately 16° north of west, and the magnetic deviation, between 'true' north and magnetic north, is approximately 3°, so the cable route is at an angle of approximately 13° to the earth's magnetic field.

4.2. Magnetic field strength at the surface

Water depth	Height above cables	Magnetic field strength
(m)	(m)	(μT)
10	11.5	0.14
50	51.5	0.01
100	101.5	<0.01

4.3. Compass deviation (magnitude)

Water depth	Angle between cable route and the earth's magnetic field				
(m)	0°	15°	30°	60°	90°
10	0.16°	0.15°	0.14°	0.08°	0°
50	0.01°	0.01°	0.01°	0.01°	0°
100	<0.01°	<0.01°	<0.01°	<0.01°	0°

TECHNICAL NOTE 1

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CHECKED:	Rose Urban	**APPROVED:**	Daniel Abbott

4.4. Minimum depth for compass deflections of 3° and 5°

4.4.1. Magnetic field for deflections of 3° and 5°

Deflection	Angle between cable route and the earth's magnetic field				
(m)	0°	15°	30°	60°	90°
3°	2.62μT	2.71μT	3.03μT	5.24μT	-
5°	4.37μT	4.53μT	5.05μT	8.85μT	-

4.4.2. Minimum depth for deflections of 3° and 5°

Deflection	Angle between cable route and the earth's magnetic field				
(m)	0°	15°	30°	60°	90°
3°	1.3m	1.25m	1.05m	0.4m	-
5°	0.6m	0.5m	0.4m	<0m*	-

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5. CONCLUSIONS

5.1. For bundled cables installed 1.5m below the seabed, the calculated compass deviation is less than 0.2°, at a water depth of 10m, regardless of the angle between the cable route and magnetic north.

5.1.1. The maximum compass deviation is less than that stipulated by the Maritime & Coastguard Agency for water depths greater than 1.3m.

5.2. At the landfalls, where the cables will be installed in ducts installed by Horizontal Directional Drilling (HDD), the spacing will increase considerably, resulting in significant increases in the strength of the magnetic field (typically up to 15μT), and therefore the compass deviation, which could exceed 10°.

5.2.1. However, this will only apply to, typically, the last 300-400m at each end of the offshore cable route. We would not expect larger vessels to be this close to either landfall, as they are not at ports, and any smaller vessels would probably navigate by sight this close to shore, rather than relying upon compass bearings.