Scottish Hydro Electric Power Distribution Plc

SHEPD Mull to Coll Cable Replacement

Marine Environmental Appraisal

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ABBREVIATIONS

µPA	Micro Pascal
AA	Appropriate Assessment
AP	Articulated Pipe
BGS	British Geological Society
BMC	Briggs Marine Contractors
BWM	Ballast Water Management
CEMP	Construction Environmental Management Plan
CFLO	Liaison Officer
CFP	Common Fisheries Policy
CLV	Cable Lay Vessel
dB re 1 µPA	Decibels relative to 1 Micro Pascal
DD	Decimal Degrees
DDM	Degrees and Decimal Minutes
DMS	Degrees Minutes Seconds
EEC	European Economic Community
EMEC	European Marine Energy Centre
EPS	European Protected Species
EUNIS	European Union Nature Information System
FCS	Favourable Conservation Status
FIR	Fisheries Industry Representative
FLMAP	Fishing Liaison Mitigation Action Plan
FLO	Fisheries Liaison Officer
HF	High Frequency
HRA	Habitats Regulations Appraisal
Hz	Hertz
IMO	International Marine Organisation
ICPC	International Cable Protection Committee
IRPCS	International Regulations for the Prevention of Collision
HWDT	Hebridean Whale and Dolphin Trust
JNCC	Joint Nature Conservation Committee

kHz	Kilohertz
KIS-ORCA	Kingfisher Information Service – Offshore Renewable and Cable Awareness
km	Kilometres
km^2	Kilometres Squared
kV	Kilo-Vaults
LAT	Lowest Astronomical Tide
LF	Low Frequency
LSE	Likely Significant Effects
m	Metres
m^2	Metres Squared
MEA	Marine Environmental Appraisal
MLWS	Mean Low Water Springs
MEPC	Marine Environmental Protection Committee
MHWS	Mean High Water Spring
MPA	Marine Protected Area
MSFD	Marine Strategy Framework Directive
MS-LOT	Marine Scotland Licensing Operations Team
MU	Management Unit
NCMPA	Nature Conservation Marine Protected Area
nm	Nautical Miles
NMP	National Marine Plan
NMPi	National Marine Plan interactive
NNMS	Non-Native Marine Species
NOAA	National Oceanic and Atmospheric Administration
OOS	Out of Service
PAD	Protocol for Archaeological Discoveries
PLGR	Pre-Lay Grapnel Run
PW	Phocid Carnivores in Water
ROV	Remotely Operated Vehicle
RPL	Route Position List
RSPB	Royal Society for the Protection of Birds

SAC	Special Areas of Conservation
SCOS	Special Committee on Seals
SEPA	Scottish Environmental Protection Agency
SHEPD	Scottish Hydro Electric Power Distribution plc
SMWWC	Scottish Marine Wildlife Watching Code
SSEN	Scottish and Southern Electricity Networks
SSSIs	Sites of Special Scientific Interest
SOLAS	Safety of Life at Sea
SOPEP	Shipboard Oil Pollution Emergency Plans
SPA	Special Protection Area
UK	United Kingdom
UKHO	UK Hydrographic Office
UNCLOS	United Nations Convention on the Law of the Sea
USBL	Ultra-Short Baseline
VHF	Very High Frequency
WCA	Wildlife and Countryside Act
WFD	Water Framework Directive

1 INTRODUCTION

Scottish Hydro Electric Power Distribution plc (SHEPD) holds a licence under the Electricity Act 1989 for the distribution of electricity in the north of Scotland including the Islands. It has a statutory duty to provide an economic and efficient system for the distribution of electricity and to ensure that its assets are maintained to ensure a safe, secure and reliable supply to customers.

SHEPD have identified that the existing submarine power cable between Mull and Coll, in the Inner Hebrides on the west coast of Scotland, has reached the end of its operational life. The cable is still operational and requires replacement to ensure network integrity and security of supply for customers.

The installation of replacement cables is a licensable activity under Part 4 of The Marine (Scotland) Act 2010, and as such Marine Licences will be required to conduct the works. SHEPD have carried out Pre-application Consultation (PAC) and have prepared a PAC report to support this application which summarises stakeholder engagement.

This Marine Environmental Appraisal (MEA) provides an assessment of the potential environmental impacts which may result from the Mull – Coll cable replacement and will be used to inform the licence applications for this project. The mitigation requirements identified by this MEA will be included in the accompanying Marine Construction Environmental Management Plan (CEMP) Ref: A-303128-S00-TECH-019, in order to ensure they are effectively disseminated to, and implemented by SHEPD and the cable installation contractor during the proposed works.

This MEA should be read in conjunction with the following documents:

- Marine Licence Application Form;
- Project Description: Mull – Coll Cable Replacement;
- Cost Benefit Analyses (CBA);
- Fishing Liaison Mitigation Action Plan (FLMAP) (covering all legitimate sea users);
- Construction Environment Management Plan (CEMP);
- Operation, Inspection, Maintenance and Decommissioning Strategy;
- EPS Licence Application Form; and
- Basking Shark Derogation Licence Application Form.

1.1 Project Need

Electricity is considered to be an essential service for communities, particularly on remote islands. The Mull-Coll cable is reaching the end of its operational life and requires replacement to ensure an economic and efficient distribution of electricity which is safe, secure and reliable. The Mull - Coll cable was inspected in late 2018 where it was observed to be in poor condition with damage to the external armour. The cable was installed in 2001 and in light of its condition is considered to have reached the end of its economic life.

SHEPD's first priority is to provide a safe and reliable network for the supply and distribution of electricity to domestic, commercial and industrial customers in the north of Scotland and the Islands. It is responsible for maintaining, repairing and improving the electricity network in these regions. Therefore, the proposed cable replacement activities are essential to maintaining this service. The Mull - Coll cable distributes electricity to domestic and business customers, providing a long term economic and social benefit to the communities. The

replacement of the cables will provide assured efficiency of electricity distribution to Coll and Tiree, providing social and economic benefits.

1.2 Consideration of Alternatives

The following three options were considered by SHEPD for the cable replacement:

- Option 1 – Do nothing at this time. Under this scenario the existing Mull-Coll would continue to provide the grid network connection. At some point in the future it would be expected that this cable would fail, and at this point require either repair or replacement. For a repair option to be progressed, the cable must be in good mechanical condition because cable recovery and jointing results in significant mechanical stresses and fatigue within the cable. On this basis a future offshore piece in repair is considered unlikely to be either successful or represent best value for consumers due to the condition of the cables and the low confidence in a successful repair being achieved. The most likely future outcome of this option would be end to end replacement of the faulted cable.
- Option 2 – Proactive cable replacement in proximity to the existing cable. This option would see a new cable installed before the existing cable fails in order to ensure network integrity and security of supply for customers. The replacement cable would be installed in proximity to existing cable.
- Option 3 - Proactive cable replacement in a location remote from the existing cables. This option would see a new cable installed before the existing cable fails in order to ensure network integrity and security of supply for customers. The replacement cable would be installed in a new location remote from the existing cable. A suitable subsea crossing location would require to be identified and new onshore infrastructure installed in order to connect the new cable to the existing networks on both Mull and Coll.

SHEPD is progressing on the basis of Option 2 as it reduces environmental effects to a minimum and is the option that most closely aligns with our statutory duty for this specific cable.

An initial routing exercise has been conducted for the installation corridor. The corridor was routed to avoid rocky outcrops as far as possible, as the main routing concern for the cable was to avoid interaction with steep slopes and maximise the potential for burial along the route. The landfalls at Mull and Coll were selected to enable the sharing of facilities with existing infrastructure at both landfall sites. The cable will be buried where possible, however, sections are expected to be surface laid, such as in areas of seabed with unavoidable bedrock / boulders and at cable crossings. Route engineering is ongoing and minor alterations to the cable routing shall be made as part of the detailed route engineering.

Further details of the specific project descriptions for each cable is discussed in Section 3 and in the Mull - Coll Cable Replacement Project Description.

1.3 Exclusions from the Scope of Assessment

As described above, the new cable has been routed primarily to avoid the rocky outcrops present in the area and maximise the potential for cable burial. As a result, the new cable will be located to the north of the existing cable. However, the operational aspects (such as snagging risk, electromagnetic fields, and sediment heating effects) of this project are not expected to constitute a substantial change from baseline conditions, as the cable replacement will still be located proximal to the existing cable within a similar baseline environment. Therefore, only the installation phase is considered by this MEA. This appraisal only covers the marine cable installation activities, below Mean High Water Spring (MHWS).

SHEPD also recognise the need to consider options regarding the future of the existing cable and this is covered in the accompanying Operations Inspection Maintenance and Decommissioning (OIMD) Strategy document which outlines why SHEPD do not propose to remove the existing cable once it is de-energised.

Geophysical survey operations including, pre, during and post-installation, will be conducted as part of the proposed cable replacement works. However, these survey operations are subject to existing consents held by SHEPD, specifically:

- An EPS Licence Reference – EPS/BS-00009076; and
- A Basking Shark Derogation Licence Reference - EPS/BS-00009077.

As such no geophysical survey operations are included within the scope of this MEA.

2 LEGISLATIVE CONTEXT

This section presents the key UK and Scottish policies which are applicable to the proposed cable replacement works and explains how and where these have been considered in the production of this MEA. This includes adherence to statutory legislation as well as to the policies presented in Scotland's National Marine Plan (NMP) (Scottish Government, 2015). Where necessary, additional mitigation measures have been presented in topic specific chapters to ensure that the proposed cable replacement works adhere to relevant legislation and policies and comply with the conditions required when granting applicable licenses. The information is provided in table form for ease of reference, as shown in Table 2-1.

Table 2-1 Key UK and Scottish Policies Pertinent to the Proposed Cable Replacement Works

Legislation or Policy	Key Requirements	Relevant Section (where applicable)
Marine (Scotland) Act 2010	The Marine (Scotland) Act 2010 applies to Scottish territorial waters and makes provisions in relation to functions and activities in the Scottish marine area. The following regulations are pertinent to the Project: • Under Section 37 of the act a marine licence is required for any activity which involves: o deposit of any substance or object in the sea or on or under the seabed o construct, alter or improve works on or over the sea or on or under the seabed o remove substances or objects from the seabed o carry out dredging o deposit and/or use explosives o incinerate substances or objects • Under section 82 of the Marine (Scotland) Act 2010, Marine Scotland Licensing Operations Team (MS-LOT) is required to consider whether a licensable activity is capable of affecting (other than insignificantly) a protected feature in a Nature Conservation Marine Protected Area (NCMPA) or a historic marine asset in a Historic Marine Protected Area (MPA). • Under Section 107 of the act, it is an offence to kill, injure or take a live seal; and • The seal haul-out sites, designated under The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014 (as amended), are protected under Section 117 of the act.	SHEPD will submit a Marine Licence Application for the cable replacement works. **Section 5 – Designated Sites** assesses the potential impacts on NCMPAs in the vicinity of the Installation Corridor. This concluded that no effects on NCMPAs were expected. **Section 7 – Marine Megafauna** assessed the potential for the Project activities to injure seals or disturb seals at designated seal haul-outs. This assessment concluded there should be no injury to seals and no disturbance at designated seal haul-outs. **Section 10 – Marine Archaeology** assesses the impact of the cable installation on Historic Marine Protected Areas. This concluded that no impacts were expected.
Conservation (Natural Habitats, &c) Regulations 1994 (as amended in Scotland) (also known as 'The Habitats Regulations') and the revision to The Conservation (Natural Habitats) (EU Exit) (Scotland) (Amendment) Regulations 2019	The Conservation (Natural Habitats, &c) Regulations 1994 (as amended in Scotland) transpose the European Habitats Directive (92/43/EEC) and Birds Directive (79/409/EEC) into Scottish Law. In addition, the Conservation (Natural Habitats) (EU Exit) (Scotland) (Amendment) Regulations 2019 make provision for the selection, designation, registration and notification of sites to be protected under the EC Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. The Habitats Regulations Appraisal (HRA) process forms part of these regulations. The HRA process requires that any proposal which has the potential to result in a negative Likely Significant Effect (LSE) to a European site or its designated features, to be subject to an HRA by the Competent Authority, and if necessary, an Appropriate Assessment (AA). The Conservation (Natural Habitats, & c) Regulations 1994 as amended make it an offence to deliberately or recklessly capture, kill, injure, harass or disturb an EPS. When European protected species are present, licences to permit works that will affect them can only be granted when: • there is no satisfactory alternative, and • the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range. The 2019 Regulations make amendments to the existing instruments that transpose the habitats and wild birds' directives so that they are operable.	**Section 5 – Designated Sites** concluded that no Likely Significant Effect was expected on any designated site in the vicinity of the Installation Corridor. **Section 7 – Marine Megafauna** assessed the potential impacts on EPS which have a potential connectivity with the Project activities (cetaceans and otters). This concluded that there will be no injurious impacts to these receptors, however, as disturbance could not be ruled out, an EPS licence will be submitted to Marine Scotland.

Legislation or Policy	Key Requirements	Relevant Section (where applicable)
Wildlife and Countryside Act 1981 (as amended) and the Nature Conservation (Scotland) Act 2004	Basking sharks are protected under Schedule 5 of the Wildlife and Countryside Act (WCA) (1981 as amended) which prohibits the killing, injuring or taking by any method of those wild animals listed on Schedule 5 of the Act. The Nature Conservation (Scotland) Act 2004, Part 3 and Schedule 6 make amendments to the WCA, strengthening the legal protection for threatened species to include 'reckless' acts, and specifically makes it an offence to intentionally or recklessly disturb or harass basking sharks. A derogation licence under the WCA will therefore be required for any activity which may result in disturbance or injury to basking sharks. In addition, the primary legislation for the protection of birds in the UK is the WCA in combination with the Nature Conservation (Scotland) Act 2004. Under these acts, it is an offence to harm wild bird species, their eggs and nests. Additional protection is provided for certain bird species listed on Schedule 1 of the WCA, and it is an offence to disturb those species at their nest while it is in use. Licensing for wild birds does not cover development purposes, so any activity that could result in disturbance of a nesting Schedule 1 species should not proceed unless out-with the breeding season. In addition, the Conservation (Natural Habitats) (EU Exit) (Scotland) (Amendment) Regulations 2019 also instrument an amendment to Section 27 of the Wildlife and Countryside Act 1981 to ensure that existing protections continue.	Section 7 – Marine Megafauna concluded that there is not likely to be any impacts on basking sharks. Section 9 – Ornithology concluded that no impacts to birds were expected from the Project activities.
Scottish National Plan Policy GEN 2 Economic benefit	Sustainable development and use which provides economic benefit to Scottish communities is encouraged when consistent with the objectives and policies of this Plan.	Section 1 – Introduction outlines the potential benefits of the cable replacement activities. These will help to ensure a resilient network serving residents on the remote islands of Coll and Tiree which will inherently provide the potential for social and economic benefit for the communities on the Islands.
Scottish National Plan Policy GEN 5 Climate change	Marine Planners and decision makers must act in the way best calculated to mitigate and adapt to climate change.	Section 3 - Project Description outlines how failure to complete the replacement works could negatively impact the electricity distribution network serving Coll and Tiree.
Scottish National Plan Policy GEN 6 Historic environment	Development and use of the marine environment should protect and, where appropriate, enhance heritage assets in a manner proportionate to their significance.	Section 10 – Marine Archaeology concluded that no impacts are expected on protected marine assets.
GEN 7 Landscape/seascape	Marine planners and decision makers should ensure that development and use of the marine environment take seascape, landscape and visual impacts into account.	The submarine cable will have no long-term landscape/seascape effects.
Scottish National Plan Policy GEN 8 Coastal process and flooding	Developments and activities in the marine environment should be resilient to coastal change and flooding, and not have unacceptable adverse impact on coastal processes or contribute to coastal flooding.	No impacts to coastal change and flooding are expected from the cable replacement works.
Scottish National Plan Policy GEN 9 Natural Heritage	Development and use of the marine environment must: • Comply with legal requirements for protected areas and protected species. • Not result in significant impact on the national status of Priority Marine Features. • Protect and, where appropriate, enhance the health of the marine area.	Section 5 – Designated Sites concluded that no impacts on protected areas are expected. Section 7 – Marine Megafauna concluded that no adverse impacts on protected marine megafauna were expected. Section 8 – Benthic and Intertidal Ecology concluded that no adverse impacts on protected benthic or intertidal features were expected. Section 9 – Ornithology concluded that no adverse impacts on birds was expected.

Legislation or Policy	Key Requirements	Relevant Section (where applicable)
Scottish National Plan Policy GEN 10 Invasive non-native species	Opportunities to reduce the introduction of invasive non-native species to a minimum or proactively improve the practice of existing activity should be taken when decisions are being made.	Section 8 – Benthic and Intertidal Ecology concluded that the likelihood of invasive species being introduced as part of the Project activities is low.
Scottish National Plan Policy GEN 12 Water quality and resource	Developments and activities should not result in a deterioration of the quality of waters to which the Water Framework Directive, Marine Strategy Framework Directive (MSFD) or other related Directives apply.	Section 6 – Seabed and Water Quality concluded that no deterioration in water quality in the vicinity of the installation corridor is expected.
Scottish National Plan Policy GEN 13 Noise	Development and use in the marine environment should avoid significant adverse effects of man-made noise and vibration, especially on species sensitive to such effects.	Section 7 – Marine Megafauna concluded that no adverse impacts to marine mammals are anticipated from underwater noise generated from the activities.
Scottish National Plan Policy GEN 18 Engagement	Early and effective engagement should be undertaken with the general public and all interested stakeholders to facilitate planning and consenting processes.	See FLMAP SHEPD have also consulted key stakeholders and considered their views within this MEA.
Scottish National Plan Policy Sea Fisheries – Fisheries 1	Taking account of the Habitats Directive, Birds Directive and MSFD, marine planners and decision makers should aim to ensure: • Existing fishing opportunities and activities are safeguarded wherever possible; • Protection for vulnerable stocks (in particular for juvenile and spawning stocks through continuation of sea area closures where appropriate); • That other sectors take into account the need to protect fish stocks and sustain healthy fisheries for both economic and conservation reasons; and • Mechanisms for managing conflicts between fishermen and/or between the fishing sector and other users of the marine environment.	See: FLMAP Argyll; and How SHEPD co-exists with Other Marine Users.
Scottish National Plan Policy Sea Fisheries – Fisheries 2	The following key factors should be taken into account when deciding on uses of the marine environment and the potential impact on fishing: • The cultural and economic importance of fishing, in particular to vulnerable coastal communities; • The potential impact (positive and negative) of marine developments on the sustainability of fish and shellfish stocks and resultant fishing opportunities in any given area; • The environmental impact on fishing grounds (such as nursery, spawning areas), commercially fished species, habitats and species more generally; and • The potential effect of displacement on fish stocks, the wider environment, use of fuel, socio-economic costs to fishers and their communities and other marine users.	See Cost Benefit Analysis Model. The impact submarine electricity cables have on fuel poverty (including associated increased health service and social care costs for island communities), commercial fishing and planned renewable electricity generation projects on the islands is considered within socio-economic impact of the Cost Benefit Analysis Model.
Scottish National Plan Policy Sea Fisheries – Fisheries 3	Where existing fishing opportunities or activity cannot be safeguarded, a Fisheries Management and Mitigation Strategy should be prepared by the proposer of the development or use, involving full engagement with local fishing interests (and other interests as appropriate) in the development of the Strategy. All efforts should be	See Cost Benefit Analysis Model

Legislation or Policy	Key Requirements	Relevant Section (where applicable)
	made to agree with those interests. Those interests should also undertake to engage with the proposer and provide transparent and accurate information and data to help complete the Strategy. The Strategy should be drawn up as part of the discharge of conditions of permissions granted. • The content of the Strategy should be relevant to the particular circumstances and could include: • An assessment of the potential impact of the development or use on the affected fishery or fisheries, both in socio-economic terms and in terms of environmental sustainability; • A recognition that the disruption to existing fishing opportunities/activity should be minimised as far as possible; • Reasonable measures to mitigate any constraints which the proposed development or use may place on existing or proposed fishing activity; and • Reasonable measures to mitigate any potential impacts on sustainability of fish stocks (e.g. impacts on spawning grounds or areas of fish or shellfish abundance) and any socioeconomic impacts.	The impact submarine electricity cables have on fuel poverty (including associated increased health service and social care costs for island communities), commercial fishing and planned renewable electricity generation projects on the islands is considered within the socio-economic impact of the Cost Benefit Analysis Model. Section 8– Benthic and Intertidal Ecology concluded that no impacts on fish are expected.
Scottish National Plan Policy Recreation and Tourism 2	The following key factors should be taken into account when deciding on uses of the marine environment and the potential impact on recreation and tourism: • The extent to which the proposal is likely to adversely affect the qualities important to recreational users, including the extent to which proposals may interfere with the physical infrastructure that underpins a recreational activity. • The extent to which any proposal interferes with access to and along the shore, to the water, use of the resource for recreation or tourism purposes and existing navigational routes or navigational safety. • Where significant impacts are likely, whether reasonable alternatives can be identified for the proposed activity or development; and • Where significant impacts are likely and there are no reasonable alternatives, whether mitigation, through recognised and effective measures, can be achieved at no significant cost to the marine recreation or tourism sector interests.	See: FLMAP Argyll; and How SHEPD co-exists with other marine users.
Scottish National Plan Policy Transport 1	Navigational safety in relevant areas used by shipping now and in the future will be protected, adhering to the rights of innocent passage and freedom of navigation contained in United Nations Convention on the Law of the Sea (UNCLOS). The following factors will be taken into account when reaching decisions regarding development and use: • The extent to which the locational decision interferes with existing or planned routes used by shipping, access to ports and harbours and navigational safety. This includes commercial anchorages and defined approaches to ports; • Where interference is likely, whether reasonable alternatives can be identified; and • Where there are no reasonable alternatives, whether mitigation through measures adopted in accordance with the principles and procedures established by the International Maritime Organization can be achieved at no significant cost to the shipping or ports sector.	See: FLMAP Argyll; and How SHEPD co-exists with other marine users.
Scottish National Plan Policy Transport 6	Marine planners and decision makers and developers should ensure displacement of shipping is avoided where possible to mitigate against potential increased journey lengths and associated fuel costs, emissions and impact on journey frequency) and potential impacts on other users and ecologically sensitive areas.	See: FLMAP Argyll and How SHEPD co-exists with other marine users.

Legislation or Policy	Key Requirements	Relevant Section (where applicable)
Scottish National Plan Policy Cables 1	Cable and network owners should engage with decision makers at the early planning stage to notify of any intention to lay, repair or replace cables before routes are selected and agreed. When making proposals, cable and network owners and marine users should evidence that they have taken a joined-up approach to development and activity to minimise impacts, where possible, on the marine historic and natural environment, the assets, infrastructures and other users. Appropriate and proportionate environmental consideration and risk assessments should be provided which may include cable protection measures and mitigation plans. Any deposit, removal or dredging carried out for the purpose of executing emergency inspection or repair works to any cable is exempt from the marine licensing regime with approval by Scottish Ministers. However, cable replacement requires a Marine Licence. Marine Licensing Guidance should be followed when considering any cable development and activity.	SHEPD have consulted with stakeholders prior to the replacement works commencing. This MEA has indicated how impacts on the marine environment have been minimised. A Marine License application will be submitted for the cable replacement.
Scottish National Plan Policy Cables 2	The following factors will be taken into account on a case by case basis when reaching decisions regarding submarine cable development and activities: • Cables should be suitably routed to provide sufficient requirements for installation and cable protection; • New cables should implement methods to minimise impacts on the environment, seabed and other users, where operationally possible and in accordance with relevant industry practice; • Cables should be buried to maximise protection where there are safety or seabed stability risks and to reduce conflict with other marine users and to protect the assets and infrastructure; • Where burial is demonstrated not to be feasible, cables may be suitably protected through recognised and approved measures (such as rock or mattress placement or cable armouring) where practicable and cost-effective and as risk assessments direct; and • Consideration of the need to reinstate the seabed, undertake post-lay surveys and monitoring and carry out remedial action where required.	**The Mull - Coll Project Description** has outlined the protective measures for the cable route. This MEA has concluded that no likely significant impacts are expected from the cable replacement works once relevant mitigation measures have been implemented. The cable will be buried where possible and this was the primary routing concern during the cable routing process. Suitable external protection measures have been proposed in areas of the cable which will be surface laid, (e.g. areas of shallow sediments and rocky seabed).
Scottish National Plan Policy Cables 3	A risk-based approach should be applied by network owners and decision makers to the removal of redundant submarine cables, with consideration given to cables being left in situ where this would minimise impacts on the marine historic and natural environment and other users.	Refer to the Operation, Inspection, Maintenance and Decommissioning Strategy.

3 PROJECT DESCRIPTION

This section provides an overview of the proposed project activities which will be conducted during the replacement of the Mull - Coll cable. A detailed project description is provided in the Mull - Coll Cable Replacement Project Description.

The proposed activities are planned to be undertaken between December 2021 and June 2022, with the installation of the Mull – Coll cable anticipated to take place over 68 days. This end date includes contingency to allow for potential unforeseen operational and/or weather delays.

The cable is located in the Inner Hebrides off the west coast of Scotland between the islands of Mull and Coll. The project is to install an up to 16.5 km long replacement 11kV HVAC cable between Mull and Coll. The existing Mull – Coll cable route is installed from Port Langamull, Mull and passes through the Tiree passage in a north easterly direction in the Sea of Hebrides to a landfall at Sorisdale Bay, Coll. At each shore end landfall site, the existing land-based network connects the submarine cable to the SHEPD network.

In order to allow sufficient flexibility for detailed route engineering and associated micro-routing, a ~500 m wide corridor will be consented and considered within this MEA. The location of the installation corridor is shown in Figure 3-1, with coordinates of the bounding points provided in Table 3-1. To maximise cable burial potential and avoid the steep slopes associated with rocky outcrops present in the area, the replacement will be installed to the north of the existing cable and will be buried or surface laid within the installation corridor, depending on ground conditions and existing infrastructure (existing in and out of service cables). The maximum offset from the existing cable is ~1800 m at approximately KP 10.300. The cable will landfall at the same sites as the existing cable.

The cable has been routed through gullies between rocky outcrops and through smooth, sandy areas of seabed, wherever possible, identified through UKHO and geophysical survey data. Crossings with the existing in-service and out of service Mull – Coll cables occur at the Mull shore end. The location of the out of service cable will be confirmed during the route survey operations. Micro-routing may still be required during the lay operations, however, all works will be completed within the consented installation corridor.

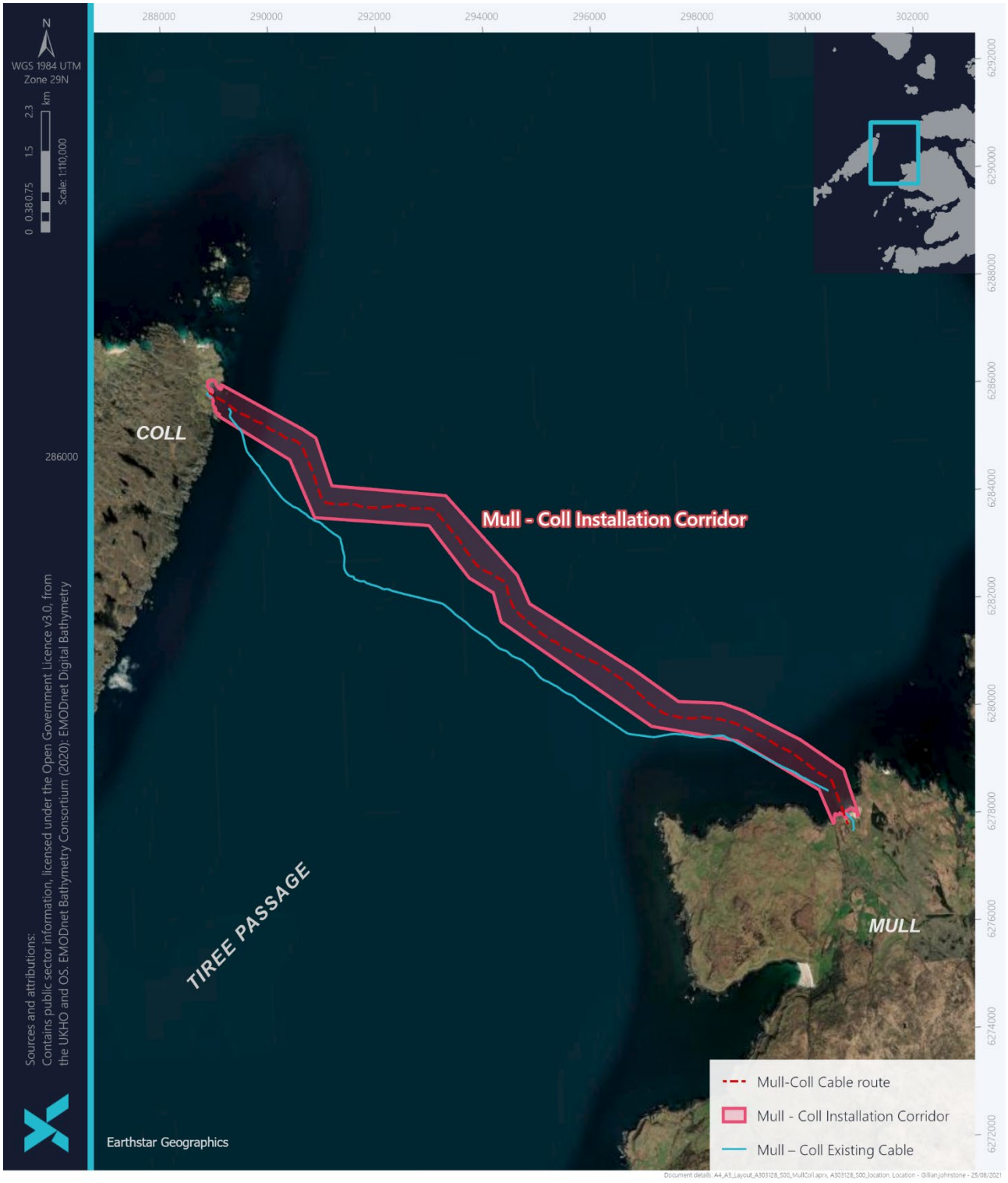


Figure 3-1 Location of the Proposed Replacement Cable Installation Corridor for Mull - Coll (includes an indicative centreline)

Table 3-1 Cable Installation Corridor Coordinates in Degrees, Minutes and Seconds (DMS), Degrees & Decimal Minutes (DDM) and Decimal Degrees (DD).

Cable Installation Corridor Coordinates (WGS84)					
Latitude DMS	Longitude DMS	Latitude DDM	Longitude DDM	Latitude DD	Longitude DD
56° 40' 53.281" N	6° 27' 14.973" W	56° 40.888' N	6° 27.250' W	56.681467	-6.454159
56° 40' 21.994" N	6° 25' 39.451" W	56° 40.367' N	6° 25.658' W	56.672776	-6.427625
56° 40' 16.435" N	6° 25' 25.367" W	56° 40.274' N	6° 25.423' W	56.671232	-6.423713
56° 39' 47.194" N	6° 25' 9.780" W	56° 39.787' N	6° 25.163' W	56.663109	-6.419383
56° 39' 38.700" N	6° 23' 5.546" W	56° 39.645' N	6° 23.092' W	56.660750	-6.384874
56° 38' 49.119" N	6° 21' 50.663" W	56° 38.819' N	6° 21.844' W	56.646978	-6.364073
56° 38' 31.680" N	6° 21' 38.428" W	56° 38.528' N	6° 21.640' W	56.642133	-6.360674
56° 37' 49.535" N	6° 19' 47.412" W	56° 37.826' N	6° 19.790' W	56.630427	-6.329837
56° 37' 29.182" N	6° 18' 59.716" W	56° 37.486' N	6° 18.995' W	56.624773	-6.316588
56° 37' 27.127" N	6° 18' 12.020" W	56° 37.452' N	6° 18.200' W	56.624202	-6.303339
56° 37' 22.008" N	6° 17' 48.378" W	56° 37.367' N	6° 17.806' W	56.622780	-6.296772
56° 37' 3.299" N	6° 16' 48.141" W	56° 37.055' N	6° 16.802' W	56.617583	-6.280039
56° 36' 44.180" N	6° 16' 2.090" W	56° 36.736' N	6° 16.035' W	56.612272	-6.267247
56° 36' 33.055" N	6° 15' 56.239" W	56° 36.551' N	6° 15.937' W	56.609182	-6.265622
56° 36' 17.757" N	6° 15' 48.682" W	56° 36.296' N	6° 15.811' W	56.604933	-6.263523
56° 36' 15.182" N	6° 16' 2.392" W	56° 36.253' N	6° 16.040' W	56.604217	-6.267331
56° 36' 11.989" N	6° 16' 15.679" W	56° 36.200' N	6° 16.261' W	56.603330	-6.271022
56° 36' 32.667" N	6° 16' 29.844" W	56° 36.544' N	6° 16.497' W	56.609074	-6.274957
56° 37' 4.122" N	6° 17' 57.218" W	56° 37.069' N	6° 17.954' W	56.617812	-6.299227
56° 37' 14.812" N	6° 19' 29.937" W	56° 37.247' N	6° 19.499' W	56.620781	-6.324982
56° 38' 21.432" N	6° 22' 10.219" W	56° 38.357' N	6° 22.170' W	56.639287	-6.369505
56° 38' 39.078" N	6° 22' 17.571" W	56° 38.651' N	6° 22.293' W	56.644188	-6.371548
56° 38' 48.559" N	6° 22' 43.393" W	56° 38.809' N	6° 22.723' W	56.646822	-6.378720
56° 39' 21.068" N	6° 23' 25.213" W	56° 39.351' N	6° 23.420' W	56.655852	-6.390337
56° 39' 28.443" N	6° 25' 29.711" W	56° 39.474' N	6° 25.495' W	56.657901	-6.424920
56° 39' 28.031" N	6° 25' 29.711" W	56° 39.467' N	6° 25.495' W	56.657787	-6.424920
56° 40' 3.803" N	6° 25' 54.587" W	56° 40.063' N	6° 25.910' W	56.667723	-6.431830
56° 40' 27.656" N	6° 26' 59.652" W	56° 40.461' N	6° 26.994' W	56.674349	-6.449903
56° 40' 27.682" N	6° 26' 59.677" W	56° 40.461' N	6° 26.995' W	56.674356	-6.449910
56° 40' 29.434" N	6° 27' 4.419" W	56° 40.491' N	6° 27.074' W	56.674843	-6.451228
56° 40' 31.766" N	6° 27' 10.841" W	56° 40.529' N	6° 27.181' W	56.675491	-6.453011
56° 40' 40.071" N	6° 27' 24.621" W	56° 40.668' N	6° 27.410' W	56.677797	-6.456839
56° 40' 45.284" N	6° 27' 18.998" W	56° 40.755' N	6° 27.317' W	56.679246	-6.455277
56° 40' 53.281" N	6° 27' 14.973" W	56° 40.888' N	6° 27.250' W	56.681467	-6.454159
For the avoidance of doubt, the landward boundaries of the cable corridor covered by this MEA shall be MHWS. The landfall boundaries defined by the coordinates within this document should be considered approximations, due to the requirement to limit the number of vertices.					

Detailed information regarding cable pull-in, cable lay operations and cable protection are provided in the Mull - Coll Cable Replacement Project Description. The final methodology will be engineered following the results of the pre-installation survey operations and on completion of the On-Bottom Stability (OBS) analysis and the Cable Burial Risk Assessment (CBRA). A brief summary of the proposed marine cable installation method is provided below.

Following onshore preparations for the Transition Joint Pit (TJP) and pull-in site at the Coll landfall, which are located above MHWS, the cable pull-in operations will commence with the use of support craft vessels to transfer a winch wire from the Coll landfall to the Cable Lay Vessel (CLV). The cable will then be transferred from the CLV to the TJP to secure the cable's onshore position and prepare for the cable lay operations. The onshore preparations above MHWS for the cable pull-in at the Mull landfall will occur concurrently to those at Coll. Please note that the operations above MHWS are not included within this MEA.

The cable will be laid between Coll and Mull on the seabed by the CLV, and a Remotely Operated Vehicle (ROV) and/or subsea sonar equipment will be used to monitor the cable at the touch down location This will capture seabed information at the contact point and will help observe the lay tension that is applied to the cable from the vessel. Ultrashort Baseline (USBL) positioning equipment will monitor the position of the subsea equipment. During these operations, the vessel structure may be outside the licenced corridor, however, all deposits will be installed within the allocated boundary. Vessel movements will be notified by notice to mariners issued to inform other sea users for safety.

Following cable lay along the main route, the second pull-in operations at Mull will commence. The cable will be offloaded from the CLV with assistance from support crafts until the cable end is received onshore. Pull-in will be complete when the agreed overpull from the TJP has been achieved.

Detailed engineering design is ongoing. On the basis of the studies completed at the time of authoring the Project Description, it is expected that up to 62% of the cable may have to be surface laid with the remainder buried. Burial extents will be maximised as far as possible. For both cable ends, between MHWS and MLWS, the cable is proposed to be encased either in Articulated Pipe (AP) ('split pipe') or uraduct. At Mull, a trench will be opened up from the TJP to MLWS and the cable laid into it, with AP then applied and the spoil replaced. The situation at Coll is similar, although burial will be limited by the natural rock outcrops and subcrops. Here, the cable will most likely be restricted to opening up a trench where possible from the Coll TJP and elsewhere clearing gravel, cobbles and boulders so the AP lies on the bedrock with subsequent replacement of spoil to a seaward limit of MLWS. Beyond MLWS, the cable will be surface laid initially and encased in AP or uraduct, and thereafter either buried and stabilised by jet trenching where ground conditions permit or surface laid with external protection such as rock placement, rock bags or mattresses. In shallow water areas, where CLV and jet trencher access is not possible, a shallow water jet trenching skid may be utilised to obtain cable burial, although this is subject to further analysis. Grout bags may also be required to rectify any cable free spans observed following cable installation. Further details of the cable protection methods are provided in the Mull - Coll Cable Replacement Project Description.

Prior to cable installation operations commencing, a final pre-lay survey of the route will be conducted to identify possible debris and obstructions on the route. Where possible, debris and obstructions will be removed. An ROV or Pre-Lay Grapnel Run (PLGR) may be undertaken to remove debris and a diver may be required to remove debris in the nearshore area. Multiple pre-lay grapnel runs both end-to-end and perpendicular to the route may be required within the licensed installation corridor as part of any route preparation activities, where appropriate. Natural debris, such as boulders, will be relocated from the route by a 20 – 30 m distance, and manmade debris will be removed completely and sent for onward disposal/recycling at an appropriate facility onshore. Where individual boulders require relocating, a subsea rock grab may be used.

Sea Earths may also be installed at both shore-ends in order to provide protection from surges and lightning strikes to the electrical circuit provided by the proposed Mull-Coll replacement cable. The Sea Earth consists of two bare cooper wires at each landfall and is installed around the TJB perimeter and is connected to outer marine cable armour and the metallic elements of the Fibre Optic (FO) cable package associated with the TJB. The earth

wire is typically installed into the same trench as the marine cable (although some cable manufactures may stipulate a separate trench) with a minimum separation of approx. 200mm. Up to two trenches may be required at each landfall site for the Sea Earth, each with a maximin depth of approx. 1.5m and a width of approx. 1m. Therefore, a total of three trenches may be required at each landfall, one for the marine cable, one for the earth for the marine cable and one for the sea earth for the fibre optic cable. The earth wires will extend beyond the TJB to below MLWS and will be connected to a copper rod or clump weight at the sea-end which will be driven or placed into the seabed, respectively, for protection.

A summary of the activities considered by this assessment, is provided below. Please refer to Mull - Coll Cable Replacement Project Description for further detail:

- Prior to cable installation, a work class ROV or PLGR may be used to remove debris from the proposed routes;
- Proposed to bury the cable between MHWS to MLWS where possible using land-based excavators at both shore-ends. Where burial is not possible the cable will be surface laid with either AP or uraduct. Three trenches may be required to accommodate the use of the Sea Earth wire. A 10 m working corridor width has been assumed to accommodate the trench requirements for the Sea Earth wires;
- Below MLWS, the submarine power cable will be surface laid or buried using a CLV and jet trencher, with the potential for shallow water burial using shallow water burial skid where the CLV and jet trencher cannot access. The working corridor width will be a maximum of 10 m, which will include the width of the jet trencher or burial skid. The remaining portions of the cable will be surface laid;
- External protection for the cable, including AP or uraduct between MHWS and MLWS and in a short distance beyond MLWS. Rock placement, rock bags and / or concrete mattresses will be used for external protection and/or stabilisation. Grout bags may be installed where free spans are identified during post-installation surveys; and
- Associated vessel presence.

4 ASSESSMENT METHODOLOGY

This MEA supports SHEPD's applications for authorisation to complete the required works, by providing an assessment of potential impacts on sensitive environmental receptors. Where potentially significant adverse effects are identified, appropriate mitigation will be prescribed in order to reduce the magnitude of effect to an acceptable level.

An assessment of environmental impacts has been undertaken to support the submission of Marine Licence and associated European Protected Species (EPS) Licence and Basking Shark Licence applications. The scope of this assessment is exclusively focused on impacts to receptors pertaining to the proposed cable installation activities below MHWS. Data sources used to input into the subsequent assessment have been derived from:

- Relevant studies and reports available for the Cable Route locations as supplied by SHEPD;
- Publicly available literature; and
- Previous reports relating to SHEPD operations within close proximity to the area.

Potential impacts have been evaluated to determine how the cable route replacement activities could affect the environment and the corresponding significance of those impacts. Where potential impacts are likely to be significant, specific mitigation measures have been identified for implementation.

4.1 Marine Surveys

Fugro were contracted to conduct marine geophysical, geotechnical and environmental surveys along the proposed cable route corridor between Mull and Coll, with the surveys being undertaken between December 2020 to March 2021. Figure 4-1 illustrates the location of the survey corridor and associated seabed photography transects. The surveys involved the sampling and analysis of both offshore and nearshore areas and includes the following:

- Fugro (2021a). Fugro was commissioned by Global Marine Group to undertake a geophysical survey for the proposed Mull - Coll power cable system connecting the Isle of Mull to Coll. The survey comprised the collection of multibeam bathymetry (MBES), side scan sonar (SSS), magnetometer, and sub-bottom profiler (SBP) data within the cable corridor; utilising the Fugro Frontier, Fugro Seeker and Valkyrie survey vessels. Additionally, the Fugro Galaxy and Fugro Frontier were also utilised for the offshore geotechnical operations performed on the Mull to Coll cable route. Survey activities were conducted between 24th December 2020 to 21st March 2021. A topographic survey was also undertaken at both shore-ends and an Unexploded Ordnance (UXO) drone survey was carried out by a third party at the inshore and landfall sites.
    - The purpose of the survey was to identify all features or items that lie within the survey area and highlight those that pose a threat to the security of the cable, such as man-made features, wrecks or third party pipeline/cable crossings, or seabed features such as rock outcrops, areas of high mobility or steep slopes which may impact engineering methods. The survey also provided geotechnical sampling data for sites along the route.

- Fugro (2021b) – On the instruction of Global Marine Group, Fugro also acquired environmental data along the Mull to Coll proposed cable route. Fugro performed Phase 1 intertidal walkover surveys at both shore-end proposed landfall locations. The survey was conducted over low water during the survey period: 12th February 2021 on Mull and 28th February – 1st March 2021 on Coll. Fugro also performed a subtidal survey using seabed photography/video systems on the MV Fugro Valkyrie between 6th and 9th February 2021 and the MV Fugro Frontier between 2nd and 3rd March 2021.
    - The purpose of the Mull and Coll benthic intertidal ecology surveys were to provide a robust baseline characterisation of the survey areas and to supplement the existing benthic ecology data from within the area of interest. The intertidal survey recorded intertidal sediments and associated conspicuous species, in addition to classification and mapping of intertidal biotopes within the survey area.
    - Following the acquisition of the geophysical survey data, the results were reviewed by an environmental scientist to identify locations for underwater camera investigations. 15 transect locations were identified to investigate potential seabed features identified on geophysical data and sediment boundaries.
    - The habitat assessment was required to describe all habitats within the survey area and to identify the presence and extent of any Annex I habitats, as well as any other habitats or species of conservation interest.

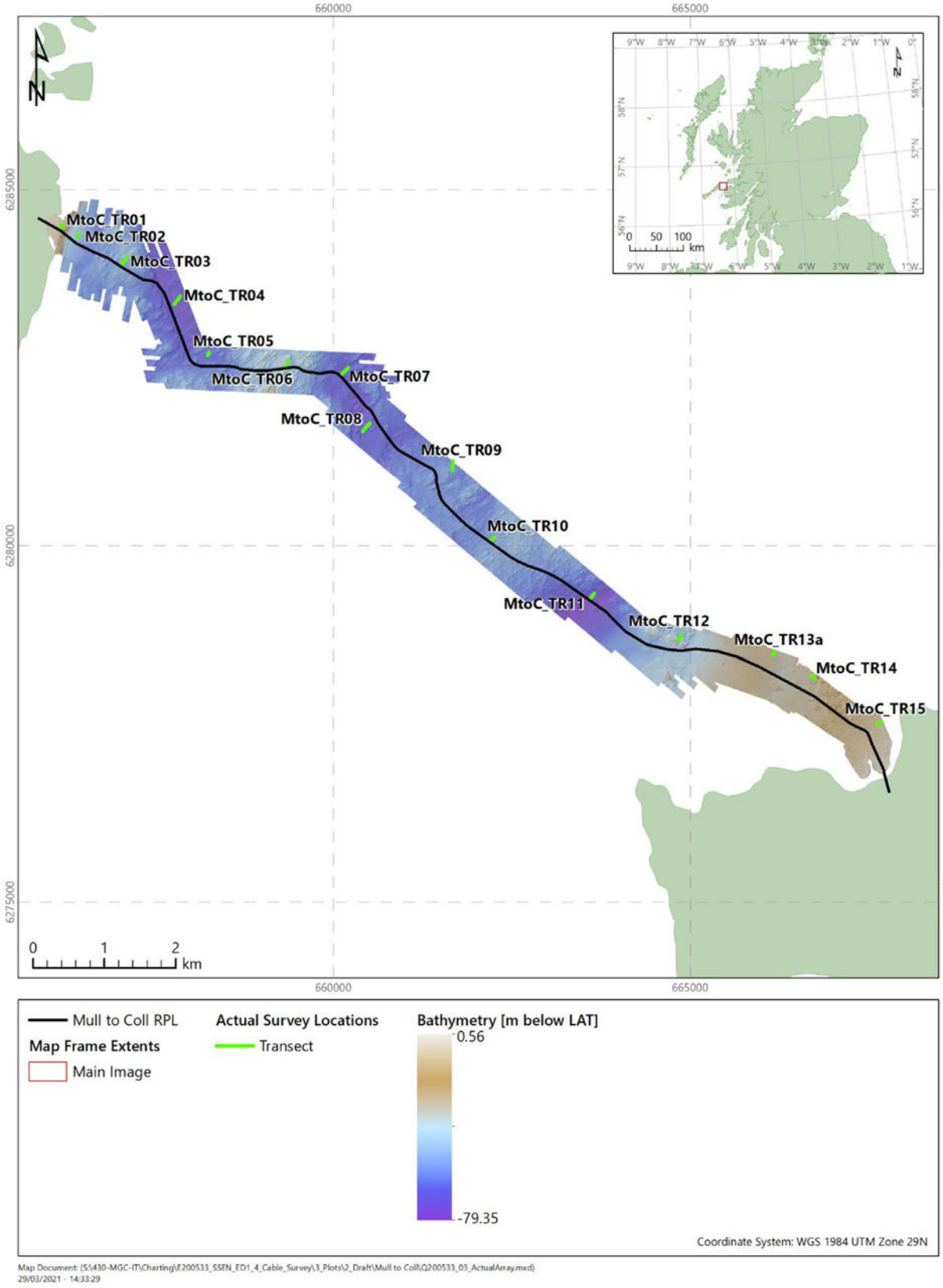


Figure 4-1 Bathymetry and Location of the Environmental Surveys – Mull to Coll (Fugro, 2021b)

4.2 Assessment Criteria

This MEA provides an assessment of potential impacts resulting from the effects of the cable route replacement activities on environmental receptors. The terms effect and impact are different, as one drives the other. Effects are measurable physical changes in the environment (e.g. volume, time and area) arising from project activities, while impacts consider the response of a receptor to an effect. Impacts can be defined as direct or indirect, beneficial or adverse.

In order to implement a systematic assessment of impacts between the different receptors an overall approach to the assessment of impacts in order to determine their significance has been implemented. The process considers:

- Sensitivity and value of a receptor;
- Magnitude of effect; and
- Determination and qualification of the significance of the impact.

4.2.1 Sensitivity and Value

The sensitivity of a receptor is a function of its capacity to accommodate change and reflects its ability to recover if it is impacted. Sensitivity of a receptor is based on the following factors:

- Tolerance to change;
- Recoverability;
- Adaptability; and
- Value.

The scale of sensitivity is as follows; negligible, low, medium, high, very high.

4.2.2 Magnitude of Impact

The magnitude of an effect can be characterised by considering the following factors:

- Duration of the impact;
- Size and scale;
- Timing/seasonality; and
- Frequency.

Categorisation of the magnitude of impact will vary for specific topics. The magnitude categories used are negligible, minor, moderate and major.

4.2.3 Significance of Impact

The significance of potential effects has been determined by a combination of the sensitivity and value of a receptor and the magnitude of an effect. The general framework for assessing the significance of potential effects is outlined below (Table 4-1).

Table 4-1 Significance of Impact

Magnitude	Sensitivity/Value				
	Negligible	Low	Medium	High	Very high
Negligible	Negligible	Negligible	Negligible	Minor	Minor
Minor	Negligible	Negligible	Minor	Minor	Moderate
Moderate	Negligible	Minor	Moderate	Moderate	Major
Major	Minor	Minor	Moderate	Major	Major

In general, moderate or major impacts are classified as significant and will require additional mitigation in order to reduce the magnitude of effect to an acceptable level. Where a range of significant effects are determined, expert judgement will be used to consider the final impact.

4.3 Mitigation Requirements

Certain measures are incorporated into the project design as adherence to standard industry best practices or embedded mitigation which is fundamental to how the project will be executed. Details of the embedded mitigation which SHEPD are committed to implementing, and hence has be considered by this MEA are presented in Table 4-2. All embedded mitigation will be included within the CEMP.

Additional mitigation has been suggested on a receptor specific basis informed by the impact assessments. During the assessment of impacts in the receptor specific assessment chapters, all proposed mitigation is considered when assessing the significance of an impact.

Table 4-2 Embedded Mitigation and Best Practice Relevant to the Project

Measure	Details
Production of a Construction Environmental Management Plan (CEMP)	Measures will be adopted to ensure environmental impacts are minimised, and to reduce the potential for release of pollutants from installation works. This will be informed by the results of this MEA.
All project personnel will be trained and informed of their responsibility to implement the environmental and ecological mitigation outlined in the CEMP	Toolbox talks, inductions, and awareness notices will be used to disseminate this information among all relevant project personnel.
Preconstruction surveys will be conducted to inform detailed route engineering.	Appropriate preconstruction surveys and visual inspection will be conducted to confirm the locations of potentially sensitive features.
Environmental planning.	The final cable routes, and positioning of filter bags and concrete mattresses will be optimised to avoid impacts on sensitive environmental features, including Annex 1 habitats and wrecks insofar as possible.
Scottish Marine Wildlife Watching Code (SMWWC)	All vessels will adhere to the provisions of the SMWWC during installation works. NatureScot developed the Code as part of its duties under the Nature Conservation (Scotland) Act 2004. The Code was first published in 2006 and was revised in 2017. The code aims to minimise disturbance to marine wildlife.
Lighting on board installation vessels will be kept to a minimum	Lighting on-board the cable installation vessel will be kept to the minimum level required to ensure safe operations. This will minimise disturbance to seabird species.
Deployment of anchor chains on the seabed will be kept to a minimum	Reduces the potential for disturbance to benthic habitats and species including those which utilise the seabed.
Vessels will be travelling at a slow speed during installation works.	The slow speed of installation vessels will minimise the risk of disturbance and injury impacts to seabird, basking shark and marine mammal receptors.
Production of an Emergency Spill Response Plan	An Emergency Spill Response Plan will help to ensure that the potential for release of pollutants from cable installation works is minimised.
Control measures and Shipboard Oil Pollution Emergency Plans (SOPEP) will be in place and adhered to under MARPOL Annex I requirements for all vessels. In the event of an accidental fuel release occurring appropriate standard practice management procedures will be implemented accordingly.	As per the MARPOL 73/78 requirement under Annex I, all ships with 400 GT and above must carry an oil prevention plan as per the norms and guidelines laid down by International Maritime Organization under MEPC (Marine Environmental Protection Committee) act. Production of this plan will help to ensure that the potential for release of pollutants from construction, operation and decommissioning is minimised.
Vessels will be equipped with waste disposal facilities (sewage treatment or waste storage) to IMO MARPOL Annex IV Prevention of Pollution from Ships standards.	Measures will be adopted to ensure that the potential for release of pollutants from installation vessels is minimised.

Measure	Details
Ballast water discharges from vessels will be managed under International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (Ballast Water Management (BWM) Convention).	The BWM Convention, adopted in 2004, aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments. Measures will be adopted to ensure that the risk of Non-Native Marine Species (NNMS) introduction during cable installation works is minimised.
Use of clean materials.	Only clean stone (free from organic contaminants) shall be used in filter bags to reduce the risk of NNMS.
Profiling of rock berms	All rock berms will be profiled with shallow side slopes and constructed of appropriate materials to minimise snagging risk.
Avoidance of Trawling	In line with guidance provided by the UKHO and International Convention for the Safety of Life at Sea (SOLAS), SHEPD recommend that fishing vessels should avoid trawling over installed seabed infrastructure. Vessels are also advised in the Mariners Handbook not to anchor or fish (trawl) within 500m of the cable.
Guard Vessels	A guard vessel may be used during the installation campaign where a potential risk to the asset or danger to navigation has been identified.
A Fisheries Liaison Officer (FLO) will be employed to manage interactions between cable installation vessels, personnel, equipment and fishing activity. This will be managed through the Fisheries Liaison Mitigation Action Plan.	Employment of a FLO will ensure all commercial fisheries operators in the vicinity of the Project will be proactively and appropriately communicated with in terms of proposed Project operations.
Notice to Mariners (including local), Kingfisher bulletins, Radio Navigational Warnings, and/or broadcast warnings will be promulgated in advance of any proposed works. The notices will include the time and location of any work being carried out, and emergency event procedures.	Promotes navigational safety and minimises the risk of equipment snagging.
Compliance with International Regulations for the Prevention of Collision at Sea (IRPCS) (IMO, 1972) and the International Regulations for the Safety of Life at Sea (SOLAS).	IRPCS are the international standards designed to ensure safe navigation of vessels at sea. All installation vessels will adhere to these rules, including displaying appropriate lights and shapes. SOLAS is an international maritime treaty which sets minimum safety standards in the construction, equipment and operation of merchant ships. The convention requires signatory flag states to ensure that ships flagged by them comply with at least these standards. In relation to the Project its compliance will ensure navigational safety.
As built survey data will be provided to the UKHO and Kingfisher for inclusion on Admiralty Charts and the Kingfisher Information Service – Offshore Renewable and Cable Awareness (KIS-ORCA) charts.	Ensure navigational safety and minimise the risk and equipment snagging.

4.4 Cumulative Impact Assessment

The Current Marine Projects list on Marine Scotland's website (Marine Scotland, 2021) was reviewed to identify other projects with the potential to result in cumulative effects. However, considering the extremely localised nature of the effects likely to be associated with the proposed cable replacement works, no potential cumulative effects were identified, and no further assessment is required.

5 DESIGNATED SITES

5.1 Introduction

This chapter will provide the information required to support the HRA process. As such, the project activities will be assessed as to whether they are likely to constitute a LSE on a designated site, in line with the HRA process. Therefore, magnitude and significance of impact will not be discussed within this chapter and these will be determined in the topic-specific receptors impact chapters.

LSE on European sites which include Special Protection Areas (SPA), Special Areas of Conservation (SAC) and Ramsar Sites will be determined. In addition to this, the potential impact on NCMPAs and Designated Seal Haul-outs will also be assessed as per section 82 and 117 of the Marine (Scotland) Act 2010.

No LSE on Ramsar sites or terrestrial SPAs are expected, as an overview of those present within the wider area (Sitelink, 2021) revealed that none were designated for features which have any ecological connectivity with the proposed cable replacement works. The cable installation corridor lies approximately 0.3 km from the Coll SPA, designated for non-breeding Greenland white-fronted goose (*Anser albifrons flavirostris*) and Greenland barnacle goose (*Branta leucopsis*) under Article 4.1 of the Birds Directive (79/409/EEC) (NatureScot, 1994). The Coll Ramsar site overlaps with the Coll SPA and has Greenland white-fronted goose as a qualifying feature (JNCC, 2005). As these two geese species are terrestrial, and there is no direct overlap with these designated sites, there is expected to be very limited ecological connectivity between the qualifying features of this SPA and Ramsar with the marine cable replacement activities. Therefore, no LSE are predicted on these sites with no further assessment necessary. These sites are not considered further in this assessment.

The following criteria has been used to select those designated sites where potential impacts need to be assessed:

- SACs and NCMPAs (including proposed and candidate sites) with cetaceans or basking sharks as qualifying features within 50 km of the proposed cable replacement works;
- SACs (including proposed and candidate sites) with harbour seal interests within 50 km of the proposed cable installation corridor and breeding grey seal within 20 km of the proposed cable replacement works;
- Designated seal haul-outs or grey seal breeding sites that overlap with or located within 500 m of the proposed cable replacement works;
- SACs and NCMPAs (including proposed and candidate sites) with otter interests that overlap with or located within 500 m of the proposed cable replacement works;
- SPAs and NCMPAs (including proposed and candidate sites) with birds as qualifying features that overlap with or are located within 2 km of the proposed cable replacement works; or
- SACs and NCMPAs (including proposed and candidate sites) with seabed / benthic protected features that overlap with the proposed cable replacement works.

It should be noted that all distances to designated sites have been calculated on a straight-line basis. For marine megafauna designations, the travel distances of species to the installation corridor may be significantly greater than this in reality.

Where no LSE is predicted on a Natura 2000 site, NCMPA or Designated Seal Haul-out, the site has been screened out for further assessment in this report. Where an LSE cannot be ruled out, a more detailed assessment has been carried out. Details of mitigation measures have then been presented where necessary. Further details on impacts

to qualifying features will also be assessed in the topic-specific chapters in Section 7 – Marine Megafauna, Section 8 – Benthic and Intertidal Ecology and Section 9 – Ornithology.

5.2 Data Sources

This section draws on a number of data sources including published papers and industry-wide surveys. A key data source available for Scottish waters (within 12 nautical miles and offshore) is the National Marine Plan interactive (NMPi) website (NMPi, 2021) which underpins the Scottish NMP (Scottish Government, 2015). Identification of designated sites within the vicinity of the Installation Corridor has been obtained using publicly available geospatial data.

5.3 Baseline and Receptor Identification

The designated sites located in the vicinity of the installation corridor are displayed on Figure 5-1. Those which have the potential to be impacted by the activities subject to the selection criteria above are outlined in the following sections and Table 5-1.

5.3.1 SACs and NCMPAs with Cetaceans or Basking Sharks as Qualifying Features

The installation corridor overlaps with the Inner Hebrides and the Minches SAC, designated for harbour porpoise (*Phocoena phocoena*) and the Sea of the Hebrides NCMPA, designated for minke whale (*Balaenoptera acutorostrata*) and basking shark (*Cetorhinus maximus*).

The Inner Hebrides and the Minches SAC was designated in 2018 and extends almost across the entire north west coast of Scotland, covering an area of 13,815 km^2. The site contains a mosaic of sediment types which are expected to support a diverse range of fish species preyed upon by harbour porpoise. This productive foraging area is expected to contribute to the high densities of harbour porpoise observed at the site. It is estimated that the SAC supports approximately 5,438 individuals for at least part of the year[1] (NatureScot, 2019a).

The Sea of the Hebrides NCMPA supports high densities of minke whale and basking shark. The waters within this area are nutrient-rich and this creates a large feeding ground for these two species (NatureScot, 2019b). Minke whale and basking shark sightings are expected to be highest during the late summer months. Notably, the Sea of the Hebrides NCMPA contains a basking shark awareness zone surrounding Coll, Tiree and the Small Isles, where aggregations of basking shark are expected to occur more frequently compared to other areas within the NCMPA. This zone has been identified as a potential area for further conservation management. The installation corridor lies within the basking shark awareness zone (NatureScot, 2020a).

Due to the mobile nature of the cetaceans and basking sharks and the fact that the installation corridor overlaps with these two designated sites, there is considered to be potential connectivity with these sites.

[1] Please note that this does not represent a population estimate for this site. Due to the mobile nature of harbour porpoise, the Management Unit (MU) should be used for population estimates as it accounts for daily and seasonal movements (NatureScot, 2019b).

5.3.2 SACs with Harbour or Grey Seal as a Qualifying Feature and Seal Haul-out Sites

There are two SACs with seals as their qualifying feature within a 50 km distance (harbour) and 20 km (grey) as per the assessment criteria outlined in Section 5.1. The Eileanan agus Sgeiran Lios mor SAC, designated for harbour seal lies 42 km from the installation corridor (JNCC, 2021a) and the Treshnish Isles SAC, designated for grey seal lies 10.7 km from the installation corridor (JNCC, 2021b). The Eileanan agus Sgeiran mor SAC supports a harbour seal colony which represents just over 1% of the UK population (JNCC, 2021a). The Treshnish Isles SAC contributes to just under 3% of the annual UK grey seal pup population (JNCC, 2021b).

Due to the mobile nature of seals, there is considered to be potential connectivity with these two sites.

5.3.3 Designated Seal Haul-Outs or Grey Seal Breeding Sites

There are no designated seal haul outs or breeding sites within 500 m of the installation corridor. The closest is the Cairns of Coll seal haul-out which is approximately 567 m from the installation corridor. No ecological connectivity is expected with these designated sites, and as such they have not been considered for further assessment.

5.3.4 SACs and NCMPAs with Otter Interests

There are no SACs or NC MPAs located within 500 m of the proposed repair works which are designated for the conservation of otters. Therefore, no adverse impacts to otter are expected and further assessment of these features have not been carried out.

5.3.5 SPAs and NCMPAs with Birds as Qualifying Features

There is one SPA which is located within 2 km of the proposed cable replacement works. The Coll and Tiree SPA is located 0.8 km north from the installation corridor.

This site qualifies as an SPA under Article 4.1 of the of the Birds Directive (79/409/EEC) by regularly supporting a wintering population of European importance of great northern diver (*Gavia immer*) (an Annex 1 species) and under Article 4.2 for regularly supporting populations of migratory common eider (*Somateria mollissima*) (NatureScot, 2020b). Great northern diver are present in winter in Scottish waters with common eider being present all year round. Both species forage primarily through surface diving (NatureScot, 2017). Although the installation corridor does not directly overlap with this SPA, there is the potential for great northern diver and common eider may be foraging within the vicinity of the cable replacement works.

As described in Section 5.1, the Coll SPA and Ramsar are approximately 0.3 km from the installation corridor. However, no ecological connectivity between the qualifying features of these sites and the replacement works has been identified, and hence, no LSE on these sites are predicted.

5.3.6 SACs and NCMPAs with Seabed / Benthic Protected Features

As described in Section 5.3.1, the installation corridor overlaps with the Sea of the Hebrides MPA. In addition to basking shark and minke whale, this site is designated for marine geomorphology of the Scottish Shelf Seabed. Specifically, the site is designated for the Inner Hebrides Carbonate Production Area which consists of shelves, banks and sand wave fields with carbonate rich sands and gravels (NatureScot, 2020d). Biogenic components to this feature include maerl beds, horse mussel beds and seagrass beds. These features capture carbon and when they are broken down, sediment transport systems transfer the carbon rich sediments to shore, which are a key component of the rare dune-machair systems (NatureScot, 2019). As the installation corridor overlaps with this designated site, there is the potential for ecological connectivity with the installation activities.

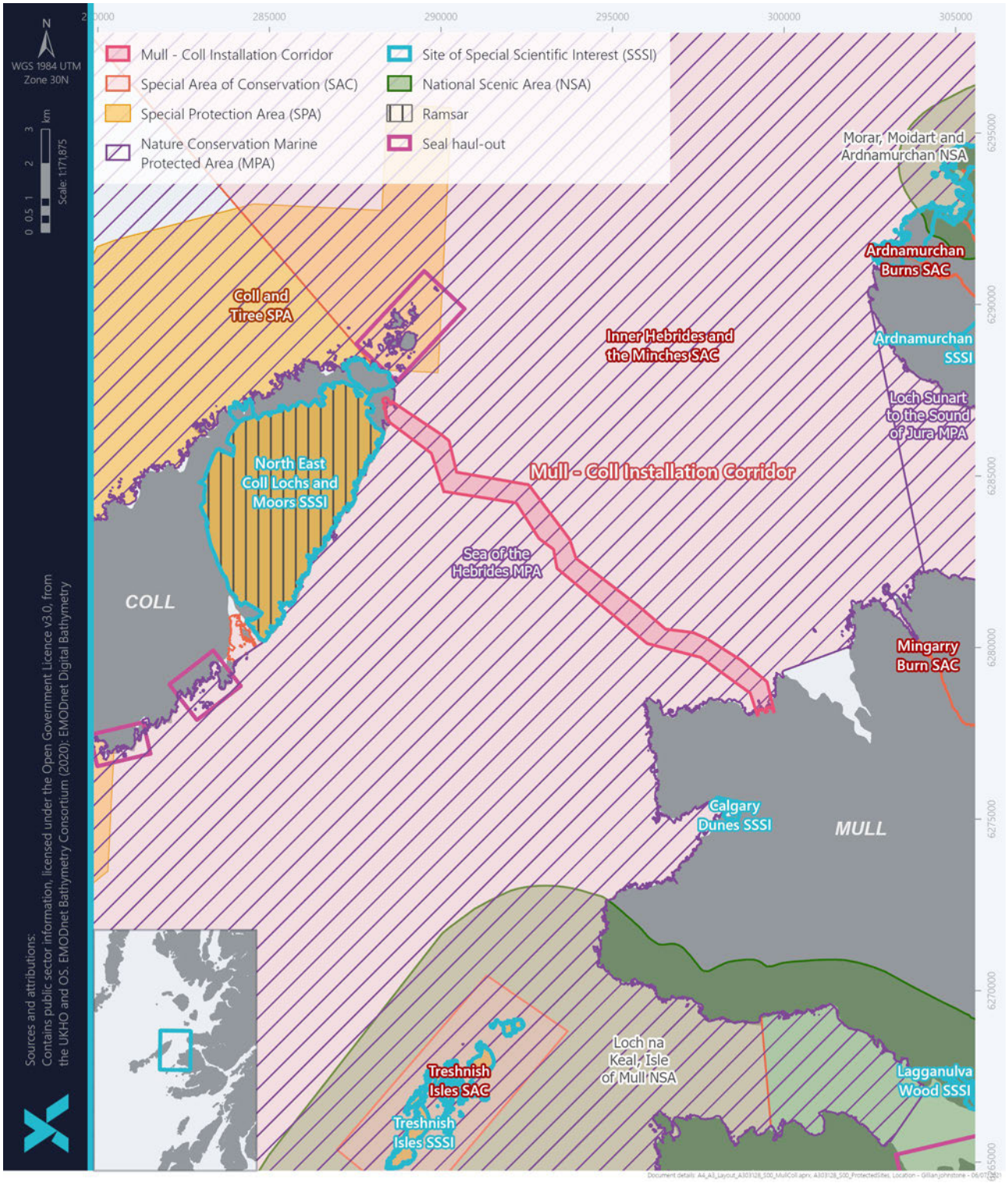


Figure 5-1 Protected Sites in the Vicinity of the Installation Corridor

5.4 Potential Connectivity with Designated Sites

Although there are designated sites within relatively close proximity to the proposed installation corridor, for a LSE to arise, there has to be potential ecological connectivity between the cable repair works and the qualifying features of a designated site. An initial consideration has been provided within Table 5-1 identifying whether particular designated sites or particular impacts require a more detailed investigation of whether there is a potential LSE. Those sites or impacts for which no likely significant effect is expected are not considered for further assessment.

Table 5-1 Protected Sites in the Vicinity of the Installation Corridor as per the Assessment Criteria (Criteria outlined in Section 5) (JNCC, 2021a; JNCC, 2021b; JNCC, 2021c; NatureScot, 2020b; NatureScot, 2020c)

Designated Site	Reason for Selection	Distance to Mull to Coll Installation Corridor (km)	Relevant Qualifying features of designated site	Potential impact from cable replacement works	Requirement for further assessment
Inner Hebrides and the Minches SAC	This designated site overlaps with the installation corridor.	0	• Harbour porpoise (*Phocoena phocoena*)	• Underwater noise; and • Vessel presence.	Overlaps with proposed activities and therefore **further assessment is required.**
Sea of the Hebrides NCMPA	This designated site overlaps with the installation corridor.	0	• Basking Shark (*Cetorhinus maximus*); • Minke Whale (*Balaenoptera acutorostrata*); • Fronts; and • Marine geomorphology of the Scottish Shelf seabed.	• Underwater noise; • Seabed disturbance associated with seabed preparation activities (e.g. PLGR) and cable installation; and • Vessel presence.	Overlaps with proposed activities and therefore **further assessment is required.**
Coll and Tiree SPA	This designated site is within 2 km of the installation corridor.	0.8	• Common eider (*Somateria mollissima*); and • Great Northern diver (*Gavia immer*)	• Vessel presence.	Seabirds utilising this site may be foraging in the vicinity of the proposed cable replacement works, and as such **further assessment for these qualifying features is required for potential impacts at sea.**
Treshnish Isles SAC	This designated site is within 20 km of the installation corridor.	10.7	• Reefs; and • Grey seal (*Halichoerus grypus*).	• Underwater noise; and • Vessel presence.	The intervening distance between the installation corridor and the designated site means that disturbance or loss of the reef habitat designated within this site is not anticipated and **no further assessment of LSEs to this qualifying feature is required.** Due to the mobile nature of harbour seals, **further assessment is required for this qualifying feature.**
Eileanan agus Sgeiran Lios mor SAC	This designated site is within 50 km of the installation corridor.	42	• Harbour seal (*Phoca vitulina*)	• Underwater noise; and • Vessel presence.	Due to the mobile nature of harbour seals, **further assessment is required.**

5.5 Assessment of Likely Significant Effects

The following sections will assess the potential for LSE on the designated sites which require further assessment. For each designated site that has the potential to be impacted by the cable replacement works, mitigation measures have been considered based upon site-specific protected features.

5.5.1 Assessment of Likely Significant Effects on SACs and NCMPAs with Cetaceans and Basking Shark as a Feature

The installation corridor overlaps with the Inner Hebrides and the Minches SAC, designated for harbour porpoise and the Sea of the Hebrides NCMPA, designated for basking shark and minke whale (NatureScot, 2020c, JNCC, 2021c). Further details on the assessment of potential impacts on cetaceans and basking sharks is provided in Section 7.

5.5.1.1 Underwater noise

As detailed in Section 7 and Appendix A, no injury risk is associated with the proposed installation works, and the disturbance range is limited to approximately 200 m. Nevertheless, there is the potential for noise emissions to disturb harbour porpoise and minke whale.

However, the short-term and transient nature of the cable installation works means the risks to cetaceans are extremely localised and temporary, therefore animals within a particular area will not be exposed to extended periods of underwater noise. The temporary and transient in nature of the potential disturbance, in conjunction with the highly mobile and wide-ranging nature of harbour porpoise and minke whales means that the disturbance is unlikely to cause a negative effect at a population level.

Although there is the possibility that the installation works will occur entirely over winter, when basking sharks do not utilise the waters off the west coast of Scotland, the installation period extends out until June. Therefore, there is still considered to be the potential for impacts to occur to this species. However, as described in Section 7.4.1.2, the noise frequencies associated with the USBL survey equipment are expected to be outwith the range of frequencies audible to this species, and hence, impacts are anticipated to be minimal.

Therefore, it is not expected that the proposed works will adversely affect the conservation objectives of these two sites and as such no LSE is expected. An assessment of potential LSE on the seabed features designated within the Sea of the Hebrides NCMPA is provided in Section 5.5.4.

5.5.1.2 Vessel Presence

With the increase in vessel traffic associated with the cable installation, marine mammals and basking shark could potentially be at an increased risk of collision. This likely poses the greatest risk to basking sharks as this species have slower swimming speeds than the highly manoeuvrable minke whales and harbour porpoise.

However, as the installation vessels will be slow-moving, and with a commitment to adhere to the SMWWC, as set out in Section 4.3, collision risk is generally considered to be low. Moreover, the presence of vessel associated with the installation works is not considered to be substantive change from baseline vessel activity in the area and as such, there is no LSE expected on these sites.

5.5.2 Assessment of Likely Significant Effects on SACs with Harbour and/or Grey Seals as a Feature

The installation corridor lies 42 km from the Eileanan agus Sgeiran Lios mor SAC, designated for harbour seal and 10.7 km from Treshnish Isles SAC, designated for grey seal. Further details on the impact of the installation corridor on seals is provided in Section 7.

5.5.2.1 Underwater noise

Underwater noise emissions have the potential to cause physical injury or disturbance to seals, particularly if they fall within their generalised hearing range (Southall *et al.*, 2019; NOAA, 2018). As detailed in Section 7 and Appendix A, no injury risk is associated with the proposed installation works, and the disturbance range is limited to approximately 200 m.

The proposed cable replacement works are unlikely to coincide with breeding and moulting periods (mid-June – August) of the harbour seal qualifying features relevant to the Eileanan agus Sgeiran Lios mor SAC. Furthermore, considering the intervening distance between the Eileanan agus Sgeiran Lios mor SAC and the installation corridor, and the availability of comparable marine habitat surrounding the installation works, the potential for adverse effects on harbour seals is considered limited and are not anticipated to impede their ability to forage or transit to or from their breeding sites within the SAC. In addition, the installation vessel will generally be moving, and therefore effects will be transient.

The Treshnish Isles SAC is located 10.7 km from the Mull-Coll installation corridor. The proposed cable replacement activities will be conducted between December and June, which is outwith the breeding season for grey seals on the north and west coast of Scotland (September to November), and avoids the most sensitive period for the species. As detailed above, the potential zone of disturbance will be limited to within the immediate vicinity of the installation works, and as such it is not expected to occlude access for grey seals to the Treshnish Isles SAC, especially considering the installation vessel will be continually moving.

As the installation activities will be transient, temporary and localised, any disturbance to seals at these sites resulting from underwater noise emissions will be temporary and this is not thought to adversely affect the conservation objectives of the protected site. As such, no LSE on the Eileanan agus Sgeiran Lios mor SAC or the Treshnish Isles SAC are expected from underwater noise emissions.

5.5.2.2 Vessel Presence

With the increase in vessel traffic associated with the cable installation, marine mammals could potentially be at an increased risk of collision and disturbance.

However, as the installation vessels will be slow-moving, collision risk is generally considered to be low. Moreover, the presence of vessel associated with the installation works is not considered to be substantive change from baseline vessel activity in the area and as such, there is no LSE expected on these sites.

5.5.3 Assessment of Likely Significant Effects on SPAs with Seabirds as a Features

As per the assessment criteria outlined in Section 5.1, there is one SPA within 2 km designated for seabirds. This site is the Coll and Tiree SPA which is located 0.8 km from the Mull to Coll installation corridor. Further details on the assessment of potential impacts on seabirds is provided in Section 9.

5.5.3.1 Vessel Presence

The proposed Mull – Coll cable replacement will be conducted during the wintering bird season. It is recognised that with the increase in vessel traffic associated with the cable installation, seabirds could potentially be at an increased risk of collision and disturbance at sea.

The installation corridor does not directly overlap with the SPA and hence, is considered to be outwith the key foraging grounds for great northern diver and common eider. Furthermore, as the installation vessels will be slow-moving, and as detailed in Section 4.3, lighting on board the vessels will be minimised in so far as possible, disturbance and risk of collision at sea is anticipated to be minimal. Moreover, the presence of vessel associated with the installation works is not considered to be a substantive change from baseline vessel activity in the area and as such, there is no LSE expected on the Coll to Tiree SPA.

5.5.4 Assessment of Likely Significant Effects on SACs and NCMPAs with Seabed / Benthic Protected Features

The installation corridor overlaps with the Sea of the Hebrides NCMPA, which has Marine geomorphology of the Scottish shelf seabed (Inner Hebrides Carbonate Production Area) as a protected feature. Further details on the potential impacts on this feature are discussed in Section 6 and 8.

5.5.4.1 Disturbance

Seabed preparation activities (e.g. PLGR) and cable installation works have the potential to disturb carbonate sands and gravel habitat and biogenic components, such as maerl beds, horse mussel beds, blue mussel beds and seagrasses associated with this habitat. As described in Section 8, disturbance could result from direct habitat loss, sediment resuspension, the introduction of non-native marine species (NNMS) and the accidental release of hazardous substances.

Disturbance from direct habitat loss is expected to be highly localised in extent and will only result in permanent effects to the sand and gravel habitat where cable burial is not possible. In these areas, the habitat loss will be confined to the small footprint of the cable and its external protection measures. Furthermore, the only biogenic elements identified during the surveys undertaken between January and March 2021 were maerl beds, identified with a coverage of < 10% of the seabed and a seagrass bed towards the Coll landfall (Fugro, 2021a). Any disturbance or loss of these features will be limited to the immediate footprint of the cable installation activities, and hence, will impact a very small portion of the designated site. Sediment resuspension is also expected to only impact a small footprint around jet trenching activities on a temporary basis, as described in Section 8. In addition the mitigation measures described in Section 4.3 are expected to adequately mitigation against any impacts associated with NNMS and the accidental release of hazardous substances. As a result, the cable installation is not expected to affect the functioning of this habitat as a carbonate production area or impede on the wider benefits that this ecosystem provides. Therefore, no LSE expected on the Sea of the Hebrides NCMPA, with respect to its seabed features.

5.5.5 Impact Assessment

Due to the localised nature of the proposed cable replacement works, no LSE is predicted on the conservation objectives of any protected site and as such it is not expected that an Appropriate Assessment (AA) will be required. Overall, the replacement of the Mull - Coll cable constitutes work of an overriding public need whilst presenting a trivial and temporary disturbance in a limited area.

6 SEABED AND WATER QUALITY

6.1 Introduction

This section provides an overview of potential impacts on seabed conditions and water quality resulting from the proposed cable replacement works. Details on baseline seabed conditions presented in this section provide the relevant information for the purposes of the MEA and are not intended for engineering applications.

In the sections of the offshore section of the proposed cable which will be surface laid, no disturbance to underlying geological features is expected. The footprint of the works in the sections of the cable which will be surface laid will be minimal and largely confined to the physical footprint of the cable itself, as no seabed modification such as trenching and/or burial will be undertaken in these areas. Lateral movement of the cable will be prevented where required by the placement of rock berms, rock filter bags or concrete mattresses directly onto the cable, with their placement impacts discussed in Section 8. The remaining areas of the cable will be buried using a jet trencher, resulting in localised sediment and bedform disturbance. However, the installation activities are of a short duration with any disturbance being highly localised. It is also expected that natural sediment movement will begin to backfill the trench over time. Therefore, no permanent impacts from the cable burial activities are expected.

For the reasons described above, potential effects on seabed quality have been screened out of this assessment.

6.2 Data Sources

This section draws on a number of data sources including published papers, industry-wide surveys and site-specific investigations. The key data sources used include the NMPi website (NMPi, 2021) which underpins the Scottish NMP (Scottish Government, 2015) and the geophysical and landfall survey report for the Mull – Coll cable (Fugro, 2021b).

6.3 Baseline and Receptor Identification

According to the British Geological Survey (BGS) illustrated on NMPi (2021) the surface sediments in the vicinity of the installation corridor comprise coarse sediment. This is generally consistent with the recent survey data for the Mull – Coll cable which identified SAND and GRAVEL surface sediments across the majority of the installation corridor with some sections of silt towards the Mull landfall. The offshore section towards the Mull landfall is composed of mostly SAND sediments, with GRAVEL sediments located arounds outcropping bedrock and patches of SILT. The seabed located in the north west of the installation corridor consists predominantly of GRAVEL with SAND sediments on the approach to the Coll landfall (Figure 6-1) (Fugro, 2021a).

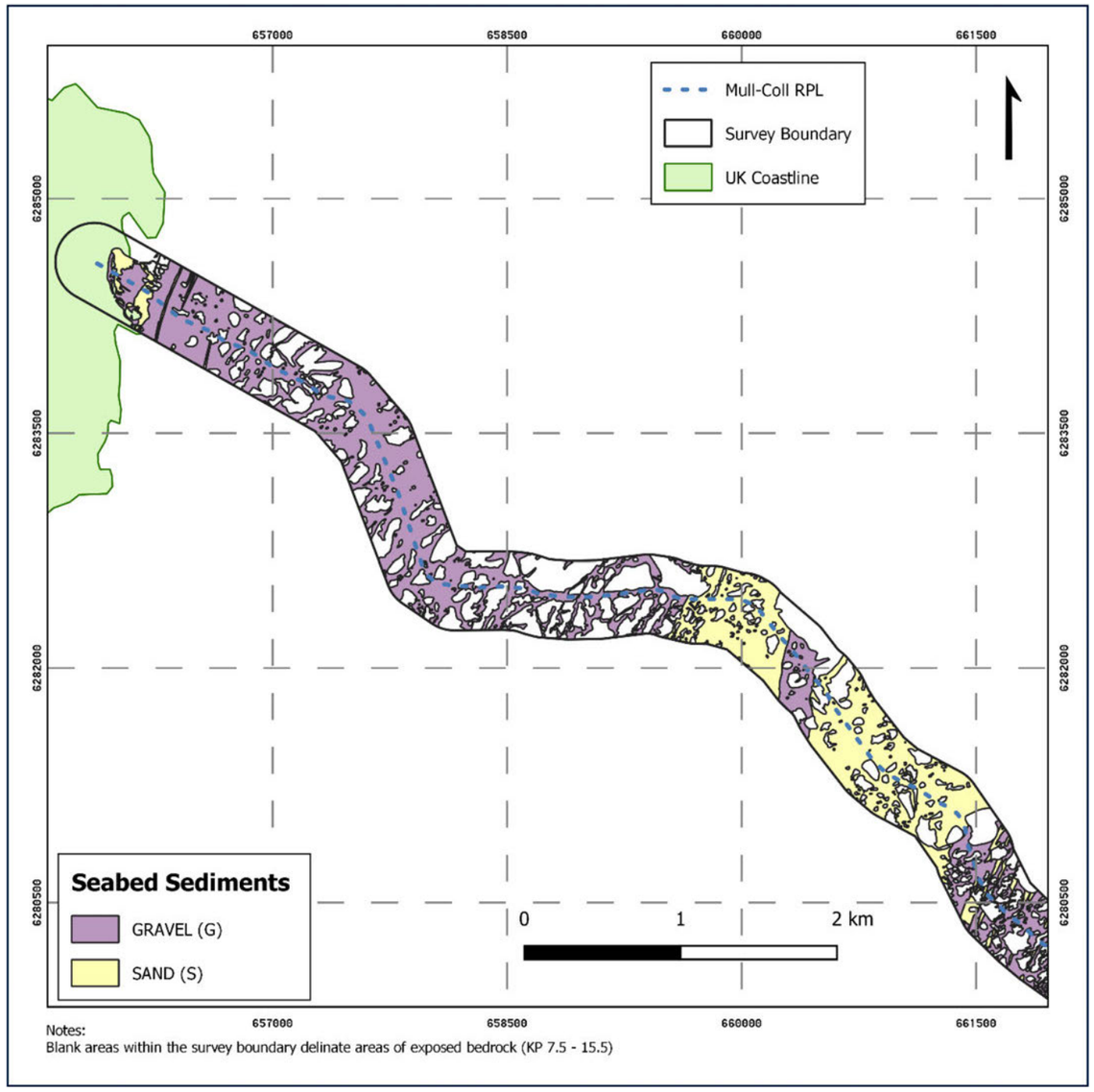
Water depths across the installation corridor range from approximately 0.6 m above Lowest Astronomical Tide (LAT) to 70.4 below LAT (Figure 6-2). The bathymetry at the landfall sites is displayed in Figure 6-3.

Areas of outcropping bedrock are prevalent throughout the installation corridor and were the most prominent seabed feature observed during the survey. Areas of bedrock in the nearshore zones also coincided with boulder fields. Large areas of outcropping bedrock are especially prevalent in the centre and north west of the installation corridor. Bedforms were also present sporadically throughout the installation corridor (Fugro, 2021a).

The environmental survey conducted for the Mull – Coll cable identified that Annex I bedrock reef was likely to be present in the installation corridor, associated with the areas of outcropping bedrock. Furthermore, sections of the cobbles and boulders in the nearshore section of the installation corridor towards Mull were identified as

potential Annex I stony reef (Fugro, 2021b). Areas of potential Annex I bedrock reef were also identified at the intertidal area of both shore ends (Fugro, 2021b).

The Water Framework Directive (WFD) on coastal water body classifications by Scottish Environment Protection Agency (SEPA) over the period 2007 – 2017 (NMPi, 2021) shows that coastal waters in the vicinity of the Installation Corridor have an overall moderate or high status.



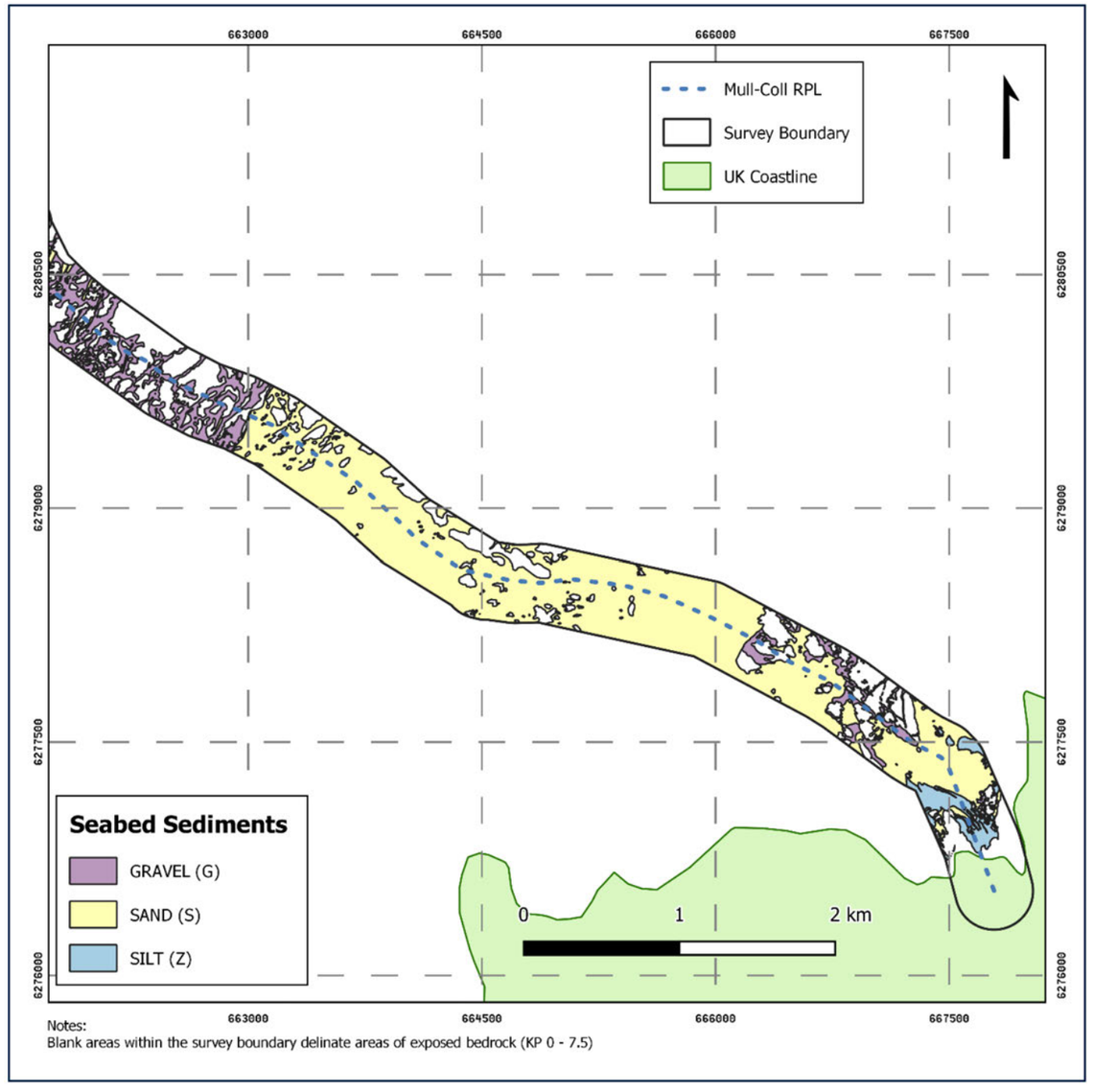


Figure 6-1 Seabed Sediments Overview (Fugro, 2021a)

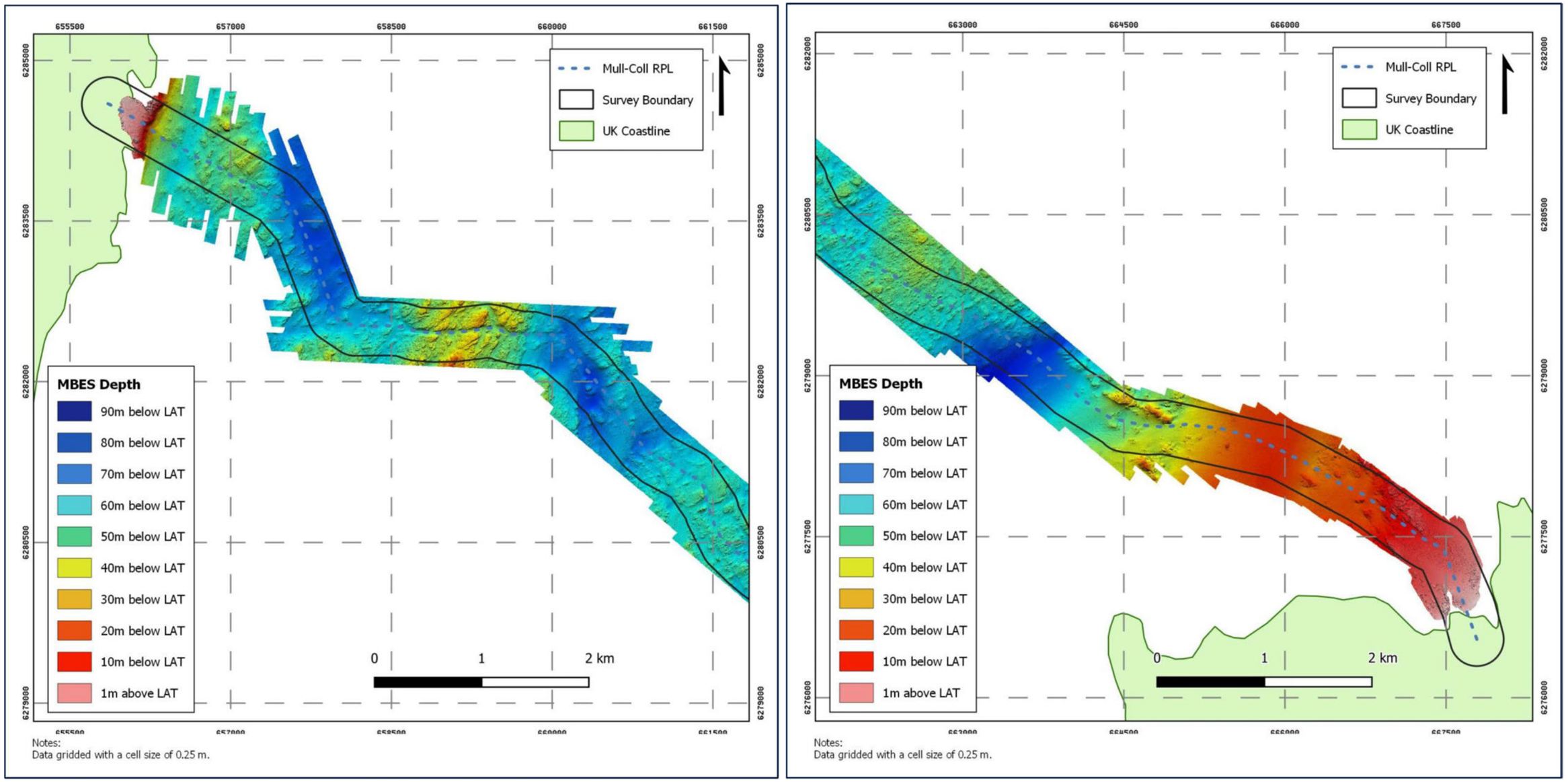


Figure 6-2 Bathymetry Along the Proposed Mull – Coll Cable Route (Fugro, 2021a)

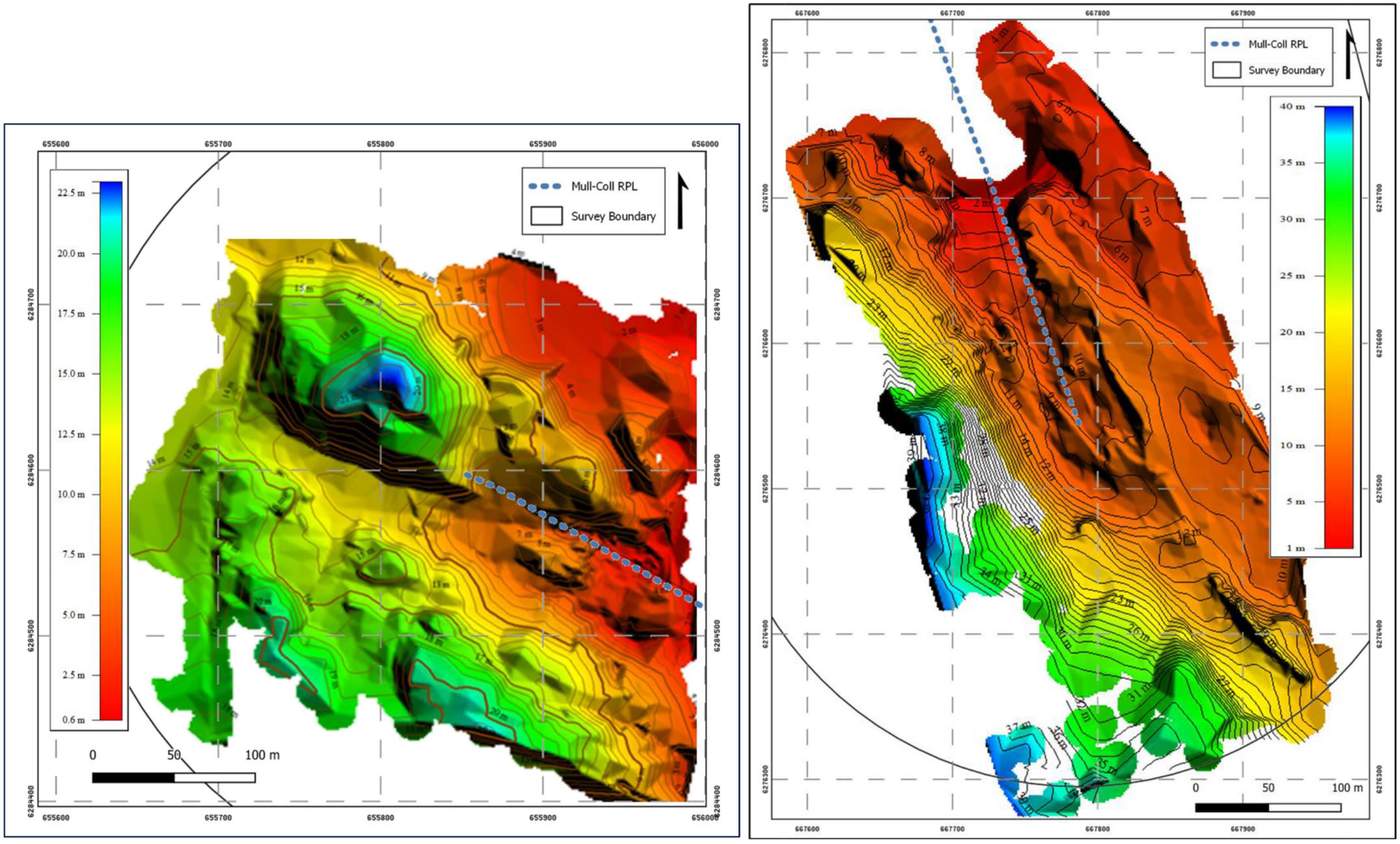


Figure 6-3 Bathymetry at Coll (left) and Mull (right) Landfall Locations (Fugro, 2021a)

6.4 Impact Assessment

6.4.1 Coastal Sediment Suspension

As highlighted in Section 3, where technically achievable, a portion of the nearshore sections of both cables will be buried by means of a land-based excavator within the intertidal area out to MLWS. The timing of trenching works will be tide dependent (working at low water when the intertidal zone is exposed). It is therefore expected that there will be no disturbance of submerged sediments. There may be temporary and highly localised increase in suspended sediment caused by the incoming tide interacting with the trench walls and associated spoil. However, this will not be significantly greater than that expected by wave action causing low-level erosion of the shoreline sediments. As such the impact on sediment loading is considered to be non-significant.

Assessment of Impact Significance		
All installation activities at the landfall locations will be tidally dependent, working at low water. Increased suspended sediment will only occur during the interaction between the incoming tide, the trench walls and spoil heaps. This will result in highly localised and temporary increases in suspended sediment. Mitigation measures considered as part of the project design are listed in Section 4.3.		
Sensitivity / value	Magnitude of effect	Level of impact
Low	Minor	Negligible
Impact significance – NOT SIGNIFICANT		

6.4.2 Offshore Sediment Suspension

Sections of the offshore portion of the cable are expected to be buried via jet trenching. Jet trenching is a method of fluidising and transporting the sediment by injecting water with low pressure and high volume below the sediment surface via jet legs/swords. When the water pressure is removed, a proportion of the sediment resettles over the cable. It is expected that in general approximately 60% to 80% of the fluidised sediment would remain or settle back into the trench, and only the remaining 20-40% would be suspended into the water column. A study on the Environmental Impact of Subsea Trenching Operations (Gooding *et al.*, 2012) identified that impacts from sediment disturbance are localised and considered to be restricted to the immediate vicinity of the trench (less than 10 m either side). Suspended solid concentrations, although elevated immediately after trenching, have been shown to fall to ambient levels within 66 m of trenching activity in hard ground areas and 70 m in sandy areas.

Effects on surrounding sediment type and geological features could occur due to the displacement and redistribution of sediment during trenching operations which would result in deposition of a layer of sediment over the immediate area. This is expected to impact the immediate vicinity of the cable trench and to not extend further than the trench area and trenching tool footprint.

As defined above, seabed sediment in the area is mainly composed of sand and gravel, with some small sections of silt towards the Mull landfall (Fugro, 2021b). The finer sediments (such as the areas of silt proximal to the Mull landfall) may be deposited over a larger area. However, it is expected that sediments will re-deposit over a short period of time and effects to the seabed conditions and water quality in the area will be limited and short-term.

Assessment of impact significance		
Finer sediments will be re-suspended over a larger area following trenching activities. However, the majority of re-distributed sediments will be highly localised and limited to the footprint of the trench. Although areas of bedrock along the cable corridor have been identified as being potential Annex I reef during recent surveys, due to the fact that reef comprises a hard substrate, it is unlikely that the cable will be buried in these portions of the corridor. Considering the localised impact of the sediment resuspension, no significant impacts are anticipated. Mitigation measures considered as part of the project design are listed in Section 4.3.		
Sensitivity / value	Magnitude of effect	Level of impact
Low	Minor	Negligible
Impact significance – NOT SIGNIFICANT		

6.4.3 Changes to Sediment and Water Quality Following Accidental Release of Hydrocarbons

There is the potential for an unplanned spill to occur in the event that a collision with another vessel occurs, one of the project vessels loses containment of hydrocarbon bunkers, or that a hydraulic line leaks or fails (for example associated with cranes and ROVs). The main release risk associated with the cable installations is a loss of diesel fuel from the installation and support vessels. Diesel has very high levels of light ends, evaporating quickly on release. The low asphaltene content prevents emulsification, therefore reducing its persistence in the marine environment. Light oil (such as diesel) tends to dissipate completely through evaporation and physical dispersion within 1 - 2 days and does not normally form emulsions. Some small-dispersed globules of semi-solid oil may persist for some time if the oil possesses wax or other persistent components.

Any discharge of hydrocarbons will be limited to the inventory of each vessel during the cable installation. Due to the low viscosity of diesel, it will spread very rapidly to form a thin sheen at the surface. The sheen will break up rapidly under the influence of spreading and evaporation. Diesel is unlikely to persist within the water column once the spill has occurred.

Based on the volume and components of marine diesel, it is unlikely that diesel will percolate to the seabed and deposit on sediments. Therefore, sediments are unlikely to be affected by a spill. As such, it is not considered to present a major risk to the environment. Additionally, the project's Emergency Spill Response Plan, and the SOPEPs in place for each vessel, will provide a clear protocol in the event of a release scenario, resulting in rapid and effective remedial action, limiting the extent of any spill.

Accidental releases of hydraulic fluids from the cranes on the project vessels and used for the ROVs are possible. Hydraulic fluids are used as part of a closed system (i.e. lines) in cranes and other machinery equipment (such as ROVs). The potential impacts of a hydraulic fluid release depend on the properties and components of each hydraulic fluid. Hydraulic fluids can either be oil- or water-based. Water-based hydraulic fluids used are unlikely to be toxic to the marine environment and will disperse rapidly as they tend to not bioaccumulate and are biodegradable. Any accidental spills of oil-based hydraulic fluid are unlikely to form a sheen, as the potential volume of hydraulic fluid spilled is likely to be small and mineral oil content is low. Equipment (cranes, ROVs etc.) used during the project will be regularly maintained, reducing the likelihood of a release.

A large spill of hydrocarbons or hydraulic fluids is very unlikely during the planned cable replacement activities. The impact of an accidental release (diesel or hydraulic fluid) is therefore considered to be minor and not significant.

Assessment of impact significance		
Best Practice will be followed, and it is therefore unlikely that a spill from would occur during the operations. Impact significance will vary depending on the size, volume and nature of the spill. Based on the very low likelihood of such an event, the overall level of impact is Minor. Mitigation measures considered as part of the Project design are listed in Section 4.3.		
Sensitivity/ value	Magnitude of effect	Level of impact
Low	Moderate	Minor
Impact significance – NOT SIGNIFICANT		

6.5 Conclusion

All installation activities at the landfall locations will be tidally dependent. Increased suspended sediment will only occur during the interaction between the incoming tide, the trench walls and spoil heaps. Furthermore, any suspended sediment associated with cable burial via jet trenching in parts of the offshore section of the cable will be highly localised, with an expectation that suspended sediment concentrations will return to ambient levels within a short distance from the trench. This will result in highly localised and temporary increases in suspended sediment which will not have a significant impact on coastal or offshore water quality.

Best practice will be followed by all installation vessels, therefore the likelihood of an accidental hydrocarbon releases from the installation vessel is extremely remote. The level of impact is therefore considered minor and not significant.

7 MARINE MEGAFAUNA

7.1 Introduction

This section of the report provides further detail on the large marine species, including marine mammals and basking sharks, in the vicinity of the proposed marine cable installation corridor, and presents results from an assessment of potential impacts on key sensitive species. Management and mitigation measures to ensure impacts are minimised will also be suggested.

This section also provides a Protected Species Risk assessment, with regard to potential impacts on cetaceans and basking sharks, in order to inform the associated EPS and basking shark licence applications.

7.2 Data Sources

This section draws on a number of data sources including published papers and industry-wide surveys such as Hague *et al.*, (2020). A key data source available for Scottish waters is the NMPi website (NMPi, 2021) which underpins the Scottish NMP (Scottish Government, 2015).

7.3 Existing Baseline Description

7.3.1 Cetaceans

Around 20 species of cetacean have been recorded off the west coast of Scotland, with eight being commonly observed (HWDT, 2018); harbour porpoise, minke whale (*Balaenoptera acutrostrata*), common dolphin (*Delphinus delphis*), bottlenose dolphin, Risso's dolphin (*Grampus griseus*), white-beaked dolphin (*Lagenorhynchus albirostris*), white-sided dolphin (*Lagenorhynchus acutus*) and killer whale (*Orcinus orca*) (HWDT, 2018). High densities of cetacean sightings are recorded around the isles of Mull, Coll and Tiree, proximal to the installation corridor (HWDT, 2018). The following summarises those species regularly sighted within the vicinity of the installation corridor:

- Harbour porpoise are the most abundant cetacean species in UK waters and are generally observed in small groups of one to three individuals (Reid *et al.,* 2003). Harbour porpoise are commonly sighted on the west coast of Scotland at a high frequency, and this has contributed to the designation of the Inner Hebrides and the Minches SAC (see Section 5) (HWDT, 2018). The distribution model prepared by Heinänen and Skov (2015) predicted persistent high summer densities of harbour porpoise during the summer months across the north west of Scotland. There are also several expected 'hot spots' for this species on the north west coast of Scotland, including the west coast of Mull and a preference for water depths between 50 and 150 m is expected (Booth *et al.*, 2013). The density of harbour porpoise within Block G of the of the SCANS III survey, within which the project resides, was approximately 0.336 animals / km^2, which is average in the context of the wider United Kingdom Continental Shelf (UKCS) region (Hammond *et al.*, 2017). According to density modelling data (combining SCANS-III density data with environmental predictive factors), it is predicted that harbour porpoise densities within the installation corridor will be low compared with the densities observed elsewhere in UK waters (Hague *et al.*, 2020; Hammond *et al.*, 2017).
- Minke whale are present on the west coast of Scotland between May and October and are most commonly sighted in the summer months (June – August) (Weir *et al.*, 2001). They feed mainly in shallower waters over the continental shelf and regularly appear around shelf banks and mounds, or near fronts where zooplankton and fish are concentrated at the surface (Reid *et al.,* 2003). They are also commonly seen in the strong currents

around headlands and small islands, where they can come close to land, even entering estuaries, bays and inlets. The highest encounter rates for minke whale on the west coast of Scotland are east of the Outer Hebrides in the Minch and in the Sea of Hebrides, and high densities are observed between Mull and Coll (HWDT, 2018). Minke whale density in Block G of the SCANS-III survey is considered to be moderate to high in comparison to the rest of the UKCS, with an estimate of 0.027 animals / km^2 (Hammond *et al.*, 2017). This species shows a large seasonal variation with much lower densities in the winter months, likely driven by variations in sea surface temperature and chlorophyll concentrations (Hague *et al.*, 2020). Macleod *et al.*, 2004 observed that minke whale distributions shifted eastwards from the waters between Mull and Coll to the waters around the Small Isles between June and Autumn and this was expected to reflected shift in prey availability. The high predicted densities of this species by Paxton *et al.*, (2014) contributed to the designation of the Sea of the Hebrides NCMPA which contains minke whale as a protected feature.

- Bottlenose dolphin are present in Scottish waters year-round, with the highest encounter rates observed in coastal waters (Hague *et al.*, 2020). Two distinct bottlenose dolphin populations reside on the west coast of Scotland, one found mostly around Skye, and one around Barra with a total population of around 45 individuals (Cheney *et al.*, 2013). Bottlenose dolphin density in Block G of the SCANS-III survey was estimated at 0.121 animals / km^2, which is considered to be high in comparison to the rest of the UKCS (Hammond et al., 2017). Notably, Hammond *et al.*, (2017) estimate that the abundance of bottlenose dolphins in Block G, which corresponds to the project area, is 1,824 individuals, several orders of magnitude higher than the biogeographic population estimate of 45 individuals for the Coastal west Scotland and Hebrides Management Unit (MU) (IAMMWG, 2015).
- Common dolphin are generally sighted in groups of up to 30 with the exception of summer months when 'super pods' of up to hundreds of individuals are observed (HWDT, 2018). They are seasonal visitors to Scotland with this species being most commonly sighted on the west coast of Scotland, predominantly between April and October, although some winter sightings do occur (Hague *et al.*, 2020; HWDT, 2018). Most sightings on the west coast occur north of the installation corridor, although sightings do occur to the north of Coll (HWDT, 2018).
- Risso's dolphin are present in Scottish waters year-round but are in fairly low densities across the west of Scotland (HWDT, 2018; Reid *et al.*, 2003; Hague *et al.*, 2020). Risso's dolphin show a preference for deeper waters on the west coast of Scotland such as in the Hebrides, but have been sighted throughout the region (HWDT, 2018).
- Other species, such as killer whale, white-beaked dolphin, white-sided dolphin and humpback whale are seen infrequently in varying numbers and are occasional and/or seasonal visitors (Hammond *et al.*, 2017; Reid *et al.*, 2003).

The distribution, density, and abundance of the three most commonly occurring cetacean species in the vicinity of the installation corridor are described in Table 7-1.

Table 7-1 Population Parameters of Cetacean Species Potentially Present in the Vicinity of the Installation Corridor

Species name	Estimated density across the project area[2] (individuals/km²) (Hammond et al., 2017)	Management Unit (MU) / biogeographical population estimate (IAMMWG, 2015)
Harbour porpoise	0.336	21,462
Minke whale	0.027	23,528
Bottlenose dolphin	0.121	45
Common dolphin	*Not available*	56,556
Risso's dolphin	*Not available*	*Not available*

7.3.2 Seals

Two species of seals inhabit UK waters: the grey seal (*Halichoerus grypus*) and the harbour seal (*Phoca vitulina*). The waters around Scotland are an important habitat for both species, which utilise the coastlines and nearshore waters year-round for breeding and feeding (Pollock *et al.*, 2000).

The at-sea densities of grey and harbour seals surrounding the Mull-Coll corridor are shown in Figure 7-1.

The mean at-sea usage of grey seals is low to moderate for the installation corridor (5 - 10 individuals per 25 km²) when compared with the wider Scottish waters (Carter *et al.*, 2020). The mean at-sea usage of harbour seals is low to moderate for the installation corridor when compared to the wider region (10 – 50 individuals per 25 km²).

The pupping season of harbour seals is mid-June to July with moulting occurring in August. Grey seals breed from August to December in the UK and then moult until early April. In the north and west of Scotland, pupping mainly occurs between September and late November (SCOS, 2020). Similar to seabirds, seals are central-place foragers, utilising a terrestrial 'base' for important life history events (i.e. breeding, pupping, moulting, etc.) and to rest, and then head offshore on foraging trips before returning to land (Pollock *et al.*, 2000). While both species are associated with shallower shelf waters, grey seals often make longer foraging trips to deeper waters than harbour seals.

As discussed in Section 5, there are two SACs with seals as their qualifying feature within distances of 50 km (harbour) and 20 km (grey). The closest of these two sites is the Treshnish Isles SAC (designated for grey seal) which is 10.7 km from the installation corridor. The other site is the Eileanan agus Sgeiran Lios mor SAC (designated for harbour seal) is located approximately 42 km from the installation corridor.

[2] SCANS III Block G used for density estimate

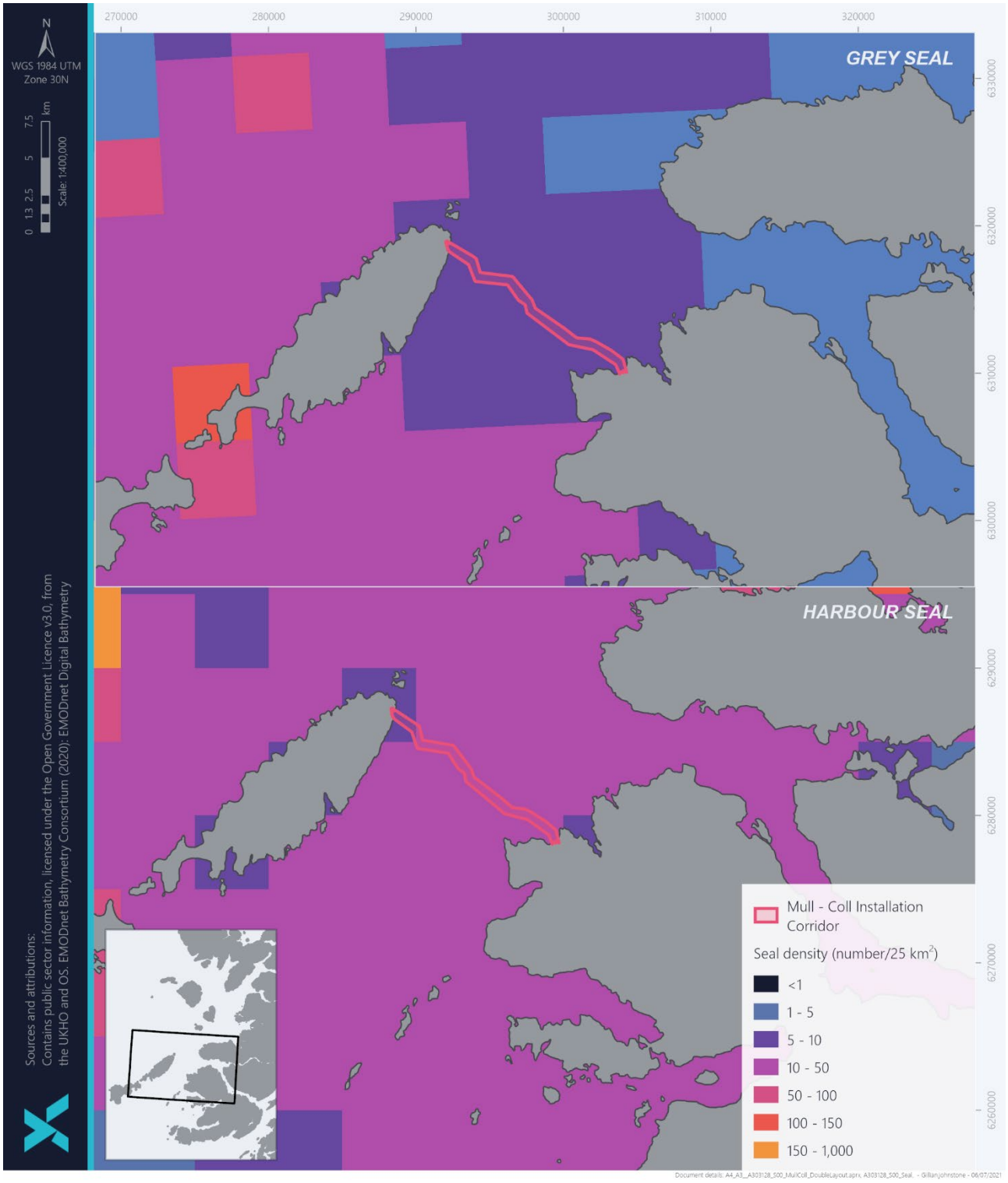


Figure 7-1 Estimated Grey and Harbour Seals at Sea Densities in the Vicinity of the Installation Corridor

7.3.3 Basking Shark

Basking shark is the second largest fish in the world (Sims, 2008). This species can be found throughout the offshore waters in the UK continental shelf (Sims, 2008) and are considered frequent visitors to the north and west coasts of Scotland with the waters here having a high suitability for basking sharks (HWDT, 2018; Witt *et al.*, 2012;

Austin *et al.*, 2019). They are widely distributed in cold and temperate waters and feed predominantly on plankton and zooplankton e.g. barnacles, copepods, fish eggs and deep-water oceanic shrimps by filtering large volumes of water through their wide-open mouth. They typically move very slowly (around 4 miles per hour). In the winter, they dive to great depths to get plankton while in the summer they are mostly near the surface, where the water is warmer.

Due to their size, slow swimming speeds and preference for swimming in coastal waters during the summer months, basking sharks are considered to be at potential risk of collision with vessels associated with the cable installation activities. Given that basking sharks are slow to mature and have a long gestation period, the species can be slow to recover if populations are rapidly depleted.

The west coast of Scotland has one of the highest sighting densities of basking sharks in the UK (Bloomfield & Solandt, 2006). Basking sharks are present along Scottish shores between spring and autumn, and peak sighting densities in the west coast of Scotland occur in August (Witt *et al.*, 2012). Some of the high-density areas (> 3 sightings an hour) in the west coast of Scotland occur close to the installation corridor around Mull, Tiree, and Coll (Witt *et al.*, 2012; Speedie *et al.*, 2009). In particular, the waters surrounding Mull and Coll were designated as 'hot spots' for basking shark sightings by Bloomfield & Solandt (2006) and Speedie *et al.*, (2009), respectively. The predicted densities maps produced by Paxton *et al.*, 2014 also highlighted the Sea of Hebrides as supporting high densities of basking shark and this contributed to the designation of the Sea of the Hebrides NCMPA which contains basking shark as a protected feature. The migratory movements of basking shark are still unclear. However, recent tracking studies indicate that most basking sharks perform a southerly migration in the post-summer months, departing coastal regions of UK and Ireland returning in Spring. Basking sharks also spend less time at the surface during winter (Doherty *et al.*, 2017a). Within the Sea of Hebrides, basking sharks show a seasonal residency and fidelity towards the area, indicating that the conditions are favourable for this species (Doherty *et al.*, 2017b).

7.4 Impact Assessment

This section outlines the proposed activities which have the potential to impact upon marine megafauna species, including cetaceans, pinnipeds, and basking shark.

7.4.1 Identification of Potential Impacts

This section reviews potential impacts to marine megafauna receptor species from the proposed Project and narrows down which Project activities require further assessment to identify the likelihood and significance of those impacts.

Impacts from accidental releases from pollution for all marine megafauna have not been considered for further assessment given that the likelihood of this is extremely low.

7.4.1.1 Impacts on Marine Mammals

Underwater noise emissions from the cable installation activities are likely to constitute the greatest potential risk to marine mammals within the vicinity of the Project. Noise has the potential to impact cetaceans and other marine species in two ways:

- Injury – physiological damage to auditory or other internal organs; and
- Disturbance (temporary or continuous) – disruptions to behavioural patterns, including, but not limited to: migration, breathing, nursing, breeding, foraging, socialising and / or sheltering (note: this impact factor does not have the potential to cause injury).

If a noise emission is composed of frequencies which lie outside the estimated auditory bandwidth for a given species, then the potential for auditory impacts are considered to be very unlikely (NOAA, 2018). To understand the potential for noise-related impacts, the likely hearing sensitivities of different marine mammal hearing groups has been summarised in below in Table 7-2

Table 7-2 Auditory Bandwidths Estimated for Marine Mammals (Southall et al., 2019; NOAA, 2018)

Hearing group	Estimated auditory bandwidth
Low-frequency cetaceans (LF): (e.g. baleen whales, such as minke whales, humpback whales, etc.)	7 Hz to 35 kHz
High-frequency cetaceans (HF): (e.g. dolphins, toothed whales, beaked whales and bottlenose whales)	150 Hz to 160 kHz
Very high-frequency cetaceans (VHF): (e.g. marine mammal species such as harbour porpoises and other 'true' porpoises)	275 Hz to 160 kHz
Phocid carnivores in water (PW): (e.g. earless or 'true' seals, such as grey and harbour seals)	50 Hz to 86 kHz

The main sources of underwater noise associated with cable installation activities include:

- Vessel noise from ships and other marine plant utilised during the works;
- Noise from cable laying activities;
- Noise from the USBL device used to position the ROV to conduct touch down monitoring and installation of external protection; and
- Noise from geophysical survey devices used during pre, during and post installation survey and inspection. However, geophysical surveys are subject to existing consents held by SHEPD and are out-with the scope of this assessment.

While vessel noise is broadband and will be audible to marine mammals, the presence of the installation vessels along the installation corridor will not constitute a substantive change from baseline vessel numbers, or types of vessels in the area. As such, the presence of installation vessels will not result in a significant change to the existing soundscape in the vicinity of the project, hence, this aspect does not have the potential to result in adverse underwater noise impacts on cetaceans and is not considered further.

Underwater noise emissions resulting from the cable laying and protection activities are expected to be minimal. Studies of previous cable installation projects have shown that noise emissions associated with trenching and cable installation are typically broad band, with source levels in the region of 178dB re 1µPa (rms) at 1 m from the source (frequency range of 0.7 to 50 kHz) observed by Nedwell *et al.*, (2003) and 188.5 dB re 1 µPa (frequency at 11 kHz) at 1 m from the source by Bald *et al.*, 2015. Due to these low source levels, noise from cable laying and protection works do not have any potential for adverse effects on cetaceans, as individuals would have to remain within close range of the activities for an extended period of time for any significant disturbance or injury to occur. For this reason, this impact is not considered further.

USBL devices commonly operate in a frequency range which makes them audible to cetaceans, and hence this activity does have the potential to result in adverse effect on these receptors. The highly mobile nature of cetaceans and the temporary, localised nature of USBL noise emissions associated with the project dramatically

reduce the likelihood of interactions between project activities and cetacean receptors resulting in significant impacts. However, as the risk of injury or disturbance to a small number of individual animals remains, impacts from noise emissions associated with USBL have been carried forward for further assessment.

Collision risk is another potential risk to marine mammals in the Project area and may cause mortality and sublethal injury (Laist *et al*. 2001). However, marine mammals are highly mobile and as all of the proposed activities associated with cable installation are due to take place from slow moving vessels operating in well-defined routes, collision risk is anticipated to be negligible. Any remaining residual risk from vessel movements will be further reduced on the basis of the embedded mitigation measures outlined in Section 4, which include the management of vessel speed and the commitment for project vessels to adhere to the SMWWC (SNH, 2017). For this reason, vessel movements have not been identified as having the potential to cause adverse or significant impacts to the Favourable Conservation Status (FCS) of any marine mammal population and has therefore been screened out from further assessment.

The marine mammal species of interest in the project area do not rely extensively on eyesight for hunting and navigation and potential impacts resulting from localised elevation of sediment, considering this and the fact that changes to water quality are expected to be minimal (as detailed in Section 6), water quality impacts are not discussed further.

Vessel and human presence in the immediate vicinity of seal haul-outs may potentially impact seals. Seals are particularly susceptible to disturbance during their respective pupping and moulting seasons, when the residency of seals at haul-outs and in surrounding waters elevates the relative density of each species. Given that the proposed cable installation works are expected to occur between December and June, there is a limited potential for the installation activities to overlap with the pupping and moulting season for harbour seals and grey seals. In addition, there are no designated seal breeding or haul-out sites within 500m of the installation corridor (as detailed in Section 5.3). As such, impacts to seals from landfall activities has not been considered further.

7.4.1.2 Impacts on Basking Sharks

The basking shark is an elasmobranch (sharks and rays) which is a group with generally low sensitivity to noise vibrations due to the fact they do not have a swim bladder. The hearing range of basking sharks is not known; however, five other elasmobranchs have been found to have a hearing range between 20 Hz to 1 kHz (Macleod *et al*., 2011). It is acknowledged that this may not be entirely transferable to basking sharks, however since the USBL equipment operates at a minimum frequency of 20kHz which is several orders of magnitude higher than 1 kHz, it is unlikely this equipment will be audible to basking sharks. Any noise emissions resulting from the cable installation equipment is also expected to be minimal and unlikely to result in any injury or significant disturbance (as described in Section 7.4.1.1). On this basis, the potential for noise emissions to impact upon basking sharks is screened out of further assessment.

Vessel collision does pose a threat to this slow-moving species. Collision risk increases with increasing vessel speed. As the survey vessels will be moving slowly, collision risk is generally low, however does warrant further assessment.

7.4.2 Injury or Disturbance from Noise Emissions

Underwater noise generated by USBL constitutes the only source of sound with the potential to cause injury or significant disturbance to marine mammals. USBL typically operates in the frequency range of 20 – 33.5 kHz, and as such is audible to all marine mammal species likely to be present in the vicinity of the cable corridor. The USBL source level utilised during the cable replacement activities will be limited to 200dB re 1µPa (peak).

Noise modelling has been undertaken to identify the potential range (i.e. the straight-line distance from the source) in which noise impacts to marine mammals could occur. This assessment was based on the methods and thresholds provided by the current best practice guidance, as presented by NOAA and Southall (NOAA, 2018;

Southall *et al.*, 2019). The full noise assessment has been presented in Appendix A, a summary of the results is presented below.

The peak injury criteria were not exceeded for any marine mammal hearing group, since the source level is less than 202 dB re 1µPa (peak), as such no injury risk to marine mammals has been identified for USBL according to this metric. However, a theoretical risk of injury has been identified with regard to the cumulative sound exposure level criteria.

Under the worst-case scenario, the largest injury range resulting form USBL was 104 m for VHF cetaceans (harbour porpoises), when considering cumulative sound exposure levels for a stationary animal. For whale, dolphin, and seal receptors (LF, VHF and PW hearing groups) the potential injury ranges were significantly reduced. While a theoretical injury risk is identified by the underwater noise modelling, this is based on a cumulative exposure over an extended time period. As such, in order for a harbour porpoise to be at risk of injury, an animal would have to remain within 104 m of the USBL device for a period of several hours. The likelihood of this scenario occurring is extremely low when considering that the source is deployed from a moving vessel, and that animals will tend to move away from sources of acoustic disturbance.

As such, the assessment concludes that there is no realistic risk of injury to marine mammals, resulting from the use of USBL with source levels up to 200 dB re 1µPa (peak).

Whilst no injury impacts are expected, noise emissions have the potential to affect the behaviour of marine mammals in the vicinity of the noise source. Significant or strong disturbance may occur when an animal is at risk of a sustained or chronic disruption of behaviour or habitat use resulting in population-level effects. The potential impacts resulting from USBL noise was modelled in the noise assessment in Appendix A.

Under the worst-case scenario, it was predicted that a behavioural change may occur for marine mammals within 207 m of the cable installation vessel. As such, underwater noise emissions from the use of USBL have the potential to elicit a strong behavioural response in marine mammals which could be classed as a disturbance of EPS offence as defined under Regulations 39(1) or 39(2).

However, for the relevant biogeographical population Management Units (MU) for harbour porpoise, minke whale and bottlenose dolphin, which all occur in the area, this will not result in population levels effects or adverse impact the FCS of the species. This is due to the fact that the noise assessment predicts that less than 0.1% of the biogeographic populations of relevant cetacean species will be impacted by noise-related disturbance as a result of USBL operations. Moreover, the number of animals within the disturbance range at any one time is predicted to be < 0.1. This means that on average, there will be no marine mammals within the disturbance range for 90% of USBL operations, making potential disturbance impacts at the population level arising from this equipment negligible.

As the vessel and/or the deployment craft (e.g. an ROV) will generally not be stationary during USBL operations, animals within a particular area will not be exposed to extended periods of underwater noise. Rather, individuals would have to follow the moving equipment to be subjected to lasting or prolonged periods of acoustic disturbance. As such, the exposure to disturbance from USBL operations will be extremely limited in duration, and hence does not have the potential to result in adverse effects at a population or species level.

Given the transient, highly localised and short-term nature of the USBL activities, it is highly unlikely that any disturbance offences from use of USBL would negatively impact upon the FCS of any of the cetacean species which may be present in the survey area. This is on the basis that the modelled level of disturbance is unlikely to affect the ability of any individual animal to survive or reproduce and will not have significant population-level impacts to any marine mammal. As such, no mitigation is required to limit the potential impacts on marine mammals resulting from USBL operations.

The above notwithstanding, it is possible that a small number of cetaceans may experience some level of disturbance for the short period that they encounter the proposed installation activities. As such, EPS Licences are

expected to be required for the USBL-related activities which will be conducted during the installation of the Mull - Coll cable replacement (as per Regulation 39(2)) (Scottish Government, 2020).

Impacts to marine mammal receptors

There will be no injurious impacts to marine mammals as a result of noise-generating Project activities. However, there is potential for disturbance to marine mammals from underwater noise. Project-related disturbance is expected to be limited to one or a few individuals of a species and will therefore not result in any adverse impact to the FCS of any marine mammal species.

As the impact is not significant, no secondary mitigation measures are required. Embedded mitigation measures considered as part of the Project design are listed in Section 4.3.

Sensitivity/value	Magnitude of effect	Level of impact
High	Minor	Minor
Impact significance – NOT SIGNIFICANT		

7.4.3 Injury or Disturbance from Vessel Presence (Basking Sharks)

As discussed in Section 7.4, impacts on marine mammals resulting from vessel presence are screened out of this assessment. However, basking sharks are considerably less mobile than marine mammals, and are therefore identified as being more sensitive to vessel presence.

Project vessels will be moving slowly during the cable installation works reducing the risk of collision and disturbance to basking sharks, and SHEPD are committed to ensuring vessels adhere to the SMWWC (SNH, 2017). In addition, only a small number of vessels are required for the cable installation activities, which will be present in the area for a short duration only. Furthermore, basking shark densities are expected to be low in the winter months when the cable installation activities are expected to commence, reducing the potential for collision risk for the installation period, with the likelihood of this impact being limited to the latter months of the installation period only. These factors considerably reduce the risk of injury or disturbance to basking sharks resulting from interaction with project vessels. Therefore, despite the importance of this area for basking sharks, the risk of collision between basking shark and project vessels is considered to be low.

Considering these factors, and that the presence of the project vessels will not constitute a substantive change from baseline vessel activity in the vicinity of the Mull-Coll installation corridor, it is concluded that vessel presence will not adversely affect the FCS of basking sharks. However, since the risk of disturbance cannot be entirely ruled out, a basking shark derogation licence may be required under the WCA 1981.

Impacts to basking sharks

There the risk of injury or disturbance of basking sharks as a result of vessel presence during the Mull – Coll cable replacement projects is extremely limited, and not expected to reduce FCS of the species.

As the impact is not significant, no secondary mitigation measures are required. Embedded mitigation measures considered as part of the Project design are listed in Section 4.3.

Sensitivity/value	Magnitude of effect	Level of impact
High	Minor	Minor
Impact significance – NOT SIGNIFICANT		

7.5 Conclusion

Underwater noise emissions are the impact mechanism most likely to affect marine megafauna in the Project area. Noise modelling used to inform the assessment, presented in Appendix A, demonstrates that whilst there may be some disturbance to marine mammals resulting from USBL operations, this is likely to be limited in space and time and should only affect a few individuals of any species.

There will be no injurious impacts to cetaceans or seals as a result of project activities and no requirement to apply for an EPS Licence in that respect. However, there is potential for disturbance to cetaceans, and SHEPD will therefore apply for an EPS Licence in respect to disturbance of cetaceans. However, this disturbance is expected to be limited to one or a few individuals of the local population and will therefore not result in any adverse impact to the FCS of any marine mammal species.

Project activities will not result in the catching or killing of seals, and thus the protection provided to the two species by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) will not be breached.

Furthermore, the short-term and localised nature of the proposed activities mean that harbour and grey seals making use of protected haul-outs is not expected to be significantly disturbed. As such, the protection given by Section 117 or the Marine (Scotland) Act 2010, and the Protection of Seals (Designation of Haul-Out Sites) (Scotland) 2014 will also not be breached.

It is acknowledged that the presence of the installation vessels does have the potential to result in adverse (injury or disturbance) interactions with basking sharks. However, considering the slow speeds of the installation vessels, the embedded mitigation and the short duration of the project activities, the vessel collision risk is low. No adverse impact on the FCS of basking shark is therefore expected. However, SHEPD will apply for a basking shark derogation licence, since the risk cannot be entirely ruled out.

Considering the temporary and localised nature of the project activities, there are not anticipated to be any significant impacts to individuals or populations of marine megafauna in the project area.

8 BENTHIC AND INTERTIDAL ECOLOGY

8.1 Introduction

This section provides detail on the benthic and intertidal habitats and species located along, and in the immediate vicinity of, the installation corridor and landfall locations. An assessment of potential impacts on key sensitive habitats and species is presented, along with an outline of secondary mitigation measures that will be undertaken in order to ensure impacts are minimised. The impact assessment focuses on habitats that are protected or are qualifying features of conservation sites located in the vicinity of the cable route and that have the potential to be impacted.

The formation of the trenches at the landfalls have the potential for sediment resuspension. However, these activities are expected to be undertaken during low tide. Within the offshore section of the cable, jet trenching some sections of the cable will also result in the resuspension of sediments, which will then resettle in the vicinity of the works (approximately 70 m).

8.2 Data Sources

This section draws on a number of data sources including published papers, industry-wide surveys and site-specific investigations. Key data sources available for Scottish waters is the NMPi website (NMPI, 2021) which underpins the Scottish NMP (Scottish Government, 2015) and the geophysical, geotechnical and environmental surveys for the Mull – Coll installation corridor undertaken between 2020 and 2021 (Fugro, 2021a; Fugro, 2021b).

8.3 Baseline and Receptor Identification

The Mull – Coll cable is located in the Tiree passage within the Sea of the Hebrides. Fugro were commissioned to undertake geophysical and geotechnical surveys for the Mull-Coll installation corridor, carried out between December 2020 and March 2021 (Fugro, 2021a; Fugro, 2021b). The geophysical surveys consisted of Multibeam Echosounder (MBES), Side Scan Sonar (SSS) and Sub-Bottom Profiling (SBP). Video and photograph stills were taken at 15 transects along the installation corridor. The locations of the transects were guided by a review of the geophysical data by an environmental scientist which identified areas of conservation interest (Fugro, 2021b). Within the intertidal area, environmental data was acquired through a modified Phase 1 walkover biotope mapping survey.

8.3.1 Nearshore Characteristics

8.3.1.1 Mull Nearshore Area

The nearshore (intertidal) area at the Mull landfall consists of two bedrock slabs which extend into the subtidal area, separated by sandy beaches.

A total of 25 habitats were identified during the intertidal Phase 1 habitat survey at the Mull landfall, including five coastal habitats, three infralittoral habitats and sixteen littoral habitats which represent a mixture of rocky and sandy biotopes, with a dominance of seaweeds over invertebrates (Figure 8-1). The upper shore within the centre and east of the installation corridor was dominated by sandy sediments including 'Sand beaches above the drift line' (EUNIS habitat B1.2) and 'Littoral sand and muddy sand' (EUNIS habitat A2.2). The upper shore then transitioned into a mixture of sandy and rocky habitats types, dominated by 'Yellow and grey lichens on supralittoral rock' (EUNIS habitat B3.111), 'Littoral sand and muddy sand' (EUNIS habitat A2.2), '*Laminaria digitata* on moderately exposed sublittoral fringe rock' (EUNIS habitat A3.211), with depressions in the mid-shore bedrock

forming pools classified as the habitat 'Communities of Littoral Rockpools' (EUNIS habitat A1.41). 'Infralittoral Sand' (EUNIS habitat A5.23) was identified in some areas during low tide around outcropping bedrock (Fugro, 2021b).

The west of the installation corridor contains a 30 m high slope with the upper shore consisting of rocky cliff habitats such as '*Verrucaria maura* on littoral fringe rock' (EUNIS habitat B3.113) and 'Yellow and grey lichens on supralittoral rock' (EUNIS habitat B3.111) which transition into a narrow band of shoreline dominated by '*Fucus vesiculosus* on full salinity moderately exposed to sheltered mid eulittoral rock' (A1.3131) in the mid-shore and 'Kelp and red seaweeds (moderate energy infralittoral rock)' (EUNIS habitat A3.21) in the lower shore.

A list of the biotopes recorded during the intertidal surveys at the Mull landfall is provided in Table 8-1.

Table 8-1 Key biotopes recorded in the intertidal areas at the Mull landfall (Fugro, 2021b)

Habitat	EUNIS Code	EUNIS Description
A1 – Littoral rock and other hard substrata	A1.1122	*Chthamalus spp.* and *Lichina pygmaea* on steep exposed upper eulittoral rock
	A1.1131	*Semibalanus balanoides*, *Patella vulgata* and *Littorina spp.* on exposed to moderately exposed or vertical sheltered eulittoral rock
	A1.21	Barnacles and fucoids on moderately exposed shores
	A1.211	*Pelvetia canaliculata* and barnacles on moderately exposed littoral fringe rock
	A1.212	*Fucus spiralis* on full salinity exposed to moderately exposed upper eulittoral rock
	A1.213	*Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock
	A1.214	*Fucus serratus* on moderately exposed lower eulittoral rock
	A1.2141	*Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock
	A1.3131	*Fucus vesiculosus* on full salinity moderately exposed to sheltered mid eulittoral rock
	A1.3141	*Ascophyllum nodosum* on full salinity mid eulittoral rock
	A1.41	Communities of littoral rockpools
	A1.411	Coralline crust-dominated shallow eulittoral rockpools
	A1.412	Fucoids and kelp in deep eulittoral rockpools
	A1.421	Green seaweeds (Enteromorpha spp. and Cladophora spp.) in shallow upper shore rockpools
A2 – Littoral sediment	A2.1	Littoral coarse sediment
	A2.2	Littoral sand and muddy sand
	A2.55	Pioneer saltmarshes
A3 – Infralittoral rock and other hard substrata	A3.21	Kelp and red seaweeds (moderate energy infralittoral rock)
	A3.211	*Laminaria digitata* on moderately exposed sublittoral fringe rock

Habitat	EUNIS Code	EUNIS Description
A5 – Sublittoral sediment	A5.23	Infralittoral fine sand
B1 – Coastal dunes and sandy shores	B1.1	Sand beach drift lines
	B1.2	Sand beaches above the drift line
B3 – Rock cliffs, ledges and shores, including the supralittoral	B3.11	Lichens or small green algae on supralittoral and littoral fringe rock
	B3.111	Yellow and grey lichens on supralittoral rock
	B3.113	*Verrucaria maura* on littoral fringe rock

Figure 8-1 displays the areas in the intertidal zone at the Mull landfall identified as potentially sensitive habitats or species. The areas of bedrock identified in the survey, which are separated by the sandy bay in the centre of the installation corridor, were identified as having the potential to be Annex I reef (bedrock) habitat. This potential Annex I reef (bedrock) area extends across a large portion of the intertidal area. A small area of saltmarsh was also identified within the upper shore in the east of the installation corridor (EUNIS habitat A2.55) and was identified as potentially being the UKBAP habitat 'Coastal Saltmarsh'. No other sensitive habitats or species were observed in the intertidal survey area at Mull (Fugro, 2021b).

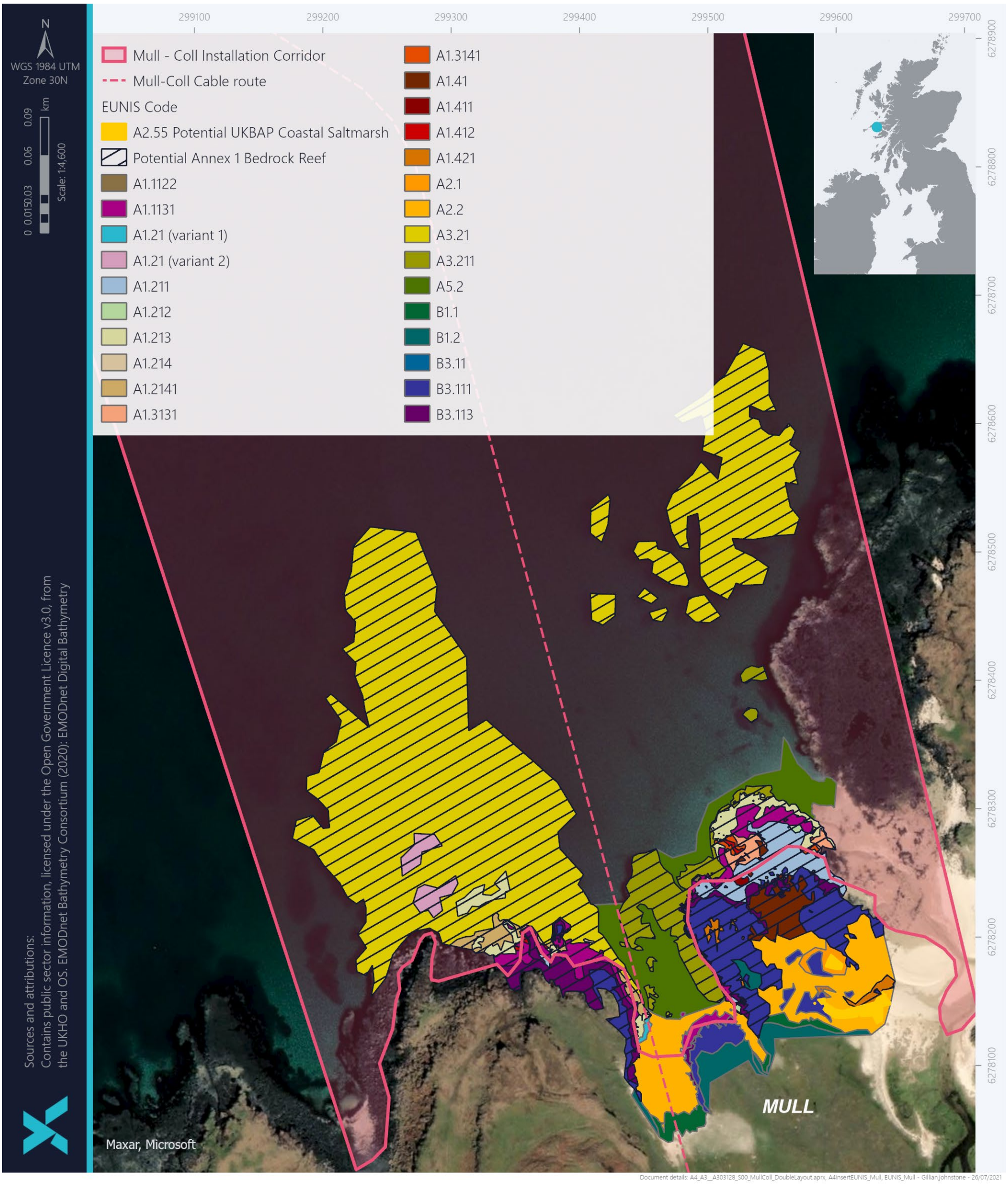


Figure 8-1 Intertidal EUNIS habitat Classifications at the Mull Landfall (Fugro, 2021b)

8.3.1.2 Coll Nearshore Area

At the Coll landfall, the intertidal area, predominantly consists of bedrock slabs extending into the subtidal zone. 23 habitats were observed during the Phase 1 intertidal walkover survey, including three coastal habitats, one infralittoral habitat and nineteen littoral habitats.

The upper shore was dominated by 'Coastal stable dune grassland (grey dunes' (EUNIS habitat B1.4), with a narrow band of rocky cliff habitat 'Lichens or small green algae on supralittoral and littoral fringe rock' (EUNIS habitat B3.111). Within the mid-shore zone, rocky habitats were dominated by seaweed covered rock including '*Pelvetia canaliculata* on sheltered littoral fringe rock' (EUNIS habitat A1.311), '*Fucus spiralis* on sheltered upper eulittoral rock' (EUNIS habitat A1.312) and '*Himanthalia elongata* and red seaweeds on exposed lower eulittoral rock' (EUNIS habitat A1.123). Within the lower shore, '*Liminara digitata* on moderately exposed sublittoral rock' (EUNIS habitat A3.211) was dominant. Overall, these habitats were considered to be typical of sheltered to moderately exposed rocky shores (Fugro, 2021b).

Across most of the installation corridor, there is a transition to rocky habitats in the mid and lower shore. However, the northern section of the intertidal zone at the Coll landfall consisted of sandier habitats in the mid and lower shore in comparison to the remaining intertidal area. Within this section, the sand dune habitats in the upper shore transition into 'Littoral sand and muddy sand' (EUNIS habitat A2.2) in the mid and lower shore (Figure 8-2).

A list of the key biotopes recorded during the intertidal surveys at the Coll landfall location is provided in Table 8-2.

Table 8-2 Key biotopes recorded in the intertidal areas at the Mull landfall (Fugro, 2021b)

Habitat	EUNIS Code	EUNIS Description
A1 – Littoral rock and other hard substrata	A1.123	*Himanthalia elongata* and red seaweeds on exposed lower eulittoral rock
	A1.213	*Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock
	A1.214	*Fucus serratus* on moderately exposed lower eulittoral rock
	A1.2141	*Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock
	A1.2142	*Fucus serratus* and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders
	A1.311	*Pelvetia canaliculata* on sheltered littoral fringe rock
	A1.312	*Fucus spiralis* on sheltered upper eulittoral rock
	A1.313	*Fucus vesiculosus* on moderately exposed to sheltered mid eulittoral rock
	A1.314	*Ascophyllum nodosum* on very sheltered mid eulittoral rock
	A1.411	Coralline crust-dominated shallow eulittoral rockpools
	A1.4111	Coralline crusts and *Corallina officinalis* in shallow eulittoral rockpools
	A1.412	Fucoids and kelp in deep eulittoral rockpools
	A1.4121	*Sargassum muticum* in eulittoral rockpools

Habitat	EUNIS Code	EUNIS Description
A1 – Littoral rock and other hard substrata	A1.413	Seaweeds in sediment-floored eulittoral rockpools
	A1.421	Green seaweeds (Enteromorpha spp. and Cladophora spp.) in shallow upper shore rockpools
	A1.45	Ephemeral green or red seaweeds (freshwater or sand-influenced) on non-mobile substrata
A2 – Littoral sediment	A2.1	Littoral coarse sediment
	A2.2	Littoral sand and muddy sand
	A2.82	Ephemeral green or red seaweeds (freshwater or sand-influenced) on mobile substrata
A3 – Infralittoral rock and other hard substrata	A3.211	*Laminaria digitata* on moderately exposed sublittoral fringe rock
B1 – Coastal dunes and sandy shores	B1.4	Coastal stable dune grassland (grey dunes)
B3 – Rock cliffs, ledges and shores, including the supralittoral	B3.111	Yellow and grey lichens on supralittoral rock
	B3.113	*Verrucaria maura* on littoral fringe rock

Figure 8-2 displays the areas in the intertidal zone at Coll identified as potentially being sensitive habitats or species. The rocky outcrops present at the intertidal zone were identified as being potential Annex I (bedrock) reef. In addition, the small patches of EUNIS habitat A1.2142 ('*Fucus serratus* and under-boulder fauna exposed to moderately exposed lower eulittoral boulders') identified in the mid-shore zone has the potential to be the UKBAP habitat 'Intertidal under-boulder communities'. The EUNIS habitat B1.4 ('Coastal Stable Dune Grassland (Grey Dunes'), which is dominant in the upper shore area, also potentially classifies as UKBAP habitat 'Maritime Cliff and Slopes'. No other potentially sensitive habitat or species was identified in the Phase 1 intertidal walkover survey (Fugro, 2021b).

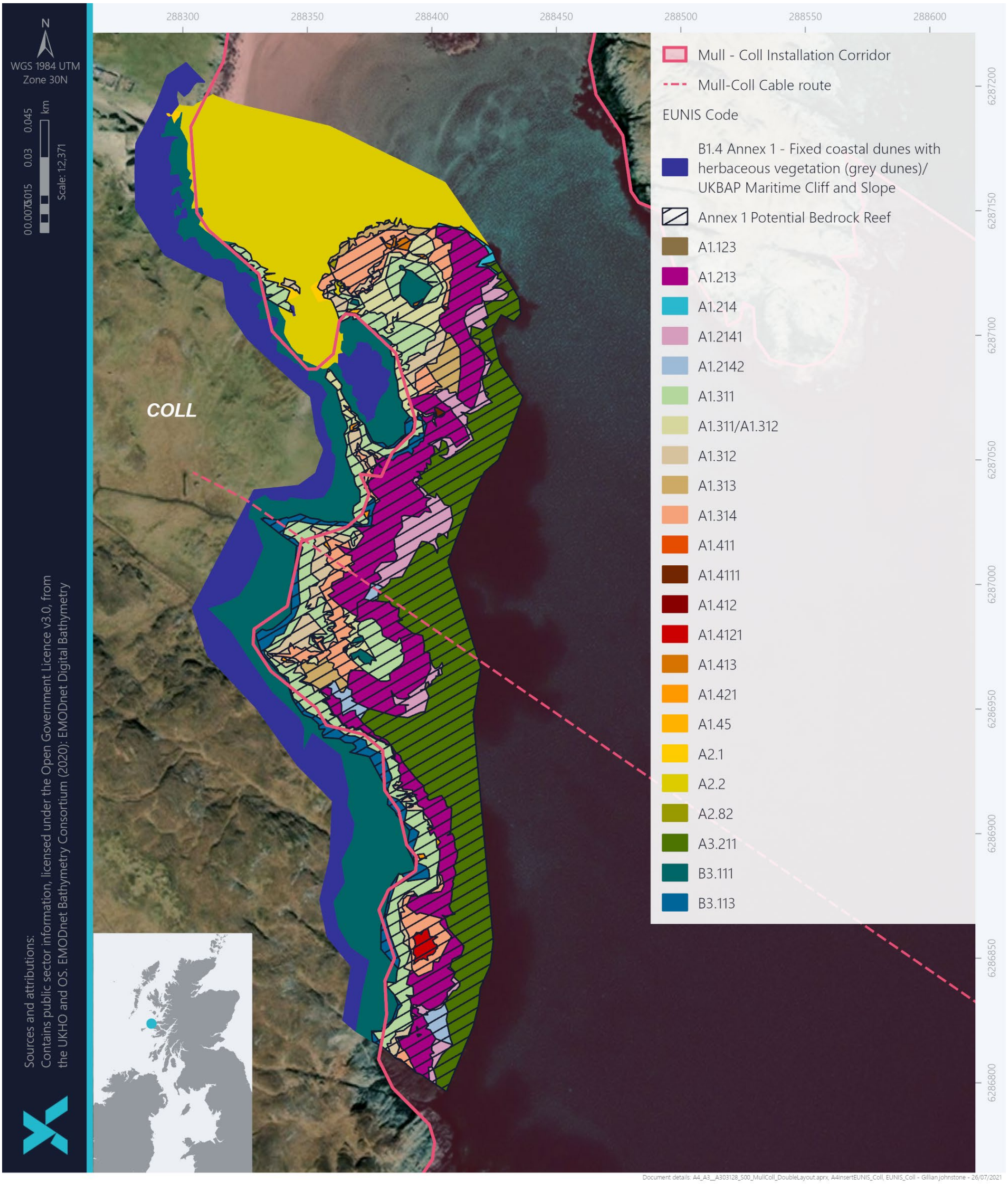


Figure 8-2 Intertidal EUNIS habitat Classifications at the Coll Landfall (Fugro, 2021b)

8.3.2 Offshore Characteristics

The data on the EUSeaMap (EMODnet, 2019) suggests that the majority of the installation corridor is composed of coarse sediments. This generally corresponds to the sediment types observed during the recent surveys, which identified that the installation corridor consisted primarily of sand and gravel sediments and to a lesser extend silt. The recent surveys also identified that rock outcrops were the most prominent seabed feature, especially in the centre and northwest section of the installation corridor (Fugro, 2021a). Twenty areas of boulder fields, where more than 25 boulders are present within a 100 m^2 area, were also recorded within the installation corridor (Fugro, 2021a).

Habitat maps were created using the geophysical and photographic data and were further informed by habitats previously observed in the area (e.g. desk-based sources such as EMODnet (2019)) (Fugro, 2021b) (Figure 8-3). The habitat map indicates that a mixture of rocky and sediment biotopes are present within the installation corridor. The installation corridor mostly consists of coarse biotopes, dominated by 'Circalittoral coarse sediment' (EUNIS habitat A5.14) in the south east and 'Circalittoral mixed sediments' (EUNIS habitat A5.44) in the north west, as well as 'Infralittoral coarse sediment' (EUNIS habitat A5.13) at both shore-ends. Rocky biotopes and outcrops were also interspersed throughout the corridor, present in the areas of outcropping bedrock identified in the geophysical surveys. The bedrock mostly corresponded to 'Atlantic and Mediterranean moderate energy circalittoral rock' (EUNIS habitat A4.2) or 'Atlantic and Mediterranean moderate energy infralittoral rock' (EUNIS habitat A3.2), although EUNIS habitat A3.211 and A3.2, described in Sections 8.3.1.1 and 8.3.1.2 were also mapped at the shore-ends, which corresponds to the rocky habitats observed in the intertidal region which extended into the subtidal. Sandy areas, consistent with 'Sublittoral sand' (EUNIS habitat A5.2) are also mapped at both shore-ends.

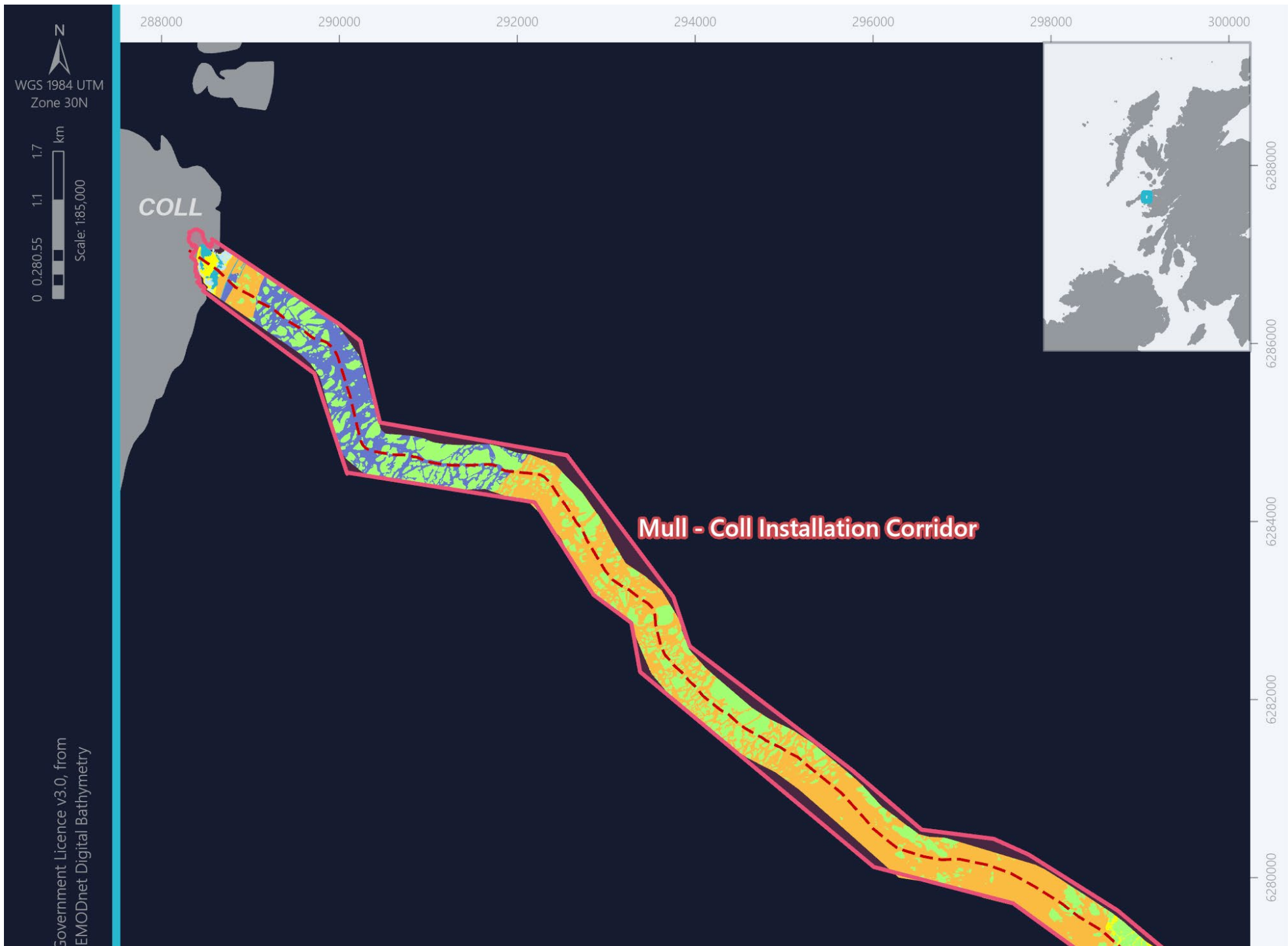


Figure 8-3 Offshore Habitat Map (Fugro, 2021b)

The EUNIS habitat classifications identified from the drop-down photography and video footage at the 15 transects is displayed in Figure 8-4. Most of the rocky habitat within the transects corresponded to EUNIS habitat A4.2. However, the rocky biotopes 'Sediment-affected or disturbed kelp and seaweed communities' (EUNIS habitat A3.12) and 'Brittlestars on faunal and algal encrusted exposed to moderately wave-exposed circalittoral rock' (EUNIS habitat A4.2144) were identified in some of the transects in the north west of the installation corridor and 'Mixed faunal turf communities on circalittoral rock' (EUNIS habitat A4.13) was present where bedrock was overlain with sand, cobbles and boulders in the south-east of the installation corridor.

At the Coll landfall, the drop-down photography and video footage identified an area of rippled sand with shell fragments associated with *Zostera marina* is consistent with '*Zostera marina / augustifola* beds on lower shore or infralittoral clean or muddy sand' (EU habitat A5.5331) at transect MtoC_TR01 proximal to the Coll landfall. In addition, transect MtoC_TR15, towards the Mull landfall, was composed of rippled gravel covered by algae and maerl, consistent with 'Kelp and seaweed communities on sublittoral sediment' (EUNIS habitat A5.52).

The sediment properties and associated supporting network communities for the habitats identified within the installation corridor are provided in Table 8-3.

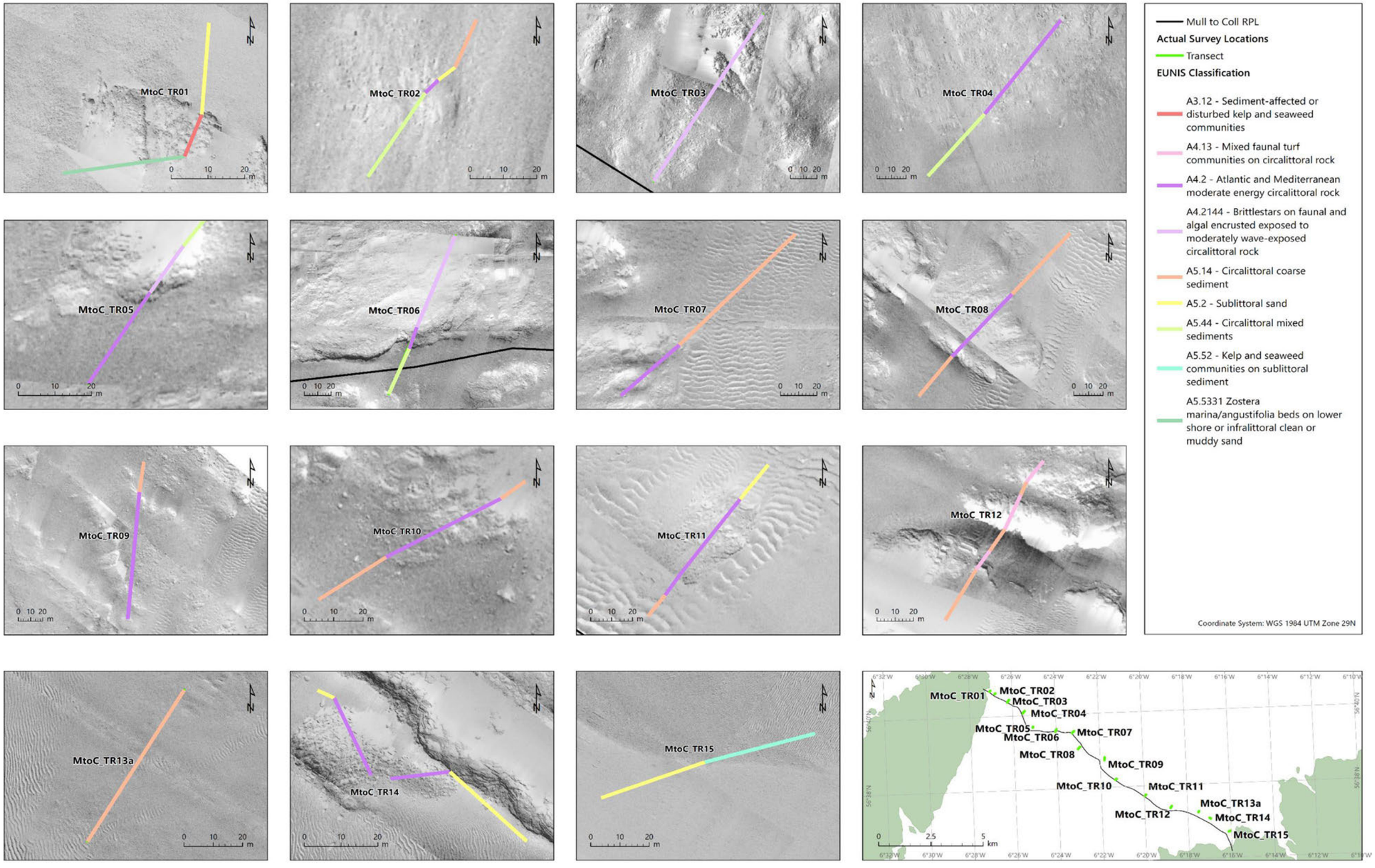


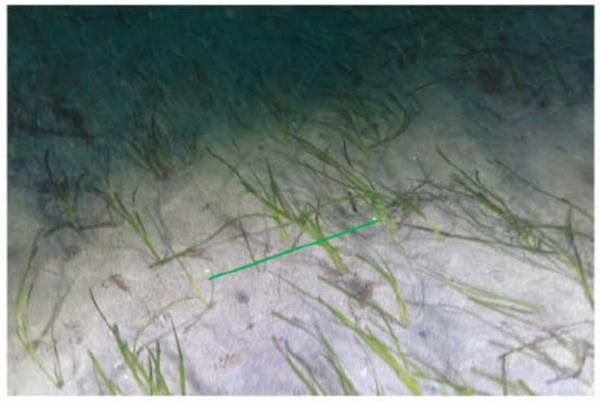
Figure 8-4 Drop-Down Photography and Video Transects and EUNIS Classifications (Fugro, 2021b)

Table 8-3 EUNIS Classification of Sediment Types Mapped and/or Observed within the Mull – Coll Installation Corridor (European Environment Agency, 2021; Fugro, 2021b)

EUNIS Classification	Supporting Network	Example Image from drop-down photograph stills / video
A3.12 - Sediment-affected or disturbed kelp and seaweed communities	*"Infralittoral rock habitats, subject to disturbance through mobility of the substratum (boulders or cobbles) or abrasion/covering by nearby coarse sediments or suspended particulate matter (sand). The associated communities can be quite variable in character, depending on the particular conditions, which prevail. The typical Laminaria hyperborea and red seaweed communities of stable open coast rocky habitats (A3.21) are replaced by those, which include more ephemeral species or those tolerant of sand and gravel abrasion. As such Laminaria saccharina, Saccorhiza polyschides or Halidrys siliquosa may be prominent components of the community."*	
A3.2 - Atlantic and Mediterranean moderate energy infralittoral rock	*"Predominantly moderately wave-exposed bedrock and boulders, subject to moderately strong to weak tidal streams. On the bedrock and stable boulders there is typically a narrow band of kelp Laminaria digitata in the sublittoral fringe which lies above a Laminaria hyperborea forest and park. Associated with the kelp are communities of seaweeds, predominantly reds and including a greater variety of more delicate filamentous types than found on more exposed coasts."*	N/A
A3.21 - Kelp and red seaweeds (moderate energy infralittoral rock)	*"Infralittoral rock subject to moderate wave exposure, or moderately strong tidal streams on more sheltered coasts. On bedrock and stable boulders there is typically a narrow band of kelp Laminaria digitata in the sublittoral fringe which lies above a Laminaria hyperborea forest and park."*	N/A
A3.211 - *Laminaria digitata* on moderately exposed sublittoral fringe rock	*"Exposed to moderately exposed sublittoral fringe rock characterised by the kelp Laminaria digitata with coralline crusts covering the rock beneath the kelp canopy."*	N/A
A4.13 - Mixed faunal turf communities on circalittoral rock	*"This habitat type occurs on wave-exposed circalittoral bedrock and boulders, subject to tidal streams ranging from strong to moderately strong. This complex is characterised by its diverse range of hydroids, bryozoans and sponges, forming an often dense, mixed faunal turf."*	

EUNIS Classification	Supporting Network	Example Image from drop-down photograph stills / video
A4.2 - Atlantic and Mediterranean moderate energy circalittoral rock	*"Mainly occurs on exposed to moderately wave-exposed circalittoral bedrock and boulders, subject to moderately strong and weak tidal streams. This habitat type contains a broad range of biological subtypes, from echinoderms and crustose communities (A4.21) to Sabellaria reefs (A4.22) and circalittoral mussel beds (A4.24)"*	
A4.2144 - Brittlestars on faunal and algal encrusted exposed to moderately wave exposed circalittoral rock	*"This variant is typically found on the upper faces of exposed and moderately wave-exposed circalittoral bedrock, boulders and cobbles subject to moderately strong to weak tidal streams. It is characterised by high densities of brittlestars (predominantly Ophiothrix fragilis, Ophiocomina nigra and Ophiura albida). In fact, they may form such dense beds that the seabed underneath may not be visible. The rocky substratum is usually colonised by species such as encrusting red algae and the white, calcareous tubes of the polychaete Pomatoceros triqueter. Only robust hydroids such as Abietinaria abietina, Alcyonium digitatum and bryozoan crusts such as Parasmittina trispinosa are able to tolerate the significant smothering effect from the dense mat of brittlestars. Other species typically seen include Echinus esculentus, Asterias rubens, Pagurus bernhardus, Anapagurus hyndmanni, Gibbula cineraria, Urticina felina, Pododesmus patelliformis and Ciona intestinalis."*	
A5.13 - Infralittoral coarse sediment	*"Moderately exposed habitats with coarse sand, gravelly sand, shingle and gravel in the infralittoral, are subject to disturbance by tidal steams and wave action. Such habitats found on the open coast or in tide-swept marine inlets are characterised by a robust fauna of infaunal polychaetes such as Chaetozone setosa and Lanice conchilega, cumacean crustacea such as Iphinoe trispinosa and Diastylis bradyi, and venerid bivalves. Habitats with the lancelet Branchiostoma lanceolatum may also occur."*	N/A
A5.2 - Sublittoral sand	*"Clean medium to fine sands or non-cohesive slightly muddy sands on open coasts, offshore or in estuaries and marine inlets. Such habitats are often subject to a degree of wave action or tidal currents which restrict the silt and clay content to less than 15%. This habitat is characterised by a range of taxa including polychaetes, bivalve molluscs and amphipod crustacea."*	

EUNIS Classification	Supporting Network	Example Image from drop-down photograph stills / video
A5.14 - Circalittoral coarse sediment	*"Tide-swept circalittoral coarse sands, gravel and shingle generally in depths of over 15-20m. This habitat may be found in tidal channels of marine inlets, along exposed coasts and offshore. This habitat, as with shallower coarse sediments, may be characterised by robust infaunal polychaetes, mobile crustacea and bivalves. Certain species of sea cucumber (e.g. Neopentadactyla) may also be prevalent in these areas along with the lancelet Branchiostoma lanceolatum."*	
A5.43 - Infralittoral mixed sediments	*"Shallow mixed (heterogeneous) sediments in fully marine or near fully marine conditions, supporting various animal-dominated communities, with relatively low proportions of seaweeds. This habitat may include well mixed muddy gravelly sands or very poorly sorted mosaics of shell, cobbles and pebbles embedded in mud, sand or gravel. Due to the quite variable nature of the sediment type, a widely variable array of communities may be found, including those characterised by bivalves (A5.433, A5.431, and A5.435), polychaetes (A5.432) and file shells (A5.434)."*	N/A
A5.44 - Circalittoral mixed sediments	*"Mixed (heterogeneous) sediment habitats in the circalittoral zone (generally below 15-20 m) including well mixed muddy gravelly sands or very poorly sorted mosaics of shell, cobbles and pebbles embedded in or lying upon mud, sand or gravel. Due to the variable nature of the seabed a variety of communities can develop which are often very diverse. A wide range of infaunal polychaetes, bivalves, echinoderms and burrowing anemones such as Cerianthus lloydii are often present in such habitat and the presence of hard substrata (shells and stones) on the surface enables epifaunal species to become established, particularly hydroids such as Nemertesia spp and Hydrallmania falcata."*	

EUNIS Classification	Supporting Network	Example Image from drop-down photograph stills / video
A5.52 - Kelp and seaweed communities on sublittoral sediment	*"Shallow sublittoral sediments which support seaweed communities, typically including the kelp Laminaria saccharina, the bootlace weed Chorda filum and various red and brown seaweeds, particularly filamentous types. The generally sheltered nature of these habitats enables the seaweeds to grow on shells and small stones which lie on the sediment surface; some communities develop as loose-lying mats on the sediment surface."*	
A5.5331 - *Zostera marina/angustifolia* beds on lower shore or infralittoral clean or muddy sand	*"Expanses of clean or muddy fine sand and sandy mud in shallow water and on the lower shore (typically to about 5 m depth) can have dense stands of Zostera marina/angustifolia."*	

Areas of rock outcrops were identified during the geophysical surveys and at several transects in the survey, especially in the north-west and centre of the installation corridor. Bedrock outcrops also extended from the intertidal to subtidal zone. This habitat corresponds to potential Annex I bedrock reef habitat. This type of reef is geogenic in origin and consists of rock which rises from the seabed and can be associated with a range of different communities, including algae and invertebrates (JNCC, 2021d).

Several cobbles and boulders were also identified, predominantly in the centre of the installation corridor. A stony reef assessment was conducted to ascertain whether these areas corresponded to Annex I stony reef. This assessment concluded that most sections were classified as 'Not a reef'. A transect proximal to the Mull landfall, was classified as 'Medium reef' due to the fact that there was > 40% cover of cobbles and boulders and an elevation of 64 mm to 5 m from the seabed, and another transect proximal to the Coll landfall was classified as 'Low reef', meaning there was 10 – 40% cover of cobbles or boulders and an elevation of < 64 mm. Therefore, there is the potential for Annex I stony reef to be located within the installation corridor (Fugro, 2021b). This type of reef is also geogenic in origin and consists of stable boulders and rocks associated with communities of algae or invertebrates (JNCC, 2021d). The coarse sediments within the installation corridor also correspond to the UKBAP and PMF habitat 'subtidal sands and gravel'. This habitat is widely distributed throughout Scottish waters.

Several other sensitive features / species were identified in the transects within the installation corridor. A seagrass bed was identified at a transect proximal to the Coll landfall (transect MtoC_TR01), which consisted of a 34 m section of the transect with at least 30% coverage of *Zostera marina* on the seabed. Subtidal seagrass beds are a PMF, included an OSPAR threatened and/or declining habitats and are associated with Annex I habitats such as 'Estuaries' and 'Coastal lagoons'. In addition, a transect proximal to the Mull landfall (MtoC_TR15) corresponded to the PMF biotope 'Kelp and seaweed communities on sublittoral sediment' (EUNIS habitat A5.2). This transect also contained live maerl which covered < 10 % of the seabed. Maerl beds are a PMF habitat, UKBAP habitat and an OSPAR threatened and/or declining habitat. However, live maerl were only observed in the south-east of the installation corridor and classed as 'low' sensitivity due a low coverage. Maerl did not form a notable feature of the sediment (Fugro, 2021b).

No other Annex I habitats, OSPAR threatened and/or declining habitats or UKBAP priority habitats and species were observed in the installation corridor (Fugro, 2021b). However, as discussed in Section 5, the installation corridor overlaps with the Sea of the Hebrides NCMPA, which is designated for geomorphology of the Scottish Shelf Seabed (Inner Hebrides Carbonate Production Area). This feature consists of shelves, banks and sand wave fields with carbonate rich sands and gravels (NatureScot, 2020d). The Inner Hebrides Carbonate Production Area is also associated with biogenic elements such as maerl beds, blue mussel beds, horse mussel beds and seagrass beds which are generally slow growing and sensitive to physical disturbance (NatureScot, 2020a). The survey identified the presence of live maerl and seagrass beds within the installation corridor, however, both habitat types were only observed at a single transect, and hence, it is not expected that these biogenic elements associated with this NCMPA will be widespread across the corridor.

8.4 Impact Assessment

8.4.1 Area of Impact

Potential impacts associated with the installation of the proposed cable include habitat loss and disturbance, introduction of invasive non-native species, sedimentation, and pollution.

The proposed cable replacement and associated protection and stabilisation activities in direct contact with the seabed have the potential to directly impact on the benthic species and habitats within the project footprint. The cable installation corridor will cross a variety of benthic habitats and biotopes as described in Section 8.3. The cable has been routed with the aim of avoiding areas of bedrock associated with steep slopes and maximise cable burial, however, this was not always possible. There is also still the potential for micro-routeing to avoid or

minimise the impact on sensitive marine features as well as technical constraints informed by further surveys and detailed route engineering. As such, the exact cable location cannot be determined and therefore the impact footprint on specific habitat types encountered along each installation corridor has not been estimated.

The total length of the cable is up to 16,500 m and associated footprint of the cable has been included in Table 8-4, along with the anticipated external protection measures and other deposits to represent the worst-case scenario.

At landfall, the cable will initially be installed via an excavated trench pull in, and the remaining cable will either be buried via a jet trencher or surface laid, depending on ground conditions and existing infrastructure.

The following worst-case assumptions have been made for the area of seabed impacted:

- The impacts corridor of the landfall sites where the cable will be buried with a land-based excavator is 10 m wide;
- The impact corridor of the offshore section of the cable corridor is assessed as 10 m wide to include the requirement for jet-trenching considering the footprint of the trencher. This has been assessed assuming the whole length of the cable will be buried to represent a worst-case. In reality, some sections of the cable will be surface laid;
- The rock berm is expected to have a 13 m wide footprint over approximately 54% of the length of the cable;
- Clump weights for the Sea Earthing cable are 1 m diameter with a footprint of 0.79 m^2;
- Clump weights of the mooring system for the Multicat vessel carrying out mattress installation are 3.5 x 3.5 m footprint with a footprint of 12.25 m^2;
- The mooring lines for the Multicat vessel carrying out mattress installation are each 36 mm in diameter and 150 m in length with a total footprint of 43.92 m^2;
- Each grout bag measures 0.9 m x 0.9 m x 0.9 m, therefore impacting an area of 0.81 m^2 each;
- Each rock bag is 2.4 m diameter, therefore impacting an area of 4.52 m^2; and
- Each mattress measures 6 m x 3 m x 0.3 m, therefore impacting an area of 18 m^2 each.

Table 8-4 Footprint of the Cable Installation Methods and Permanent Materials Along the Installation Corridor

Location and protection method	Source of Impact	Area of seabed impact on biotope/habitat (m^2)	Area of seabed impact on biotope/habitat (km^2)
Excavation activities between MHWS and MLWS and the submarine cable (From Coll MLWS to Mull MLWS)[1]	Excavation activities: At each landfall site (x2), where technically achievable, the nearshore sections of both cables will be buried by means of a land-based excavator within the intertidal area out to MLWS. All cable in this area whether buried or surface laid will have AP or Uraduct protection. A maximum	165,000 m^2	0.165 km^2

Location and protection method	Source of Impact	Area of seabed impact on biotope/habitat (m^2)	Area of seabed impact on biotope/habitat (km^2)
	10 m working corridor width is assumed. Submarine cable: A maximum 10 m working corridor width is assumed. Cable diameter: 103 mm (corridor of 10 m) Length: 16.5 km		
Sea Earth: Clump Weights[2]	1 m diameter – total of 2 at each landfall	3.2 m^2	0.0000032 km^2
Cable protection: rock placement[3]	8.425 km x 13 m corridor	109 m^2	0.000109 km^2
Cable protection: concrete mattresses	Size: 6 x 3 x 0.3 m (assumed dimensions) – a total of 93 (includes contingency)	502.2 m^2	0.0005022 km^2
Cable protection: rock bags	2.4 m diameter rock bags – total of 185 bags (includes contingency)	832.5 m^2	0.0008325 km^2
Cable protection: grout bags	0.9 x 0.9 x 0.9 m – total of 36 bags (includes contingency)	26.2 m^2	0.0000262 km^2
Clump weights[4]	3.5 m x 3.5 m clump weights – a total of 8	98 m^2	0.000098 km^2
Mooring lines[4]	150 m x 36 mm chain – a total of 8	44 m^2	0.000044 km^2
Total Impact of Installation Corridor		166,615 m^2	0.1666151 km^2

[1] The worst-case scenario for the area of impact has been assessed assuming the whole length of cable will be buried, as this represents the worst-case in terms of seabed footprint. The 10 m footprint includes the footprint of the jet trencher and the requirement for split pipe and the Sea Earth wire.

[2] Potential for copper rod to be used with 12 mm diameter and 5 m length. However, the clump weight has a larger diameter and represents the worst-case scenario.

[3] With respect to rock placement, the berm is based on being required along the length of cable that could be Surface Laid whilst at the same time still being accessible by a rock placement vessel. The resulting length of the route that could be protected using rock placement has therefore been considered to be 8.425km, 54% of the cable route.

[4] These items represent temporary deposits.

8.4.2 Direct Loss of/Disturbance to Benthic Habitats and Communities

Cable installation works that will disturb the seabed, including the excavation of the trench at both landfalls, boulder clearance, PLGR, trenching, installation of external protection and anchor deployment in the offshore area will lead to disturbance or loss of benthic habitats.

The sensitive habitats in the nearshore area at Mull include potential Annex I reef and a small patch of potential UKBAP Coastal saltmarsh. At Coll, the sensitive habitats include Annex I reef, UKBAP coastal grassland and UKBAP intertidal under-boulder communities. These habitats may be disturbed by the installation activities within the intertidal area. However, at both Mull and Coll, any disturbance to these habitats will be highly localised, representing a small area of the total extent of each habitat type.

In the offshore area, activities may affect sensitive seabed features, such as the potential Annex I rocky and stony reef habitat, seagrass beds, kelp and seaweed on sublittoral sediment, subtidal sands and gravels and live maerl. Annex I reef and subtidal sands and gravels are expected to be the most prominent habitats of conservation importance present within the installation corridor.

The cable has been routed to avoid rocky outcrops as far as possible to maximise the potential for cable burial. However, where burial is not possible, which is expected in several sections of the installation corridor where bedrock and/or boulder habitat is unavoidable, the cable will be surface laid with external protection (articulated pipe or uraduct, rock placement, rock bags and/or concrete mattresses). Disturbance of benthic habitat / species will occur within the footprint of these deposits. However, the materials placed during the installation works represent a substrate to which benthic organisms typically living on hard substrates can attach to, therefore there is potential for re-colonisation of the surface laid cable and associated material by epifauna, and habitat loss in this habitat type is likely to only be temporary.

The cable is expected to be buried in sandy, coarse and mixed sediments. In these areas, the disturbance is expected to be temporary, with a recovery of the seabed to its natural state over time. However, if the cable is surface laid in areas of sandy, coarse and mixed sediments, where burial might is not achievable due to localised geology, benthic organisms living on the surface of sediments will not be able to colonise the hard substrate of the surface-laid cable with external protection. In addition, grout bags may also be utilised in areas identified with free spans during the post-installation surveys. However, considering the small footprint of activities and the fact that cable burial is the preferred installation method within this sediment type, the permanent habitat loss will result in imperceptible change to the wider habitat and will not change the ecology of the area, therefore the impact is not considered significant.

As identified within the recent surveys, the rocky habitat within the installation corridor has the potential to be Annex I bedrock reef, with three transects identifying potential Annex I stony reef. The installation of the cable will lead to temporary habitat loss within the direct footprint of the surface laid cable associated external protection. However, as described above, this will be a highly localised seabed footprint, with recolonization of benthic organisms associated with this habitat expected on the hard substrate over time.

A seagrass bed was identified in a 34 m section of transect during the recent surveys, towards the Coll landfall. It is recognised that this habitat is sensitive to physical disturbance and loss and is also of conservation importance, being listed as a PMF, an OSPAR threatened and/or declining habitat and associated with Annex I habitats. However, this habitat type was only observed in one transect within the survey area and therefore, the cable installation works are expected to impact a very small area of seagrass bed habitat, when considering the limited footprint expected from the cable installation works. Any disturbance or loss of live maerl will also be minimal considering the low coverage of maerl on the seabed (<10% of the seabed) and the localised extent of the seabed footprint. Similarly, any disturbance to the PMF habitat 'Kelp and seaweed communities on sublittoral sediment' and the PMF habitat 'Subtidal Sands and Gravels' is expected to be highly localised, impacting a small extent of these habitats, which are widespread in Scotland.

As described in Section 5, the installation corridor overlaps with the Sea of the Hebrides NCMPA which consists of the Inner Hebrides Carbonate Production Area as a protected feature (amongst others). However, the installation works are only expected to impact a small area of this protected area and is not expected to impact the function that this ecosystem plays in carbonate production.

Overall, given the small footprint of the proposed cable replacement works, no significant loss of habitat or features will occur.

Assessment of impact significance

Sensitive benthic features have been identified in the nearshore and offshore sections of the installation corridor, such as coastal and intertidal UKBAP habitats and potential Annex I bedrock reef in the nearshore region and potential Annex I bedrock and stony reef, seagrass beds, live maerl , 'Kelp and seaweed communities on sublittoral sediment' and 'Subtidal sands and gravels' within the offshore region. The installation corridor also overlaps with the Sea of the Hebrides NCMPA, which has the Inner Hebrides Carbonate Production Area as a protected feature. This feature is associated with carbonate sands and gravels and biogenic elements such as maerl beds and seagrass beds. On this basis, the subtidal and intertidal habitats and species potentially affected by the project are considered to be of high sensitivity to disturbance/loss.

A minor shift from the baseline conditions is anticipated, however the impact will be highly localised with disturbance occurring to a small proportion of the habitat / species present in the installation corridor. Furthermore, it is expected that the cable will be surface laid with external protection in areas of potential Annex I reef habitat, with recolonization of benthic species to the hard substrate anticipated to occur over time. Similarly, where the cable is buried in softer sediments, recovery of the seabed is also expected to occur over time. Taking a localised footprint, the magnitude of effect is considered minor resulting in a minor level of impact and the residual impacts on benthic ecology are not significant.

The proposed cable installation activities will result in a direct habitat loss of only a limited area of seabed, approximately 0.1666151 km^2. The impact is therefore assessed as minor and not significant.

As the impact is not significant, no secondary mitigation measures are required. Embedded mitigation measures considered as part of the project design are listed in Section 4.3.

Sensitivity / value	Magnitude of effect	Level of impact
High	Minor	Minor
Impact significance – NOT SIGNIFICANT		

8.4.3 Temporary Increase in Suspended Sediments and Associated Sediment Deposition

At both landfall locations, the cable will initially be installed via a land-based excavator. The timing of trench works will be tide dependent (working at low water when the intertidal area is exposed). Therefore, there will be no disturbance of submerged sediments. There may be temporary and highly localised increase in suspended sediment caused by the incoming tide and wave action interacting with the trench walls and associated spoil. However, this will not be significantly greater than that expected occur naturally, through wave action remobilising shoreline sediments.

The habitat complexity of the intertidal zone supports a wide range of species that will demonstrate different sensitivities to increased turbidity and sediment deposition. The intertidal survey identified a range of species, with seaweeds being prominent over invertebrates (Fugro, 2021b). The resettlement of sediments is expected to occur within the 100 m of the excavated trench in the intertidal zone, and the impacts will be most applicable to sessile and less mobile fauna. Suspension and deposition of fine particles may have an effect on low mobility filter feeders; however, the benthic communities in sandy sediments will be generally adapted to high sediment loading and have a high tolerance to smothering. The sensitivity of the intertidal community could be considered high on a precautionary basis, however given the temporary and highly localised effects, the magnitude would be negligible.

Within the offshore area, jet trenching has the potential to result in suspended sediment loads that we resettle on the seabed. As described in Section 6, suspended solid concentrations are expected to reach ambient levels within 70 m of the trench, and the resettlement of sediments is therefore expected to occur within the ±100 m cable

installation corridor. The impacts will be most applicable to sessile and less mobile fauna. The coarse sediment which is dominant in the installation corridor is expected to settle quickly on the seabed. Limited impacts are expected to Annex I reef habitat, as the preferred installation method on bedrock habitat is surface lay. Seagrass and maerl are potentially sensitive to increases in suspended sediment that could significantly increase turbidity in the water column and to potential smothering from sediment deposition (D'Avack *et al.*, 2019; Perry & Tyler-Walters, 2015). However, any increases in suspended sediment will be highly localised and temporary, and therefore, no significant impacts are expected.

Assessment of impact significance

The sensitivity of the varied intertidal community to increased sediment resuspension possible during tide and wave action is considered high on a precautionary basis. The sensitivity of seagrass and maerl to sediment resuspension is also high, due to the potential for increased turbidity to reduce the light attenuation and for sediment deposition resulting in smothering. However, the highly localised and temporary nature of the impact is of a minor magnitude. Therefore, the significance is considered negligible.

As the impact is not significant, no secondary mitigation measures are required. Embedded mitigation measures considered as part of the Project design are listed in Section 4.3.

Sensitivity / value	Magnitude of effect	Significance of impact
High	Negligible	Minor
Impact significance – NOT SIGNIFICANT		

8.4.4 Impact from Non-Native Marine Species (NNMS)

A number of NNMS in UK waters have the potential to impact benthic species and habitats, including circalittoral and infralittoral mixed sediments and reef habitats. Natural England have commissioned a study that investigated the potential impacts of eight NNMS on marine protected area features in England (Macleod *et al.*, 2016). All eight of the NNMS studied were considered as having the potential to colonise or interact with reefs (bedrock and stony), seven could impact seagrass beds and two had the potential to colonise or interact with maerl beds. In addition, five NNMS could impact subtidal coarse sediments and two could impact subtidal mixed sediments (Macleod *et al.*, 2016).

An approved ballast water management plan will be adopted by all relevant vessels, according to the International Maritime Organization (IMO) ratified the International Convention for the Control and Management of Ships' Ballast Water and Sediments Management Convention in September 2017 (the BWM Convention). Implementation of the BWM Convention will not mitigate the risk of an NNMS being introduced via biofouling on a vessel. However, this vector is considered to carry a lower risk of NNMS introduction than ballast water and the installation vessel movements are unlikely to constitute a change from baseline conditions with respect to the potential for introducing NNMS. The rock used to construct rock berms and contained within the rock bags will be terrestrially sourced, clean and free from organic material. Concrete mattresses and clump weights will be new, and free from organic material. The installation of rock and concrete mattresses do not therefore present a risk of transport and introduction of NNMS.

The risk of rocky reef, seagrass beds and maerl beds being adversely impacted by NNMS depends on the severity of the threat, the likelihood of introduction, which is the potential of the activities to create a suitable vector capable of carrying and introducing a NNMS and/or pathogen, and finally on the likelihood of establishment and spread of the NNMS, which is dependent on the ecological preferences and dispersal potential of NNMS within the recipient environment (Macleod *et al.*, 2016). Although the severity of the threat is high due to the high sensitivity of these features, the embedded biosecurity measures, including management of ballast water in adherence with the BWM Convention, will ensure that there are no pathways for NNMS to be introduced by the

proposed works and subsequently spread. Therefore, the likelihood of introduction of NNMS and the likelihood of spread and establishment are reduced to low and the residual impact is not significant.

Assessment of impact significance		
Given that the embedded mitigation measures will ensure that no NNMS are introduced and spread as a result of the proposed works, no residuals impact on reef communities, seagrass and maerl are anticipated. Embedded mitigation measures considered as part of the Project design are listed in Section 4.3.		
Sensitivity / value	Magnitude of effect	Level of impact
High	Minor	Minor
Impact significance – NOT SIGNIFICANT		

8.4.5 Accidental Release of Hazardous Substances

The use of vessels could lead to a fuel release, or of cleaning fluids, oils and hydraulic fluids used on board vessels and during ROV operations, which could be released overboard or accidentally discharged. These discharges can be potentially harmful and can lead to localised organic enrichment and a change in the balance of the food chain. However, as the vessels will be < 12 NM from shore, there will be no discharge of grey water, sewage, food waste or drain water.

All vessels will be compliant with IMO and MARPOL and as such, the risk of oils and other contaminants entering the marine environment is very low. Neither organic enrichment nor oxygen depletion is considered likely, due to the relatively small cumulative volume of any discharges. Any reduced water quality will be short-term and localised in nature along the installation corridor, occurring sequentially with the location of the installation activity, and near the seabed. A temporary and localised reduction low in water quality is unlikely to cause a detectable change to the benthic species and habitats along the consenting corridor.

Assessment of impact significance		
Given that the embedded mitigation measures will ensure the risk of releases of hazardous substances being released into the marine environment are minimised, impacts on benthic receptors are expected to be minimal. Embedded mitigation measures considered as part of the Project design are listed in Section 4.3.		
Sensitivity / value	Magnitude of effect	Level of impact
High	Negligible	Minor
Impact significance – NOT SIGNIFICANT		

8.5 Conclusion

Physical disturbance through seabed preparation, land-based excavation at the landfall, cable laying, protection and burial activities, and smothering of benthic habitat and species via sediment re-suspension and settlement are likely to occur within the footprint of the proposed works. Several protected features were identified during the recent surveys, including potential Annex I (bedrock reef) and coastal and intertidal UKBAP habitats in the intertidal region, and potential rocky and stony reef, seagrass beds, maerl beds and the PMF habitats 'Subtidal sands and gravels' and 'Kelp and seaweed communities on sublittoral sediment' in the offshore region. However, the effects are expected to be highly localised and temporary. Consequently, there will be no significant impact on the benthic and intertidal ecology resulting from the Mull - Coll cable replacement project.

9 ORNITHOLOGY

9.1 Introduction

This section of the report provides detail on the ornithological receptors in the vicinity of the proposed marine cable installation corridor and presents results from an assessment of potential impacts which may result from the proposed cable replacement works. Management and mitigation measures to ensure impacts are minimised will also be suggested where necessary.

9.2 Data Sources

This section draws on a number of data sources including published papers and industry-wide surveys. A key data source available for Scottish waters is the NMPi website (NMPi, 2021) which underpins the Scottish NMP (Scottish Government, 2015).

9.3 Baseline and Receptor Identification

As noted in Section 5, the Mull – Coll installation corridor is located within 0.8 km of the Coll and Tiree SPA. This SPA is located on the north and west coast of Coll and also surrounds Tiree. The SPA is designated for non-breeding populations of great northern diver and common eider, which utilise the waters within the SPA boundaries to feed, moult (common eider) and roost. Both species forage through surface diving, with great northern diver feeding on fish and crabs, with common eider feeding on shellfish (NatureScot, 2017).

This site qualifies as an SPA under Article 4.1 of the of the Birds Directive (79/409/EEC) by regularly supporting a wintering population of European importance of great northern diver (an Annex 1 species) and under Article 4.2 for regularly supporting populations of migratory common eider (NatureScot, 2020b).

Although the installation corridor does not overlap with this SPA, there are expected to be relatively high numbers of seabirds present in the vicinity of the cable replacement installation corridor, especially over winter, when great northern diver are present in Scottish seas and when densities of common diver are expected to be highest.

9.4 Impact Assessment

The proposed cable replacement may be undertaken during winter months, potentially overlapping with the winter season where densities of common eider and great northern diver are expected to be highest. However, the installation corridor does not overlap with the SPA, and as such there is no potential for direct disturbance of any foraging, moulting or roosting within the SPA boundary. The distribution of this species is also expected to be comparatively lower in the vicinity of the installation corridor in comparison to within the SPA (NatureScot, 2017).

The cable replacement works within the Mull - Coll installation corridor do have the potential to affect seabirds at sea, outwith the SPA boundary, due to the mobile nature of these species. However, the proposed cable replacement works are considered unlikely to result in any adverse effects on the FCS of sensitive ornithological receptors. This is concluded for the following reasons:

- Cable installation vessels will be slow moving, as detailed in Section 4.3, reducing the potential for disturbance;
- During night-time operations, vessel lighting will be minimised insofar as possible whilst allowing for safety, as detailed in Section 4.3. This will reduce the potential for bird strikes or disturbance of seabirds;

- The waters in the vicinity of the cable installation corridor is subject to relatively high levels of vessel activity, predominantly associated with passenger vessels associated with ferry routes travelling from Coll and Tiree and with cargo vessels travelling through the passage of Tiree. As such, the presence of the installation vessels required to facilitate the cable replacement will not constitute a substantive change from baseline vessel activity in the vicinity of the installation corridor; and
- The cable installation vessels will be constantly moving, the zone of potential disturbance is extremely limited, and the disturbance will be limited to the installation period. As such, any potential disturbance to seabirds will be transient, localised and temporary.

Assessment of impact significance

Given that the presence of the installation vessel will not constitute a change from baseline conditions, together with the transient, localised and temporary nature of potential impacts whilst considering the embedded mitigation measures; effects on ornithological receptors are expected to be minor, and no adverse effects on the FCS of any species are anticipated.

Embedded mitigation measures considered as part of the project design are listed in Section 4.3.

Sensitivity / value	Magnitude of effect	Level of impact
High	Minor	Minor
Impact significance – NOT SIGNIFICANT		

9.5 Conclusion

The installation corridor is located within in waters of potential importance to wintering seabirds. The proposed activities could cause disturbance to these species through vessel presence. However, given the transient, temporary and localised nature of the effects and the mitigation measures described in Section 4.3, activities are unlikely to significantly impact populations of seabirds.

10 MARINE ARCHAEOLOGY

10.1 Introduction

This section provides detail on marine archaeological features in the vicinity of the proposed installation corridor. An assessment of potential impacts on these features is then presented, along with recommendations for additional secondary mitigation measures that may be required in order to ensure losses of or impacts to the archaeological record are minimised.

10.2 Data Sources

A review of publicly available information pertaining to marine archaeological sites on the coast of Scotland was conducted in order to inform this assessment. The key sources utilised were:

- Geophysical and Landfall Survey Report – Mull Coll (Fugro, 2021a);
- UK Hydrographic Office's (UKHO) wrecks database (UKHO, 2021);
- NMPi (2021); and
- Canmore Maritime records of marine losses (Canmore, 2021).

10.3 Baseline and Receptor Identification

There are no charted wrecks within the installation corridor and no wrecks were observed in the recent surveys (Fugro, 2021a). However, there are 4 wrecks within 5 km of the installation corridor, as shown in Figure 10-1. These include:

- 2 non-dangerous wrecks of unknown identity;
- St Brandon, a 20th century cargo ship which is classified as showing a portion of hull or superstructure, lost in 1920; and
- Teunika, a 20th century Dutch cargo ship, classed as a non-dangerous wreck which was lost in 1969.

In addition to the wrecks shown in Figure 10-1, the Canmore Maritime Records note approximately 6 further losses in the vicinity of the of the Mull – Coll installation corridor. However, it should be noted that the positions assigned to these losses are noted as being arbitrary, and hence very little confidence can be placed in them (Canmore, 2021).

Given the available data, it considered unlikely that sites of marine archaeological significance are located within the installation corridor, although their presence (such as drifted debris) cannot be ruled out.

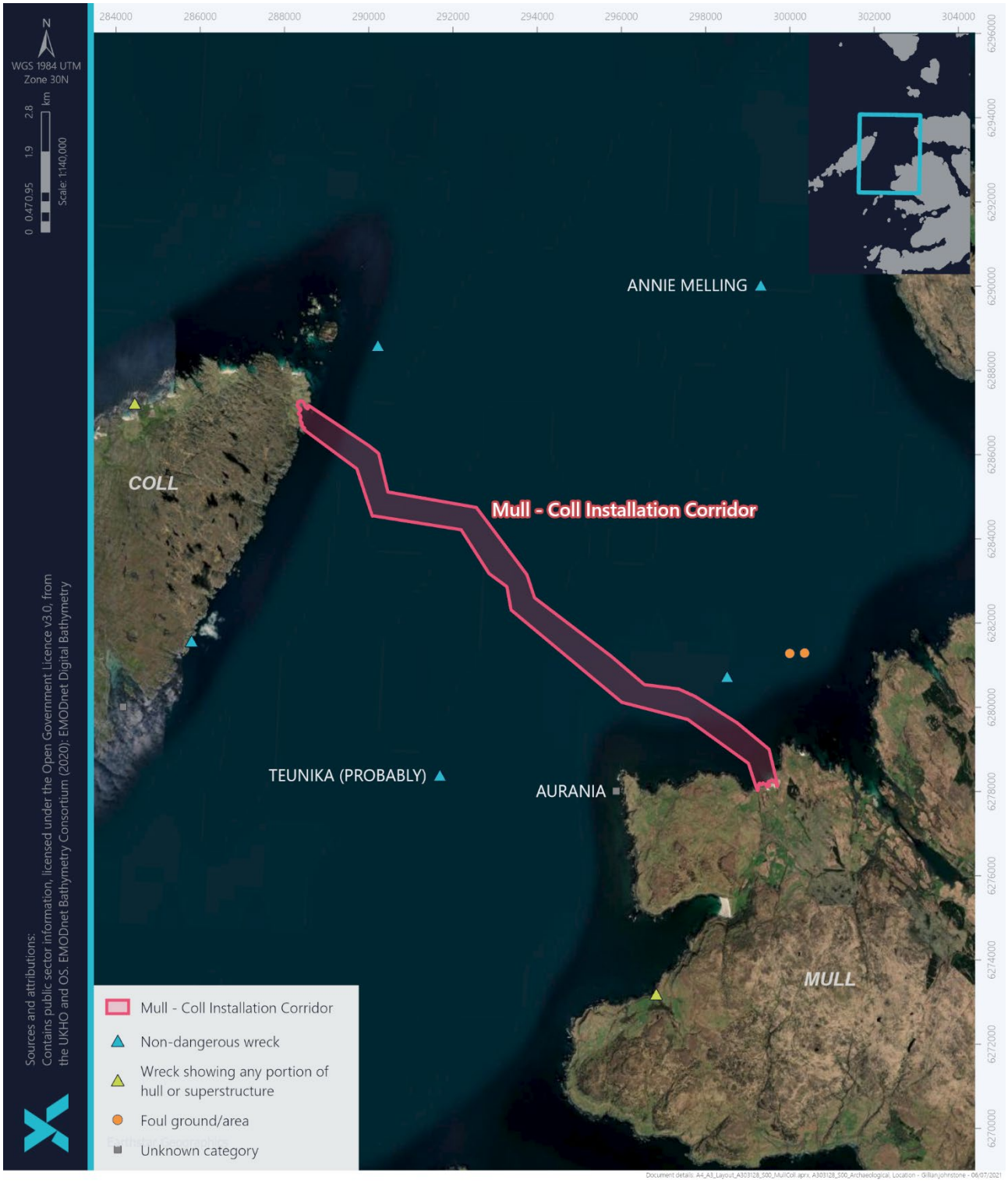


Figure 10-1 Sites of Potential Archaeological Significance in the Vicinity of the Installation Corridor.

10.4 Impact Assessment

As detailed in Section 10.3, while there are no confirmed wrecks within the installation corridor, their presence cannot be ruled out from the available data. As such the cable installation works have the potential to result in damage to or loss of the historic record. This would be limited to interactions with wrecks or artefacts during cable laying and burial operations, and the placement of external protection (i.e. rock berms, rock filter bags and mattresses). Should such interactions occur, the damage or loss of archaeological features would be a permanent effect on a potentially highly sensitive receptor, which has no ability to recover, and as such could constitute a significant impact on historic records.

The surveys undertaken between January and March did not identify any wrecks or obstacles present within the installation corridor, and hence, the presence of wrecks is considered unlikely (Fugro, 2021b). Pre-lay surveys will be undertaken to inform the final routing of the replacement cables. This will identify obstacles, such as sites of potential archaeological significance to be identified prior to cable installation works commencing. During detailed route design the following provisions shall be implemented with regard to wrecks or other features of potential archaeological value identified in the survey data:

- All wrecks or features of potential archaeological significance shall be avoided by a buffer of at least 50 m during detailed route design;
- The locations of wrecks and features of potential archaeological significance will be clearly identified on electronic charts on board the installation vessel and utilised to guide cable installation operations; and
- The location of any wrecks or features of potential archaeological significance will be provided to Historic Environment Scotland, and the UKHO.

However, it is acknowledged that there is the potential that archaeological features could be present within the Installation Corridor, which are not identified by preconstruction surveys. In order to account for this, and subject to further discussion with Historic Environment Scotland, the Crown Estate's Protocol for Archaeological Discoveries (PAD) (TCE, 2014) would be used as a basis for further mitigation during installation activities. The role of the Implementation Service described within the above protocol would be replaced by an archaeological service provider appointed by SHEPD or their installation contractor.

Assessment of impact significance		
The presence of significant historic sites within the installation corridor cannot be ruled out, although it is thought to be unlikely. This notwithstanding, if such a site is present, and were disturbed or destroyed by the installation works, it would have a significant adverse effect on the historic record. Pre-construction surveys did not identify the presence of any wrecks, making it extremely unlikely that adverse impacts will occur. Implementation of the PAD will further reduce the risk of adverse impacts on the archaeological record.		
Sensitivity / value	Magnitude of effect	Level of impact
High	Negligible	Minor
Impact significance – NOT SIGNIFICANT		

10.5 Conclusion

The publicly available data could not rule out the possibility that features of archaeological significance may be present within the installation corridor at each cable route site. No wrecks were observed in the pre-construction surveys undertaken between January and March. Following the implementation of the mitigation measures, it is considered to be extremely unlikely that the cable installation works would result in the loss or damage of

archaeological features. As such this assessment concludes that the project will not result in any significant adverse impacts on the historic record.

11 COMMERCIAL FISHERIES AND OTHER SEA USERS

11.1 Introduction

Through good communication and understanding of viewpoints, SHEPD aim to minimise any potential impacts by agreeing mitigation strategies before the works begin. This approach continues through all phases of the project, thus enabling co-existence with other marine users as SHEPD and their Contractors carry out the cable replacement activities.

Works are planned to keep unnecessary interference with other legitimate sea users to a minimum. SHEPD achieve this by actively engaging with legitimate sea users and those with consented development rights close to the operations.

SHEPD's consultations and agreements are tracked through the Fishing Liaison Mitigation Action Plan – Argyll (FLMAP). This is a key document which shows the associated risks to the commercial fishing industry and other legitimate sea users, addresses the potential effects and identifies how to minimise and mitigate potential impacts.

SHEPD will give as much notice as is practicably possible for the operations and provide updates when things change.

11.2 Supporting Documents

11.2.1 FLMAP – Argyll

The purpose of the FLMAP is to:

- Illustrate the associated risks to the commercial fisheries industry (and other legitimate sea users), address the potential effects (highlighted in the marine licenced evidence); and
- Identify how to minimise and mitigate potential impacts on local communities.

A summary assessment of all the potential marine interactions and activities which could influence or affect the proposed cable works is given in Chapters 6, 7 and 8 of the FLMAP.

11.2.2 FLMAP Delivery Programme

The FLMAP Delivery Programme sets out how the Liaison Officer (CFLO) and Fishing Industry Representative (FIR) will communicate during the replacement works and how the deliverables, set out in the FLMAP, will be measured and fulfilled. This document will also highlight any regional specific communication and consultation that is required, which may extend the notice period required to issue notice to mariners and communicate upcoming works. It will also highlight any ongoing issues which may arise throughout the works.

11.2.3 How Scottish Hydro Electric Power Distribution Co-Exists with Other Marine Users

How Scottish Hydro Electric Power Distribution co-exists with other marine users details how we plan to co-exist with other marine users as SHEPD carry out the proposed works and follow on from the recent consultations with fishermen in 2020 and into 2021.

11.3 Approach to Mitigation

A summary of SHEPD's approach to mitigating interactions with commercial fisheries and other sea users during the installation and operation of the proposed cable replacement is presented in Table 11-1 below.

Table 11-1 Summary of mitigation for commercial fisheries and other sea users

Measure	Details
Avoidance of Trawling	In line with guidance provided by the UKHO and International Convention for the Safety of Life at Sea (SOLAS), SHEPD recommend that fishing vessels should avoid trawling over installed seabed infrastructure. Vessels are also advised in the Mariners Handbook not to anchor or fish (trawl) within 500m of the cable.
A Fisheries Liaison Officer (FLO) will be employed to manage interactions between cable installation vessels, personnel, equipment and fishing activity. This will be managed through the Fisheries Liaison Mitigation Action Plan.	Employment of a FLO will ensure all commercial fisheries operators in the vicinity of the Project will be proactively and appropriately communicated with in terms of proposed Project operations.
Notice to Mariners (including local), Kingfisher bulletins, Radio Navigational Warnings, and/or broadcast warnings will be promulgated in advance of any proposed works. The notices will include the time and location of any work being carried out, and emergency event procedures.	Promotes navigational safety and minimises the risk of equipment snagging.
Compliance with International Regulations for the Prevention of Collision at Sea (IRPCS) (IMO, 1972) and the International Regulations for the Safety of Life at Sea (SOLAS).	IRPCS are the international standards designed to ensure safe navigation of vessels at sea. All installation vessels will adhere to these rules, including displaying appropriate lights and shapes. SOLAS is an international maritime treaty which sets minimum safety standards in the construction, equipment and operation of merchant ships. The convention requires signatory flag states to ensure that ships flagged by them comply with at least these standards. In relation to the Project its compliance will ensure navigational safety.
Guard Vessels	A guard vessel may be used during the installation campaign where a potential risk to the asset or danger to navigation has been identified.
Profiling of rock berms	All rock berms will be profiled with shallow side slopes and constructed of appropriate materials to minimise snagging risk.
As built survey data will be provided to the UKHO and Kingfisher for inclusion on Admiralty Charts and the Kingfisher Information Service – Offshore Renewable and Cable Awareness (KIS-ORCA) charts.	Ensure navigational safety and minimise the risk and equipment snagging.

12 CONCLUSIONS

The MEA supports SHEPD's application for a Marine Licence to complete the required Mull-Coll cable replacement works. It provides a robust assessment of potential impacts of the cable installation activities on groups of sensitive environmental receptors (Sections 5 – 11). Where relevant, these impact assessments have considered interactions with protected sites, and indirect impacts on other receptors. Specifically, environmental assessments of potential impact from the proposed works has been carried out for the following receptors:

- Designated Sites;
- Seabed and Water Quality;
- Marine Megafauna;
- Benthic and Intertidal Ecology;
- Ornithology;
- Marine Archaeology; and
- Commercial Fisheries and Other Sea Users.

Table 12-1 gives an overview of the findings from the environmental assessments undertaken within this MEA. On the basis of the findings and recommendations of the impact assessments presented in Sections 5 – 11, and the embedded mitigation requirements discussed in Section 4.3, it is anticipated that the cable replacement activities, will be conducted without significant impact on any relevant environmental receptor.

Table 12-1 Outcomes of Environmental Assessments on Receptors

Environmental Receptor Group	Assessment Undertaken	Level of Impact	Assessment Outcome	Overall LSE / Impact Significance	Additional Mitigations Measures Identified	Post Mitigation Impact
Designated Sites (Section 5)	SACs and NCMPAs with cetaceans and basking sharks as a feature (Inner Hebrides and the Minches SAC and the Sea of the Hebrides NCMPA)	No LSE	Due to the temporary and localised nature of the proposed cable replacement works, no LSE is predicted on the conservation objectives of any protected site and as such it is not expected that an Appropriate Assessment (AA) will be required. Overall, the replacement of the submarine power cable constitutes work of an overriding public need whilst presenting a trivial and temporary disturbance in a limited area. Therefore, no likely significant effects are expected from the cable replacement activities.	No LSE Identified	No additional mitigation measures identified specific to designated sites. See Section 4.3 for embedded mitigation requirements, and topic specific mitigation presented in Chapters 5-11.	No LSE
	SACs with harbour seals as a feature (Eileanan agus Sgeiran Lios mor SAC)	No LSE				
	SACs with grey seals as a feature (Treshnish Isles SAC)	No LSE				
	SPAs with seabirds as a feature (Coll and Tiree SPA)	No LSE				
	NCMPAs with seabed / benthic features (Sea of the Hebrides NCMPA)	No LSE				
Seabed and Water Quality (Section 6)	Coastal Sediment Suspension	Negligible	All installation activities at the landfall locations will be tidally dependent. Increased suspended sediment will only occur during the interaction between the incoming tide, the trench walls and spoil heaps. Furthermore, any suspended sediment associated with cable burial in parts of the offshore section of the cable will be highly localised, with an expectation that suspended sediment concentrations will return to ambient levels within a short distance from the trench. This will result in highly localised and temporary increases in suspended sediment which will not have a significant impact on coastal or offshore water quality. Best practice will be followed by all installation vessels, therefore the likelihood of an accidental hydrocarbon releases from the installation vessel is extremely remote. The level of impact is therefore considered minor and not significant.	Not Significant	No additional mitigation measures identified. See Section 4.3 for embedded mitigation requirements.	Not Significant
	Offshore Sediment Suspension	Negligible				
	Changes to Sediment and Water Quality Following Accidental Release of Hydrocarbons	Minor				
Marine Megafauna (Section 7)	Injury or Disturbance from Noise Emissions	Minor	Underwater noise emissions are the impact mechanism most likely to affect marine megafauna in the Project area. Noise modelling used to inform the assessment, presented in Appendix A, demonstrates that whilst there may be some disturbance to marine mammals resulting from USBL operations, this is likely to be limited in space and time and should only affect a few individuals of any species.	Not Significant	No additional mitigation measures identified. See Section 4.3 for embedded mitigation requirements.	Not Significant

Environmental Receptor Group	Assessment Undertaken	Level of Impact	Assessment Outcome	Overall LSE / Impact Significance	Additional Mitigations Measures Identified	Post Mitigation Impact
	Injury or Disturbance of Basking Sharks from Vessel Presence	Minor	There will be no injurious impacts to cetaceans or seals as a result of project activities and no requirement to apply for an EPS Licence in that respect. However, there is potential for disturbance to cetaceans, and SHEPD will therefore apply for an EPS Licence in respect to disturbance of cetaceans. However, this disturbance is expected to be limited to one or a few individuals of the local population and will therefore not result in any adverse impact to the FCS of any marine mammal species. Project activities will not result in the catching or killing of seals, and thus the protection provided to the two species by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) will not be breached. Furthermore, the short-term and localised nature of the proposed activities mean that harbour and grey seals making use of protected haul-outs is not expected to be significantly disturbed. As such, the protection given by Section 117 or the Marine (Scotland) Act 2010, and the Protection of Seals (Designation of Haul-Out Sites) (Scotland) 2014 will also not be breached. It is acknowledged that the presence of the installation vessels does have the potential to result in adverse (injury or disturbance) interactions with basking sharks. However, considering the slow speeds of the installation vessels, the embedded mitigation and the short duration of the project activities, the vessel collision risk is low. No adverse impact on the FCS of basking shark is therefore expected, however SHEPD will apply for a basking shark derogation licence, since the risk cannot be entirely ruled out. Considering the temporary and localised nature of the Project activities, there are not anticipated to be any significant impacts to individuals or populations of marine megafauna in the Project area.	Not Significant		Not Significant
Benthic and Intertidal Ecology (Section 8)	Direct Loss of/ Disturbance to Benthic Habitats and Communities	Minor	Physical disturbance through seabed preparation, land-based excavation at the landfall, cable laying and burial activities, and smothering of benthic habitat and species via sediment re-suspension and settlement are likely to occur within the footprint of the proposed works. Several protected features were identified during the recent surveys, including potential Annex I (bedrock reef) and coastal and intertidal UKBAP habitats in the intertidal region, and potential rocky and stony reef, seagrass beds, maerl beds and the PMF habitats 'Subtidal sands and gravels' and 'Kelp and seaweed communities on sublittoral sediment' in the offshore area. However, the effects are expected to be highly localised and temporary. Consequently, there will be no significant impact on the benthic and intertidal ecology resulting from the Mull - Coll cable replacement project.	Not Significant	No additional mitigation measures identified. See Section 4.3 for embedded mitigation requirements.	Not Significant
	Temporary Increase in Suspended Sediments and Associated Sediment Deposition	Minor				
	Impact from Non-Native Marine Species (NNMS)	Minor				
	Accidental Release of Hazardous Substances	Minor				

Environmental Receptor Group	Assessment Undertaken	Level of Impact	Assessment Outcome	Overall LSE / Impact Significance	Additional Mitigations Measures Identified	Post Mitigation Impact
Ornithology (Section 9)	SPA within 2 km of the cable installation works and installation being in summer months	Minor	The installation corridor is located within waters of potential importance to wintering seabirds associated with the Coll and Tiree SPA. The proposed activities could cause disturbance to these species through vessel presence. However, given the transient, temporary and localised nature of the effects and the mitigation measures described in Section 4.3, activities are unlikely to significantly impact populations of seabirds.	Not Significant	No additional mitigation measures identified. See Section 4.3 for embedded mitigation requirements.	Not Significant
Marine Archaeology (Section 10)	Damage or Loss of Historic Record – Wreck Sites	Moderate	The publicly available data could not rule out the possibility that features of archaeological significance may be present within the installation corridor at each cable route site. No wrecks were observed in the pre-construction surveys undertaken between January and March. Following the implementation of the mitigation measures, it is considered to be extremely unlikely that the cable installation works would result in the loss or damage of archaeological features. As such this assessment concludes that the project will not result in any adverse impacts on the historic record.	Significant	During detailed route design the following provisions shall be implemented with regard to wrecks or other features of potential archaeological value identified in the survey data: • All wrecks or features of potential archaeological significance shall be avoided by a buffer of at least 50 m during detailed route design; • The locations wrecks and features of potential archaeological significance will be clearly identified on electronic charts on board the installation vessel, utilised to guide cable installation operations; • The location of any wrecks or features of potential archaeological significance will be provided to Historic Environment Scotland, and the UKHO. it is acknowledged that there is the potential that archaeological features could be present within the Installation Corridor, which are not identified by preconstruction surveys. In order to account for this, and subject to further discussion with Historic Environment Scotland, the Crown Estate's Protocol for Archaeological Discoveries (PAD) (TCE, 2014) would be used as a basis for further mitigation during installation activities. The role of the Implementation Service described within the above protocol would be replaced by an archaeological service provider appointed by SHEPD or their installation contractor.	Not Significant
Commercial Fisheries and Other Sea Users (Section 11)	Assessment of impacts on commercial fisheries and other sea users has been presented in FLMAP Argyll	Not – significant as per FLMAP	The cable installation works have the potential to disrupt the activities of commercial fisheries and other legitimate sea users. SHEPD has taken a pro-active approach to minimising impacts on commercial fisheries and other legitimate sea users. Potential impacts have been identified and appropriate mitigation measures and consultations will be in place to minimise these. Once these consultations and mitigation measures have been implemented, no significant impact on commercial fisheries and other sea users are expected. This information has been provided in the supporting documents outlined in Section 11.	Not – significant as per FLMAP	Additional mitigation measures identified are provided in the supporting documents in Section 11. See Section 4.3 for embedded mitigation requirements.	Not – significant as per FLMAP

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APPENDIX A NOISE IMPACT ASSESSMENT

During the cable lay, an ROV with USBL will be utilised, deployed from the CLV, to monitor the cable at the touch down locations with the seabed. This will capture seabed information at the contact point and helps observe the lay tension that is applied to the cable from the vessel. This will also help to minimise the potential for cable suspensions along the route. If rock bags or mattresses are required, the ROV with USBL will be used for these activities too.

This section describes the potential frequency impacts and disturbance to marine mammal species in the area as a result of utilising USBL.

1.1 Acoustic Injury or Disturbance Criteria for Marine Mammals

1.1.1 Injury

A dual-metric approach has been adopted which identifies the range of potential injury to marine mammals from both the peak sound pressure level (SPLPeak; also called the source level) and cumulative SEL for each equipment type identified to require consideration for noise-related injury (see Table 1-1). The thresholds above which each marine mammal hearing group may experience noise-related injury are presented in Table 1-1 below. These thresholds are derived from measurements of marine mammal hearing using weighting functions which account for peak hearing abilities for each hearing group (NOAA, 2018).

Table 1-1 Criteria Considered in this Assessment for the Onset of Injury in Marine Mammals from Impulsive Noise (NOAA, 2018; Southall et al., 2019)

Marine mammal hearing group	Impulsive noise		Non-impulsive noise
	Peak pressure (dB re 1 µPa)	Cumulative SEL (dB re 1 µPa2s)	Cumulative SEL (dB re 1 µPa2s)
Low-frequency (LF) cetaceans	219	183	199
High-frequency (HF) cetaceans	230	185	198
Very high-frequency (VHF) cetaceans	202	155	173
Phocid pinnipeds (underwater)	218	185	201

1.1.2 Disturbance

1.1.2.1 Disturbance Regulations

There are two regulations which govern disturbance to EPS: Regulation 39(1) and Regulation 39(2). Regulation 39(1) from the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) defines disturbance for all EPS in UK waters and individuals which are vulnerable to disturbance due to biological or environmental circumstances. Regulation 39(2) goes beyond the disturbance guidelines provided in Regulation 39(1) by making it an offence to deliberately or recklessly disturb any cetacean in Scottish Territorial Waters (i.e. up to 12 nm) (Marine Scotland, 2014). The definitions of disturbance are provided in Box 1 below.

Box 1 Disturbance Regulations in Scottish Territorial Waters

The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)

Regulation 39 (1) makes it an offence —

(a) deliberately or recklessly to capture, injure, or kill a wild animal of a European protected species;

(b) deliberately or recklessly –

(i) to harass a wild animal or group of wild animals of a European protected species;

(ii) to disturb such an animal while it is occupying a structure or place which it uses for shelter or protection;

(iii) to disturb such an animal while it is rearing or otherwise caring for its young;

(iv) to obstruct access to a breeding site or resting place of such an animal, or otherwise to deny the animal use of the breeding site or resting place;

(v) to disturb such an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs;

(vi) to disturb such an animal in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young; or

(vii) to disturb such an animal while it is migrating or hibernating.

Regulation 39(2) provides that it is an offence —

to deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean).

To consider the possibility of a disturbance offence resulting from the proposed activities, it is necessary to consider the likelihood that the activities would generate a non-trivial disturbance based on the sensitives of the species present and whether the number of individuals impacted would generate population-level consequences. Where there is a possibility of disturbing an individual animal, it is necessary to apply for a Marine EPS Licence to ensure that an offence is not committed. However, in issuing a Marine EPS Licence, Marine Scotland must consider whether the FCS of any species will be affected. Consequently, the impacts of proposed activities on the FCS of all protected species must be considered to satisfy both Regulation 39(1) and 39(2). The impact assessment below addresses the impacts of the activities on the existing conservation status of protected species within the area.

1.1.2.2 Acoustic Disturbance Criteria

Auditory thresholds for disturbance, as defined by NMFS (2014), coupled with behavioural response criteria detailed in Southall et al. (2007) have been adopted for the assessment of potential marine mammal disturbance from both non-impulsive and impulsive noise sources. These thresholds and behavioural response severity ratings are provided in Table 1-2 below.

Table 1-2 Disturbance threshold criteria for impulsive sounds (Southall et al., 2007; NMFS, 2014)

Behavioural Effect	Threshold Criteria SPL_{rms} (dB re 1 µPa)
Potential strong behavioural reaction (6 or more on the severity scale)	160

1.2 Noise Modelling Approach

Noise modelling has been undertaken to identify the potential range (i.e. the straight-line distance from the source) in which noise impacts to marine mammals could occur. The dual-metric modelling approach disseminated in NOAA (2018) has been used to identify impacts from: (1) the peak SPL; and (2) the cumulative SEL, where necessary these values are derived from the root-mean-square (rms) pressure level (SPL_{rms}). The SEL represents the total energy produced by a noise-generating activity standardised to a one-second interval. This enables comparison of the total energy attributed to different activities with different inter-pulse intervals. As described above, empirically-based weighting functions (NOAA, 2018; Southall *et al.*, 2019) have been applied to the modelling outputs to account for peak hearing sensitivity for the respective marine mammal hearing groups.

The following assumptions have been applied to the models:

1. Maximum sound pressure levels have been used for all calculations;
2. Maximum pulse length and minimum turn around has been used where provided;
3. Where source frequencies occur across a range of frequencies, a flat 3rd octave spectrum has been used;
4. Where data is unavailable, the time between pulses has been calculated as 1.5 times the ping length;
5. Mammals swim at seabed depths (this represents the worst-case);
6. Vessels are moving at slow speeds; and
7. Survey equipment likely to be used in the nearshore shallow water environment (i.e. <10 m) will be very high frequency to provide better resolution and will have a lower SPL, and so does not constitute a worst-case scenario.

It is important to note that the rms value associated with the SPL_{rms} depends upon the length of the integration window used. Using a longer duration integration window results in a lower rms than produced by a shorter integration window.

An acoustic phenomenon results from the elongation of the waveform with distance from the source due to a combination of dispersion and multiple reflections. Measurements presented by Breitzke *et al.*, (2008) indicate elongation of the T90 window up to approximately 800 m at 1 km. This temporal "smearing" reduces the rms amplitude with distance by elongating the rms window and has been included within the disturbance modelling scenarios. Since the auditory organs of most marine mammals integrate low frequency sounds over an acoustic window of around 200 ms (Madsen *et al.*, 2006 and references therein), this duration was used as a maximum integration window for the received SPL_{rms}.

The directivity characteristics of the sound sources are also an important factor affecting the received sound pressure levels from noise-generating activities. In geophysical surveys, source arrays are designed so that the majority of acoustic energy is directed downwards towards the ocean floor for data collection purposes. As such, the amount of energy emitted across the horizontal plane is significantly less (20 dB +) than that emitted directly downwards. Due to the frequency-dependent nature of sound, the loss of pressure on the horizontal plane is more pronounced at higher frequencies than at lower frequencies. Directivity corrections can be applied to the

model outputs, which provide broadband normalised amplitudes at varying angles of azimuth[3] and dip[4] angle. Directivity corrections have been applied to the modelling outputs under the assumption that the animal is directly in-line with the vessel (i.e. at the 0° azimuth).

1.3 Injury Impacts

The expected frequency range for USBL overlaps with the hearing range of all cetacean hearing groups (Table 7-2 of the Main Report). Potential injury to cetaceans (i.e. injury which results from a permanent threshold shift in hearing abilities) is limited to impulsive noise sources which exceed the injury thresholds defined in Table 1-3.

Modelling of ranges at which injury impacts may result from the USBL operations has been undertaken, as described in Section 1.1. Impacts from noise sources which are strictly behavioural in nature (i.e. disturbance impacts) are covered in Section 1.4.

[3] The azimuth is taken as the angle of circumference around the boat which lies parallel to the surface of the water, progressing around the boat from port to starboard.
[4] The dip angle is taken as the angle under the boat, progressing from prow to stern.

Table 1-3 Noise Modelling Results for Injury Impacts from Impulsive Noise Sources (N/E = no exceedance of thresholds)

Activity	Depth (m)[5]	Frequency (kHz)	Source Level SPL_{Peak} (dB re 1µPa)	Injury range (m)											
				Cumulative SEL (Static Mammals)				Cumulative SEL (Moving Mammals)				Peak SPL			
				VHF	HF	LF	PW	VHF	HF	LF	PW	VHF	HF	LF	PW
USBL	100	20 – 33.5	200	104	98	73	86	104	56	36	44	-	-	-	-
	10	20 – 33.5	200	12	11	11	11	12	11	11	11	-	-	-	-

[5] Depth refers to depth below the survey activity, which has been assumed to be hull-mounted or towed at the surface.

The model outputs suggest that there is a potential for USBL at 200 dB re 1µPa (peak) to result in injury to marine mammals. Across all modelling scenarios and metrics, the injury ranges were generally highest for the VHF hearing group (Table 1-3), which is represented by harbour porpoise in UK waters. Conversely, HF cetaceans seemed to constitute the hearing group with the lowest potential impact. No exceedances of the SPL_{Peak} injury criteria are expected, since the source level is below 202 dB re 1µPa (peak) (the lowest peak injury threshold).

The deployment of a hull-mounted USBL in 100 m depths elevated the potential range of impact to a maximum of 104 m for VHFs, when considering cumulative SEL metric. However, the likelihood of a cetacean being this close to operational equipment is extremely low when considering that the source is deployed from a moving vessel and, in some cases, is being towed at depth (e.g. a USBL may be mounted on an ROV within a few metres of the seabed).

The injury ranges were at least slightly reduced when considering animal movement during cumulative SEL estimation. Swim speeds of the species most likely to be observed in the area have been shown to be several ms-1 (e.g. cruising minke whale swim speed is 3.25 ms-1 and harbour porpoise may swim up to 4.3 ms^{-1}) (Blix and Folkow, 1995; Otani *et al.*, 2000). Furthermore, SNH (2016b) has provided standard values for mean swimming speeds of various marine mammal species likely to occur in the project area, including harbour porpoise (1.4 ms^{-1}; Westgate et al., 1995); harbour seal / grey seal (1.8 ms^{-1}; Thompson, 2015); and minke whale (2.1 ms^{-1}; Williams, 2009). To offer a representative model of the predicted noise exposure ranges of marine mammals moving away from the sound source, a mean swim speed of 1.5 ms^{-1} has been used in the calculations. Considering that the USBL equipment will take be operated while the vessel is moving, the cumulative SEL is expected to be even lower based on the premise that animals are likely to move away from the mobile noise source at some angle opposite to the direction of travel of the vessel.

It should also be noted that the modelling scenarios are meant to define the worst-case injury ranges associated with the deployment of the project's survey equipment. The in-situ deployment of the noise-generating survey equipment will most frequently occur in waters of intermediate depths (i.e. somewhere between 10-100 m). Moreover, the frequency ranges depicted constitute the lowest and highest reasonably practicable settings for the activities modelled, meaning that the spread of sound in the marine environment is also likely to fall somewhere between the modelled extremes. The injury ranges anticipated to result from equipment use are thus likely to fall within the spectrum of those defined by the model outputs, thereby reducing the impact ranges associated with the low frequency equipment.

As such, the assessment concludes that there is no realistic risk of injury to EPS which may result from the use of USBL with SPL_{Peak} source levels of up to 200 dB re 1µPa.

1.4 Disturbance Impacts

Whilst no injury impacts are expected, noise emissions have the potential to affect the behaviour of cetaceans in the vicinity of the noise source. Significant or strong disturbance (see Southall *et al.*, 2007) may occur when an animal is at risk of a sustained or chronic disruption of behaviour or habitat use resulting in population-level effects. An assessment of potential disturbance impacts from USBL is provided in the below. The outputs of the noise modelling assessment against the disturbance thresholds are provided in Table 1-4.

Table 1-4 Noise Modelling Results for Disturbance Impacts from Impulsive Noise Sources

Activity	Depth (m)	Frequency (kHz)	SPL_{rms} (dB re 1µPa)	Range of Behavioural Change (m)
USBL	100	20 – 33.5	197	182
	10	20 – 33.5	197	207

The USBL activities have the potential to generate a strong disturbance event (i.e. a disturbance offence) as described in Section 1.1. The sound generated by the USBL has the potential to generate disturbance impacts on the order of a couple hundred metres (Table 1-5).

The number of individuals which may experience disturbance from the worst-case scenario for USBL has been calculated in Table 1-5 below, based on the population parameters supplied in Table 7-1 of the main report. In these calculations, the impact range serves as a radius with which to calculate the total area of coverage for a potential disturbance event associated with USBL.

Table 1-5 Number of Cetacean Individuals and Proportion of the MU Which May Experience a Disturbance Offence from USBL Activities, Based on Known Population Parameters of the Most Frequently Occurring Species

Species name	Number of individuals which may incur a strong disturbance	Maximum proportion of the MU potentially affected by project activities
	USBL (0.13 km^2 area)	
Harbour porpoise	< 0.1	< 0.1%
Minke whale	< 0.1	< 0.1%
Bottlenose dolphin	< 0.1	< 0.1%

The source levels associated with USBL have the potential to elicit a strong behavioural response in EPS which could be classed as a disturbance offence as defined under Regulations 39(1) or 39(2) (Box 1). However, for the relevant biogeographical population Management Units (MU) for harbour porpoise, minke whale and bottlenose dolphin, which all regularly occur in the area, this will not incur significant impacts. For these species, less than 0.1% of the biogeographic population will be impacted by noise-related disturbance (Table 1-5). Moreover, less than a tenth of any cetacean will be potentially disturbed by USBL deployment at any given time, making potential disturbance impacts from this survey equipment negligible.

Given the transient and short-term nature of the cable installation activities, it is highly unlikely that any disturbance offences from the use of USBL would negatively impact upon the FCS of any of the cetacean or seal species which may be present in the area. This is on the basis that the modelled level of disturbance is unlikely to affect the ability of any individual animal to survive or reproduce and will not have significant population-level impacts to any EPS. Regardless, it is possible that a small number of animals may experience some level of disturbance for the short period that they encounter the proposed survey activities.