Scottish and Southern Electricity Networks (SSEN)

Aultbea to Ullapool Network Upgrade: Loch Broom Subsea Cable Installation

Marine Environmental Appraisal

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ABBREVIATIONS

µPA	Micro Pascal
µm	Micro Metre
AA	Appropriate Assessment
AC	Alternative Current
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
BMC	Briggs Marine Contractors
BWM	Ballast Water Management
CBA	Cost Benefit Analysis
CEMP	Construction Environmental Management Plan
CFLO	Company Fisheries Liaison Officer
CLV	Cable Lay Vessel
CPSP	Cable Protection and Stabilisation Plan
dB re 1 µPA	Decibels relative to 1 Micro Pascal
DC	Direct Current
DD	Decimal Degrees
DDM	Degrees and Decimal Minutes
DDV	Drop-Down Video
DECC	Department of Energy and Climate Change
DMS	Degrees Minutes Seconds
EC	European Community
EEC	European Economic Community
EPS	European Protected Species
EU	European Union
EUNIS	European Union Nature Information System
FCS	Favourable Conservation Status
FIR	Fisheries Industry Representative
FLMAP	Fishing Liaison Mitigation Action Plan
FLO	Fisheries Liaison Officer
HDD	Horizontal Directional Drilling
HF	High Frequency
HMPA	Historic Marine Protected Area
HRA	Habitats Regulations Appraisal
HVAC	High Voltage Alternating Current
HWDT	Hebridean Whale and Dolphin Trust
Hz	Hertz
IAMMWG	International-Agency Marine Mammal Working Group
IMO	International Marine Organization
INNS	Invasive Non-Native Species

IRPCS	International Regulations for the Prevention of Collision
JNCC	Joint Nature Conservation Committee
kHz	Kilohertz
KIS-ORCA	Kingfisher Information Service – Offshore Renewable and Cable Awareness
km	Kilometres
km^2	Kilometres Squared
kV	Kilovolts
LF	Low Frequency
LSE	Likely Significant Effects
m	Metres
m^2	Metres Squared
MARPOL	International Convention for the Prevention of Pollution from Ships
MBES	Multi-Beam Echo Sounder
MEA	Marine Environmental Appraisal
MEPC	Marine Environmental Protection Committee
MSFD	Marine Strategy Framework Directive
MHWS	Mean High Water Spring
MLWS	Mean Low Water Springs
mm	Millimetres
MPA	Marine Protected Area
MS-LOT	Marine Scotland Licensing Operations Team
MTS	Marine Traffic Survey
MU	Management Unit
NATO	North Atlantic Treaty Organisation
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
NRA	Navigational Risk Assessment
NSA	National Scenic Area
OCT	Open Cut Trench
OESEA	Offshore Energy Strategic Environmental Assessment
OIMD	Operation, Inspection, Maintenance and Decommissioning Strategy
PAC	Public Accounts Committee
PAD	Protocol for Archaeological Discoveries
PLGR	Pre-Lay Grapnel Run

PMF	Priority Marine Features
pSPA	Proposed Special Protection Area
PW	Phocid Carnivores in Water
ROV	Remotely Operated Vehicle
SAC	Special Areas of Conservation
SCANS	Small Cetaceans Abundance in the North Sea
SCOS	Special Committee on Seals
SEL	Sound Exposure Level
SEPA	Scottish Environmental Protection Agency
SHEPD	Scottish Hydro Electric Power Distribution plc
SMWWC	Scottish Marine Wildlife Watching Code
SSSI	Sites of Special Scientific Interest
SNH	Scottish Natural Heritage (now NatureScot)
SOLAS	Safety of Life at Sea
SOPEP	Shipboard Oil Pollution Emergency Plans
SPA	Special Protection Area
TCE	The Crown Estate
TDM	Touch Down Monitoring
TJP	Transition Joint Pit
UK	United Kingdom
UKBAP	United Kingdom Biodiversity Action Plan
UKCS	United Kingdom Continental Shelf
UKHO	United Kingdom Hydrographic Office
UNCLOS	United Nations Convention on the Law of the Sea
USBL	Ultra-Short Baseline
UXO	Unexploded Ordnance
VHF	Very High Frequency
WCA	Wildlife and Countryside Act
WFD	Water Framework Directive
WHS	World Heritage Site
WWII	World War 2

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 propose to install a new 33 kV (Kilovolts) subsea power cable which will tie-in with the existing network on the Ullapool side and a proposed extension to the overhead line network on the southern side of Loch Broom at Altnaharrie.

The length for the proposed cable will be approximately 1.9 km between the two transition joints, which are located inshore from Mean High Water Spring (MHWS). This distance factors in and allows for obstacle avoidance during the cable lay and tolerances with the cable lay operations. The estimated duration of the cable installation activities is 45 days. This anticipated duration includes nearshore and offshore works as well as cable pull-in.

The installation of the cable is a licensable activity under Part 4 Section 21 of The Marine (Scotland) Act 2010, and as such a Marine Licence will be required to conduct the works. SHEPD have carried out Pre-Application Consultation (PAC) and a PAC report summarising stakeholder engagement is provided in support of this application. In addition to the Marine Licence, the Loch Broom Subsea Cable installation will require a European Protected Species (EPS) Licence and a Basking Shark Derogation Licence, under The Conservation (Natural Habitats, &c.) Regulations 1994 and the Wildlife and Countryside Act 1981, respectively.

This Marine Environmental Appraisal (MEA) provides an assessment of the potential environmental impacts which may result from the Loch Broom subsea cable installation activities and will be used to inform the licence applications. The mitigation requirements identified by this MEA will be included in the accompanying Marine Construction Environmental Management Plan (CEMP) Ref: A-303128-S02-TECH-004, 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:

- Aultbea Ullapool: Loch Broom Subsea Cable Installation Project Description;
- Cost Benefit Analysis (CBA);
- Fishing Liaison Mitigation Action Plan (FLMAP) Aultbea and Ullapool;
- Aultbea Ullapool: Loch Broom Subsea Cable Installation Navigation Risk Assessment;
- CEMP;
- PAC Report;
- Operation, Inspection, Maintenance and Decommissioning (OIMD) Strategy;
- Aultbea to Ullapool: EPS and Protected Species Risk Assessment (WSP, 2021);
- Marine Licence Application Form;
- EPS Licence Application Form; and
- Basking Shark Derogation Licence Application Form.

1.1 Project Need

The installation of this cable is required to provide an additional link and improved resilience in the power distribution networks providing supply to communities in Wester Ross. The project extends from Aultbea to Ullapool with the aim of reinforcing the 33kV Aultbea – Ullapool network. This reinforcement will serve to make Ullapool P2[1] compliant as well as greatly enhancing the security of supply to Aultbea for the 33 kV network. As part of the project, it has been proposed to install a subsea cable section that will connect the south side of Loch Broom (Altnaharrie) to the north side of Loch Broom (Ullapool). This £9.5 million project will benefit approximately 4,500 customers in the local area. It will enable continued delivery and assured efficiency of electricity distribution in the area, providing social and economic benefits.

1.2 Consideration of Alternatives

As the proposed activities will involve installing a new cable within the region of Loch Broom, the main considerations made were the route this cable would take from Aultbea to Ullapool. The following options were considered:

- Option 1: Do Nothing. This was discounted as a viable option due to the network requiring to be reinforced.
- Option 2: 33kV Interconnection between Lairg and Lochinver. This option has been discounted due to it not supporting the security of supply for the Aultbea network. In addition, the expenditure and technical difficulties associated with this scheme are anticipated to be considerably greater due to the long distance of new circuit that would require construction over mountainous and difficult terrain.
- Option 3: 33kV Interconnection between Aultbea and Ullapool. This is the preferred option as it provides enhanced security of supply to both Aultbea and Ullapool. The layout of the existing network means the scheme may be delivered at a reduced cost and technical difficulty when compared to Option 2. A Feasibility Study was carried out for Horizontal Directional Drilling (HDD) but was deemed unsuitable. A subsea cable lay was deemed feasible for the crossing.
- Option 4: 33kV interconnection Between Aultbea and Ullapool (land route only). This option was discounted due to the poor voltage losses expected when back feeding Aultbea or Ullapool circuits via the proposed 35 km land route necessary to bypass Loch Broom. Additionally, although the unit costs associated with this option are comparable to the subsea route, experience suggests the difficult terrain will amplify expenditure drastically.

SHEPD is progressing on the basis of Option 3 as it minimises potential environmental impacts, whilst remaining technically viable and will allow SHEPD to meet their statutory requirements as the Distribution Network Operator.

Further details of the specific project description for the cable are discussed in Section 3.

[1] *P2 compliant relates to the distribution network planning standard whereby it sets out the minimum levels of security of supply that distribution licensees must achieve on UK distribution networks under DCRP/18/03 – Revision of Engineering Recommendation (EREC) P2 – Security of Supply (Ofgem, 2019).*

1.3 Exclusions from the Scope of Assessment

This appraisal only covers the marine cable installation activities below MHWS.

SHEPD also recognise the need to consider options regarding potential future activities relating to maintenance and/or future decommissioning of the installed cable. This is therefore covered in the accompanying OIMD Strategy document which outlines SHEPD's current standpoint on these installation activities. As such future decommissioning is out-with the scope of this MEA.

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

- An EPS Licence Reference – EPS/BS-00009369; and
- A Basking Shark Derogation Licence Reference - EPS/BS-00009371.

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 installation activities 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 installation activities adhere to relevant legislation and policies and comply with the conditions required when granting applicable licences. 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 Installation Activities

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 proposed activities:
	
	• Under Section 21 of the act a marine licence is required for any activity which involves:
	  ○ Deposit of any substance or object in the sea or on or under the seabed
	  ○ Construct, alter or improve works in or over the sea or on or under the seabed
	  ○ Remove substances or objects from the seabed
	  ○ Carry out dredging
	  ○ Deposit or use explosives
	  ○ 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 of a Nature Conservation Marine Protected Area (NCMPA) or a marine historic asset in a Historic Marine Protected Area (HMPA).
	
	• Under Section 107 of the 2010 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 proposed installation activities.
		
		Section 5 – Designated Sites assesses the potential impacts on NCMPAs in the vicinity of the Installation Corridor. This concluded that no effects on NCMPAs are to be expected.
		
		Section 7 – Marine Megafauna assessed the potential for the installation activities to injure seals or disturb seals at designated seal haul-outs. This assessment concluded there should be no injury to seals and/or disturbance at designated seal haul-outs.
		
		Section 10 – Marine Archaeology assesses the impact of the cable installation activities on HMPAs. This assessment 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 (European Economic Community)) and Birds Directive (79/409/EEC) into Scottish Law. In addition, the Conservation (Natural Habitats) (European Union (EU) Exit) (Scotland) (Amendment) Regulations 2019 make provision for the selection, designation, registration and notification of sites to be protected under the European Community (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 EPS are present, licences to permit activities 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 (FCS) 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 LSE 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 proposed activities (cetaceans and otters). This assessment concluded that there will be no injurious impacts to these receptors, however, as disturbance could not be ruled out, an EPS Licence application 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) (European Union (EU) Exit) (Scotland) (Amendment) Regulations 2019 also instrument an amendment to Section 27 of the WCA 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 proposed installation 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 installation activities. This will ensure a reliable power source to residents in the remote areas of Aultbea and Ullapool which will inherently provide the potential for social and economic benefits for communities within the area.
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 the installation of a new cable between Aultbea and Ullapool would result in an increase in manageable and comprehensive resources.
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 proposed 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/or flooding are expected from the cable installation activities.

Legislation or Policy	Key Requirements	Relevant Section (where applicable)
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 (PMF). • 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.
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 a result of the cable installation 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 (WFD), 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 proposed installation 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.	Refer to 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.	Refer to documents: • FLMAP Aultbea - Ullapool; and • How SHEPD co-exists with other marine users. Section 12 – Commercial Fisheries and Other Sea Users concluded that minimal impacts on fish and fisheries are expected.

Legislation or Policy	Key Requirements	Relevant Section (where applicable)
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.	Refer to the Cost Benefit Analysis Model. The impact submarine electricity cables have on fuel poverty (including associated increased health service and social care costs for remote communities), commercial fishing and planned renewable electricity generation projects in remote areas is considered within the socio-economic impact of the Cost Benefit Analysis Model. Section 12 – Commercial Fisheries and Other Sea Users concluded that minimal impacts on fish and fisheries are expected.
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 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.	Refer to the Cost Benefit Analysis Model. The impact submarine electricity cables have on fuel poverty (including associated increased health service and social care costs for remote communities), commercial fishing and planned renewable electricity generation projects on remote area 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. Section 12 – Commercial Fisheries and Other Sea Users concluded that minimal impacts on fish and fisheries 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.	Refer to documents: • FLMAP Aultbea - Ullapool; and • How SHEPD co-exists with other marine users.

Legislation or Policy	Key Requirements	Relevant Section (where applicable)
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.	Refer to documents: • FLMAP Aultbea - Ullapool; • Aultbea Ullapool: Loch Broom Subsea Cable Installation Navigational Risk Assessment (NRA); 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.	Refer to documents: • FLMAP Aultbea – Ullapool • Aultbea Ullapool: Loch Broom Subsea Cable Installation NRA; and • How SHEPD co-exists with other marine users.
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 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 installation activities commencing. A PAC Report has been included within the licence application pack. This MEA has indicated how impacts on the marine environment have been minimised. A Marine Licence application will be submitted for the cable installation.
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 Aultbea Ullapool: Loch Broom Subsea Cable Installation Project Description outlines the protective measures for the cable. This MEA has concluded that no likely significant impacts are expected from the cable installation activities, once relevant mitigation measures have been implemented. It is expected that the cable will be surface laid from each MLWS as the area is comprised of large 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.	No redundant cables exist in the area and therefore consideration and evaluation of

Legislation or Policy	Key Requirements	Relevant Section (where applicable)
		options relating to potential removal have not been undertaken.

3 PROJECT DESCRIPTION

3.1 Overview

This section provides an overview of the proposed installation activities. The installation activities across Loch Broom are planned to be undertaken between September 2022 and January 2023. A detailed project description is provided in the Aultbea Ullapool: Loch Broom Subsea Cable Installation Project Description, which should be read in conjunction with this MEA.

The installation activities are expected to take 45 days. This anticipated duration includes all nearshore and offshore works as well as cable pull-in. The completion date is anticipated to be the 31st January 2023 as a worst-case. This end date includes contingency to allow for potential unforeseen operational and/or weather delays.

The cable route is located within Loch Broom along the northwest coast of Scotland. The proposed scope is to install an approximately 1.9 km long, 33 kV subsea cable which will tie-in with the existing network on the Ullapool side and a proposed overhead line network on the southern side of Loch Broom at Altnaharrie. The intention is to surface lay the cable within the installation corridor, with any obstructions and/or debris avoided where possible or removed by conducting a Pre-Lay Grapnel Run (PLGR) if required. It should be noted that there are no in or out of service cables within the installation corridor. Therefore, it is expected that this activity will be completed shortly in advance of the cable installation activities to ensure that the route remains free of debris prior to installation.

The cables within the intertidal sections at the landfall locations at Aultbea and Ullapool will be trenched by land-based excavators. Detailed route engineering will be completed based on the offshore survey data between the existing landing points. Routing will be selected to avoid sensitive environmental receptors and technical constraints (significant rocky outcrops or complex bedforms) where possible, to reduce environmental impact and prevent cable suspensions and abrasion following the installation.

In order to allow sufficient flexibility for detailed route engineering, a 100 m wide installation corridor, centred on the proposed cable installation route, will be licensed and considered by 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.

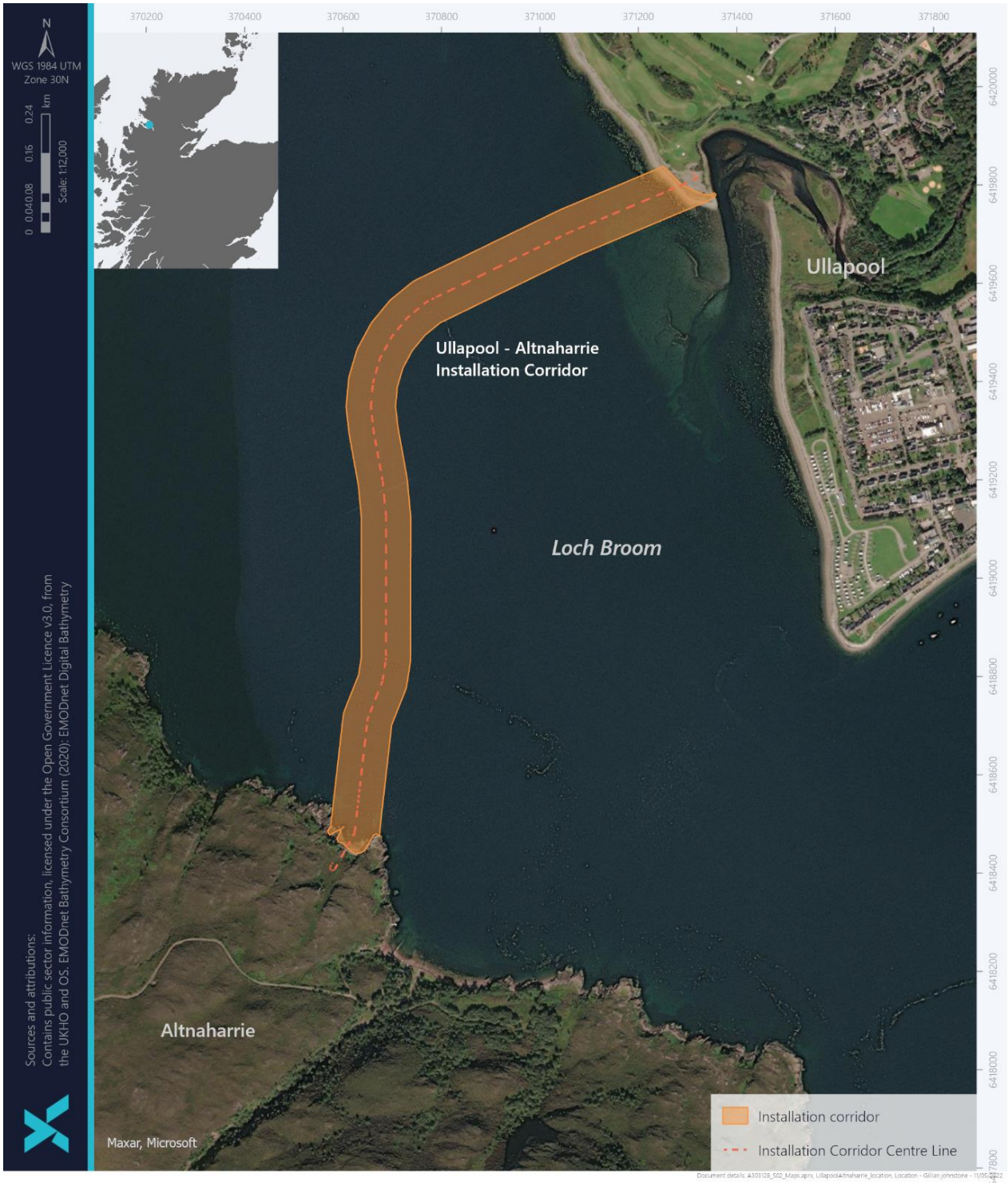

Figure 3-1 Location of the Proposed Cable Installation Corridor for Aultbea - Ullapool

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

Cable Installation Corridor Coordinates (WGS84)					
Latitude DMS	Longitude DMS	Latitude DDM	Longitude DDM	Latitude DD	Longitude DD
5° 10' 20.913" W	57° 54' 6.461" N	57° 54.108' N	5° 10.349' W	57.901794642986	-5.172475775691
5° 10' 13.665" W	57° 54' 4.415" N	57° 54.074' N	5° 10.228' W	57.901226509003	-5.1704626111284
5° 10' 49.751" W	57° 53' 55.491" N	57° 53.925' N	5° 10.829' W	57.898747588287	-5.180486302496
5° 10' 52.923" W	57° 53' 52.132" N	57° 53.869' N	5° 10.882' W	57.897814353037	-5.181367555582
5° 10' 50.566" W	57° 53' 44.383" N	57° 53.740' N	5° 10.843' W	57.895661894021	-5.180712802106
5° 10' 49.420" W	57° 53' 34.304" N	57° 53.572' N	5° 10.824' W	57.892862088643	-5.180394368040
5° 10' 53.125" W	57° 53' 21.547" N	57° 53.359' N	5° 10.885' W	57.889318626599	-5.181423580002
5° 10' 55.634" W	57° 53' 20.113" N	57° 53.335' N	5° 10.927' W	57.888920255683	-5.182120472537
5° 10' 59.705" W	57° 53' 21.595" N	57° 53.360' N	5° 10.995' W	57.889331995179	-5.183251254496
5° 10' 58.263" W	57° 53' 29.476" N	57° 53.491' N	5° 10.971' W	57.8915210777116	-5.182850795093
5° 10' 56.462" W	57° 53' 32.611" N	57° 53.544' N	5° 10.941' W	57.892392037818	-5.182350638721
5° 10' 59.695" W	57° 53' 49.668" N	57° 53.828' N	5° 10.995' W	57.897129862515	-5.183248702829
5° 10' 59.461" W	57° 53' 52.585" N	57° 53.876' N	5° 10.991' W	57.897940373421	-5.1831837092091
5° 10' 57.442" W	57° 53' 56.338" N	57° 53.939' N	5° 10.957' W	57.898982873825	-5.182622680073
5° 10' 51.907" W	57° 53' 59.110" N	57° 53.985' N	5° 10.865' W	57.899752662863	-5.18108518111293
5° 10' 38.512" W	57° 54' 2.558" N	57° 54.043' N	5° 10.642' W	57.900710427053	-5.177364560926
5° 10' 20.913" W	57° 54' 6.461" N	57° 54.108' N	5° 10.349' W	57.901794642986	-5.172475775691
For the avoidance of doubt, the landward boundaries of the installation 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.					

3.2 Cable Protection and Stabilisation

At both landfalls, where the cable approaches the shore, articulated split pipe may be fitted around the cable for additional protection both above and below MLWS. It is not expected that stabilisation and protection material such as rock bags and/or concrete mattresses will be required, however these have been included for assessment within this MEA as contingency in case they are found to be needed. Cable Protection and Stabilisation Plans (CPSP) have been developed to support the Marine Licence applications with further details on deposits provided in the associated Aultbea Ullapool: Loch Broom Subsea Cable Installation Project Description.

An assessment of the protection measures and deposits has been included as part of this MEA with the potential worst-case seabed disturbance outlined in Section 8.4.1.

Where the cable approaches the landfalls, above Mean Low Water Spring (MLWS), articulated (split pipe) / uraduct protection will be fitted around the cable for additional protection. A maximum of 448 m of split pipe protection may be required for the cable (including contingency). This is installed directly from the Cable Lay Vessel (CLV), by divers or via land based access and protects the cable in the nearshore and intertidal section of the cable corridor.

Sea Earths may also be installed in order to protect the cable infrastructure from surges and lightning strikes. It is expected that two earthing cables will be required at each shore end using stainless steel cables with a cross sectional diameter of 95 mm^2. One cable will earth the armour of the High Voltage Alternating Current (HVAC) cable system, while the other provides an earth for the fibre optic armour (integral to the HVAC cable system. Below MHWS, the earth wire will be installed in a separate trench with a minimum separation of 10 m. The working corridor will be 20 m either side of each trench (10 m either side of the cable). This will still be inside the consented corridor as defined by SHEPD.

Concrete mattresses and rock bags have also been included in this MEA. It is not expected that rock bags and/or mattresses will be required during the installation of the new Ullapool to Altnaharrie subsea power cable. However, for the requested purposes of contingency (i.e., cable stability or cable protection) a maximum of 60 rock bags and 33 mattresses have been listed to cover all eventualities. The assessment of disturbance in Section 8.4 includes these contingency options. Installation of rocks bags and/or mattresses will either be from the CLV deck, a separate large construction vessel with ROV, or multi-cat vessel. Trips to a port to re-fill the deck with rock bags may be required where rock bags are deemed necessary.

It should also be noted that during the laying of the cable below MLWS, a Remotely Operated Vehicle (ROV) will be used for Touch Down Monitoring (TDM). 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. An ROV will also be used during the installation of any external protection measures (i.e., mattress and/or rock bags – if required) following cable laying activities. During all ROV operations, Ultra Short Baseline (USBL) positioning systems will be used to monitor the underwater position of the subsea equipment.

A summary of the activities considered by this assessment, is provided below. Please refer to the Aultbea Ullapool: Loch Broom Subsea Cable Installation Project Description for further details.

- Prior to cable installation, a work class ROV or PLGR may be used to remove debris from the proposed routes;
- The submarine power cable will be surface laid using a CLV below MLWS;
- Placement of rock bags and/or concrete mattresses may be used to pin the cable to the seabed below MLWS. In addition, there will also be temporary use of clump weights;
- It is proposed to install the cable by using an open-cut trench (OCT) method of installation between MLWS to MHWS at the landfall locations. An OCT will be excavated to install and bury the cable, and split pipe may be used; 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 EPS Licence and Basking Shark Derogation 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 installation 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

Briggs Marine Contractors (BMC) were appointed to undertake marine geophysical and environmental surveys along the proposed cable route between Aultbea and Ullapool in 2021. Figure 4-1 illustrates the location of the survey corridor. The surveys involved the sampling and analysis of both offshore and nearshore areas. The main objectives of the marine survey were to:

- Assess potential risks to the cable from local seabed influences including boulders, crossings, debris, freespans, trawl scars, etc;
- Investigate the benthic ecological features and habitats that were present within the installation corridor, and identify potentially sensitive features; and
- Provide data that forms the basis for route engineering for the proposed cable.

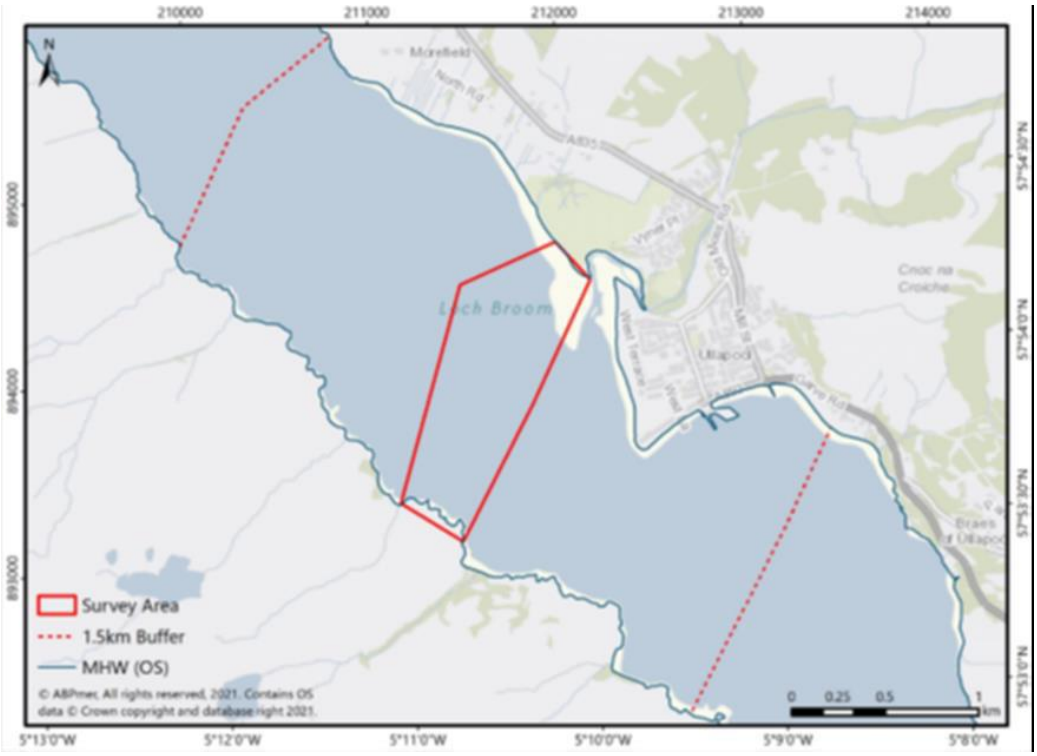

Figure 4-1 Location of the Environmental Survey Area between Aultbea and Ullapool (BMC, 2022a)

4.2 Assessment Criteria

This MEA provides an assessment of potential impacts resulting from the effects of the cable installation 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 been considered by this MEA 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 Proposed Activities

Measure	Details
Production of a 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 personnel.
Pre-construction surveys will be conducted to inform detailed route engineering.	Appropriate pre-construction surveys and visual inspection will be conducted to confirm the locations of potentially sensitive features. Any obstructions or debris will be removed, if possible. A work class ROV or PLGR will be undertaken to remove debris from the proposed route. In the nearshore area, a diver may be required to remove debris.
Environmental planning.	The final cable routes, and positioning of protective deposits will be optimised to avoid impacts on sensitive environmental features, including Annex 1 habitats and wrecks.
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.

Measure	Details
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 the International Convention for the Prevention of Pollution from Ships (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 gross tonnage and above must carry an oil prevention plan as per the norms and guidelines laid down by International Maritime Organization under Marine Environmental Protection Committee (MEPC) 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 International Marine Organisation (IMO) MARPOL (International Convention for the Prevention of Pollution from Ships) 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.
The WFD provides the legislative framework for the collection, transport, recovery and disposal of waste, and includes a common definition of waste. The Environment Agency (in England and Wales) and the Scottish Environment Protection Agency (SEPA) (in Scotland) are responsible for administering and enforcing the waste management controls A Waste Management Strategy Plan documenting and mapping each step in the process (i.e. location and company managing waste) and define individual roles and responsibilities.	A Waste Management Plan will be developed and implemented to ensure the waste hierarchy is followed and all waste is sent onward to recycling or disposal via a licenced waste route.
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.

Measure	Details
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 FLMAP.	Employment of a FLO will ensure all commercial fisheries operators in the vicinity of the proposed activities will be proactively and appropriately communicated with in terms of the proposed activities.
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.	Ensure navigational safety and minimise the risk and 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 United Kingdom Hydrographic Office (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, 2022) 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 installation activities, 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 an 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 2010 Act.

There are no Ramsar sites within 40 km of the proposed works and therefore, no LSE on Ramsar sites are expected. Moreover, 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 installation activities. As such, impacts on Ramsar sites have not been considered for further 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 installation corridor;
- 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 installation corridor;
- Designated seal haul-outs or grey seal breeding sites that overlap with or located within 500 m of the installation corridor;
- SACs and NCMPAs (including proposed and candidate sites) with otter interests that overlap with or located within 500 m of the installation corridor;
- SPAs (or proposed SPAs (pSPA)) and NCMPAs (including proposed and candidate sites) with birds as qualifying features that overlap with or are located within 2 km of the installation corridor;
- SACs and NCMPAs (including proposed and candidate sites) with seabed / benthic protected features that overlap with the installation corridor; or
- Other sites of importance, including Sites of Special Scientific Interest (SSSI), National Scenic Area (NSAs) and World Heritage Sites (WHS) which transect the installation corridor.

It should be noted that all distances to associated sites have been calculated on a straight-line basis. For marine mammal 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 European 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 (NM) and offshore) is the National Marine Plan interactive (NMPi) website (NMPi, 2022) which underpins the Scottish NMP (Scottish Government, 2015).

Identification of designated sites within the vicinity of the installation corridor have been obtained using publicly available geospatial data.

5.3 Baseline and Receptor Identification

The designated sites located in the vicinity of the proposed cable installation corridor which has the potential to be impacted by the activities subject to the selection criteria above are outlined in the following sections and in Table 5-1. Figure 5-1 shows the geographical location of these sites.

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

Cetaceans are present in the region of the proposed installation corridor. There is only one protected site within 50 km of the proposed works which is designated for cetaceans and/or basking sharks. The relevant site is the Inner Hebrides and Minches SAC located 3.5 km from the proposed cable installation corridor and is designated for Annex II species harbour porpoise *Phoecoena phocoena*.

The Inner Hebrides and the Minches SAC is a complex site which has resulted in the development of diverse marine habitats that support a variety of natural resources. This includes fish living within the area that can be harvested by humans or utilised by other marine species. The site supports wildlife including bird and mammal species, in particular high densities of harbour porpoise and other cetaceans such as minke whale and Risso's dolphin (NatureScot, 2020). Specifically, this site covers an estimated 13,813.91 km^2 and is designated for the Annex II species harbour porpoise (JNCC, 2022a). The main conservation benefits of this site are:

- It is the second largest protected area for harbour porpoise in Europe and the only one for harbour porpoise in Scotland;
- Provides protection to approximately 32% of the harbour porpoise population found on the west coast of Scotland; and
- Contains the highest density of harbour porpoise in Scotland.

The conservation objectives of this site are to keep the protected feature in favourable condition (NatureScot, 2020).

Due to the mobile nature of the harbour porpoises and the fact that the installation corridor is within 3.5 km of this SAC, there is considered to be potential connectivity with the site.

No sites with basking shark qualifying features were identified within 50km of the installation corridor, and as such do not require further consideration in the MEA.

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

As outlined in the criteria set out in Section 5.1, the designated sites which should be considered for discussion are:

- A designated SAC with harbour seal as a qualifying feature and within 50 km of the proposed cable installation corridor; or
- A designated SAC with grey seal as a qualifying feature and within 20 km of the proposed cable installation corridor.

There are no SACs with grey seals or harbour seals as their qualifying feature within a 20 km or 50 km distance, respectively. Therefore, no LSE is expected for designated sites with seals as their qualifying feature. As such, no further assessment regarding sites designated for seals is required.

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 cable installation corridor. The closest site is Carn nan Sgeir which is approximately 12 km northwest of the cable installation corridor. Therefore, it is not expected that seals utilising the haul out will be disturbed by the proposed cable installation works. Therefore, no ecological connectivity is expected. As such seal haul-out sites have not been considered further in this assessment.

5.3.4 SACs and NCMPAs with Otter Interests

The Eurasian otter *Lutra lutra* are listed in Annex IV of the Habitats Directive as EPS. They are small, semi-aquatic mammals which inhabit riverine, brackish and coastal environments throughout the United Kingdom (UK). Although land mammals, otters depend on both freshwater and marine environments for food. Their marine habitat comprises low, peat-covered coastlines with shallow, seaweed rich waters and a consistent freshwater supply (DECC, 2016).

There are no SACs or NCMPAs located within 500 m of the installation corridor which are designated for the conservation of otters. That said, as discussed further in Section 8.3.3, in the nearshore survey conducted by BMC, there was evidence of recent otter scat visible on the upper bedrock (BMC, 2022b).

No adverse impacts to otter are expected and further assessment of these features have not been carried out. As part of the scope of work relating to the onshore works otter surveys have been commissioned in consultation with NatureScot and any further licensing requirements will be informed by the outcome of these surveys.

5.3.5 SPAs and NCMPAs with Birds as Qualifying Features

As detailed in Section 5.1, the criteria set-out is to include sites which state birds as their qualifying feature and are located within 2 km of the proposed cable installation corridor. No such sites fall within this criterion and no ecological connectivity is expected. As such seabirds and their respective protected sites have not been considered further in this assessment.

5.3.6 SACs and NCMPAs with Seabed / Benthic Protected Features

As detailed in Section 5.1, the criteria set-out is to include sites which state seabed and/or benthic species as a protected feature and which protected areas overlap with the installation corridor. One site meets this criterion which is the Wester Ross NCMPA.

In 2014 59,900 hectares (599 km^2) of coastal waters in the northern part of Wester Ross (from Rubha Rèidh to Coigach) was declared a Marine Protected Area (MPA).

This site was designated in July 2014 to protect diverse and fragile seabed habitats and to enable the recovery of protected species such as maerl (a pink seaweed) and flame shell beds. Maerl and flame shell beds are vital to the health of the local marine ecosystem, and they support local fisheries such as scallops, cod and keystone species like herring. Within the intricate mosaic of tidal bays, sea lochs and scattered island channels, the NCMPA also encompasses a host of PMFs, including kelp forests, burrowed mud with seapens, burrowing sea cucumbers and northern feather stars (JNCC, 2022b).

It is expected that the potential impacts to this protected site will be negligible, with the area of seabed disturbance being minimal when compared to the wider available seabed.

As the installation corridor overlaps with this designated site, there is the potential for ecological connectivity with the installation activities.

5.3.7 Other Sites of Importance

There are no SSSI, NSA or WHS which transects the cable installation corridor. Therefore, these are not discussed further as part of this report.

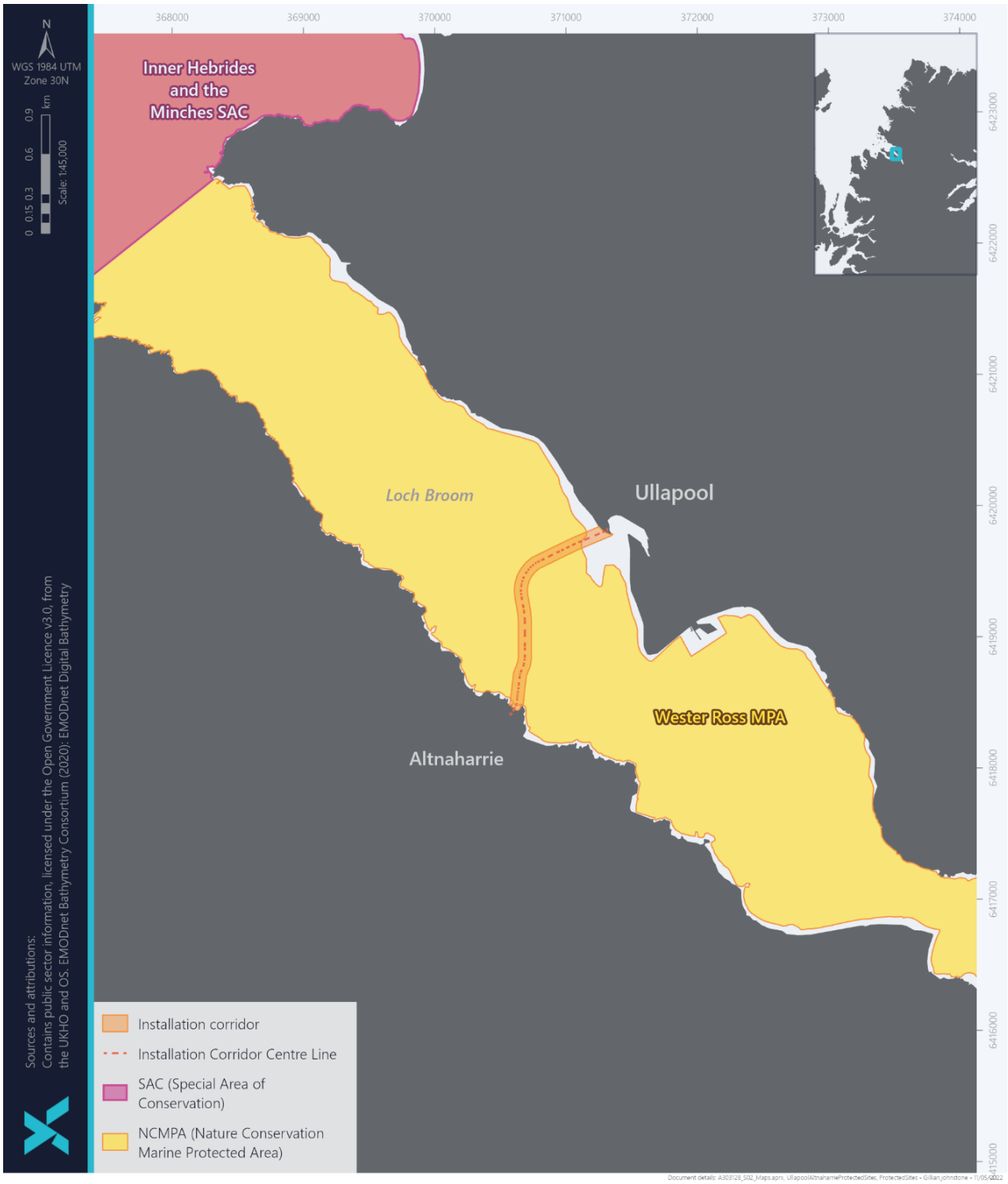

Figure 5-1 Protected Sites in the Vicinity of the Installation Corridor

5.4 Potential Connectivity with Designated Sites

Although there are designated sites within relatively close proximity to the proposed Installation Corridor, for a likely significant effect to arise, there has to be potential ecological connectivity between the installation activities 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 LSE 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, 2022a; 2022b)*

Designated Site (Name and Designation)	Reason for Selection	Distance to Installation Corridor (km)*	Relevant Qualifying features of Designated Site	Potential Impact from Cable Installation Activities	Requirement for Further Assessment
The Inner Hebrides and the Minches SAC	This designated site is within 50 km of the installation corridor.	3.5	• Harbour porpoise	• Underwater noise; and • Vessel presence.	The intervening distance between the installation corridor and this designated site means that direct impacts on the SAC are not expected. However, due to the mobile nature of harbour porpoise further assessment for this qualifying feature is required.
Wester Ross MPA	The installation corridor transects the designated site.	0	Species: • Northern feather star aggregations. Habitats: • Burrowed mud; • Circalittoral muddy sand communities; • Flame shell beds; • Kelp and seaweed communities on sublittoral sediment; • Maerl beds; and • Maerl or coarse shell gravel with burrowing sea cucumbers. Geology: • Marine geomorphology of the Scottish shelf seabed; • Banks of unknown substrate Quaternary of Scotland; • Glaciated channels/troughs Quaternary of Scotland; • Mega-scale glacial lineations Quaternary of Scotland; • Moraines; and • Seabed fluid and gas seeps; and • Pockmarks.	• Cable installation and protective structures	Overlaps with proposed activities and therefore 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 installation activities, mitigation measures have been considered based upon site-specific protected features.

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

As per the assessment criteria outlined in Section 5.1, there is one SAC within 50 km designated for harbour porpoise (the Inner Hebrides and Minches SAC).

The Inner Hebrides and Minches SAC is located 3.5 km from the installation corridor. Further details on the assessment of potential impacts on harbour porpoise is provided in Section 7.

Underwater Noise

Underwater noise emissions have the potential to cause physical injury or disturbance to cetaceans, particularly if they fall within their generalised hearing range (Southall *et al.*, 2019; NOAA, 2018). As detailed in Section 7 and Appendix A, no realistic risk of injury risk is associated with the proposed installation activities, and the disturbance range is limited to approximately 200 m. As highly mobile features, it is possible that harbour porpoise from the SAC may be present in the vicinity of the installation corridor, and hence be subject to disturbance due to the underwater noise emissions.

However, the short-term and transient nature of the cable installation works means the risks to harbour porpoise 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 means that the disturbance is unlikely to cause a negative effect at a regional or population level.

Considering the above, this is not thought to potential to adversely affect the conservation objectives of the Inner Hebrides and Minches SAC. As such, no LSE on this protected site is expected from underwater noise emissions.

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, and all vessels will adhere to the Scottish Marine Wildlife Watching Code, further reducing the risk of collision. Moreover, the presence of vessels associated with the installation activities 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 SACs and NCMPAs with Seabed / Benthic Protected Features

As per the assessment criteria outlined in Section 5.1, there is one designated site which transect the installation corridor designated for benthic and/or seabed protected features. This site is the Wester Ross NCMPA designated for a variety of important features aiding in biodiversity of the area. Further details on the assessment of potential impacts on benthic features is provided in Section 8.

Cable Installation and Protective Structures

Seabed preparation activities (e.g., PLGR) and cable installation works have the potential to the benthic qualifying features of the Wester Ross MPA, such as biogenic features including maerl and flameshell beds as well as habitats including burrowed muds and circalittoral muddy sand communities. As described in Section 8, a number of the habitats observed during the BMC (2022a) and BMC (2022b) survey were identified as being protected and/or potentially sensitive. These included the tall sea pen *Funiculina quadrangularis* and firework anemone *Pachycerianthus multiplicatus*. Disturbance could result from direct habitat loss, sediment resuspension, the introduction of non-native marine species (NNMS) and the accidental release of hazardous substances.

It should be noted that no management features of the Wester Ross NCMPA were observed within the Altnaharrie survey area and no PMFs or Invasive Non-Native Species (INNS) were observed at either site. The intertidal survey areas do not fall within any SACs and no qualifying Annex I habitats were identified.

Given that the cable will be surface laid, disturbance from direct habitat loss is expected to be highly localised in extent, limited to the footprint of the cable, and any rock bags or concrete mattresses if required. Furthermore, the cable corridor has been optimised to avoid sensitive benthic features, and no biogenic reefs or other qualifying habitats of the MPA were identified during the surveys.

Any disturbance or loss of benthic habitats 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 result from the OCT works in the intertidal areas which are not a substantive change from baseline conditions, 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 the habitat complex within the MPA or impede on the wider benefits that this ecosystem provides. Therefore, no LSE is expected on the Wester Ross MPA, with respect to its seabed features.

5.6 Impact Assessment

Due to the temporary and localised nature of the proposed cable installation activities, no LSE is predicted on the conservation objectives of any protected site and as such it is not expected that an AA will be required. Overall, the installation of the Loch Broom subsea 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 installation activities (including potential deposits from rock bags and /or mattresses). Details on baseline seabed conditions presented in this section provides the relevant information for the purposes of the Environmental Appraisal and is not intended for engineering applications.

The offshore section of the proposed cable will be surface laid, and as such no disturbance to underlying geological features in the area is expected. The benthic footprint of the works will also be minimal, largely confined to the physical footprint of the cable itself, as no seabed modification such as trenching and/or burial will be undertaken. Associated impacts on benthic features are discussed in Section 8. As such, potential effects on seabed quality have been screened out of this assessment.

As the offshore sections of the cable will be surface laid, the installation activities will not result in significant levels of sediment resuspension, as may be expected from burial activities. Therefore, offshore sedimentation related impacts are screened out and the water quality assessment will focus on potential impacts resulting from accidental release of chemical or hydrocarbon from the installation vessels. It should be noted that burial of the cable is proposed within the intertidal areas, and hence coastal sediment suspension is assessed.

6.2 Data Sources

This section draws on a number of data sources including published papers, industry-wide surveys and site-specific investigations. A key data source available for Scottish waters (within 12 NM and offshore) is the NMPi website (NMPi, 2022) which underpins the Scottish NMP (Scottish Government, 2015) as well as the seabed habitats as shown on EMODnet (2022). In addition to this, data from the site specific geophysical and environmental surveys conducted in 2021 (BMC, 2022a) has also been utilised, as detailed in Section 4.1.

6.3 Baseline and Receptor Identification

According to EMODnet (2022) the surface sediments in the vicinity of the installation corridor comprise European Union Nature Information System (EUNIS) description of Atlantic infralittoral rock (MB12) and Atlantic circalittoral rock (MC12) which corresponds to the moderate energy found within the area.

This is consistent with what was observed during the marine surveys conducted by BMC which found that subtidal sediments were generally characterised by mud and gravel substrates with varying proportions of sand according to location. Most stations were dominated by gravel except for stations 2, 5, 8 and 10 which were predominantly sand with a small fraction of gravel and mud (see Figure 6-1). The highest composition of sand (i.e., 63-2000 µm) was observed towards Ullapool at Station 8 and 10, representing 64.29% and 62.16%, respectively. Gravel (> 2 mm) content was observed more towards the Aultbea landfall which observed the highest gravel content of 66.76% at Station 1 (BMC, 2022a).

There are no Annex I habitats within the installation corridor.

The Multi-Beam Echo-Sounder (MBES) bathymetry and associated contours within the cable corridor in the offshore region of Loch Broom is presented in Figure 6-2 (BMC, 2022a).

The Water Framework Directive (WFD) on coastal water body classifications by SEPA over the period 2007 – 2017 (NMPi, 2022) shows that waters in the vicinity of the installation corridor has an overall good potential / status or pass.

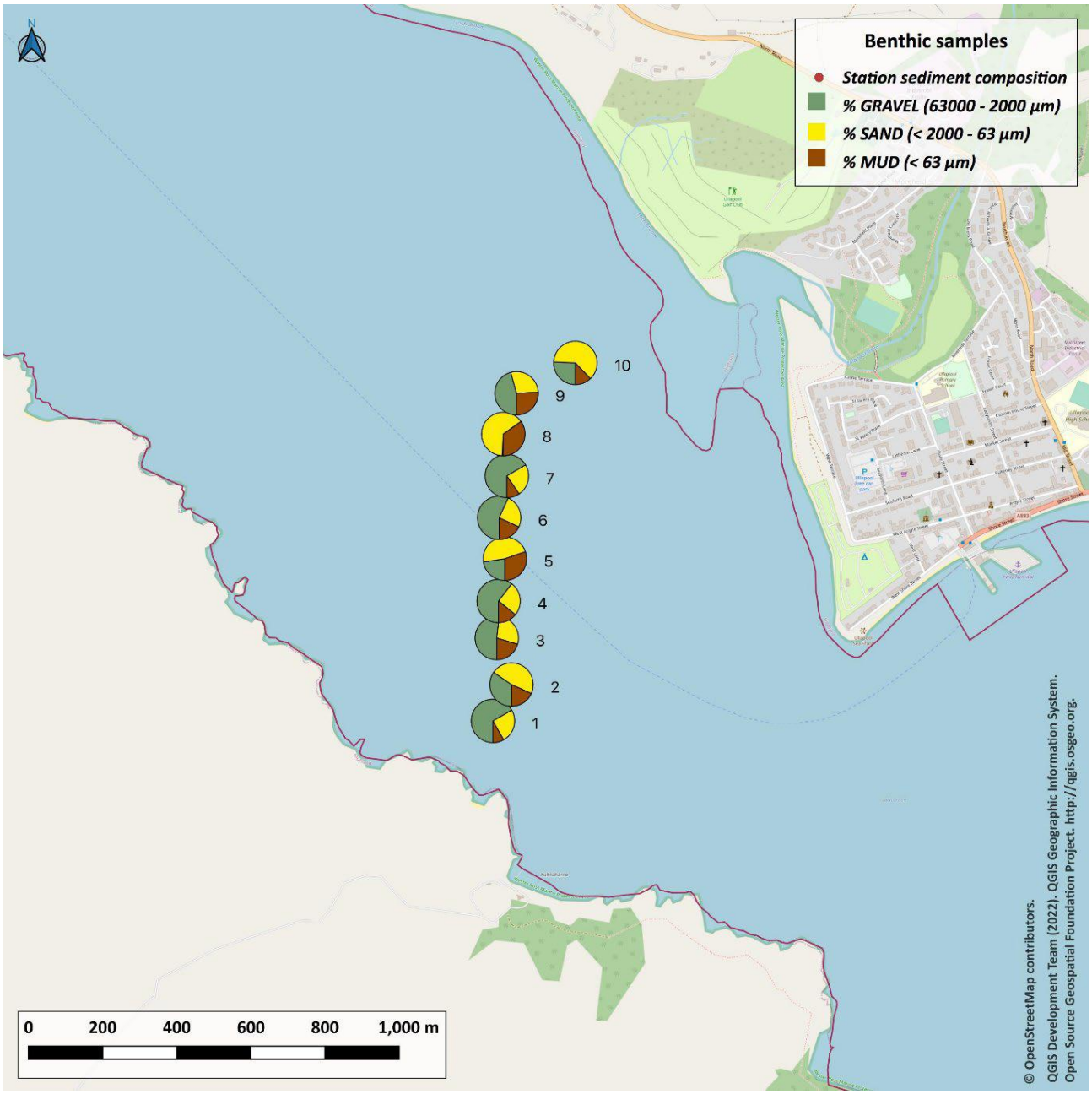

Figure 6-1 Seabed Sediments Overview (BMC, 2022a)

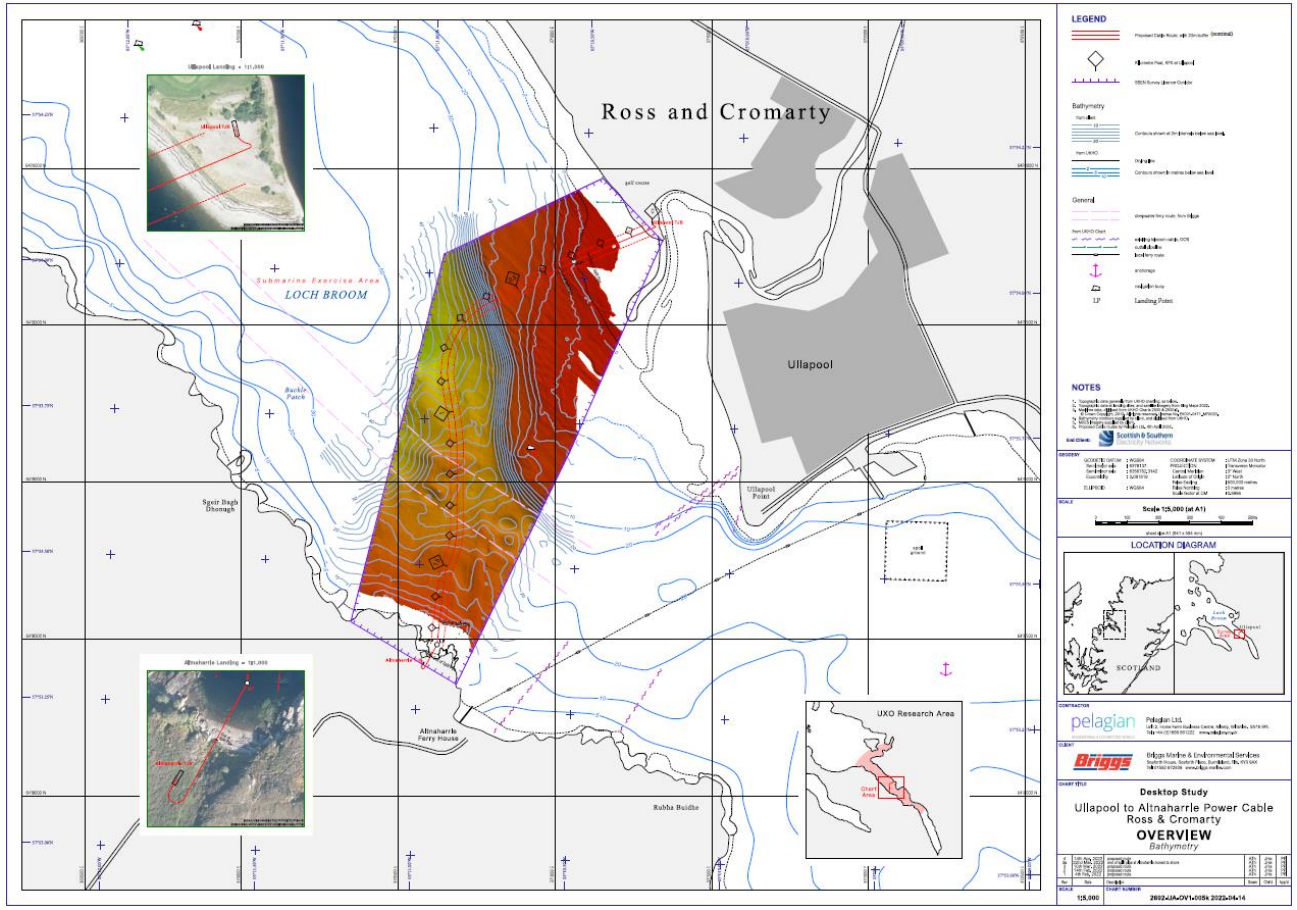

Figure 6-2 Bathymetry at the Aultbea (left) and Ullapool (right) Landfall Locations (BMC, 2022a)[2]

[2] *It should be noted that the red line is the centre of the survey corridor and not the designed cable route.*

6.4 Impact Assessment

6.4.1 Coastal Sediment Suspension

As detailed in Section 3, the nearshore sections of the cable will be trenched using land-based excavators. The timing of these works will be tide dependent (working at low water when the intertidal zone is exposed), using traditional terrestrial-based plant including excavators at low tide. It is therefore expected that there will be no disturbance of submerged sediments. There may be temporary and highly localised increases 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.

There is also the potential that a limited section of the cable at the Ullapool landfall is buried below MLWS, if required, this would be conducted using a diver operated dredge pump. Given the proximity to MLWS, and the fact that sediment disturbance from handheld dredging equipment is highly localised, it is not expected that this activity will result in sediment suspension outwith the natural range for the area.

As such the impact on sediment loading is considered to be not 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 – Assessment Methodology.		
Sensitivity / value	Magnitude of effect	Level of impact
Low	Minor	Negligible
Impact significance – NOT SIGNIFICANT		

6.4.2 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 installation 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 – Assessment Methodology.		
Sensitivity/ value	Magnitude of effect	Level of impact
Low	Moderate	Minor
Impact significance – NOT SIGNIFICANT		

6.4.3 Operation

The cable has been designed to be maintenance free, as such no planned ongoing maintenance activities are proposed. SHEPD will conduct routine inspections and surveys of the cable throughout its operational life to ensure it remains in good condition. There is a potential for remedial cable repair works to be required, in the event the cable is damaged or the need for additional stabilisation materials is identified during the routine surveys.

If required, impacts on seabed and water quality resulting from cable repairs will be analogous those occurring during construction, although significantly reduced on both spatial and temporal scales. As such, impacts during the operational phase are considered to be not significant.

6.5 Conclusion

The majority of 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 or potentially during diver dredging if required. This will result in highly localised and temporary increases in suspended sediment which will not have a significant impact on coastal 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 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 (2020). A key data source available for Scottish waters is the NMPi website (NMPi, 2022) which underpins the Scottish NMP (Scottish Government, 2015) as well as the UK Offshore Energy Strategic Environmental Assessment 4 (OESEA4) (BEIS, 2022).

7.3 Existing Baseline Description

7.3.1 Cetaceans

Around nine species of cetacean have been recorded off the west coast of Scotland. According to Hammond *et al.*, (2021) four have been sighted in this area which includes: harbour porpoise *Phocoena phocoena*, minke whale *Balaenoptera acutrostrata*, common dolphin *Delphinus delphis* and striped dolphin *Stenella coeruleoalba*. It should be noted that the installation corridor is located within SCANS Block I. The following summarises those species regularly sighted within the Aultbea – Ullapool area:

- 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). They are the most frequently sighted cetacean along the east coast of Scotland where they are present year-round (NMPi, 2022; Reid *et al.*, 2003; Hague *et al.*, 2020). They are most commonly sighted between April and October when densities reach > 0.1 individuals/ km^2 (Pollock *et al.*, 2000). The density of harbour porpoise within Block I of the Small Cetaceans Abundance in the North Sea (SCANS) III survey, within which the project resides, was approximately 0.397 animals/km^2, which is average in the context of the wider United Kingdom Continental Shelf (UKCS) region (Hammond *et al.*, 2021). According to density modelling data (combining SCANS-III density data with environmental predictive factors), it is predicted that harbour porpoise densities within the area will be low, with higher densities occurring in deeper offshore waters (Hague *et al.*, 2020; Hammond *et al.*, 2021; BEIS, 2022).
- Minke whale are the smallest, most prevalent baleen whales to occur in Scottish waters. 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. Minke whale density within Block I of the SCANS -III survey is considered to be low in comparison to the rest of the UKCS, with an estimate 0.0204 animals/km^2 (Hammond *et al.*, 2021). 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). Breeding locations of this species are currently unknown.

- Common dolphins have a worldwide distribution and inhabit both oceanic and shelf-edge waters of tropical, subtropical and temperate seas of the Atlantic and Indo-Pacific. Common dolphins are found in a wide range of group sizes with offshore waters southwest of the UK often featuring mixed schools with striped dolphins. Analysis of summer sightings on shelf waters around the UK and adjacent waters showed the vast majority of common dolphins to occur in waters above 14°C in temperature (MacLeod *et al*. 2008, Cañadas *et al.* 2009). Strong seasonal shifts in their distribution have been noted, with winter inshore movements onto the Celtic Shelf and into the western English Channel and St. George's Channel resulting in pronounced concentrations (Northridge *et al*. 2004; Hague *et al.,* 2020). Densities of common dolphin along the west coast of Scotland within inland water bodies are expected to be lower than the offshore west coast and east coast of Scotland with densities within Block I of the SCANS-III survey being approximately 0.0148 animals/ km^2, which is low to average for the region (Hammond *et al.,* 2021; Hague *et al.,* 2020; BEIS, 2022).
- Striped dolphin can be found in UK waters, but this is the northern limit of the species distribution, with most sightings British waters are from the south-west approaches with occasional records in deep waters west of Britain and further north (Reid *et al.* 2003; Stone 2015). Densities of striped dolphin along the west coast of Scotland within inland water bodies are expected to be lower than other area with densities within Block I of the SCANS-III survey being approximately 0.0148 animals/ km^2, which is low for the region (Hague *et al.,* 2020; BEIS, 2022; Hammond *et al.,* 2021).
- Other species, such as killer whale, bottlenose dolphin, white-beaked dolphin, Atlantic white-side dolphin, humpback whale and Risso's dolphin are seen infrequently in varying numbers and are occasional and/or seasonal visitors (Hammond *et al,* 2021; Reid *et al.,* 2003). These species do not occur frequently enough to require specific assessment.

The distribution, density, and abundance of the four 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 Installation Corridor[3] (Individuals/km^2) (Hammond *et al.,* 2021)	Management Unit (MU) / Biogeographical Population Estimate (IAMMWG, 2021)
Harbour porpoise	0.397	28,936
Unidentified common or striped dolphin[4]	0.0148	102,656
Minke whale	0.0204	20,118

[3] SCANS III Block I used for density estimate

[4] Striped dolphins are a similar size and shape to common dolphins and therefore have been scaled together in Hammond *et al.,* (2021). The MU as per (IAMMWG, 2021) does not feature a MU for species of striped dolphin and therefore the MU for common dolphin has been used.

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 density of grey and harbour seals surrounding the Loch Broom Installation Corridor are shown in Figure 7-1.

The mean at-sea usage of grey seals is low for the installation corridor, with densities in the area ranging between 1 – 5 individuals per 25 km^2. The mean at-sea usage of harbour seals is higher than that of grey seals which features moderate densities within the installation corridor, with densities ranging between 5 - 10 individuals per 25 km^2.

The pupping season of harbour seals is mid-June to July with moulting occurring in August. Grey seals also breed from October through to December and then moult until early April (SCOS, 2018). 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, 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 no designated SACs with harbour seals or grey seals as their qualifying feature within 50 km or 20 km (respectively) from the installation corridor.

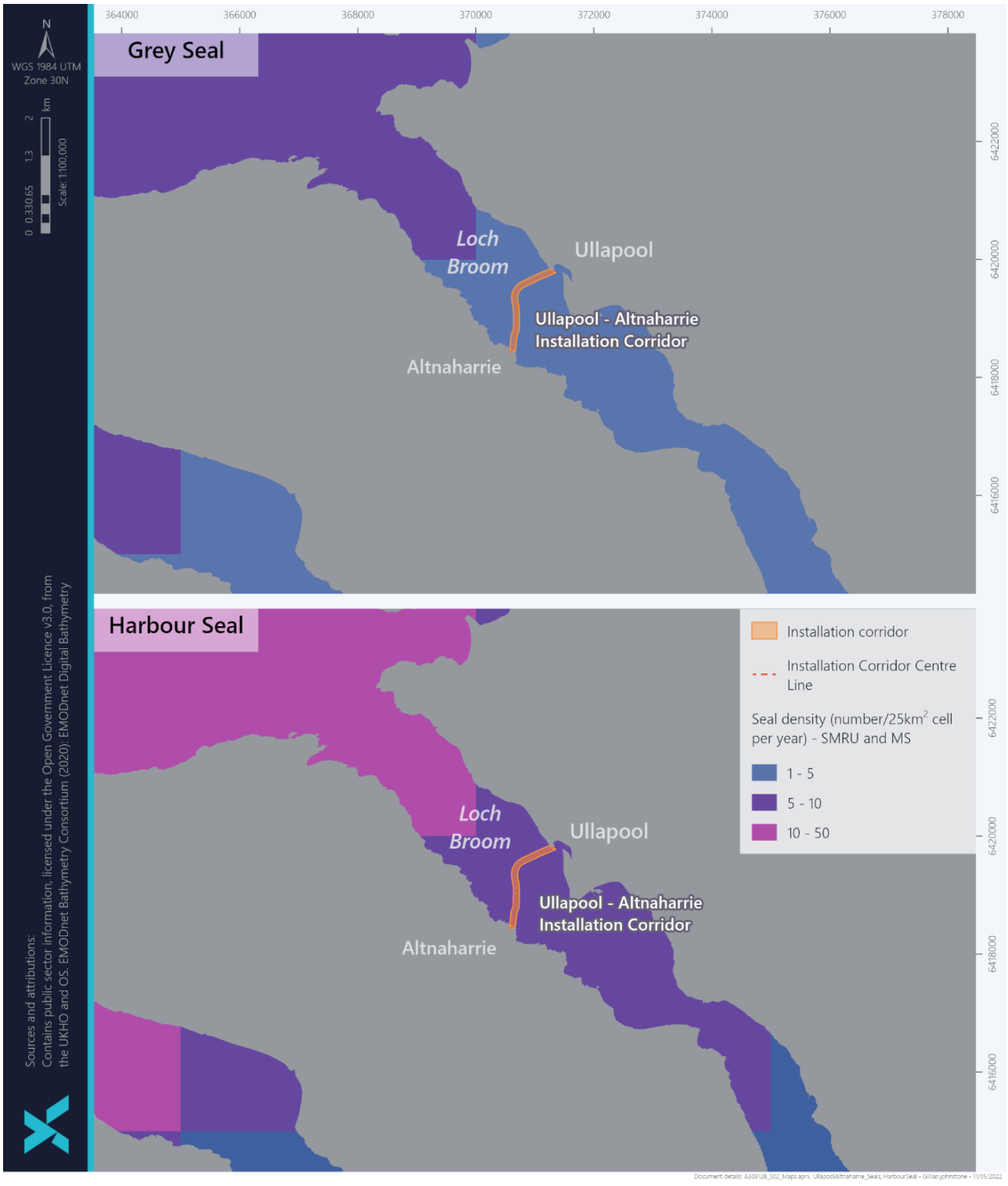

Figure 7-1 Estimated Grey and Harbour Seals at Sea Densities in the Vicinity of the Installation Corridor

7.3.3 Basking Shark

Basking sharks *Cetorhinus maximus* are one of the only three species of shark which filter feed and are 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 (HWDT, 2018; Witt *et al*, 2012). 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 route 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.

Basking sharks seasonally arrive in Scottish waters during spring and leave in autumn. They appear to aggregate in summer to breed, with peak numbers in July and August. The NMPi (2022) reports basking sharks to be present in the vicinity of Loch Broom are at a predicted density of 0.00-0.10 animals/km^2.

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 installation activities and narrows down which activities require further assessment to identify the likelihood and significance of those impacts.

Impacts from accidental releases from pollution for all marine megafaunas have not been considered for further assessment given that the likelihood of this being extremely low (Section 6.4.2).

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 proposed activities. 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 impact is 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 (LF) cetaceans: (e.g. baleen whales, such as minke whales, humpback whales, etc.)	7 Hz to 35 kHz
High-frequency (HF) cetaceans: (e.g. dolphins, toothed whales, beaked whales and bottlenose whales)	150 Hz to 160 kHz
Very high-frequency (VHF) cetaceans: (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 plants 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 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 vessels will not result in a significant change to the existing soundscape in the area, 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 activities are expected to be minimal. This is because SHEPD intend to surface lay the cable and no sub-marine trenching or burial works are proposed. Moreover, trenching works in the intertidal area will be conducted at low water when the area is dry, and hence there is no potential for underwater noise emissions to result from this activity. Further details on the cable lay methodologies are described in the Aultbea Ullapool: Loch Broom Subsea Cable Installation Project Description. As such, noise from cable laying works does not have any potential for adverse effects on cetaceans and 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 activities dramatically reduces the likelihood of interactions between the proposed activities and cetacean receptors resulting in significant impacts. However, as the risk of injury or disturbance to a small number of individual animals remains and EPS licence may be required, hence 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 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 includes the management of vessel speed and the commitment for vessels to adhere to the SMWWC. For this reason, vessel movements have not been identified as having the potential to cause adverse or significant impacts to the FCS of any marine mammal population and has therefore been screened out from further assessment.

The marine mammal species of interest in the 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 activities are expected to occur between September 2022 and January 2023, this is unlikely to overlap with the pupping and moulting season for harbour seals, but does coincide with the grey seal breeding period. However, there are no designated seal breeding or haul-out sites within 500 m of the installation corridor (as detailed in Section 5.3). As such, impacts to seals from landfall activities have not been considered further.

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 20 kHz (which is several of orders in magnitude higher than 1 kHz) it is unlikely this equipment will be audible to basking sharks. 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 installation 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 installation activities will be limited to 200 dB 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 National Oceanic and Atmospheric Administration (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 200 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 from 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 MU for harbour porpoise, minke whale, striped dolphin and common 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 subsea equipment (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 Aultbea – Ullapool cable installation activities (as per Regulation 39(2)) (Scottish Government, 2014).

Impacts to marine mammal receptors There will be no injurious impacts to marine mammals as a result of noise-generating installation activities. However, there is potential for disturbance to marine mammals from underwater noise. Activity-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.

The vessels being used for the cable installation activities will be moving slowly during operations which will reduce the risk of collision and disturbance to basking sharks. Moreover, SHEPD are committed to ensuring vessels adhere to the SMWWC. These factors considerably reduce the risk of injury or disturbance to basking sharks resulting from interaction with project vessels. Furthermore, basking shark densities are reported to be low in the vicinity of the cable installation activities which further reduces the risk of interactions between basking shark and vessels occurring.

Considering these factors, and that the presence of the vessels will not constitute a substantive change from baseline vessel activity in the vicinity of Loch Broom, 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 The risk of injury or disturbance of basking sharks as a result of vessel presence during the Loch Broom subsea cable installation activities are 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
Medium	Minor	Minor
Impact significance – NOT SIGNIFICANT		

7.4.4 Operation

The cable has been designed to be maintenance free, as such no planned ongoing maintenance activities are proposed. SHEPD will conduct routine inspections and surveys of the cable throughout its operational life to ensure it remains in good condition. There is a potential for remedial cable repair works to be required, in the

event the cable is damaged or the need for additional stabilisation materials is identified during the routine surveys.

If required, impacts on marine megafauna resulting from cable repairs will be analogous those occurring during construction, although significantly reduced on both spatial and temporal scales. As such, impacts during the operational phase are considered to be not significant.

Underwater noise from routine inspections and surveys of the cable will have the potential to affect marine mammals, however these will be consented separately through the EPS Licence regime and are not considered further.

7.5 Conclusion

Underwater noise emissions are the impact mechanism most likely to affect marine megafauna in the area of activities. 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.

The proposed 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.

It is acknowledged that the presence of the vessels does have the potential to result in adverse (injury or disturbance) interactions with basking sharks. However, considering their low abundance of the species in the area, behaviour of the vessels, and embedded mitigation the risk of this occurring is extremely remote. 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 activities there are not anticipated to be any significant impacts to individuals or populations of marine megafauna in the 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 proposed cable 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 within the installation corridor and that have the potential to be impacted.

8.2 Data sources

This section draws on a number of data sources including published papers, industry-wide surveys and site-specific investigations. A key data source available for Scottish waters is the NMPi website (NMPi, 2022) which underpins the Scottish NMP (Scottish Government, 2015). In addition to this, the environmental surveys conducted in 2021 (BMC, 2022a) and 2022 (BMC, 2022b) have also been utilised as mentioned in Section 4.1.

8.3 Baseline and Receptor Identification

8.3.1 Overview

The Loch Broom installation corridor is located within Loch Broom in an area of dynamic tidal regime. Loch Broom is a sea loch indenting the west coast of Wester Ross in the Highlands, its shores lying in Ross and Cromarty. The loch is fed by the River Broom which rises in the Dirrie mountains, issuing from two lochs: Loch Bhraoin and Loch Droma. Ullapool and Altnaharrie are nestled on the shores of Loch Broom. They are surrounded by clear, relatively shallow water, with the coastlines dominated by sheltered inlets, interspersed with ports and rocky headlands.

The below subsections summarise the sediment types and biotopes observed in the area during the survey conducted by BMC (2022a).

8.3.2 Sub-Tidal Characteristics

Offshore surveys were undertaken along the proposed Loch Broom installation corridor. As mentioned in Section 6.3, the installation corridor's offshore area primarily consists of mud and gravel substrates with varying proportions of sand according to location. The BMC (2022a) survey conducted in the area acquired video and stills photographic data along ten stations.

As discussed in Section 6, the representative EUNIS biotopes found within the area are mainly Atlantic infralittoral rock (MB12) and Atlantic circalittoral rock (MC12) which corresponds to the moderate energy found within the area (EMODnet, 2022). Within the BMC (2022a) survey, the following sediments were observed:

- Atlantic circalittoral mixed sediment (EUNIS code MC42 – i.e., A5.44);
- Atlantic infralittoral mixed sediment (EUNIS code MB42 – i.e., A5.43);
- Atlantic circalittoral mid (EUNIS code MC62 – i.e., A5.36);
- Atlantic infralittoral rock (EUNIS code MB12 – i.e., A3.2);

- Atlantic circallitroal coarse sediment (EUNIS code MC32 – i.e., A5.14; and
- Cerianthus lloydii with Nemeresia spp. And other hydroids in circalittoral muddy mixed sediment (EUNIS code MC42111 – i.e., A5.4411).

The substrate of these biotopes is classed as *"Rock or other hard substrata"* and includes habitats of bedrock, boulders and cobbles which occur in the shallow subtidal zone and typically support seaweed communities. The upper limit is marked by the top of the kelp zone whilst the lower limit is marked by the lower limit of kelp growth or the lower limit of dense seaweed growth. Infralittoral rock typically has an upper zone of dense kelp (forest) and a lower zone of sparse kelp (park), both with an understorey of erect seaweeds. In exposed conditions the kelp is *Laminaria hyperborea* whilst in more sheltered habitats it is usually *Laminaria saccharina*; other kelp species may dominate under certain conditions. On the extreme lower shore and in the very shallow subtidal (sublittoral fringe) there is usually a narrow band of dabberlocks *Alaria esculenta* (exposed coasts) or the kelps *Laminaria digitata* (moderately exposed) or *L. saccharina* (very sheltered). Areas of mixed ground, lacking stable rock, may lack kelps but support seaweed communities. In estuaries and other turbid-water areas the shallow subtidal may be dominated by animal communities, with only poorly developed seaweed communities (European Environmental Agency, 2022).

Infaunal communities in the subtidal zone of the cable corridor were complex and developed, with a diverse microbenthic assemblage identified across the survey area. A total of 3,169 individuals and 316 taxa were identified in the 10 grab samples collected. The mean number of taxa collected per sample was 81.7 while the mean abundance per sample was 316.9 individuals. This is indicative of the large biodiversity present across the site. The sampling stations with the highest abundance of individuals were 10, 1 and 5 respectively (see Figure 8-1), and the sites with the greatest biodiversity (i.e., number of taxa) were sites 1, 3 and 10 (BMC, 2022a).

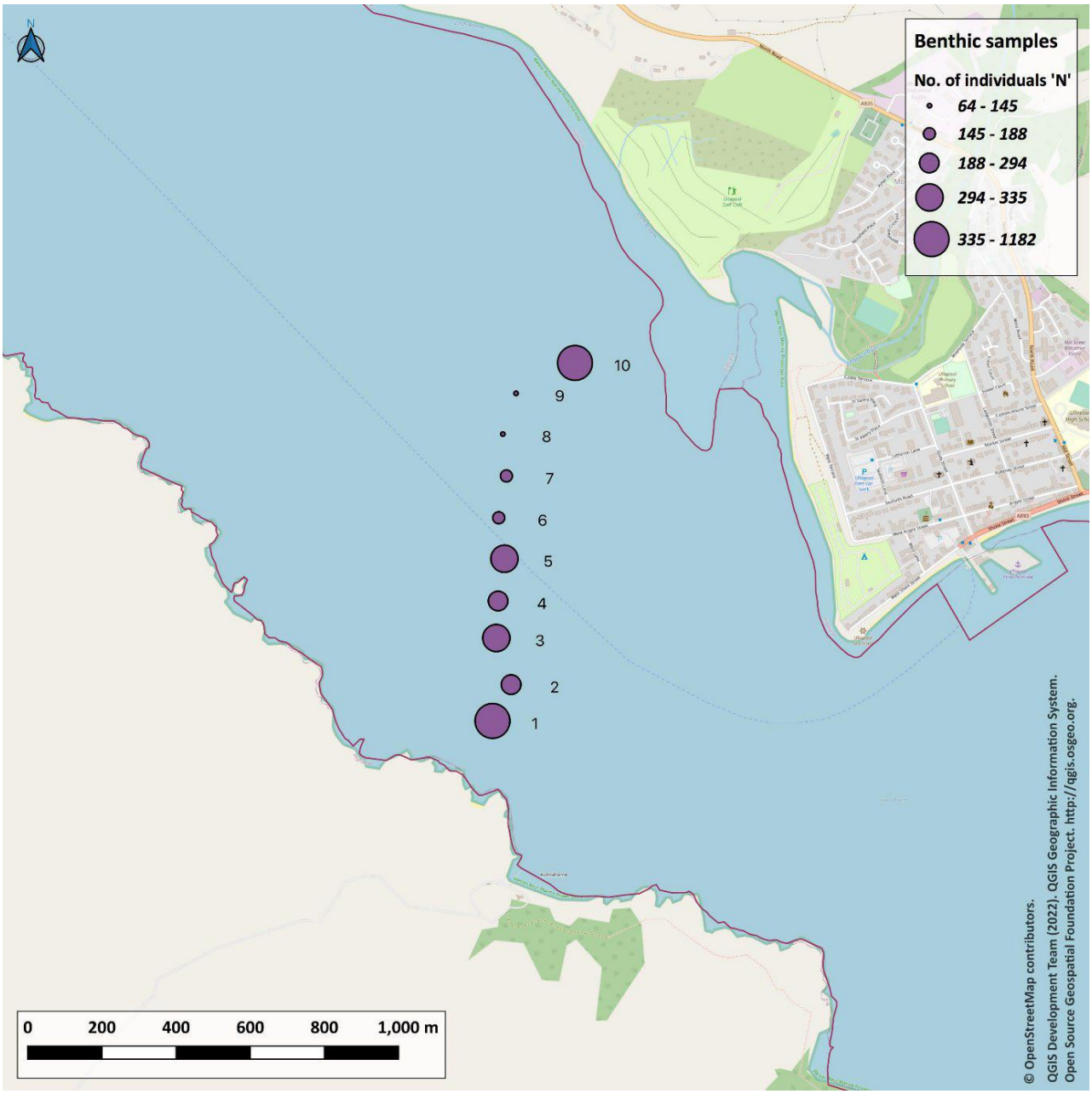

Figure 8-1 Infaunal Abundance Across the Installation Corridor (BMC, 2022a)

The sedimentary habitats as listed above, support a variety of benthic species and habitats. A total of 11 video transects were completed across the installation corridor. Transects over selected exposures of hard, rocky seabed showed a typical succession of sediment habitat types from muddy sand to coarse gravel, cobbles and boulders and returning to muddy sand once the camera had passed over the exposure. The fauna and flora at each site were recorded during the survey and is summarised Table 8-1. A number of the habitats observed during the BMC (2022a) survey were identified as being protected and/or potentially sensitive. These included the tall sea pen *Funiculina quadrangularis* and firework anemone *Pachycerianthus multiplicatus*. An example still image taken from the survey of the tall sea pen is provided in Figure 8-2.

Table 8-1 Substrate and Associated Fauna Network Found within the Installation Corridor (BMC, 2022a)

Transect Number	Substrate	Fauna and Flora Observed	UK BAP and/or PMF
1	Pebbles and cobbles over muddy sand	*Pomatocerus*, Red and coraline algae, *Echinus*, anemones, starfish.	No
2	Gravel and cobble over sand, occasional boulder	*Pomatocerus*, barnacles, Red and coraline algae, *Echinus*, anemones, starfish.	No
3	Gravel and shell hash over mud, occasional pebble	*Pomatocerus*, Auger shells, red gurnard, *Galathea*.	No
4	Gravel and pebble on muddy sand, glass bottle	*Galathea*, *Pomatocerus*, Coraline algae, bivalves, *Pecten maximus*.	No
5	Gravel and pebble over muddy sand	*Galathea*, *Pomatocerus*, starfish, *Aequipecten*, sunstar, *Echinus*	No
6	Pebble, shell and gravel over muddy sand and occasional boulder	*Galathea*, *Pomatocerus*, coraline algae, *Aequipecten*, *Asterias*, *Urticina felina*	No
7	Gravel, pebble, sand over muddy sand, and mud. Discarded fishing gear.	Red algae, *Echinus*, *Trisporterus spp.*, *Galathea*, auger shells, Firework anemone *Pachycerianthus multiplicatus*, *Nephrops* and their burrows.	Yes – firework anemone
8	Mud	*Galathea*, Augur shells, *Nephrops* and burrows, *Echinocardium*.	No
9	Mud, gravel and pebble	*Pomatocerus*, coraline algae, kelp, *Asterias*, *Echinus*, Tall seapen *Funiculina quadrangularis*, Mackeral *Scomber scombrus*, *Nephrops*.	Yes – tall sea pen (example still image taken from survey is provided in Figure 8-2).
10	Mud, gravel and pebble	Red algae, *Pomatocerus*, *Echinus*, starfish, *Galathea*, *Necora puber*	No
11	Gravel, pebble, cobble	Red algae, *Necora puber*, *Pomatcerus*, Kelp, starfish, fish, *Hyas spp.*	No

Figure 8-2 Example Image of the Identified Tall Sea Pen Observed in Drop-Down Video (DDV) Tow 9 (BMC, 2022a)

It should be noted that pieces of maerl were also observed in grab samples taken at Station 2. During laboratory analysis these pieces have been included in the sample analysis as 'Rhodophyta', due to the nature of the live pieces found. However, upon inspection of the DDV during and after the survey it was confirmed that there were no Maerl beds seen across any of the DDV survey transects. Overall, during the benthic survey, 3 sensitive areas were seen. Two of which were single tall seapens and there was one instance of fire anemone. To ensure mitigation of these areas, the cable installation route engineering has been planned to avoid these three sensitive areas. The minimum distance from any environmental area will be approximately 40 m.

Features of Interest within the subtidal cable corridor

A number of the habitats observed during the BMC (2022a) survey were identified as being protected and/or potentially sensitive. These included the tall sea pen *Funiculina quadrangularis* and firework anemone *Pachycerianthus multiplicatus*.

The tall sea pen was observed along towed transects along with associated burrows. This indicates the potential presence of the OSPAR threatened and/or declining habitat 'Seapen and burrowing megafauna communities'. OSPAR (2010) defines the 'Seapen and burrowing megafauna communities' feature as "Plains of fine mud, at water depths ranging from 15 – 200 m or more, which are heavily bioturbated by burrowing megafauna with burrows and mounds typically forming a prominent feature of the sediment surface. It should also be noted that JNCC guidance supports the view that in areas of seabed where seapens may have previously existed but have been removed by anthropogenic activities, burrowed mud areas would be deemed to be 'Seapen and burrowing megafauna communities', regardless of whether seapens are seen and/or sampled (JNCC, 2014).

Seapens are not a pre-requisite for the designation of the 'Seapen and Burrowing Megafauna Communities'; however, their presence contributes to the habitat classification, however, burrow densities are key in determining if the area can be classified as this habitat. Multiple sightings of burrows and/or mounds attributable to relevant species across a video tow or in a sufficient number of still images to identify the burrows and/or burrowing species as at

least frequent on the SACFOR scale. In order for an area to be classified as the 'Seapen and Burrowing Megafauna Communities' habitat, the presence of burrowing species or burrows should be a minimum of 'frequent' according to the SACFOR abundance scale and therefore it can be considered that this habitat is not likely to occur significantly in the area. The firework anemone is a large burrowing anemone, occupying a tube-like burrow that may exceed one metre in length. Both the length of the column and the breadth of the tentacles can reach 30 cm. The tentacles are long and occur in two cycles, with up to 200 tentacles in the marginal cycle. The tentacles are incapable of retraction but may coil spirally on disturbance. This species will feature in water depths ranging between 10 – 130 m and is listed in the UK Biodiversity Action Plan as a species of conservation concern (MARLIN, 2008).

8.3.3 Intertidal Characteristics

The Altnaharrie survey area is situated on the southwest shore of Loch Broom. The area presents primarily as remote, steep sided topography interspaced with several small gullies and bays. The intertidal areas surveyed are shown in Figure 8-3. In total, target notes and images were taken at 125 locations (57 at Ullapool and 68 at Altnaharrie) to provide localised information on habitats and features of interest present across the intertidal areas.

Figure 8-3 Overview of the Aultbea to Ullapool Survey Areas (BMC, 2022b)

Ullapool

The proposed cable will make landfall at Ullapool. the shoreline presented as a gradual sloping moderate to low exposure seabed comprised predominantly of stable gravel, shells and shell fragments in the upper shore and a mix of stable gravel and cobbles and muddy sand in the lower shore (see Figure 8-4). The upper shore was largely bare of seaweeds with occasional areas of fucoids *Fucus spiralis* dominating, whilst the lower shore presented a mix of fucoid *Fucus spiralis, Fucus vesiculosus*, wracks *Ascophyllum nodosum* leading into ephemeral greens *Ulva sp*. and *Cladophora spp*. and red seaweeds. No PMFs were identified (BMC, 2022b).

Figure 8-4 Example Site Imagery at Ullapool (BMC, 2022b)

The upper shore at Ullapool was characterised by a wide strandline (A2.21) interspaced with a gravel shore (A2.11) succeeding to wide bands of fucoid dominated mixed sediment habitats (A1.31 and A1.3122); mixed fucoids and larger wracks *Ascophyllum nodosum* (A1.3142) dominated closer to the MLWS mark. The survey area was bordered

by low lying vegetation (B2.4). A clear seaward zonation was apparent and typically presented as moderate to low energy throughout the survey area, however intertidal species were reduced on mixed sediments to the southeast of the survey area (A2.431) as the seabed shoaled towards the riverine output of the Ullapool River.

The associated biotopes observed during this survey are shown in Figure 8-5 and summarised in Table 8-2.

Table 8-2 EUNIS Classification Recorded Across the Intertidal Ullapool Survey Area

Broad Habitat Level 2	Broad Habitat Level 3	EUNIS Description	Designation Status
A1 Littoral rock and other hard substrata	A1.2 Moderate energy littoral rock	A1.21 Barnacles and fucoids on moderately exposed shores	-
	A1.3 Low energy littoral rock	A1.31 Fucoids on sheltered marine shores	-
		A1.3122 *Fucus spiralis* on full salinity upper eulittoral mixed substrata	-
		A1.3142 *Ascophyllum nodosum* on full salinity mid eulittoral mixed substrata	-
		A1.3152 *Fucus serratus* on full salinity lower eulittoral mixed substrata	-
A2 Littoral sand and muddy sand	A2.1 Littoral coarse sediment	A2.11 Shingle (pebble) and gravel shores	-
		A2.12 Estuarine coarse sediment shores	-
	A2.2 Littoral sand and muddy sand	A2.21 Strandline	-
	A2.4 Littoral mixed sediment	A2.431 Species-poor mixed sediment shores	-
	A2.8 Features of littoral sediment	A2.821 Ephemeral green and red seaweeds on variable salinity and/or disturbed eulittoral mixed substrata	-
B2 Coastal shingle	B2.4 Fixed shingle beaches, with herbaceous vegetation	B2.4 Fixed shingle beaches, with herbaceous vegetation	Coastal vegetated shingle' Habitat of Principle Importance (Nature Conservation

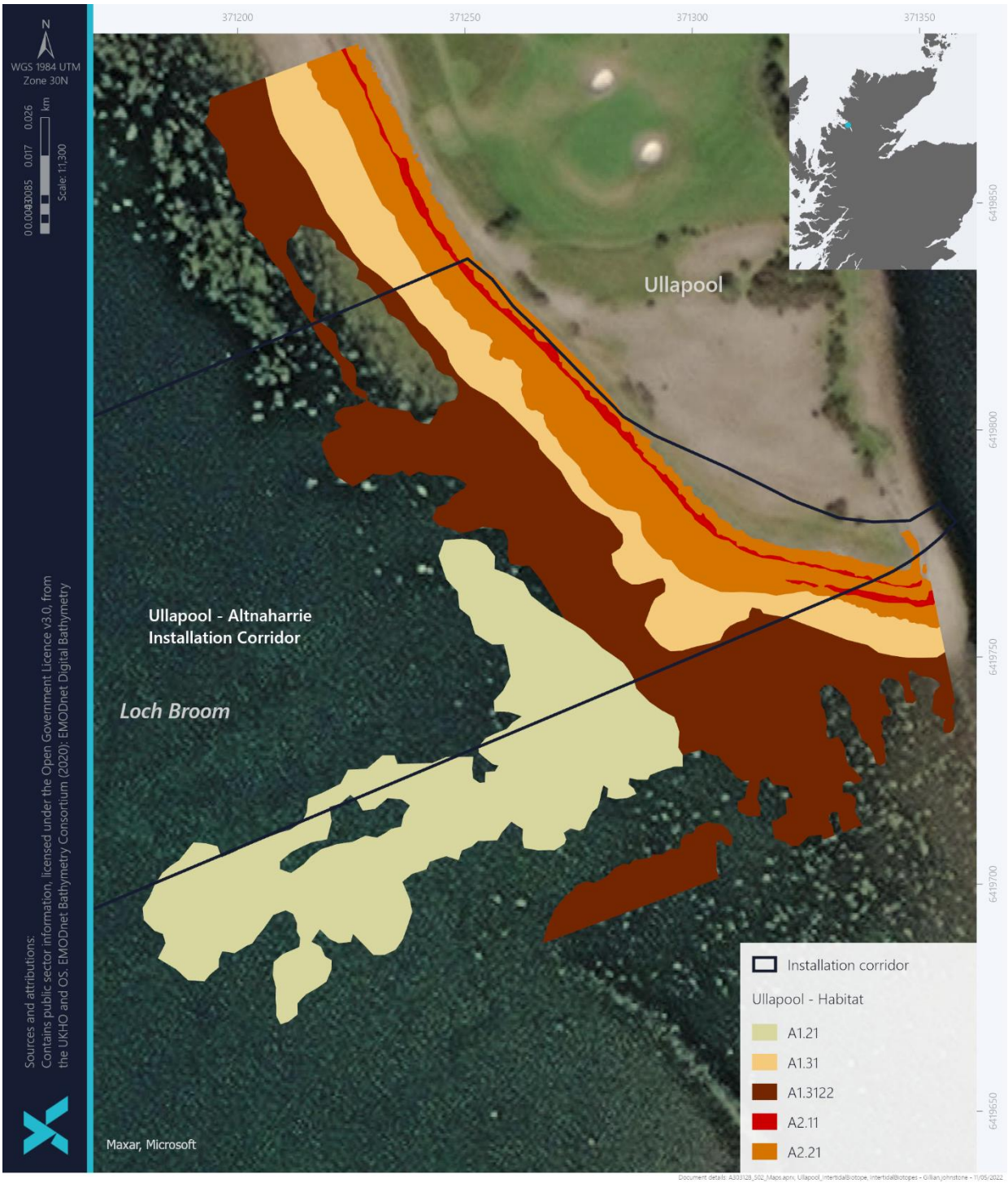

Figure 8-5 Seabed Biotopes within the Landfall Region of Ullapool (BMC, 2022b)

Altnaharrie

The proposed cable will make landfall at Altnaharrie. The shoreline presented as predominantly vertical bedrock of varying energies with two small bays of stable cobble and gravel and several narrow gullies (see Figure 8-6). Fucoid seaweeds dominated the mid shore whilst barnacles and limpets dominated the lower shore. No PMFs were observed, however sparse blue mussels *Mytilus edulis* occurred on the lower shore attached to the bedrock. Evidence of recent otter scat was visible on the upper bedrock.

Figure 8-6 Example Site Imagery at Altnaharrie (BMC, 2022b)

The majority of the Altnaharrie survey area was characterised by high to low energy littoral rock habitats (A1.1 A1.2 and A1.3). The portion of the survey area closer to land was fringed by supralittoral and littoral fringe rock covered in lichens or small green algae (B3.11) as were the tops of the vertical rock features observed throughout the survey area. The middle shore was interspersed with rocky habitats of different exposures (e.g., A1.1, A1.2 and A1.3) with the lower and extreme lower shores dominated by rocks covered in barnacles and molluscs (A1.11) in higher energy and vertical areas, and seaweed communities (A1.21, A1.31) in moderate to low energy areas.

A clear vertical and seaward zonation characterised the survey area where lichens or green algae occurred on supralittoral and littoral fringe rock (B3.11) giving way in the upper to middle shore to both exposed bedrock representative of biotopes A1.1131 and A1.1132 with fucoids present in the fissures and crevices of the bedrock (A1.1132) and sheltered bedrock and mixed sediments dominated by mixed fucoid communities (A1.311, A1.3121, A1.3122) (BMC, 2022b).

The associated biotopes observed during this survey are shown in Figure 8-7 and summarised in Table 8-3.

Table 8-3 EUNIS Classification Recorded Across the Intertidal Altnaharrie Survey Area

Broad Habitat Level 2	Broad Habitat Level 3	EUNIS Description	Designation Status
A1 Littoral rock and other hard substrata	A1.1 High energy littoral rock	A1.11 Mussel and/or barnacle	-
		A1.113 *Semibalanus balanoides* on exposed to moderately exposed or vertical sheltered eulittoral	-
		A1.1131 *Semibalanus balanoides*, *Patella vulgata* and *Littorina spp.* on exposed to moderately	-
		A1.1132 *Semibalanus balanoides* and *Littorina spp.* on exposed to moderately exposed eulittoral boulders	-
	A1.2 Moderate energy littoral rock	A1.21 Barnacles and fucoids on moderately exposed shores	-
	A1.3 Low energy littoral rock	A1.31 Fucoids on sheltered marine shores	-
		A1.311 *Pelvetia canaliculata* on sheltered littoral fringe rock	-
		A1.3121 *Fucus spiralis* on full salinity sheltered upper eulittoral	-
		A1.3122 *Fucus spiralis* on full salinity upper eulittoral mixed substrata	-
	A1.4 Features of littoral rock	A1.421 Green seaweeds (*Enteromorpha spp.* and *Cladophora spp.*) in shallow upper shore rockpools	-
A2 Littoral sand and muddy sand	A2.1 Littoral coarse sediment	A2.11 Shingle (pebble) and gravel shores	-
	A2.2 Littoral sand and muddy sand	A2.21 Strandline	-
	A2.4 Littoral mixed sediment	A2.43 Species-poor mixed sediment shores	-
B3 Rock cliffs, ledges and shores, including the supralittoral	B3.1 Supralittoral rock (lichen or splash zone)	B3.11 Lichens or small green algae on supralittoral and littoral fringe rock	'Supralittoral rock' Habitat of Principle Importance (Nature Conservation (Scotland) Act 2004)
		B3.31 Atlantic sea-cliff communities	

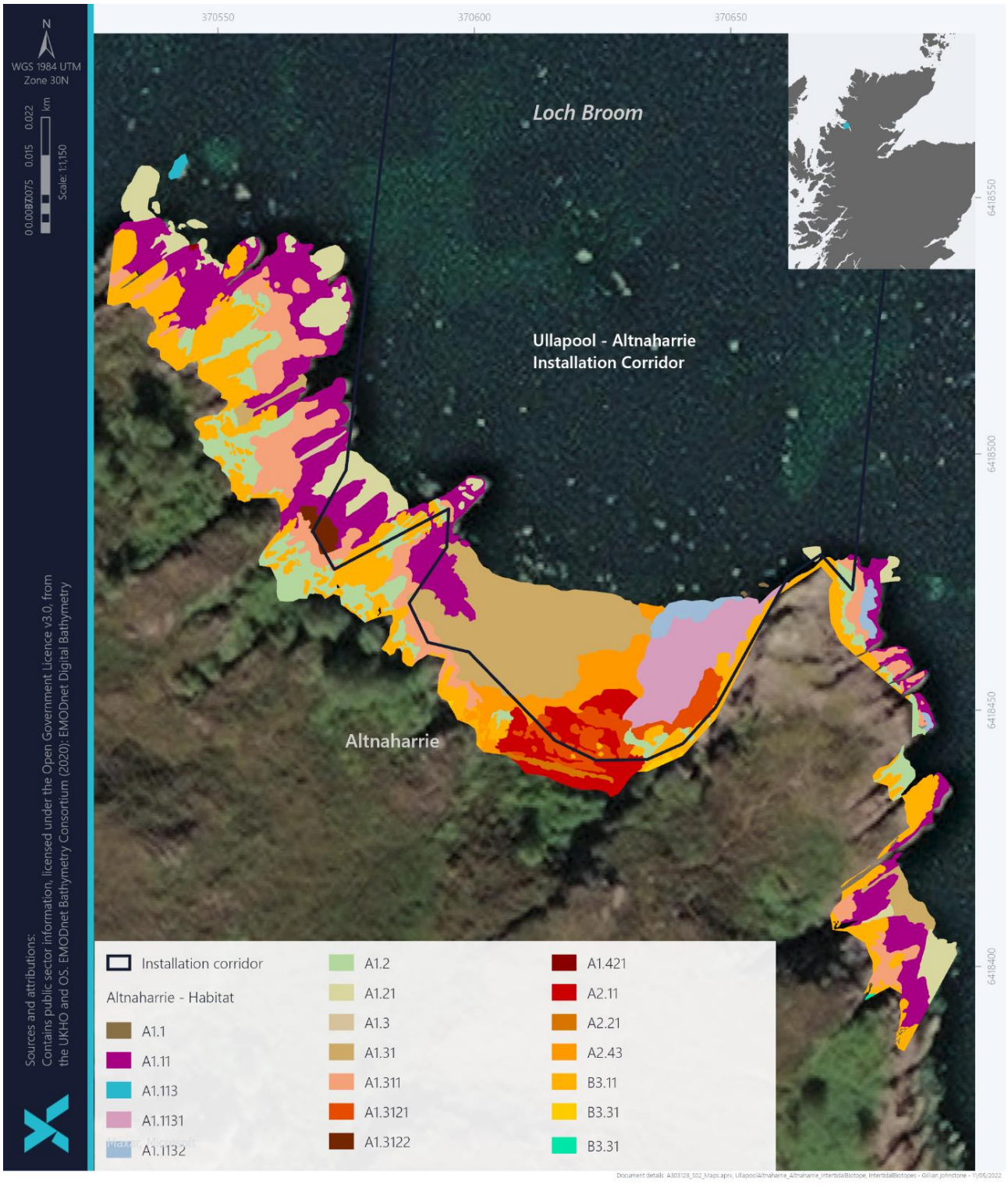

Figure 8-7 Seabed Biotopes within the Landfall Region of Altnaharrie (BMC, 2022b)

Features of Interest within the Nearshore Areas of Ullapool and Altnaharrie

Habitats of Principal Importance

A number of habitats have been identified as being the most threatened and requiring conservation action under Section 2(4) of the Habitat of Principal Importance under the Nature Conservation (Scotland) Act 2004. Habitats assigned to EUNIS classification B3.1, B3.11 and B3.3, were deemed to be included under 'Supralittoral rock: Maritime Cliff and Slopes' on this list. Similarly, habitat assigned B2.4 was deemed to be included as 'Coastal vegetated shingle' under Section 2(4) of the Nature Conservation (Scotland) Act 2004.

Other Protected Features

Both survey areas were characterised by large areas of rocky habitats comprising a mosaic of exposed bedrock, boulders, and cobbles; these were deemed to be representative of different biotopes spanning from high to low energy rock habitats with some supporting a variety of fucoids and other seaweeds.

The intertidal survey areas do not fall within any SACs and there were no qualifying Annex I habitats observed.

Despite the EUNIS rock classifications assigned during the Altnaharrie survey in the extreme lower shore falling within the boundary of the Wester Ross NCMPA, the observed habitats/biotopes do not qualify as features included in the management objectives of the NCMPA.

No habitats or species listed as PMFs were observed at either nearshore survey area.

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, cable protection installations and spud can placement in direct contact with the seabed, has the potential to impact on the benthic species and habitats directly within the project footprint. The cable installation corridor will cross a variety of benthic habitats and biotopes as described in Section 8.3. Areas of significant bedrock, boulders and sensitive habitats will be avoided during the cable installation activities where feasible, in order to minimise the impact on sensitive marine features. Therefore, the exact cable location cannot currently be determined and therefore the impact footprint on specific habitat types encountered along the installation corridor cannot be estimated.

As discussed in Section 3, it is expected that the cable will be surface laid, with excavation works carried out at each landfall site. The length of the cable will be 1.9 km between the two Transition Joint Pits (TJP's). The cable will then be buried from the TJP to MLWS using open cut trench by excavator after the installation of the cable has been completed. The length of cable proposed to be surface laid and buried is summarised in Table 8-4. The lengths and associated impacts of the cable and associated deposits have been included in Table 8-5.

Table 8-4 Burial for the Proposed Cable Below MHWS

Installation Type	Location	Extent	Length (m)	+ 10% Contingency
Burial	Ullapool Landfall	MHWS – MLWS	252	278
		Maximum burial below MLWS	50	55
Surface lay	Route	Maximum length of surface laid cable (MLWS – MLWS)	1,464	1,611
Burial	Altnaharrie Landfall	MHWS – MLWS	31	35
		TOTAL	1,797*	1,979*
**Note there is some overlap between the possible maximum burial length and maximum surface laid cable length, therefore these numbers do not equate to total cable length or route length.*				

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

- The impact corridor for OCT where excavation and the FO and Sea Earths are required in the intertidal area has been assessed based on the length of the cable expected to be buried with an assumed 20 m wide corridor. The assumption as also allowed for contingency to be applied;
- A corridor of up to 3 m wide may be disturbed during PLGR operations, of a length of approximately 1.6 km in the sub-tidal area;
- Spudding areas in Ullapool and Altnaharrie. The area of the Altnaharrie cable works spud area is approximately 0.0254 km^2 and the Ullapool cable works spud area will be 0.0361 km^2;
- The surface laid cable has a cross sectional diameter of 133 mm, resulting in a footprint of approximately 0.13 m on the seabed;
- Articulated pipe / uraduct protection has been assessed based on the length required for the cable, with a cross section of approximately 0.25 m;
- Clump weights for the Sea Earthing cables are 1 m diameter with a footprint of 0.79 m^2;
- Each rock bag is assumed to impact an area of 3.8 m^2 (2.2 m diameter);
- Each mattress measures 6 m x 3 m, therefore impacting an area of 18 m^2 each;

Table 8-5 presents the overall area of seabed impact from the proposed cable installation activities.

Table 8-5 Footprint of Cable Installation Methods and Permanent Materials Along the Cable Installation Corridor

Location and Protection Methods	Source of Impact (*Quantities up to)*	Area of Seabed Impact (m^2)	Area of Seabed Impact (km^2)
OCT excavation activities at Ullapool between MHWS and MLWS (i.e., buried cable)****	666 m of cable will be buried at Ullapool with an assumed 20 m wide corridor (333 m for the sea earth and 333 m for the FO earth).	13,320	0.013320
OCT excavation activities at Altnaharrie between MHWS and MLWS (i.e., buried cable)****	180 m of cable will be buried at Altnaharrie with an assumed 20 m wide corridor (90 m for the sea earth and 90 m for the FO earth).	3,600	0.00360
Spud can work areas	The total number of deployments is unable to be predicted. However, it is proposed that the spud cans will only be deployed within two designated spud can 'boxes'. Altnaharrie landfall spud can area will be 25,375 m^2 and Ullapool landfall spud can area 36,127 m^2.***	61,503	0.061503
PLGR (MLWS to MLWS)	Up to 3 m wide over a length of 1.467 km	4,401	0.004401
Articulated pipe / uraduct protection**	A total of 448 m will be articulated pipe and an assumed cross section of 0.25 m.	112	0.000112
Surface laid cable (MHWS – MHWS)	Approximately 1.611 km (1,611 m) will be surface laid.	210	0.000210
Mattresses*	Each 8.52 tonne mattress will be 6 m x 3 m. The quantity required will be 33.	594	0.000594
Rock bags*	Each 2 tonne rock bag will be 2.2 m in diameter. The quantity required will be 60.	228.08	0.000228
Clump weights	Each clump weight dimensions will be 1 m diameter. The quantity required will be 10.	7.9	0.000008
	TOTAL	84,677.08	0.0840

** = Structures are not expected to be required but have been included as contingency only.*

*** = Footprint likely wholly within the footprint of the cable trench.*

**** = It is key to note that the overall area covered by the spud can boxes will not be fully impacted by the spud cans, rather only a relatively small fraction of these areas will be disturbed by the deployment of the spud cans.*

***** = The Sea Earth impacts are expected to fall within the 20 m assumed corridor of the excavation disturbance.*

8.4.2 Direct Loss of/ Disturbance to Benthic Habitats and Communities

Cable installation activities will temporarily disturb the seabed, including anchor system deployment, and will lead to a temporary loss of habitat. These activities may affect sensitive seabed features and habitats (as described in 8.3) along the proposed cable installation corridor. It is acknowledged that SHEPD are committed to avoiding sensitive benthic habitats and species insofar as possible during detailed route engineering, informed by the pre-installation survey. However, since it is currently not possible to determine to what extent avoidance of these features will be possible, this embedded mitigation has not been accounted for during the assessment. The assessment therefore represents the worst case.

The activities that will lead to permanent habitat loss within the proposed cable installation corridor include surface laying of the cable and potential placement of protective deposits on the seabed (i.e., rock bags, mattresses). The proposed cable installation activities will lead to permanent loss to sandy, coarse and mixed sediments habitats as the benthic organisms living on the surface of sediments will not be able to colonise the hard substrate of the surface-laid cable and/or rock bags or mattresses. As discussed in Section 8.3.3 and Section 8.3.2, there is the potential for sensitive and protected habitats and species within the area. These include possible tall sea pen and firework anemone in the subtidal zone. Within the intertidal zone, habitats assigned to EUNIS classification B3.1, B3.11 were deemed to be included under 'Supralittoral rock: Cliff and Slopes' on this list. Similarly, habitat assigned B2.4 was deemed to be included under 'Coastal vegetated shingle' under Section 2(4) Habitat of Principal Importance under the Nature Conservation (Scotland) Act 2004 (as discussed in Section 8.3.3).

Post-disturbance recovery of the seabed is dependent both on the cohesiveness of the seabed soils and the ability of the hydrological regime to rework disrupted sediments and return the seabed to its original contours. There is little quantitative information on the likely recovery time of benthic organisms from such physical disturbance. The closest indications might be derived from studies carried out on the physical and biological impacts to the seabed caused by towed fishing gear (e.g., as reviewed by Løkkeborg, 2005). The proposed area of impact from the activities is expected to be 0.084 km^2, which is considered to be a small area with potential for rapid recovery. Such research indicates that the longevity of the physical scars in the seabed left in the wake of towed gear depends on the sediment type and the energy of the local benthic environment. Scars in high energy sandy and shallow environments may disappear within days or months of the initial disturbance, whilst those in quiescent silty and deeper areas may still be visible after 18 months.

For any activity directly impacting the sea floor, if the affected area is large, it will take a longer time to recolonise through larval dispersion settlement, whereas if it is small, organisms can recolonise quickly by migration into the area from adjacent undisturbed seabed and therefore recovery is more rapid (Løkkeborg, 2005). Studies reviewed by Løkkeborg (2005) have concluded that biological recovery can take place even though physical seabed scarring may still be visible. Therefore, in spite of the relatively quiescent environment, impacts will be minimised by the small, localised disturbance created by the cable and possible deposit stabilisations.

Considering the small footprint of activities (estimated 0.019 km^2), 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.

In addition, in rocky habitats, the installation of the cable will lead to habitat loss within the direct footprint of these structures. However, the hard structures 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 will only be temporary. As noted in Section 4.3, where possible, these features will be avoided. If avoidance is not possible, the sensitive areas which may be affected is expected to be minimal when compared in the context of the extent of the sensitive habitats in the wider region. As a result, no adverse effects are expected.

Overall, given the small footprint of the cable installation activities (estimated 0.019 km^2), no significant loss of habitat or features will occur.

Assessment of Impact Significance

Although some protected features such as the tall sea pen and firework anemone have been observed in the cable installation corridor, the great majority of the area is occupied by biotopes and habitats of no specific conservation concern which are present on a wider scale throughout this area. On this basis, the subtidal and intertidal rocky habitats and species potentially affected by the activities are considered to be of moderate sensitivity to disturbance/loss; a minor shift from the baseline conditions is anticipated, however the impact will be localised and temporary/short term with a minor change to a small proportion of the receptor population.

The mixed sediment biotopes along the installation corridor are highly sensitive to the installation of the cable and associated protection materials, resulting in permanent loss of habitat. However, the impact will be highly localised, constrained to the direct footprint of the structures and is not anticipated to cause adverse effects on existing benthic communities.

Taking an extremely localised footprint, the magnitude of effect as outlined above 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 long-term habitat loss of only a very limited area of seabed, with approximately 84,677 m^2 (0.084 km^2) of seabed impacted by the proposed operations. 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
Medium	Minor	Minor
Impact significance – NOT SIGNIFICANT		

8.4.3 Temporary Increase in Suspended Sediments and Associated Sediment Deposition

The section of cable in the intertidal areas at Ullapool and Aultbea will be installed using OCT by land-based excavation. The timing of the 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. This will also be similar for diver dredging. It is not expected that these activities will result in significant effects beyond that which is already found in the area due to the dynamic seabed currents and tidal regime and the activities being very localised. However, this will not be significantly greater than that expected by high energy wave action causing mobilisation of 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 resettlement of sediments is expected to occur within the 100 m of the excavation works 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 muddy and 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.

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. 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 and two of the NNMS could impact subtidal mixed sediments, resulting in adverse impacts.

An approved ballast water management plan will apply to vessels that operate in the waters of more than one Party to the Convention (internationally operating vessels), which is applicable 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. 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 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 protective deposits do not therefore present a risk of transport and introduction of NNMS.

The risk of the potential rocky reef features to be 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 the feature, 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.

In addition to the above, Briggs will operate with the larger vessels utilising anti-fouling measures in order to reduce NNMS impacts in the UKCS. Anti-fouling measures also help reduce the fuel consumption of the vessels being used which will in-turn reduce the volume of emissions.

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 are anticipated. Embedded mitigation measures considered as part of the Project design are listed in Section 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 installation 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		

8.4.6 Operation

Maintenance Activities

The cable has been designed to be maintenance free, as such no planned ongoing maintenance activities are proposed. SHEPD will conduct routine inspections and surveys of the cable throughout its operational life to ensure it remains in good condition. There is a potential for remedial cable repair works to be required, in the event the cable is damaged or the need for additional stabilisation materials is identified during the routine surveys.

If required, impacts on benthic ecology resulting from cable repairs will be analogous those occurring during construction, although significantly reduced on both spatial and temporal scales. As such, impacts during the operational phase are considered to be not significant.

Heating and Electro Magnetic Fields (EMF)

While operational subsea power cables generate heat since they are not made from perfect conductors, and as such in theory could result in increased temperatures in their surrounding environs. However, due to the very high heat capacity of sea water, this effect will be highly localised, and limited to the immediate vicinity (the surface) of the cable. As such, the footprint of impact resulting from heat emitted by the cable will be wholly within the footprint of the cable, and has therefore been assessed as habitat loss, so is not considered further.

Recent studies have identified potential impact on benthic organisms including crustaceans, which may result from EMFs generated by subsea power cables (Scott *et al.*, 2021 and Harsanyi *et al.,* 2022). However, these papers were focussed on cables associated with marine renewables, transmission links and interconnectors which operate at much higher voltages and currents than the proposed Loch Broom Subsea Cable. The studies found detectable changes in physiology or behaviour, when organisms were exposed to field strength ranging between 500 – 2,800 µT (Scott *et al.,* 2021 and Harsanyi *et al.,* 2022). The strength of EMFs from 33kV subsea cables, similar to that proposed for this project are in the range of 0.5 to 30 µT (Olsson *et al.*, 2010 and Oluwasegun, 2022). As such the strengths of EMF resulting from the operation for this project are several orders of magnitude lower than those which have been shown to potentially result in adverse effects on benthic receptors. Furthermore, this should be considered in the context of the natural geomagnetic field in the area, which is approximately 50 µT (BGS, 2020). It should be noted that the studies listed above are in relation to Direct Current (DC) cables. EMF effects from Alternative Current (AC) cables are also regarded as being negligible.

As such EMFs resulting from the cable operation are not anticipated to be of a magnitude which may result in adverse effects on benthic organisms according to the current literature and fall within the natural range of the earth Geomagnetic field in the vicinity of the Project. Therefore, no significant effects are anticipated.

8.5 Conclusion

Physical disturbance through seabed preparation, excavation and cable laying activities and smothering of benthic habitat and species via sediment re-suspension and settlement are likely to occur within the footprint of the proposed activities. The effects of the proposed installation activities are expected to be highly localised and temporary. Consequently, there will be no significant impact on the benthic and intertidal ecology resulting from the cable installation.

9 ORNITHOLOGY

9.1 Introduction

This section of the report provides further detail on the ornithological receptors in the vicinity of the proposed cable installation corridor and presents results from an assessment of potential impacts which may result from the proposed activities. 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, 2022) which underpins the Scottish NMP (Scottish Government, 2015).

9.3 Baseline and Receptor Identification

As noted in Section 5, the Loch Broom installation corridor is not located within any protected sites designated for seabirds. The closest SPA to the cable installation corridor is the Handa SPA situated 51 km to the north. The species listed for protection under this site are also protected by the Wildlife and Countryside Act 1981. These species include razorbill *Alca torda,* great skua *Catharacta skua,* northern fulmar, *Fulmarus glacialis,* black-legged kittiwake *Rissa tridactyla,* Arctic skua *Stercorarius parasiticus* and common guillemot *Uria aalge* (JNCC, 2020).

SHEPD notes the importance of SPAs to species growth and maintenance. Due to the activities being localised, short-lived and not within 2 km of any SPAs (as per criteria set out in Section 4.2, it is expected that the species will not be impacted by the proposed cable installation activities.

9.4 Impact Assessment

9.4.1 Installation

The proposed cable installation activities will be undertaken between September 2022 to January 2023, and as such, will not coincide with peak bird breeding seasons, when seabird numbers are expected to be highest. The installation activities are short-lived (45 days) and transient, and there is no potential for direct disturbance of breeding birds within coastal nesting sites or loafing birds on the sea surface. In addition, no SPAs site feature within 2 km of the installation corridor.

The cable installation activities do have the potential to affect seabirds at sea, out-with any SPA boundary, due to the mobile nature of the species. However, the proposed activities are considered extremely unlikely to result in any adverse effects on the FCS of sensitive ornithological receptors. This is concluded for the following reasons:

- No adverse effects on water quality are anticipated, as detailed in Section 6;
- 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 are subject to relatively high levels of vessel activity, predominantly associated with ferry and commercial vessel traffic. As such, the presence of the

installation vessels required to facilitate the cable installation will not constitute a substantive change from baseline vessel activity; and

- The 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		

9.4.2 Operation

The cable has been designed to be maintenance free, as such no planned ongoing maintenance activities are proposed. SHEPD will conduct routine inspections and surveys of the cable throughout its operational life to ensure it remains in good condition. There is a potential for remedial cable repair works to be required, in the event the cable is damaged or the need for additional stabilisation materials is identified during the routine surveys.

If required, impacts on ornithological receptors resulting from cable repairs will be analogous those occurring during construction, although significantly reduced on both spatial and temporal scales. As such, impacts during the operational phase are considered to be not significant.

9.5 Conclusion

The installation corridor is not located within 2 km of any SPA site, however due to the transient nature of seabirds could impact seabird when out-with SPA sites with disturbance to these species caused 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 and project specific information pertaining to marine archaeological sites on the coast of Scotland was conducted in order to inform this assessment. The key sources utilised were:

- BMC Survey Report (BMC, 2022a);
- UKHO wrecks database (UKHO, 2022);
- NMPi (2022); and
- Canmore Maritime records of marine losses (Canmore, 2022).

10.3 Baseline and Receptor Identification

There are no charted wrecks within the installation corridor and no wrecks were observed in the recent surveys (BMC, 2022a). However, there are 2 charted wrecks within 5 km of the installation corridor, as shown in Figure 10-1. These include:

- An unknown dangerous wreck located approximately 1.45 km (ID 94855) east of the corridor; and
- An unknown dangerous wreck located approximately 1.47 km (ID 87188) to the east of the corridor.

The next closest charted wreck is > 11 km away. In addition to the wrecks detailed above, the Canmore Maritime Records note several further reported losses or casualties in the vicinity of the of the installation corridor, but none within it. 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 corridors, although their presence (such as drifted debris) cannot be ruled out.

Figure 10-1 Sites of Wrecks in the Vicinity of the Installation Corridor (UKHO, 2021)

10.4 Impact Assessment

10.4.1 Installation

As detailed in Section 10.3, there are no known wrecks within the installation corridor, however, debris from wrecks cannot be ruled out solely from the available data. As such, the cable installation activities 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 operations, and the placement of stabilisation measures. 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.

However, as detailed in Section 4.3, preconstruction surveys will be undertaken to inform the final routing of the cable. This will allow sites of potential archaeological significance to be identified prior to the cable being installed. 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.

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) could 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 such as wrecks (vessel/aircraft etc.) within the installation corridor cannot be ruled out, although it is thought to be unlikely. If such a site is present, and were disturbed or destroyed by the installation activities, it would have a significant adverse effect on the historic record. Through the implementation of appropriate mitigation, this risk can be designed out during detailed route engineering, making it extremely unlikely that adverse impacts will occur.		
Sensitivity / value	Magnitude of effect	Level of impact
High	Negligible	Minor
Impact significance – NOT SIGNIFICANT		

10.4.2 Operation

The cable has been designed to be maintenance free, as such no planned ongoing maintenance activities are proposed. SHEPD will conduct routine inspections and surveys of the cable throughout its operational life to ensure it remains in good condition. There is a potential for remedial cable repair works to be required, in the

event the cable is damaged or the need for additional stabilisation materials is identified during the routine surveys.

If required, impacts on archaeological receptors resulting from cable repairs will be analogous those occurring during construction, although significantly reduced on both spatial and temporal scales. As such, impacts during the operational phase are considered to be not significant.

10.5 Summary

The publicly available data could not rule out the possibility that features of archaeological significance may be present within the installation corridor. As such, it was determined that the proposed cable installation activities have the potential to result in significant adverse effects on the historic record. However, following the implementation of the mitigation measures, it is considered to be extremely unlikely that the cable installation activities would result in the loss or damage of archaeological features. As such this assessment concludes that the proposed activities will not result in any adverse impacts on the historic record.

11 UNEXPLODED ORDNANCE (UXO)

11.1 Introduction

During both World Wars a large amount of ordnance, both offensive and defensive, was used in the seas around the mouth of Loch Broom.

UXO are explosive weapons (bombs, shells, grenades, land mines, naval mines, cluster munition, and other munitions) that did not explode when they were employed and still pose a risk of detonation, sometimes many decades after they were used or discarded. UXO exist worldwide and poses a potentially lethal threat in any area in which they are present. The inherent dangers associated with UXO can largely be attributed to the deterioration of the detonator and main charge, which makes these already volatile components more sensitive to disturbance such as heat, shock and/or friction.

11.2 Data Sources

As part of the route engineering process, 6 Alpha (a UXO consultancy) was enlisted to provide a UXO threat and risk assessment within the area.

11.3 Baseline and Receptors

Background UXO threats may have been generated by nearby modern military training activities, as well as due to historic aerial bombing in the wider area, though such prospective threats are purely precautionary posing only a residual background level of UXO threat. 6 Alpha has confirmed that the primary source of potential UXO contamination threat is driven by post-World War 2 (WWII) naval training, with the proposed installation works area situated within the boundaries of a large submarine exercise area. This submarine exercise area has been used by the UK and North Atlantic Treaty Organisation (NATO) forces to undertake torpedo firing and mine hunting exercises previously, although these are likely to have occurred in open areas of water as opposed to within Loch Broom and near to commercial fishing operations operating from Ullapool harbour.

6Alpha have concluded that the nature and scope of the UXO risks are categorised consistently as 'low' at the installation works area, based upon a source-pathway-receptor review, as well as the prospective consequences of initiating UXO and an analysis of the probability of encountering and of initiating UXO, in particular.

Therefore, it is considered highly unlikely that UXO will be encountered during the cable installation activities at Ullapool, within the confines of Loch Broom. The current UXO risk rating at the site has therefore been determined to be 'low'.

6 Alpha recommend that the UXO risks associated with cable installation operations, and any subsequent potential seabed intrusive operations, are further mitigated – within the bounds of the As Low as Reasonably Practicable (ALARP) risk reduction principle and in accordance with national laws - through the implementation of a proportionate and cost-effective risk mitigation strategy, which in this instance is likely to consist of limited proactive and reactive risk mitigation measures. SHPED will ensure the above is implemented.

If UXO were to be encountered they would be avoided. As such, there will be no UXO clearance associated with the proposed activities.

11.4 Impact Assessment

11.4.1 Installation

As detailed in Section 11.3, 6Alpha have concluded that the nature and scope of the UXO risks are categorised consistently as 'low' at the installation works area, based upon a source-pathway-receptor review, as well as the prospective consequences of initiating UXO and an analysis of the probability of encountering and of initiating UXO, in particular.

However, as detailed in Section 4.3, preconstruction surveys will be undertaken to inform the final routing of the cable. This will allow detection of UXO in the area; however, this is very unlikely. In addition, if UXO were to be encountered they would be avoided and SHEPD would follow the reporting protocol for accidental discoveries. As such, there will be no UXO clearance associated with the proposed activities.

Assessment of impact significance The presence of UXO in the area is regarded as very unlikely. If a UXO was present it would be avoided at all costs with no clearance expected to take place as part of the proposed installation activities. If a UXO were to be observed, it would also be recorded and documented to enable valuable information to be available as and when future activ8ties in the area take place. Through the implementation of appropriate mitigation, this risk can be designed out during detailed route engineering, making it extremely unlikely that adverse impacts will occur.		
Sensitivity / value	Magnitude of effect	Level of impact
High	Negligible	Minor
Impact significance – NOT SIGNIFICANT		

11.4.2 Operation

The operation of the cable will not result in any interaction with UXO, as such no further consideration is provided.

11.5 Summary

6Alpha have concluded that the nature and scope of the UXO risks are categorised consistently as 'low' at the installation works area, based upon a source-pathway-receptor review, as well as the prospective consequences of initiating UXO and an analysis of the probability of encountering and of initiating UXO, in particular.

12 COMMERCIAL FISHERIES AND OTHER SEA USERS

12.1 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 for each submarine electricity cable, thus enabling co-existence with other marine users as SHEPD and their Contractors carry out the cable installation 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 (FLMAP) – Aultbea - Ullapool. 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 activities and provides updates when things change.

12.2 Supporting Documents

12.2.1 FLMAP Aultbea - Ullapool

The purpose of *The FLMAP Aultbea - Ullapool* 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 installation activities is given in Chapters 6, 7 and 8 of the FLMAP.

12.2.2 High Level Navigation Risk Assessment

A targeted Marine Traffic Survey (MTS) has been undertaken to describe the relevant shipping and navigation and marine traffic baseline. Relevant baseline marine traffic conditions have been established by undertaking a review of historic Automatic Identification System (AIS) data for a 5 nautical mile corridor (study area) around the proposed installation corridor. The IMO requires that all ships of ≥ 300 gross tonnage engaged on international voyages, cargo vessels of ≥ 500 gross tonnage not engaged on international voyages, and all passenger ships regardless of size built on or after 1st July 2002, are fitted with an AIS.

The proposed cable and all associated works, including the study area extent are fully contained within the Ullapool Harbour limits, situated in Loch Broom. The harbour area covers 67.3 km^2, providing deep water anchorage for large vessel such as cruise liners and drill ships.

Ullapool is also the mainland port for ferry services to the Isle of Lewis in the Western Isles, with passenger vessels, particularly Ro-Ro/Passenger ships, accounting for the largest proportion of vessels within the harbour limits

(almost 60% of track lines within in the AIS data – refer to Section 4.2. in the Navigational Risk Assessment document).

A total of 5,563 and 2,859 vessel tracks were recorded within the 5 nautical mile study area and cable corridor between the dates 28th April 2021 and 27th April 2022, respectively. These tracks were associated to 227 unique vessels, and 885 unique routes based on previous and next port information captured in the AIS data. The summer months (June, July, and August) were the busiest, accounting for 34% (1,870 tracks) and 36% (1,025 tracks) of the total number of vessels with the study year for the 5 nautical mile study area and cable installation corridor, respectively. Winter observed the smallest number of vessels, accounting for 18% (995 tracks) and 17% (429 track) of the total number of tracks within the 5 nautical mile study area and cable installation corridor, respectively.

Further information and details relating to the vessel track within the Loch Broom area can be found within the 'Aultbea – Ullapool: Loch Broom Subsea Cable Installation – High Level Navigational Risk Assessment'. In conclusion, the Aultbea to Ullapool cable installation corridor passes through well trafficked and marked navigation channel, predominantly carrying vessels in and out of Ullapool harbour. Therefore, the slow-moving cable installation vessels, which will be limited in their ability to manoeuvre, crossing perpendicular to the channel represents a potential hazard and/or impact to shipping in the area. That said, the assessment determined that all risks to navigation associated with the development are considered ALARP.

12.2.3FLMAP Delivery Programme

The *FLMAP Delivery Programme* sets out how the Company Fisheries Liaison Officer (CFLO) and Fishing Industry Representative (FIR) will communicate during the installation activities 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.

12.2.4 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 activities and follow on from the recent consultations with fishermen in 2021 and into 2022.

12.3 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 12-1 below.

Table 12-1 Summary of Mitigation for Commercial Fisheries and Other Sea Users

Measure	Details
Avoidance of Trawling and anchoring	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. Demersal trawling is prohibited within the Wester Ross MPA.
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 and Recommended Clearance Zone (RCZ) of 500 m	A guard vessel, marshalling a 500 m RCZ, may be used during the installation campaign where a potential risk to the asset or danger to navigation has been identified.
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.
Proactive engagement with Ullapool Harbour Trust.	Ongoing consultations with Ullapool harbour authority ensure continued awareness and communication of installation and harbour specific details relevant to minimising disruption.
Proactive engagement with regular runners including Calmac ferry operator.	Engagement with regular runners and specifically Calmac ensures awareness of the installation details which minimises disruption.

Measure	Details
Deconfliction of activity schedules with Calmac ferry schedule.	Installation maintenance and decommissioning schedules arranged to minimise impact on ferry schedules. This may extend to working in night-time hours where practicable.

13 CONCLUSIONS

The MEA supports SHEPD's application for a Marine Licence to complete the required cable installation activities between Aultbea and Ullapool. It provides a robust assessment of potential impacts of the cable installation activities on groups of sensitive environmental receptors (Sections 5 – 12). 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 activities have been carried out for the following receptors:

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

Table 13-1 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 – 12, and the embedded mitigation requirements discussed in Section 4.3, it is anticipated that the cable installation activities, will be conducted without significant impact on any relevant environmental receptor.

Table 13-1 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 with cetaceans as a qualifying feature *(Inner Hebrides and Minches SAC)*	No LSE	Due to the temporary and localised nature of the proposed cable installation activities, no LSE is predicted on the conservation objectives of any protected site and as such it is not expected that an AA will be required. Overall, the installation of the power cable constitutes work of an overriding public need whilst presenting a trivial and temporary disturbance in a limited area. Therefore, no LSE are expected from the cable installation 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 – 12.	No LSE
	SAC with seabed / benthic features as a qualifying feature *(Wester Ross 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. This will result in highly localised and temporary increases in suspended sediment which will not have a significant impact on coastal water quality. Best practice will be followed by all installation vessels, therefore the likelihood of an accidental hydrocarbon release from one of the installation vessels 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
	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 is considered the impact mechanism most likely to affect marine megafauna in the proposed area of activities. Noise modelling used to inform the assessment, presented in Appendix A, demonstrates no realistic risk of injury to any species exists resulting from USBL operations. While there may be some disturbance, 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 marine mammals 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 this. 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 cetacean species, and no mitigation is proposed for USBL operations. The risk of injury or disturbance of basking sharks resulting from the cable installation vessels is minimal. This is due the low prevalence of the species in the vicinity of the installation corridor, the fact that vessels will be slow moving and not constitute a change from baseline vessel activity, and adherence to the SMWWC. No adverse effects on the FCS of basking sharks are expected. However, a basking shark derogation licence will be sought, since the risk disturbance cannot be entirely ruled out. Considering the transitory nature of the activities, there are not anticipated to be any significant impacts to individuals or populations of marine megafauna in the area.	Not Significant	No additional mitigation measures identified. See Section 4.3 for embedded mitigation requirements.	Not Significant
	Injury or Disturbance of Basking Sharks from Vessel Presence	Minor				

Environmental Receptor Group	Assessment Undertaken	Level of Impact	Assessment Outcome	Overall LSE / Impact Significance	Additional Mitigations Measures Identified	Post Mitigation Impact
Benthic and Intertidal Ecology (Section 8)	Direct Loss of/ Disturbance to Benthic Habitats and Communities	Minor	Physical disturbance through seabed preparation, landfall excavation activities, cable laying activities, smothering of benthic habitat and species via sediment re-suspension and settlement are likely to occur within the footprint of the proposed works. As discussed in Section 5.3.6, the cable installation corridor transects the Wester Ross NCMPA designated for various species including, but not limited to, protected species of maerl (a pink seaweed), flame shell beds and northern feather star. Such features may lie within the subtidal area. The effects on these habitats and associated network fauna are expected to be highly localised and temporary. Consequently, impacts to habitats are expected to be small with 0.084km^2 of the seabed expected to be disturbed by the proposed installation activities. Additionally, the expected disturbance to the associated species is likely to be impacted on an individual's basis and not likely to impact communities at a population level. Therefore, it is not likely for significant impacts on the benthic and intertidal ecology to occur.	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				
Ornithology (Section 9)	SPA within 2 km of the cable installation corridor and installation being in summer months	Minor	The proposed installation works may be conducted during the summer months, and therefore may fall within certain seabird breeding seasons where ornithological receptors are generally more sensitive. The cable installation corridor is not located within 2 km of any SPA or pSPA. However, the proposed activities could cause disturbance to seabird species out-with the SPA sites due to the transient nature of the species. Potential impacts could be caused through vessel presence. However, given the transient, temporary and localised nature of the activities 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. As such, it was determined that the proposed cable installation activities have the potential to result in significant adverse effects on the historic record if such sites were observed in the area out-with what is publicly stated. However, following the implementation of the mitigation measures outlined in Section 0, it is extremely unlikely that the cable installation activities 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 (drifted debris) 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

Environmental Receptor Group	Assessment Undertaken	Level of Impact	Assessment Outcome	Overall LSE / Impact Significance	Additional Mitigations Measures Identified	Post Mitigation Impact
UXO (Section 11)	Assessment of impacts on potential UXO within the area.	Minor	The assessment conducted by 6Alpha concluded that the nature and scope of the UXO risks are categorised consistently as 'low' at the installation works area, based upon a source-pathway-receptor review, as well as the prospective consequences of initiating UXO and an analysis of the probability of encountering and of initiating UXO, in particular.	Not significant	if UXO were to be encountered they would be avoided and SHEPD would follow the reporting protocol for accidental discoveries. As such, there will be no UXO clearance associated with the proposed activities.	Not significant
Commercial Fisheries and Other Sea Users (Section 12)	Assessment of impacts on commercial fisheries and other sea users has been presented in FLMAP Aultbea and Ullapool and the Aultbea – Ullapool: Loch Broom Subsea Cable Installation – High Level Navigational Risk Assessment'	Not – significant as per FLMAP	The cable installation activities have the potential to disrupt commercial fisheries and other legitimate sea users such as those associated with Ullapool harbour. 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 12.	Not – significant as per FLMAP	Additional mitigation measures identified are provided in the supporting documents in Section 12. 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 support vessel or 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.

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 ($SPL_{Peak;}$ also called the source level) and cumulative Sound Exposure Level (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 μPa^2s)	Cumulative SEL (dB re 1 μPa^2s)
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

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.

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).

Behavioural Effect	Threshold Criteria SPLrms
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[5] and dip angle[6]. 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 0º azimuth).

1.3 Injury Impacts

The expected frequency range for USBL overlaps with the hearing range of all cetacean hearing groups (Section 7.4 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.

[5] 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.

[6] 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)[7]	Frequency (kHz)	Source Level SPLPeak (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	-	-	-	-

[7] 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). Further, 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 surveys themselves will take place while the vessel is moving, the cumulative SELs of all equipment types are 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 survey 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 survey 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 1-4).

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 each survey activity.

Table 1-5 Noise 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%
White-Beaked 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, bottlenose dolphin and white beaked 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 survey and vessel 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 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 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.