

SCOTTISH HYDRO ELECTRIC POWER DISTRIBUTION PLC

Marine Environmental Appraisal

Mainland Orkney - Shapinsay Distribution Cable Replacement



DOCUMENT RELEASE FORM

Scottish Hydro Electric Power Distribution plc

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Marine Environmental Appraisal

Mainland Orkney - Shapinsay Distribution Cable Replacement

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GLOSSARY

AIS

Automatic Identification Systems

BAP

Biodiversity Action Plan

BSH

Broadscale Habitat

BSL

Benthic Solutions Limited

CEMP

Construction Environmental Management Plan

CES

Crown Estate Scotland

COLREGs

International Regulations for the Prevention of Collision at Sea 1972

CPP

Construction Phase Plan

EMEC

European Marine Energy Centre

EPA

Environment Protection Agency

EIA

Environmental Impact Assessment

EUNIS

European Nature Information System

FEAST

Feature Activity Sensitivity Tool

FLMAP

Fisheries Liaison Mitigation Action Plan

FLO

Fisheries Liaison Officer

FIR

Fishing Industry Representatives

HMPA

Historic Marine Protected Area

ICES

International Council for Exploration of the Sea

ICG-C

OSPAR Intersessional Correspondence Group on Cumulative Effects

INNS

Invasive Non-Native Species

JNCC

Joint Nature Conservation Committee

kV

kiloVolt

KIS-ORCA

Kingfisher Information Service - Offshore Renewable & Cable Awareness project

LAT

Lowest Astronomical Tide

MarLIN

The Marine Life Information Network

MARPOL

The International Convention for the Prevention of Pollution from Ships

MCA

Maritime and Coastguard Agency

MCCA

Marine and Coastal Access Act

MCS

Marine Conservation Society

MD-LOT

Marine Directorate Licensing Operations Team

MEA

Marine Environmental Appraisal

MHWS

Mean High Water Springs

MLWS

Mean Low Water Springs

MMO

Marine Mammal Observer

MPS

Marine Policy Statement

NMP

National Marine Plan

NRHE

National Record of the Historic Environment

NSTA

North Sea Transition Authority

OFA

Orkney Fisheries Association

OIMD

Operation, Inspection, Maintenance and Decommissioning

OIRMP

Orkney Islands Regional Marine Plan

OOS

Out of Service

OSPAR

Oslo and Paris Convention for the Protection of the Marine Environment of the North-East Atlantic

PAD

Protocol for Archaeological Discoveries

PAM

Passive Acoustic Monitoring

pUXO

Potential Unexploded Ordnance

PAC

Pre-Application Consultation

PEXA

Practice and Exercise Area

PMF

Priority Marine Feature

PLGR

Pre-Lay Grapnel Run

pUXO

Potential Unexploded Ordnance

SFF

Scottish Fishermen's Federation

SHEPD

Scottish Hydro Electric Power Distribution plc

SMWWC

Scottish Marine Wildlife Watching Code

SOLAS

International Regulations for the Safety of Life at Sea 1974

SOPEP

Shipboard Oil Pollution Emergency Plans

SOP

Standard Operating Procedures

SSE

Scottish and Southern Energy plc

MARPOL

The International Convention for the Prevention of Pollution from Ships

UK

United Kingdom

UKHO

United Kingdom Hydrographic Office

UXO

Unexploded Ordnance

ZoI

Zone of Influence

1. INTRODUCTION

Scottish Hydro Electric Power Distribution plc (SHEPD), part of the Scottish and Southern Energy plc (SSE) group of companies, holds a licence under the Electricity Act 1989 for the distribution of electricity in the north of Scotland including the islands. This region covers a quarter of the total United Kingdom (UK) landmass, with electricity being delivered to 740,000 customers. In the marine environment SHEPD maintains connections to 60 Scottish islands with over 100 subsea cable links totalling approximately 454km. SHEPD 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.

1.1 Purpose of this document

The purpose of this Marine Environmental Appraisal (MEA) is to support a Marine Licence application being made under the Marine (Scotland) Act 2010 and The Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013, by SHEPD, for the replacement of the Mainland Orkney – Shapinsay submarine electricity distribution cable (referred to hereafter as the Orkney – Shapinsay cable). Following consultation with Marine Directorate Licensing Operations Team (MD-LOT) it was confirmed on 15 August 2023 that this project is exempt from the formal Pre-Application Consultation (PAC) process, however stakeholder consultation has been undertaken on an ongoing basis. MD-LOT granted an exemption to the PAC process, based on the proximity to the existing cable and description of the works provided. MD-LOT have informed SHEPD that they will treat this as an activity which has been previously carried out at the site, or a similar site, to which the application relates and for which a licence has been previously granted.

This MEA provides the baseline information and an assessment of the potential impacts on sensitive environmental receptors. Where potentially significant adverse effects have been identified, appropriate mitigation has been detailed to reduce the magnitude of effect to an acceptable level. The mitigation requirements identified by this MEA are also included in the supporting marine Construction Environmental Management Plan (CEMP), to ensure they are effectively disseminated to, and implemented by SHEPD and the cable installation contractor during the proposed works.

1.1.1 Objectives and scope of the Marine Environmental Appraisal

This MEA Report provides an overview of the baseline environment within the proposed Application Corridor (a 250m wide corridor within which the cable will be installed). The baseline environment includes physical and biological processes, and the human environment. The MEA identifies and assesses potential impacts from the proposed installation activities. A series of supporting documents are available for the Project which will be drawn upon or referenced throughout this MEA (listed in Table 1-1).

Table 1-1 Supporting documents for the Marine Licence application

Appendix	Document
A	Mainland Orkney – Shapinsay Distribution Cable Replacement Project Description (P2663_R6269)
B	Mainland Orkney – Shapinsay Distribution Cable Replacement Navigational Risk Assessment (NRA) (P2663_R6275)
C	North Coast and Orkney Fisheries Liaison Mitigation Action Plan (FLMAP) 2021
D	North Coast and Orkney EPS and Protected Sites and Species Risk Assessment

Appendix	Document
E	Orkney – Shapinsay (Marine) Construction Environmental Management Plan (CEMP) (P2663_R6267)

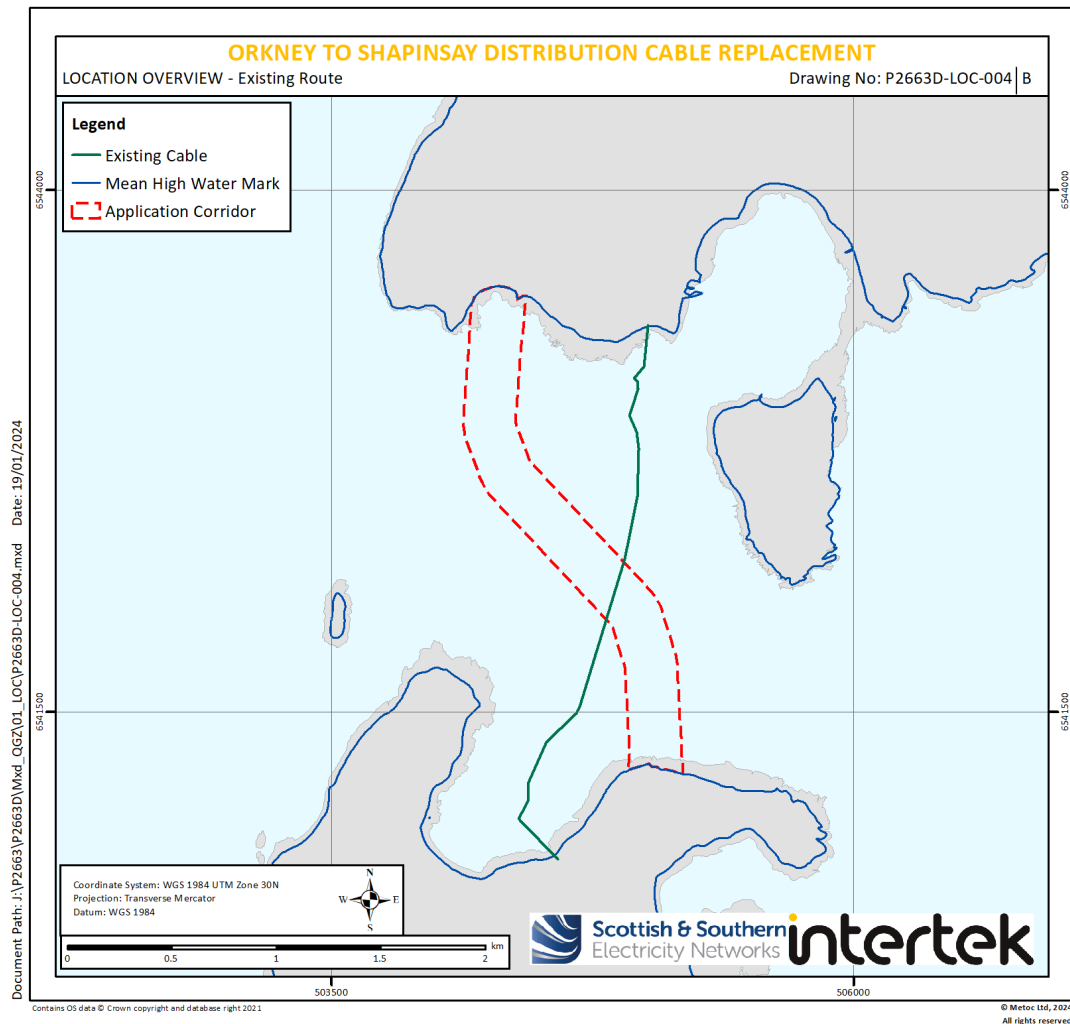
1.2 Overview of the project

The electricity networks of Shapinsay are connected to Orkney via an approximately 2,900m long cable operating at 33 kilovolt (kV), the landfalls of this cable are a beach south of Balfour, Shapinsay and the Bay of Carness, Orkney.

The present Orkney – Shapinsay subsea cable is a 70mm Ethylene Propylene Rubber steel wire armoured cable manufactured in 1993. The cable has been identified as requiring replacement as part of the Electricity Distribution 2 Price Control Period which runs from 2023 – 2028. SHEPD, therefore, propose to replace the existing Orkney – Shapinsay subsea cable.

The existing landfalls will not be reused for the new cable, instead new landfalls to the east on Orkney and the west on Shapinsay of the existing cable have been identified, and the new application corridor will cross the existing cable. An overview of the existing and proposed Orkney - Shapinsay cable replacement route is shown in Figure 1-1 (Drawing reference: P2663D-LOC-001).

Figure 1-1 Overview of the proposed replacement cable application corridor [Drawing Ref: P2663D-LOC-001]



1.3 Consideration of alternatives

Alternative landfall sites were assessed as possibilities for the Orkney – Shapinsay replacement cable, as the landfalls used for the original cable were not considered viable for an additional cable. No additional locations at the Head of Work landfall on Orkney were identified due to the rocky shoreline which is further obstructed by steep slopes and cliffs. An additional landfall was identified on Shapinsay at Doocot Point, however due to the presence of a water main at the landfall that would restrict installation activities the landfall at Twi Ness was selected.

1.4 Exclusions from assessment

This assessment covers the marine cable installation activities related to the replacement of the cable below Mean High Water Springs (MHWS). SHEPD realise that there is a need to consider options regarding potential future activities relating to maintenance and/or future decommissioning of the cable, which is the subject of the present application, specifically whether at the end of its' operational life it shall be removed or left *in situ*. A separate Operation, Inspection, Maintenance and

Decommissioning (OIMD) Strategy has been developed as a supporting document to this application which presents SHEPD's proposed approach to these aspects at this point in time.

Geophysical survey operations including, pre, during and post installation may 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-00010157; and a Basking Shark Derogation Licence Reference - BS-00010158. As such no geophysical survey operations are included within the scope of this MEA.

1.5 Consultation

1.5.1 Fisheries

SHEPD have engaged with both the Scottish Fishermen's Federation (SFF) and the Orkney Fisheries Association (OFA) throughout 2023 to communicate the progress of the Project and the planned survey and installation timescales.

1.5.2 Orkney Harbour Authority

A meeting was held with Orkney Harbour Authority in December 2023 to present the findings of the Navigational Risk Assessment (NRA) for the Orkney – Shapinsay cable. Communication regarding the progress of the Project will continue when further details are available regarding the installation dates.

1.5.3 NatureScot

Consultation with NatureScot has taken place on a regular basis throughout 2023 regarding the Orkney – Shapinsay project. NatureScot advised the Project of receptor sensitivities along the Application corridor, including seal haul outs, populations of otter, and breeding red throated diver and non-breeding great northern diver in the North Orkney Special Protection Area (SPA). NatureScot were also kept informed of the marine survey campaign that took place in August and September 2023.

1.5.4 Marine Scotland

SHEPD have held meetings with Marine Scotland (now known as the Marine Directorate) throughout 2023 to update on the planned submission of the Marine Licence application and to identify if PAC was required for the application. This was confirmed via email as discussed in Section 1.1.

1.5.5 Orkney Islands Council

A meeting was held with Orkney Islands Council on 9th October 2023 to update the Council on project progress and requirements for consultation during the Marine Licencing process. Orkney Islands Council have also been kept informed of project progress throughout 2023.

1.5.6 Royal Society for the Protection of Birds (RSPB)

RSPB have been kept informed of the progress of the Project, with SHEPD providing regular updates throughout 2023. RSPB were provided with initial project information and the marine survey campaign progress.

1.5.7 Northern Lighthouse Board

SHEPD have held two meetings with the Northern Lighthouse Board in 2023 to provide updates on the current progress of the Orkney – Shapinsay cable among others.

1.5.8 Maritime and Coastguard Agency (MCA)

A meeting was held in August 2023 to advise the MCA of the expected date of the Marine Licence application.

1.5.9 European Protected Sites and Species Risk Assessment

A European Protected Species (EPS) and Protected Sites and Species Risk Assessment was prepared prior to commencement of surveys to support application for an EPS Licence and a Basking Shark Licence. This assessment has been subsequently updated to include cable replacement installation operations and forms the basis of this assessment (Appendix D).

2. LEGISLATION AND POLICY

2.1 Introduction

This Section describes the key relevant policy, legislation and guidance which relates to the proposed cable installation activities and explains how and where these have been considered in the production of this MEA. This Section outlines the statutory legislation which SHEPD must adhere to during the installation and operation of the replacement distribution cable.

2.2 UK Marine Policy Statement

Prepared and adopted for the purposes of Section 44 of the Marine and Coastal Access Act (MCAA) 2009, the UK Marine Policy Statement (MPS) was published to provide a framework for preparing marine plans and making effective decisions affecting the marine environment (HM Government, 2011). The MPS applies to all UK waters and has been adopted by the UK government and all devolved administrations, with all regional and national plans required to conform to the MPS. The MPS also states that in relation to energy infrastructure several factors must be considered when any decision makers are examining and determining applications. Of these factors, one is relevant to this Project:

- The national level of need for energy infrastructure, as set out in the National Planning Framework which applies in Scotland.

2.3 Marine (Scotland) Act 2010

The Marine (Scotland) Act 2010 gained Royal Assent in 2010 and provides the legal mechanism to help protect Scotland's coastal and territorial waters through new and improved management systems (Scottish Parliament, 2010). The act comprises five key elements, which are:

1. A Strategic Marine Planning System;
2. Streamlined Marine Licensing System;
3. Improved Marine Nature Conservation Measures;
4. Improved Measures for the Protection of Seals; and
5. Improved Enforcement Measures.

Installation and operation of submarine cables in Scottish waters requires a Marine Licence under Part 4 of the Marine (Scotland) Act (Scottish Parliament, 2010).

2.4 Marine Licence and supporting information requirements

Submarine cables do not require an Environmental Impact Assessment (EIA) to be conducted as they are not listed under Schedule A1 or A2 of The Marine Works (EIA) (Amendment) Regulations 2017 (HM Government, 2017).

Marine Scotland advise that a Marine Licence applicant should consider the scale and nature of the submarine cable project and consider the need for a proportionate environmental assessment. This should also include the extent to which an activity is in accordance with any marine plan for the area. Where there exists the potential for the environment, human health, legitimate uses of the sea or designated sites (i.e. Emerald Network (Natura) or Marine Protected Area (MPA)) to be impacted by the Project, Marine Scotland recommends that these impacts should be assessed (Marine Scotland, 2015). The results of the assessment, along with other supporting information such as a cable-route study and cable-burial plan (if required), should be provided to Marine Scotland to support the Marine

Licence Application. This MEA report presents an overview of the baseline environment and provides the necessary environmental assessment to support the Marine Licence Application through consideration of the potential impacts of the project to the marine environment.

2.5 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 (also known as the ‘Habitats Regulations’) transposed the European Habitats Directive (92/43/EEC) and Birds Directive (79/409/EEC) into Scottish law. The Habitats Regulations enshrine the Habitats Regulations Appraisal (HRA) process in law, requiring that any proposal which has the potential to result in a negative Likely Significant Effect (LSE) to a European site or its designated features be subject to HRA, and if necessary Appropriate Assessment (AA). The regulations also make it an offence to deliberately or recklessly capture, kill, injure harass or disturb a European Protected Species (EPS). When European protected species are present, licences to permit works that will affect them can only be granted when:

- There is no satisfactory alternative; and
- The action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

The regulations were amended further in 2019 following the UK leaving the European Union (EU), by the Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019 (Scottish Government, 2019).

2.6 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 or disturb 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 until consultation is undertaken with NatureScot. 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.

2.7 Protection of Seals (Designated Sea Haul-out Sites) (Scotland) Order 2014

The Protection of Seals (Designated Sea Haul-out Sites) (Scotland) Order 2014 (made in exercise of the power conferred by section 117 of the Marine (Scotland) Act 2010) made it an offence to harass a seal (intentionally or recklessly) at a designated haul-out site, with the Order designating 194 such sites around the Scottish coastline. A haul-out site is defined as a location on land where seals come ashore at times to rest, breed, have pups or moult. Section 117 of the Marine (Scotland) Act 2010, in conjunction with this Order, is designed to offer protection to seals on land, when they are at their most vulnerable.

2.8 Scotland's National Marine Plan

Adopted by the Scottish Government in March 2015 (Marine Scotland, 2015), the Scotland's National Marine Plan (NMP) establishes policies and objectives to enable the sustainable development and management of Scotland's marine resources, in both Scottish inshore (out to 12nm) and offshore waters (12 to 200nm). The NMP details 21 general policies that are applicable to all future developments and uses within Scottish waters. Relevant policies to this Project include, but are not limited to: GEN 1, GEN 2, GEN 4, GEN 13, GEN 15, GEN 18 and GEN 12.

These general policies are supplemented by sector-specific policies, enabling policies and objectives to be targeted at particular industries. With regards to this Project, the two most relevant sectoral policy sections are sea fisheries (due to the potential impacts to local fishermen) and submarine cables.

2.8.1 Sea fisheries

The Sea Fisheries chapter of the NMP details five marine planning policies that should be taken into account when developing within the vicinity of areas used for fishing purposes. Of these five, three are relevant to this Project. These are: Fisheries 1, Fisheries 2 and Fisheries 3.

2.8.2 Submarine cables

Relevant objectives to this Project listed in the NMP regarding submarine cables include:

- Protect submarine cables whilst achieving successful seabed user co-existence;
- Achieve the highest possible quality and safety standards and reduce risks to all seabed users and the marine environment; and
- Support the generation, distribution, and optimisation of electricity from traditional and renewable sources to Scotland, UK and beyond.

In addition to these objectives, the NMP details four planning policies to be considered in the development of new submarine cable projects. These are: Cables 1, Cables 2, Cables 3 and Cables 4.

2.8.3 Shipping, ports, harbours and ferries

The Transport section of the NMP details Transport policies that should be taken into account when within the vicinity of areas used for shipping and transport. The relevant objectives to this Project listed in the NMP regarding submarine cables include Transport 1 and Transport 6.

2.9 Scottish marine regions

After multiple years of public consultation and specialist studies establishing the support for, and potential areas of marine regions in Scottish waters (Scottish Government, 2015), the Scottish Marine Regions Order 2015 came into force on the 13th of May 2015 and details the boundaries of the final 11 Scottish marine regions (Scottish Government, 2015). The Project is in Orkney Islands region. Regional Marine Plans will be developed by Marine Planning Partnerships, allowing more local ownership and decision making about specific issues within their area. Within these marine regions, Regional Marine Plans will be developed by Marine Planning Partnerships. These partnerships will comprise of groups of local marine stakeholders, allowing for more focused decision making by the local community to target the issues specific to each marine region.

Regional Marine Plans: The National Marine Plan sets the wider context for planning within Scotland, including what should be considered when creating local, regional marine plans. Eleven Scottish Marine Regions have been created which cover sea areas extending out to 12 nautical miles. Regional Marine Plans will be developed in turn by Marine Planning Partnerships, and this is an evolving process, being taken forward in phases. This Project will lie within the Orkney Islands marine plan jurisdiction once the plan is implemented.

2.9.1 Orkney Islands Regional Marine Plan

The Orkney Islands Regional Marine plan (OIRMP) aims to provide a statutory policy framework for public authorities, including regulators, planners and other decision makers to make decisions on sustainable development and activities across the Orkney Islands. Mirroring the approach taken for the National Marine Plan and the Shetland Draft Regional Marine Plan, the OIRMP relates directly to decision making and the consideration of use in the marine environment. The OIRMP is not yet drafted but when it is it will be made in accordance with the National Marine Plan and will appropriately align with the relevant aspects of the National Planning Framework.

2.10 Marine Wildlife Watching Code

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 in light of recent legislation. The Code isn't a law or a regulation, its main purpose is to raise awareness and offer practical guidance for responsible marine wildlife watching. The Code aims to:

- Help minimise disturbance to marine wildlife;
- Helps the public and organisations to enjoy watching marine wildlife;
- Improve the chances of seeing wildlife;
- Provide a standard for the wildlife watching industry; and
- Help you to stay within the law.

Prior to operations taking place all vessel crew will be made aware of all protected species within the marine environment through the following guidance; the Marine Conservation Society (MCS) Basking Shark Code of Conduct and good practice measures for boat control near basking sharks and the Scottish Marine Wildlife Watching Code and Guide to Best Practice for Watching Marine Wildlife. More information on this is provided in the Construction Environmental Management Plan (CEMP) (Appendix E).

3. PROJECT DESCRIPTION

This Section provides an overview of the activities associated with installation of the replacement cable and management of crossings of other cables across the route. A detailed project description is provided in Appendix A to this MEA.

The Orkney – Shapinsay cable is located in the Shapinsay Sound, Scotland. The replacement cable is approximately 2.84 kilometres (km) in length and routes from the beach at Work, Orkney to Twi Ness, Shapinsay. The proposed replacement cable will cross the existing Orkney – Shapinsay and an out of service (OOS) cable identified during the survey, approximately 300m from the Orkney coast. The route will be micro-routed around any potential environmental and technical constraints as informed by pre-installation surveys.

The Application Corridor to be consented will be 250m wide (+/- 125m either side of the route centreline) to allow for flexibility in route engineering. The Application Corridor is shown in Figure 1-1 of this MEA, with the co-ordinates of the corridor being provided in Table 3-1.

Table 3-1 Application Corridor simplified co-ordinates

WGS 84 UTM Zone 30N	
Latitude DDM	Longitude DDM
59° 1.852'	-2° 55.368'
59° 1.691'	-2° 55.397'
59° 1.531'	-2° 55.422'
59° 1.430'	-2° 55.354'
59° 1.086'	-2° 54.737'
59° 1.052'	-2° 54.697'
59° 0.927'	-2° 54.622'
59° 0.858'	-2° 54.611'
59° 0.660'	-2° 54.591'
59° 0.620'	-2° 54.586'
59° 0.628'	-2° 54.861'
59° 0.676'	-2° 54.854'
59° 0.852'	-2° 54.872'
59° 0.891'	-2° 54.876'
59° 0.997'	-2° 54.938'
59° 1.049'	-2° 55.027'
59° 1.341'	-2° 55.554'
59° 1.490'	-2° 55.674'
59° 1.528'	-2° 55.684'
59° 1.693'	-2° 55.659'
59° 1.831'	-2° 55.643'
59° 1.852'	-2° 55.368'

A summary of the installation activities considered by this assessment is detailed below, with further detail provided in Appendix A of this MEA. The entire marine cable will be surface laid with cable stabilisation and protection measures employed, but burial is planned at both landfalls. The installation activities will comprise of:

- A Pre-Lay Grapnel Run (PLGR) which may be required prior to operations commencing to remove any boulders or debris which may cause abrasion/disturbance.
- Surface laying of subsea cable using a cable lay vessel (CLV) with onshore trenching to the Transition Joint Pit (TJP);
- Use of a remotely operated vehicle (ROV) and associated Ultra-Short Baseline (USBL) positioning systems for pre- and post- lay survey works;
- Use of articulated pipe in the intertidal and nearshore zones for cable protection and stabilisation;
- Use of rock bags, clump weights and rock anchors in the offshore zone for cable protection and stabilisation, and concrete earthing clump weights for the surface laid sections of earthing wires;
- Use of Uraduct and/or concrete mattresses for cable crossing management and/or cable stabilisation; and
- Associated vessel presence.

4. ASSESSMENT METHODOLOGY

4.1 Assessment criteria

The environmental assessment presented in this document reports on the impacts associated with the licensable activities of the cable installation process and presents its findings and conclusions. The key stages of the assessment process are listed as follows and align with the Institute of Environmental Management & Assessment (2004) guidelines which state, *“The assessment stage of the Environmental Impact Assessment (EIA) should follow a clear progression; from the characterisation of ‘impact’ to the assessment of the significance of the effects including the evaluation of the sensitivity and value of the receptors.”* (p11/2) (IEMA, 2004):

- Characterisation of the baseline environment;
- Establish potential impacts from the Project and Zone of Influence (Zol);
- Characterisation of the change in impact;
- Evaluation of significant of effects; and
- Establish mitigation.

Zols have been identified regarding the spatial extent over which the activities of the Project are predicted to have an impact on the receiving environment. These are referred to in topic chapters and identify the extent of assessment and include mobile species or mobile users of the sea with the potential to enter the Zol.

4.1.1 Pressure identification

Pressures are the mechanism through which an activity has an effect on any part of the ecosystem. The nature of the pressure is determined by the activity type, intensity and distribution. A list of marine physical/chemical and biological pressures and their definitions has been formally agreed by the OSPAR Intersessional Correspondence Group on Cumulative Effects (ICG-C) (OSPAR 2016) and has been used in this assessment. The ICG pressure list does not include human pressures, and therefore, categories have been developed based on industry experience. In order to identify the appropriate pressures on biological features the following guidance has been considered:

- JNCC Marine Pressures and Activity database (PAD v1.5) (JNCC 2022); and
- Feature Activity Sensitivity Tool (FEAST) for identifying the sensitivity of marine habitats and features to the effects of cable installation (Marine Scotland 2021).

Biological receptors which have protected status have been fully considered in Chapter 5 ‘Protected sites’ and summarised in the biological Sections of this MEA report.

The interaction of the Project with other sea users has been considered within Appendix C – Fisheries Liaison Mitigation Action Plan (FLMAP) and referred to accordingly in the human environment Sections of this MEA report.

4.1.2 Evaluation of significance

Effects only occur when an impact is present within an environment that is sensitive to it. An impact is the consequence of the pressure i.e. a predicted change in the baseline environment. The effect is the consequence of the impact and is usually measurable.

If appropriate, and typically based on the findings of supporting studies, pressures have been screened out for further assessment in the MEA. The screening decision and justification is provided in Section 4.4, Table 4-2.

In assessing the significance of the effect, the magnitude (the spatial extent of the impact, the duration and frequency) and sensitivity, recoverability and importance of the receptor are considered. The following definitions of significance, as adapted from the Environment Protection Agency (EPA) (2017) have been used in the assessment:

- Imperceptible – An effect capable of measurement but without significant consequences.
- Not Significant – An effect which causes noticeable changes in the character of the environment but without significant consequences.
- Slight – An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
- Moderate – An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
- Significant – An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
- Very Significant – An effect which, by its character, magnitude, duration or intensity alters most of a sensitive aspect of the environment.
- Profound – An effect which obliterates sensitive characteristics.

Effects which are Imperceptible, Not Significant and Minor typically do not require mitigation measures other than compliance with environmental statute and best practice. Effects which are classified as Moderate or above would typically be unacceptable without the implementation of project specific mitigation designed to avoid, abate or reduce the significance of the effect.

4.2 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 are presented in Table 4-1. 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 4-1 Embedded mitigation and best practice measures relevant to the project

ID	Measure	Details
EM1	Production of a Construction Environmental Management Plan (CEMP).	Measures will be adopted to ensure environmental impacts are minimised, and to reduce the potential for release of pollutants from installation works. This will be informed by the results of this MEA.
EM2	All project personnel will be trained and informed of their responsibility to implement the environmental and ecological mitigation outlined in the CEMP.	Toolbox talks, inductions, and awareness notices will be used to disseminate this information among all relevant project personnel.
EM3	Environmental planning.	The final cable route will be optimised as part of the final engineering design to avoid impacts on sensitive environmental features,

ID	Measure	Details
		including Annex I habitats and wrecks insofar as possible. Cable protection methods and quantities as well as anchor chain deployment will be carefully selected and considered to minimise any potential impact on environmentally sensitive habitats.
EM4	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.
EM5	Lighting on board 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.
EM6	Vessels will be travelling at a slow speed during installation works.	The slow speed of installation vessels (less than 4 knots) will minimise the risk of disturbance and injury impacts to seabird and marine mammal receptors.
EM7	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.
EM8	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 Giga Tonne (GT) and above must carry an oil prevention plan as per the norms and guidelines laid down by International Maritime Organization under MEPC (Marine Environmental Protection Committee) act. Production of this plan will help to ensure that the potential for release of pollutants from construction, operation and decommissioning is minimised.
EM9	Vessels will be equipped with waste disposal facilities (sewage treatment or waste storage) to IMO MARPOL Annex IV Prevention of Pollution from Ship standards.	Measures will be adopted to ensure that the potential for release of pollutants from installation vessels is minimised.
EM10	Ballast water discharges from vessels will be managed under International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (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 Invasive Non-Native Species (INNS) introduction during cable installation works is minimised.
EM11	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 (Appendix B).	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 including exclusions, dates and durations.

ID	Measure	Details
EM12	Notice to Mariners (including local), Kingfisher bulletins, and/or broadcast warnings will be promulgated in advance of any proposed works. The notices 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.
EM13	Compliance with International Regulations for the Prevention of Collision at Sea 1972 (COLREGs) and the International Regulations for the Safety of Life at Sea 1974 (SOLAS).	COLREGs 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.
EM14	As built survey data will be provided to the UK Hydrographic Office (UKHO) and Kingfisher for inclusion on Admiralty Charts and Kingfisher Information Service - Offshore Renewable & Cable Awareness project (KIS-ORCA) Awareness Charts.	Ensure navigational safety and minimise the risk and equipment snagging.
EM15	Marine Mammal Protection Plan.	All works will be undertaken in accordance with the Marine Mammal Protection Plan.
EM16	Stakeholder engagement.	Continuing effective positive liaison with all interested parties through the pre-construction, construction and operational phases of the cable replacement.
EM17	Communication of project details	Details of the schedule for cable lay activities to local ports, ship operators, fishermen and recreational sailing organisations will be communicated through Notice to Mariners and the Harbour Works Licence
EM18	Automatic Identification Systems (AIS) Tracking	The cable installation vessel has will have AIS as a legal requirement.
EM19	Safety zone	Implementation of safety zones (of up to 500m) around the cable lay vessel will reduce the risk of collision between the cable laying vessel and other vessels transiting the area.
EM20	Fishing Industry Representatives (FIR) and Standard operating procedures (SOP).	Should a FIR not be present on a vessel, the Fishing Gear Interaction Standard Operating Procedure (SOP) will be followed as outlined in the FLMAP.
EM21	Consultation.	Early consultation with relevant contacts to notify of impending activity.
EM22	Guard vessel (if required)	A guard vessel may be used where a risk to the asset or a danger to navigation has been identified.
EM23	Cable protection.	Appropriate cable protection to be installed as applicable along the cable route. Any cable protection installed will ensure any reductions to the navigable depth in the area are below 5%, as required by the MCA.

ID	Measure	Details
EM24	Avoidance over the cable.	Guidance provided by the UKHO and International Convention for the Safety of Life at Sea (SOLAS) recommend that fishing vessels should avoid trawling over installed seabed infrastructure (UKHO 2020). Vessels are advised in the Mariners Handbook not to anchor or fish (trawl) within 500 m of the cable.
EM25	Potential Unexploded Ordnance (pUXO).	If pUXO items are discovered during any phase of the project, the location of the item will be recorded, and immediate advice sought from relevant authorities. Munitions awareness briefings will be given to all relevant personnel.
EM26	Marine Archaeology Management Plan.	All works will be undertaken in accordance with the Marine Archaeology Management Plan.
EM27	Monitoring and Reporting Plan.	To ensure works are carried out as per legislation, consent and licence conditions and in line with the Employer requirement, monitoring and reporting of activities is to be undertaken in accordance with Monitoring and Reporting Plan.
EM28	Preinstallation equipment checks.	All equipment will be checked and recorded prior to the commencement of installation activities to ensure that following completion of the cable installation all equipment has been recovered. The list of checks is to be determined during the Hazard Identification and Risk Assessment (HIRA) process prior to commencement of the works.
EM29	Post installation equipment checks.	Upon completion of the cable installation operation, post installation equipment checks will be completed to confirm that all equipment has been recovered in its entirety and no unlicensed deposits in the marine environment result from the project operations. The list of checks is to be determined during the HIRA process prior to commencement of the works.
EM30	Rafting seabirds.	The installation vessel will be slow moving (less than 4 knots), which will allow any rafting birds time to disperse. When not completing operational activities, vessels will avoid bird rafts where operationally possible, and it is safe to do so.
EM31	Breeding and nesting birds.	For any nesting or protected breeding populations in close proximity to the Application Corridor or the landfall, further consultation will be undertaken with NatureScot on the requirement for any seasonal restriction to be implemented for cable installation in order to avoid disturbance to qualifying species.
EM32	Basking Shark Code of Conduct	All vessels will adhere to the Basking Shark Code of Conduct to minimise potential disturbance to basking shark.
EM33	Dropped objects	Licensees must report dropped object incidents to the nearest local coastguard station by telephone at the first opportunity. In instances where the dropped object poses a hazard to other mariners, a Notice to Mariners will be issued to alert relevant parties. To ensure other sea users are aware of any hazard, incidents must also be reported through a Marine Scotland Directorate – DROPOB1 - Offshore Wind & Marine Renewables Dropped Objects Form.
EM34	Deployment of anchor chains will be kept to a minimum.	Reduces the potential for disturbance to benthic habitats and species including those which utilise the seabed.

EM = Embedded mitigation

4.3 Cumulative impact assessment

Information sources used to inform the potential cumulative effects that may be occurring in the region included the following:

- SEAFISH Kingfisher Bulletin;
- North Sea Transition Authority (NSTA): Oil and gas industry information;
- KIS-ORCA: Marine cables information;
- The Crown Estate Website: Offshore wind farm and marine aggregate digital data; and
- Marine Scotland: Marine licensing website.

The MEA will examine potential cumulative impacts of the replacement distribution cable between Mainland Orkney and Shapinsay and other plans and projects. It will also include the interactions with other environmental topics and inter-project interactions, for example the interaction of the offshore infrastructure with the onshore infrastructure which may share the same ZoI. 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.

4.4 Pressure identification, zones of influence and screening

As detailed in Section 4.1.2 above, the pressures considered in this assessment have been identified from the ICG-C pressure list (OSPAR 2016) in addition to review of the JNCC Pressure Activity Database (JNCC 2022) and the FEAST tool for identifying the sensitivity of marine habitats and features to the effects of cable installation (Marine Scotland, 2021). Several pressures have been identified for each topic area as outlined in Table 4-2. For each pressure identified, Table 4-2 presents any applicable embedded mitigation, the installation footprint and associated zone of influence and a screening decision as to whether assessment within the MEA is required.

Table 4-2 Pressures, zone of influence and screening decision

Receptor	Sensitivity of receptor to pressure	Dimensions of pressure footprint	Applicable embedded mitigation and best practice measures	Further assessment required	Reference
Physical change (to another substratum)					
Sediment quality	Low – sensitive features have been micro-routed around.	Cable 3098m x 0.154m =477.1m ²	The final cable route and positioning of cable stabilisation will be optimised as part of the final engineering design to avoid impacts on sensitive environmental features, including Annex I, II and PMF so far as possible.	Yes	Section 6
Benthic and intertidal ecology	High – Priority Marine Feature (PMF) habitat ‘Maerl beds’ present in Application Corridor and highly sensitive.	Articulated pipe 260mm x 900m = 234m ² Trench Orkney -19m x 20m = 380m ²		Yes	Section 8
Commercial fisheries (fish and shellfish)	Medium – commercial fisheries in the area are of a low density; however, evidence of potting has been observed in the Application Corridor.	Shapinsay -10m x 20m = 200m ² 2T Rock bags 1.9m x 0.4m x 34 bags = 96.4m ² 8T Rock bags 3.0m x 0.7m x 52 bags = 367.57m ² Clump weights: 1m x 0.5m x 8 weights = 4m ² Rock anchors: 0.3m x ~0.02m x 20 anchors = 0.12m ² Concrete mattresses 6m x 3m, x 8 mattresses = 144m ²		Yes	Section 11
Abrasion / disturbance at the surface of the substratum					
Sediment quality	Low – works will not disturb submerged sediments or result in sediment suspension greater than that caused by natural wave action.	Cable 3098m x 0.154m =477.1m ²	The cable will be stabilised to prevent movement and abrasion. All wrecks or features of archaeological significance will be avoided by a buffer of ≥50 m during detailed route design.	Yes	Section 6
Benthic and intertidal ecology	High - Priority Marine Feature (PMF) habitat ‘Maerl beds’ present in Application Corridor and highly sensitive.	Articulated pipe 260mm x 900m = 234m ² Trench Orkney -19m x 20m = 380m ² Shapinsay -10m x 20m = 200m ²		The locations of wrecks and features of archaeological significance will be identified on electronic charts onboard the installation vessel and will be utilised to guide installation operations.	Yes

Receptor	Sensitivity of receptor to pressure	Dimensions of pressure footprint	Applicable embedded mitigation and best practice measures	Further assessment required	Reference
Marine archaeology	Low – one known archaeological artefact is located in close proximity to the Application Corridor.	2T Rock bags 1.9m x 0.4m x 34 bags = 96.4m ² 8T Rock bags 3.0m x 0.7m x 52 bags = 367.57m ²	The locations of any wrecks or features of archaeological significance will be provided to Historic Environment Scotland and the UKHO.	Yes	Section 10
UXO and existing utilities	Low – as no trenching will take place in the marine area, works are considered unlikely to disturb any UXO.	Clump weights: 1m x 0.5m x 8 weights = 4m ² Rock anchors: 0.3m x ~0.02m x 20 anchors = 0.12m ² Concrete mattresses 6m x 3m, x 8 mattresses = 144m ² Four anchors (2.6m max width) and mooring chains (54m max length) = 561.6m ² .	If required by a condition of the Marine Licence, The Crown Estate's 'Protocol for Archaeological Discoveries' (The Crown Estate, 2014) will be implemented during installation works. If pUXO items are discovered during any phase of the project, the location of the item will be recorded, and immediate advice sought from relevant authorities. Munitions awareness briefings will be given to all relevant personnel. Deployment of any mooring spreads will be kept to a minimum to reduce disturbance to the seabed.	Yes	Section 12
Water flow (tidal current) changes – local					
Water quality	Low – No changes local currents within the Application Corridor will occur.	No change to water flow (tidal current) expected.	N/A	No	N/A
Changes in suspended solids (water clarity)					
Water quality	Low – Works will not disturb submerged sediments or result in sediment suspension greater than that caused by natural wave action.	Sediment is expected to settle within 100m of the Application Corridor (Gooding <i>et al.</i> , 2012). Fine material will be rapidly diluted and dispersed in the water.	N/A	No	N/A
Penetration and / or disturbance of the substrate below the surface of the seabed					
Sediment quality	Low - Minimal penetration of the seabed or disturbance below the surface of the seabed will occur (with exception of intertidal sediments when the tide is out)	Two spud legs will penetrate the seabed across a diameter of 914mm. They can only be deployed in a maximum water depth of 15m.	Deployment of spud legs will be kept to a minimum. Deployment of any mooring spreads will be kept to a minimum to reduce disturbance to the seabed.	No	N/A

Receptor	Sensitivity of receptor to pressure	Dimensions of pressure footprint	Applicable embedded mitigation and best practice measures	Further assessment required	Reference
Benthic and intertidal ecology	High - Priority Marine Feature (PMF) habitat 'Maerl beds' present in Application Corridor and highly sensitive.	Four anchors (2.6m max width) and mooring chains (54m max length) = 561.6m ² .		Yes	Section 8
Marine archaeology	Low - Minimal penetration of the seabed or disturbance below the surface of the seabed will occur.			No	N/A
UXO and existing utilities	Low - Minimal penetration of the seabed or disturbance below the surface of the seabed will occur.			No	N/A
Smothering and siltation rate changes					
Benthic and intertidal ecology	High - Priority Marine Feature (PMF) habitats 'Maerl beds' and Offshore Subtidal Sands and Gravels present in Application Corridor and highly sensitive.	Sediment is expected to settle within 100m of the Application Corridor (Gooding <i>et al.</i> , 2012). Fine material will be rapidly diluted and dispersed in the water.	N/A	Yes	Section 8
Accidental hydrocarbon or chemical release from installation vessel					
Benthic and intertidal ecology	Medium - Annex I habitats 'Yellow and Grey Lichens on Atlantic Supralittoral Rock' and 'Atlantic and Baltic rocky sea cliff and shore' could be affected. <i>N. lapillus</i> individuals, listed by OSPAR, could also be affected present in Application Corridor and sensitive.	Within the Application Corridor	Best practice and compliance measures will be in place to minimise the likelihood of any accidental releases and provide an action plan if they do occur to minimise any effects.	Yes	Section 8
Introduction or spread of invasive / non-native species					
Benthic and intertidal ecology	Low – No PMF habitats present in the Application Corridor are considered vulnerable to invasive or non-native species.	Immediately within the vicinity of the Application Corridor	Best practice and compliance measures will be in place to minimise the likelihood of any INNS from Project vessels or equipment.	Yes	Section 8

Receptor	Sensitivity of receptor to pressure	Dimensions of pressure footprint	Applicable embedded mitigation and best practice measures	Further assessment required	Reference
Underwater noise changes					
Protected sites	Medium – Due to the Application corridor passing within/in the vicinity of protected sites designated for seal and sandeel species.	Immediately within the vicinity of the Application Corridor	All works will be undertaken in accordance with the Marine Mammal Protection Plan. All vessels will adhere to the provisions of the Scottish Marine Wildlife Watching Code (SNH, 2017). All installation operations will be conducted at slow vessel speeds of less than 4 knots.	Yes	Section 5
Marine megafauna	High - due to known presence of basking shark, pinniped, otter and cetacean species within/in the vicinity of the Application Corridor.		Installation personnel will be made aware of all protected species within the marine environment, and their responsibility to implement the mitigation in this document	Yes	Section 7
Visual (and above water noise) disturbance					
Protected sites and species	High – Due to the Application corridor passing within/in the vicinity of protected sites.	Within the Application Corridor	The duration of the works will be limited, ensuring any potential visual and above water noise disturbance effect is temporary in nature. Vessel speeds will be slow moving. Disturbance licences will be obtained where required and all conditions adhered to.	Yes	Section 5
Ornithology	High – due to the presence of red-throated diver within/in the vicinity of the Application Corridor.	Within the Application Corridor	N/A	Yes	Section 9
Vessel presence					
Protected sites and species	High - due to the Application Corridor passing within/in the vicinity of protected sites	Within the Application Corridor	All vessels will adhere to the SMWWC, slow vessel speed, disturbance licence(s) as required.	Yes	Section 5
Marine megafauna	Medium – due to the presence of protected basking shark, pinniped, otter and cetacean within/in the vicinity of the Application Corridor.			Yes	Section 7

Receptor	Sensitivity of receptor to pressure	Dimensions of pressure footprint	Applicable embedded mitigation and best practice measures	Further assessment required	Reference
Ornithology	Medium – due to the potential presence of red-throated diver within/in the vicinity of the Application Corridor.	Within the Application Corridor	All installation operations will be conducted at slow vessel speeds of less than 4 knots.	Yes	Section 9
Changes in supporting habitat and prey availability					
Ornithology	Low - there will be no significant loss of fish and benthic species during cable installation.	N/A	N/A	No	N/A
Marine megafauna	Low – Cetacean utilise sound and vision to locate prey items. There will be no significant loss of fish and benthic species during cable installation. Cetacean echolocation of prey items will mean that prey availability is not impaired during cable installation. Pinniped also use sight to locate prey items. The duration of sediment suspension will not be significant to pinniped species. The footprint of installation is not sufficient to reduce the available prey items within the region.	N/A	N/A	No	N/A
Temporary displacement / restricted access / disruption					
Other marine users	Medium – The String is narrow so may restricted movement, but vessels will be operating at low speeds in a limited spatial and temporal extent within the Application Corridor.	Within the Application Corridor	Notice to Mariners (including local), Kingfisher bulletins, and/or broadcast warnings will be promulgated in advance of any proposed works. The notices include the time and location of any work being carried out, and emergency event procedures. Compliance with IRPCS (IMO, 1972) and the International Regulations for the SOLAS.	Yes	Section 12

Receptor	Sensitivity of receptor to pressure	Dimensions of pressure footprint	Applicable embedded mitigation and best practice measures	Further assessment required	Reference
Commercial fisheries	Medium – The String is narrow so may restricted movement, but vessels will be operating at low speeds in a limited spatial and temporal extent within the Application Corridor.		<p>Notice to Mariners (including local), Kingfisher bulletins, and/or broadcast warnings will be promulgated in advance of any proposed works. The notices include the time and location of any work being carried out, and emergency event procedures.</p> <p>Compliance with IRPCS (IMO, 1972) and the International Regulations for the SOLAS.</p> <p>As built survey data will be provided to the UKHO and Kingfisher for inclusion on Admiralty Charts and KIS-ORCA Awareness Charts.</p>	Yes	Section 11
Increased snagging risk					
Commercial fisheries	Medium – evidence of pots have been observed within the Application Corridor.	Immediately within the Application Corridor	<p>Notice to Mariners (including local), Kingfisher bulletins, and/or broadcast warnings will be promulgated in advance of any proposed works. The notices include the time and location of any work being carried out, and emergency event procedures.</p> <p>Compliance with IRPCS (IMO, 1972) and the International Regulations for the SOLAS.</p> <p>As built survey data will be provided to the UKHO and Kingfisher for inclusion on Admiralty Charts and KIS-ORCA Awareness Charts.</p>	Yes	Section 11
Damage to third party assets					
UXO and existing utilities	Medium – the Application Corridor crosses two cables and a dredge spoil dumping ground.	Within the Application Corridor	<p>Stakeholder engagement and consultation will be undertaken with other marine users to inform them of the project.</p> <p>Cable protection will be installed at crossing locations to protect both the new and operational cables.</p>	Yes	Section 12

5. PROTECTED SITES

5.1 Introduction

This Section provides details on the marine protected sites and species that may be present or have the potential to be present within or adjacent to the Application Corridor. Potential pressures on sites determined to be at risk of impact from the proposed installation activities have been assessed, along with the mitigation and management measures that will be utilised to remove or reduce these impacts. This Section should be read in conjunction with the separate European Protected Species (EPS) and Protected Sites and Species Risk Assessment (Xodus, 2023) which assessed the impacts of survey activities to protected sites and species over the North Coast and Orkney Islands region.

Protected sites including Special Areas of Conservation (SACs), Nature Conservation Marine Protected Areas (NCMPAs), Special Protection Areas (SPAs), RAMSAR sites and Sites of Special Scientific Interest (SSSIs) in the immediate vicinity of the Application Corridor for physical features and within 50km for sites designated for mobile species, have been considered within the baseline. The potential for likely significant effects has been identified and assessed.

5.2 Data sources

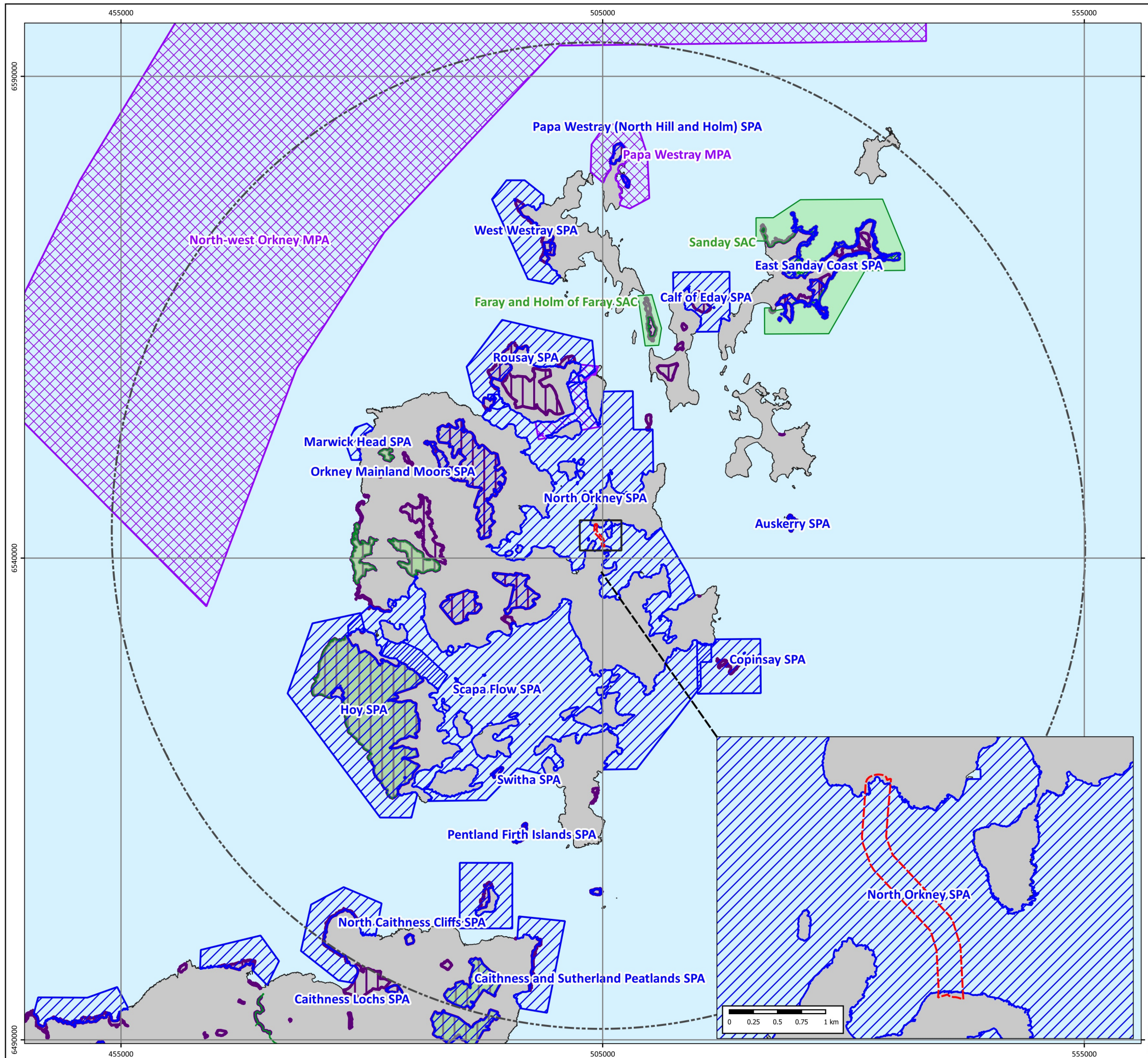
The preliminary baseline of protected sites in the region has been informed using the following sources:

- Orkney – Shapinsay Cable Route Desktop Study, document reference: 4063-GMSL-G-RD-0001 Rev 2 (OceanIQ, 2023)
- European Protected Species (EPS) and Protected Sites and Species Risk Assessment – North Coast and Orkney (Appendix D)

In order to establish baseline conditions a desktop review of publicly available information has been undertaken in addition to consultation with relevant bodies. Consultations completed as part of this application are summarised in Section 1.5. All other data sources used are referenced throughout the document.

5.3 Protected sites and species description

There is one protected site located within the Application Corridor. Upon considering industry guidance (Bennun *et al.*, 2021), a 50km screening distance was used and identified a further 38 sites designated for mobile species, with the potential to transit within the Application Corridor (see Figure 5-1 (Drawing reference: P2663D-PROT-002)).





ORKNEY TO SHAPINSAY CABLE DISTRIBUTION REPLACEMENT

PROTECTED SITES Environmental Designations within 50km

Drawing No: P2663D-PROT-002

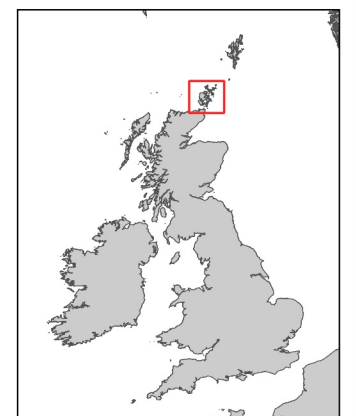
A

Legend

-  Application Corridor
-  50km Buffer

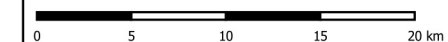
Environmental Designations

-  SAC
-  SPA
-  MPA
-  SSSI



NOT TO BE USED FOR NAVIGATION

Date	2024-01-29 15:56:39
Coordinate System	WGS 84 / UTM zone 30N
WKID	EPSG:32630
Scale @A3	1:400,000
Data Sources	OS; JNCC; NS; SHEPD; ESRI
File Reference	J:\P2663\P2663D\Mxd_QGZ\02_PROT\P2663D-PROT.qgz
Created By	Oliver Bula
Reviewed By	Emma Langley
Approved By	Vicky Fisk



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5.3.2 Special Areas of Conservation (SACs)

SACs are sites classified under the Conservation (Natural Habitats, & c.) Regulations 2010 (as amended), the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended by the Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019) and for the protection of Annex I and II habitats and species respectively (JNCC, 2019b).

There are no SAC's located within the Application Corridor; two SAC's are located within 50km of the Application Corridor with primary or qualifying features with the potential to enter the Application Corridor.

5.3.2.1 Faray and Holm of Faray (19.18km)

Covering an area of 7.8km² the Faray and Holm of Faray SAC comprises of sea inlets, coastal sand dunes, sea cliffs, sand beaches and bogs, marshes and grassland. The sites is also an SSSI and is designated for the protection of grey seal (*Halichoerus grypus*) with the two uninhabited islands supporting the second largest grey seal breeding colony in the UK, contributing around 9% of annual UK pup production (JNCC, 2023a). Given the mobile nature of grey seals and their at-sea usage within the Orkney Islands (NMPI, 2023) there is potential for their presence within the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.2.2 Sanday (26.32km)

Sanday is situated in the north-east of the Orkney archipelago and supports the largest group of harbour seal (*Phoca vitulina*) at any discrete site in Scotland. The Sanday SAC covers an area of 109.8km² and is designated for the protection of Annex I reefs, sandbanks which are slightly covered by seawater all the time as well as mudflats and sandflats not covered by seawater at low tide and the Annex II species harbour seal (JNCC, 2023b). Given the mobile nature of harbour seals and their at-sea usage within the Orkney Islands (NMPI, 2023) there is potential for their presence within the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.3 Special Protection Areas (SPAs)

SPA's are sites classified under the Conservation (Natural Habitats, & c.) Regulations 2010 (as amended), the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended by the Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019), for the protection of Annex I or migratory breeding and non-breeding birds (JNCC, 2019c).

One SPA is located within the Application Corridor; 16 SPA's are located within 50km of the Application Corridor and 12 of these support species with the potential to enter the Application Corridor.

5.3.3.1 North Orkney (within)

The North Orkney SPA became designated in February 2022 and covers an area of 211.7km². The site is designated for breeding populations of red-throated diver (*Gavia stellata*) and non-breeding populations of great northern diver (*Gavia immer*), Slavonian grebe (*Podiceps auritus*) and velvet scoter (*Melanitta fusca*) (NatureScot, 2023d). **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.3.2 Scapa Flow (6.52km)

The Scapa Flow SPA provides the protection for numerous Annex I or migratory breeding and non-breeding seabirds, including great northern diver, red-throated diver, black-throated diver (*Gavia arctica*), Slavonian grebe, common eider (*Somateria mollissima*), long-tailed duck (*Clangula hyemalis*), common goldeneye (*Bucephala clangula*), velvet scoter, red-breasted merganser (*Mergus serrator*), and European shag (*Phalacrocorax aristotelis*). As presented in Table 5-1, protected species of this

site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.3.3 Orkney Mainland Moors (8.22km)

The Orkney Mainland Moors SPA covers an area of 53.4km² comprising blanket bog, acid grassland, wet and dry heath, acidic raised-mire and calcareous valley mire. The boundaries of the SPA are coincident with those of West Mainland Moorlands SSSI, Glims Moss & Durkadale SSSI, Orphir & Stenness Hills SSSI, and Keelylang & Swartaback Burn SSSI. The site is designated for breeding populations of hen harrier, red-throated diver and short-eared owl as well as wintering populations of hen harrier also (NatureScot, 2023e). As presented in Table 5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.3.4 Copinsay (13.70km)

The Copinsay SPA covers an area of 36.1km² and supports internationally important assemblages of breeding seabirds. The site is also an SSSI and is designated for breeding populations of Fulmar (*Fulmarus glacialis*), great black-backed Gull (*Larus marinus*), kittiwake (*Rissa tridactyla*) and guillemot (*Uria aalge*) (JNCC, 2022a). As presented in Table 5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.3.5 Rousay (14.41km)

Covering 54.8km² across the northern area of the Isle of Rousay, the Rousay SPA (also an SSSI) is designated for the protection of numerous breeding seabird assemblages. These include Arctic skua (*Stercorarius parasiticus*), Arctic tern (*Sterna paradisaea*), fulmar, guillemot and kittiwake (NatureScot, 2022). As presented in Table 5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.3.6 Auskerry (19.17km)

Auskerry SPA (also designated as an SSSI) lies to the north-east of the Orkney mainland and 5 km south of Stronsay. The site is also designated as a SSSI and covers an area of approximately 1.5km² and is an internationally important breeding ground for Storm petrel (*Hydrobates pelagicus*) and Arctic tern. Storm petrels nest mainly in old rabbit burrows and Arctic terns nest in groups, tending to use different areas of the island from year to year (Orkney Islands Council, 2023). As presented in Table 5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.3.7 Hoy (20.89km)

The Hoy SPA (also designated as an SSSI) contains a variety of habitat features including the old red sandstone cliffs and sea stacks, moorland, heathland and the UK's most northerly native woodland (SNH, 2009a). This diverse range of habitats is utilised by many breeding bird populations. Qualifying species for the site include Arctic skua, fulmar, great black-backed gull, guillemot, kittiwake, peregrine (*Falco peregrinus*), puffin (*Fratercula arctica*), red-throated diver, and great skua (*Stercorarius skua*). As presented in Table 5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.3.8 Calf of Eday (22.49km)

The Calf of Eday is identified as an important area for nesting seabirds with the site known to support around 32 species. The site is also designated as an SSSI. The site is designated for the protection of breeding populations of fulmar, great black-backed gull, cormorant (*Phalacrocorax carbo*), kittiwake and guillemot (JNCC, 2015). As presented in Table 5-1, protected species of this site have the potential

to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.3.9 Marwick Head (25.08km)

Covering an area of 4.8km² the Marwick Head SPA (also designated as an SSSI) is designated for the protection of breeding populations of kittiwake and guillemot. The site regularly supports 1.1% of the Western European population of guillemot and 75,000 kittiwake individuals (JNCC, 2022b). As presented in Table 5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.3.10 Switha (25.16km)

The Switha SPA (also designated as an SSSI) covers a small grassy island east of South Walls in the Orkney archipelago of size 0.57km². The boundary of the site follow those of the Switha SSSI which includes the whole island. The site is designated for the protection of the wintering population of Greenland barnacle goose (NatureScot, 2023f). As presented in Table 5-1, it is unlikely for protected species of this site to be present within the Application Corridor. **Therefore, this site has not been taken forward for further assessment.**

5.3.3.11 West Westray (25.32km)

The West Westray SPA is designated across the western portion of the Isle of Westray and covers an area of 37.8km². The site is also designated as an SSSI and is an important area for breeding seabird assemblages and is designated for breeding populations of Arctic skua, Arctic tern, fulmar, guillemot, kittiwake and razorbill (*Alca torda*) (NatureScot, 2023c). As presented in Table 5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.3.12 East Sanday Coast (28.35km)

Covering an area of 15.1km² the East Sanday Coast SPA (also designated as an SSSI) is identified as an important area for wintering seabirds and is designated for turnstone (*Arenaria interpres*), purple sandpiper (*Calidris maritima*), bar-tailed godwit (*Limosa lapponica*) (JNCC, 2018a). As presented in Table 5-1, it is unlikely for protected species of this site to be present within the Application Corridor. **Therefore, this site has not been taken forward for further assessment.**

5.3.3.13 Pentland Firth Islands (29.80km)

Consisting of the small islands of Swona and Muckle Skerry the Pentland Firth Islands SPA (also designated as an SSSI) covers an area of 1.7km². It is designated for the protection of the breeding population of Arctic tern (NatureScot, 2023g). As presented in Table 5-1, it is unlikely for protected species of this site to be present within the Application Corridor. **Therefore, this site has not been taken forward for further assessment.**

5.3.3.14 North Caithness Cliffs (34.14km)

Covering the majority of the Caithness coastline from Red Point to Duncansby Head, along with the Island of Stroma, the old red sandstone cliffs of this site provide nesting sites for numerous species of birds (JNCC, 2018b). These birds then utilise areas within and out with the SPA for foraging. The site is designated primarily on the basis of six breeding bird species. These are fulmar, guillemot, kittiwake and peregrine, puffin and razorbill. As presented in Table 5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.3.15 Papa Westray (North Hill and Holm) (35.09km)

Covering an area of 2.5km² the Papa Westray (North Hill and Holm) SPA incorporates an area of maritime grassland and heath at the northern tip of Papa Westray in Orkney. The boundary of the

SPA follow the boundaries of North Hill SSSI and Holm of Papa Westray SSSI and is designated for the protection of breeding populations of Arctic skua and Arctic tern (NatureScot, 2023h). As presented in Table 5-1, Arctic skua have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.3.16 Caithness and Sutherland Peatlands (44.60km)

The Caithness and Sutherland Peatlands SPA contains a large proportion of the Caithness and Sutherland peatlands which form the largest and most intact area of blanket bog in Britain. This habitat supports a diverse range of rare and unusual breeding birds and the site is designated for breeding populations of black-throated diver, common scoter, dunlin, golden eagle, golden plover, greenshank, hen harrier, merlin, red-throated diver, short-eared owl, wigeon and wood sandpiper (NatureScot, 2023i). As presented in Table 5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.3.17 Caithness Lochs (44.89km)

Covering an area of 13.8km² the Caithness Lochs SPA consists of a suite of six lochs and a mire (Broubster Leans) in Caithness. The lochs cover a range of types from oligotrophic to eutrophic, and support a wide diversity of aquatic and wetland vegetation which in turn support a variety of bird species. The site is designated for the protection of non-breeding populations of Greenland white-fronted goose, greylag goose and whooper swan (NatureScot, 2023j). As presented in Table 5-1, it is unlikely for protected species of this site to be present within the Application Corridor. **Therefore, this site has not been taken forward for further assessment.**

5.3.4 Nature Conservation Marine Protected Areas

Nature Conservation Marine Protected Areas (NCMPAs) are designated by Scottish Ministers under the Marine (Scotland) Act for the protection of biodiversity and geodiversity features within territorial waters (12 nautical miles (NM) (NatureScot, 2020d).

There are no NCMPA's located within the Application Corridor; two NCMPAs are located within 50km, with protected features with the potential to enter the Application Corridor.

5.3.4.1 Papa Westray (32.94km)

The Papa Westray NCMPA covers an area of 33km² across the waters north, east and west of the Isle of Papa Westray. The site is well known for its geomorphology and is designated for the protection of marine geomorphology of the Scottish shelf seabed. As well as this the site is also designated for black guillemot (*Cepphus grylle*) (NatureScot, 2023a). As presented in Table 5-1, black guillemot protected in this site has the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.4.2 North-west Orkney (34.69km)

The North-west Orkney NCMPA is a shallow area lying to the north and west of the Orkney Isles on the Scottish continental shelf. The North-west Orkney NCMPA lies across the 12 nm territorial sea limit. The site affords protection to several geomorphological features and is designated for the protection of sandbanks, sand wave fields and sediment wave fields representative of the Fair Isle Strait Marine Process Bedforms Key Geodiversity Area. The site is also designated for sandeels (*Ammodytes tobianus*) (JNCC, 2017). The Northwest Orkney area is considered important as an export ground for sandeel, with larvae carried by currents to sandeel grounds around Shetland and the Moray Firth. The entire Orkney geographical region identified as having potential for sandeel nursery and spawning grounds (Ellis *et al.*, 2012). **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.5 Sites of Special Scientific Interest (SSSI)

SSSIs are statutory designations made by NatureScot under the Nature Conservation (Scotland) Act 2004. They are defined as areas of land and water that are considered to best represent natural heritage in terms of flora, fauna, geology and geomorphology (NatureScot, 2023b).

There no SSSI's located within the Application Corridor; there are 18 SSSI's located within 50km of the Application Corridor. 13 of these are designated for features that may enter the Application Corridor.

5.3.5.1 Keelylang Hill and Swartaback Burn (8.22km)

The site is nationally important for its gathering of upland breeding birds and especially the variety of birds of prey it supports. These include hen harriers (*Circus cyaneus*), merlin (*Falco columbarius*) and short-eared owl (*Asio flammeus*). Other birdlife includes curlew (*Numenius spp.*), golden plover (*Pluvialis apricaria*), snipe (*Gallinago gallinago*), great skua, great black-backed gull, lesser black-backed gull (*Larus fuscus*), red grouse (*Lagopus lagopus scotica*), twite (*Linaria flavirostris*), stonechat (*Saxicola rubicola*) and wheatear (*Oenanthe spp.*). The landscape is dominated by blanket bog where heather grows alongside bog cotton and Sphagnum moss. Woodrush and rushes are also found (Orkney Islands Council, 2023). As presented in Table 5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.5.2 West Mainland Moorlands (10.31km)

These moorlands are outstanding for their assemblage of upland breeding birds, in particular red-throated diver which are attracted to the hill lochans, hen harrier and short-eared owl. Other moorland birds which nest on this site include merlin, golden plover, whimbrel (*Numenius phaeopus*), wigeon (*Mareca spp.*), lapwing (*Vanellinae spp.*), dunlin (*Calidris alpina*), snipe, curlew, Arctic skua, great skua, stonechat, wheatear and ravens (*Corvus corax*) (Orkney Islands Council, 2023). The West Mainland Moorlands SSSI is designated as part of the Orkney Mainland Moors SPA (Section 5.3.3.3). As presented in Table 5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.5.3 Muckle and Little Green Holm (11.07km)

Muckle and Little Green Holm lie 4km north of Shapinsay and 2 km south of Eday. The site is home to a nationally important breeding colony of breeding grey seals. The vegetation of Muckle Green Holm consists almost entirely of rough pasture with coarse tussocks of tufted hair grass (Orkney Islands Council, 2023). Given the mobile nature of grey seals and their at-sea usage within the Orkney Islands (NMPI, 2023) there is potential for their presence within the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.5.4 Orphir and Stenness Hills (13.77km)

This SSSI is an area of Orkney moorland famous for its outstanding community of upland birds, in particular the hen harrier. Other breeding birds include merlin, short-eared owl, kestrel (*Falco tinnunculus*), golden plover, dunlin, curlew, redshank (*Tringa tetanus*), stonechat, wheatear and twite (Orkney Islands Council, 2023). As presented in Table 5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.5.5 Lochs of Harray and Stenness (15.72km)

The waters of the Harray and Stenness lochs range from marine at the seaward entrance of Stenness to freshwater in Harray with variability between marine and freshwater within Stenness itself. This gives them a rich diversity of plant and animal life. Three UK Biodiversity Action Plan priority species of lagoon charophytes have been found here and both lochs provide an important wintering ground

for a wide variety of wildfowl, including pochard (*Aythya farina*), tufted duck (*Aythya fuligula*), scaup (*Aythya marila*) and common goldeneye (Orkney Islands Council, 2023). As presented in Table 5-1, it is unlikely for protected species of this site to be present within the Application Corridor. **Therefore, this site has not been taken forward for further assessment.**

5.3.5.6 Eynhallow (16.08km)

Eynhallow is one of the two most important sites for harbour seals in Orkney and they use the island both to breed and to haul out. The island supports a locally important community of moorland birds and seabirds, including fulmar, Arctic skua, great skua, puffin and black guillemot. There is also an Arctic tern colon (Orkney Islands Council, 2023). As presented in Table 5-1, protected bird species of this site have the potential to overlap with the Application Corridor. Furthermore, given the mobile nature of harbour seals and their at-sea usage within the Orkney Islands (NMPI, 2023) there is potential for their presence within the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.5.7 Glims Moss and Durkadale (16.23km)

Glims Moss is considered to be one of the best examples of a raised bog in northern Scotland and Durkadale is the most northerly example of an alkaline valley marsh in Britain. The characteristics of these sites allow them to support a wide variety of plants which in turn support various nesting moorland birds including hen harrier, merlin and short-eared owl. Hen harriers roost together during the winter and this is one of the three most important sites in Orkney for this spectacular communal activity (Orkney Islands Council, 2023). As presented in Table 5-1, it is unlikely for protected species of this site to be present within the Application Corridor. **Therefore, this site has not been taken forward for further assessment.**

5.3.5.8 Doomy and Whitemaw Hill (16.72km)

The SSSI at Doomy and Whitemaw Hill in Eday is one of only a few places in Orkney where whimbrel nest. It is also important for Arctic skua. The botanical interest of the site is upland heath, which includes large areas of blanket bog and sandy heath, and provides excellent breeding areas for these bird species (Orkney Islands Council, 2023). As presented in Table 5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.5.9 Loch of Banks (19.88km)

This area of flooded marshland is nationally important for its plant and bird life. Hen harriers are unusual among birds of prey in that they roost together in winter. A large reed bed at Loch of Banks is a favourite roost for around eight hen harriers. Across Britain only 30 to 40 pairs of pintail (*Anas acuta*) nest each year, with one pair regularly found on this site. It also supports a large community of breeding wildfowl and waders. These include wigeon, teal (*Anas crecca*), shoveler (*Spatula clypeata*), mallard (*Anas platyrhynchos*), tufted duck, red-breasted merganser, shelduck (*Tadorna tadorna*), mute swan (*Cygnus olor*), oystercatcher (*Haematopus ostralegus*), ringed plover (*Charadrius hiaticula*), dunlin, snipe, curlew, lapwing and redshank (Orkney Islands Council, 2023). As presented in Table 5-1, it is unlikely for protected species of this site to be present within the Application Corridor. **Therefore, this site has not been taken forward for further assessment.**

5.3.5.10 Loch of Isbister and the Loons (22.00km)

Loch of Isbister and The Loons is a naturally eutrophic wetland site in the northwest of the Orkney mainland. The site is of national importance for its botanical and ornithological interest. The area supports a diverse assemblage of breeding wildfowl including pintail, wigeon, shoveler, snipe, curlew, redshank and lapwing. The site also supports a colony of Arctic tern and a wintering population of Greenland white-fronted goose (*Anser albifrons*) (Orkney Islands Council, 2023). As presented in Table

5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.5.11 Mill Loch (22.06km)

The Mill Loch SSSI is situated on the island of Eday and includes a freshwater loch surrounded by mosses and taller vegetation. The rest of the site is a mosaic of moorland vegetation. This loch is of national importance for breeding red-throated divers supporting one of the densest breeding concentrations in the British Isles (NatureScot, 2023k). As presented in Table 5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.5.12 Holm of Papa Westray (35.09km)

The Holm of Papa Westray is a small low-lying island off the east coast of Papa Westray. It is approximately 1km by 0.3km and rises gradually to a height of 15m at its south-eastern corner. The coastline is mainly rocky with areas of shingle and a small sandy bay at the southern end. The island is home to Britain's largest breeding colony of black guillemot, with between 120 and 150 pairs. It also regularly attracts as many as 600 non-breeding birds. Other birds which nest on the island include Arctic tern, storm petrel, fulmar, shag, eider duck, lesser black-backed gull, herring gull and great black-backed gull (Orkney Islands Council, 2023). As presented in Table 5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.5.13 Stroma (36.75km)

Stroma SSSI is located on the western side of the island of Stroma and is designated for maritime cliffs of heath and grassland vegetation. The site also supports breeding seabird assemblages of Arctic tern, sandwich tern (*Thalasseus sandvicensis*) and guillemot (SNH, 2009b). As presented in Table 5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.5.14 Northwall (37.28km)

Made up of four separate areas in the north-east of Sanday, this site contains the largest area of machair outside the Western Isles. Machair is one of the rarest habitats in Europe. Furthermore, given that part of the site overlaps a section of the East Sanday Coast SPA, this site is designated for many species of wader including purple sandpiper, turnstone, bar-tailed godwit, dunlin, sanderling, and grey plover (*Pluvialis squatarola*). In winter whooper swan (*Cygnus cygnus*) and pintail ducks can be seen on the North Loch (Orkney Islands Council, 2023). As presented in Table 5-1, it is unlikely for protected species of this site to be present within the Application Corridor. **Therefore, this site has not been taken forward for further assessment.**

5.3.5.15 North Hill (37.41km)

The northern tip of Papa Westray supports an internationally important Arctic tern colony. There is also a nationally important colony of Arctic skua. The cliffs are home to guillemot, razorbill and kittiwake. Eider duck, oystercatcher, ringed plover and redshank also nest on the site (Orkney Islands Council, 2023). As presented in Table 5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.5.16 Duncansby Head (41.13km)

The Duncansby Head SSSI is located at the extreme northeast of the British mainland and includes both Duncansby Head and the Stacks of Duncansby. The SSSI covers an area of 9km² and supports large populations of breeding seabirds including guillemot, kittiwake, razorbill and fulmar (The Highland Council, 2011). As presented in Table 5-1, protected species of this site have the potential

to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

5.3.5.17 Loch of Mey (44.89km)

The Loch of Mey SSSI is located near the north coast of Caithness, 11km west of John O’Groats. The site is designated for nationally important grassland habitat surrounding the loch, as well as the population of wintering Greenland white-fronted goose (NatureScot, 2023I). As presented in Table 5-1, it is unlikely for protected species of this site to be present within the Application Corridor. **Therefore, this site has not been taken forward for further assessment.**

5.3.5.18 Dunnet Head (45.93km)

Dunnet Head SSSI, measuring 0.9305km², covers the coastal sandstone cliffs of the most northerly headland of the UK mainland (SNH, 2018). The site has been designated for the nationally important maritime cliff top vegetation found here, along with the resident guillemot breeding colony (accounting for 1% of the UK population) and other breeding seabirds such as razorbill and fulmar. As presented in Table 5-1, protected species of this site have the potential to overlap with the Application Corridor. **Therefore, this site has been taken forward for assessment in Section 5.4.**

Table 5-1 Range of birds in the North Coast and Orkney Islands region

Species	Range (km)
Arctic skua (<i>Stercorarius parasiticus</i>)	62.5
Arctic tern (<i>Sterna paradisaea</i>)	25.7
Bar-tailed godwit (<i>Limosa lapponica</i>)	Unknown
Black guillemot (<i>Cepphus grylle</i>)	55
Black-throated diver (<i>Gavia arctica</i>)	5
Common eider (<i>Somateria mollissima</i>)	21.5
Common goldeneye (<i>Bucephala clangula</i>)	10
Common gull (<i>Larus canus</i>)	15
Cormorant (<i>Phalacrocorax carbo</i>)	25.6
Curlew (<i>Numenius spp.</i>)	Unknown
Dunlin (<i>Calidris alpina</i>)	2
European shag (<i>Phalacrocorax aristotelis</i>)	13.2
Fulmar (<i>Fulmarus glacialis</i>)	100
Golden plover (<i>Pluvialis apricaria</i>)	115
Great Black-backed Gull (<i>Larus marinus</i>)	73
Great northern diver (<i>Gavia immer</i>)	10
Great skua (<i>Stercorarius skua</i>)	443.3
Greenland barnacle goose (<i>Branta leucopsis</i>)	7
Greenland white-fronted goose (<i>Anser albifrons</i>)	10
Grey plover (<i>Pluvialis squatarola</i>)	5
Greylag goose (<i>Anser anser</i>)	20

Species	Range (km)
Guillemot (<i>Uria aalge</i>)	73.2
Hen harriers (<i>Circus cyaneus</i>)	5
Herring gull (<i>Larus argentatus</i>)	54
Jackdaw (<i>Coloeus monedula</i>)	Unknown
Kestrel (<i>Falco tinnunculus</i>)	6
Kittiwake (<i>Rissa tridactyla</i>)	156.1
Lapwing (<i>Vanellinae spp.</i>)	Unknown
Lesser black-backed gull (<i>Larus fuscus</i>)	141
Long-tailed duck (<i>Clangula hyemalis</i>)	20
Mallard (<i>Anas platyrhynchos</i>)	4
Merlin (<i>Falco columbarius</i>)	Unknown
Mute swan (<i>Cygnus olor</i>)	2
Oystercatcher (<i>Haematopus ostralegus</i>)	Unknown
Peregrine (<i>Falco peregrinus</i>)	5
Pintail duck (<i>Anas acuta</i>)	4
Pochard (<i>Aythya farina</i>)	Unknown
Puffin (<i>Fratercula arctica</i>)	105
Purple sandpiper (<i>Calidris maritima</i>)	2
Raven (<i>Corvus corax</i>)	22
Razorbill (<i>Alca torda</i>)	88.7
Red grouse (<i>Lagopus lagopus scotica</i>)	Unknown
Red-breasted merganser (<i>Mergus serrator</i>)	Unknown
Redshank (<i>Tringa tetanus</i>)	13
Red-throated diver (<i>Gavia stellata</i>)	40
Ringed plover (<i>Charadrius hiaticula</i>)	3
Sanderling (<i>Calidris alba</i>)	Unknown
Sandwich tern (<i>Thalasseus sandvicensis</i>)	70
Scaup (<i>Aythya marila</i>)	Unknown
Shelduck (<i>Tadorna tadorna</i>)	Unknown
Short-eared owl (<i>Asio flammeus</i>)	10
Shoveler (<i>Spatula clypeata</i>)	2
Slavonian grebe (<i>Podiceps auritus</i>)	8
Snipe (<i>Gallinago gallinago</i>)	Unknown
Stonechat (<i>Saxicola rubicola</i>)	Unknown
Storm petrel (<i>Hydrobates pelagicus</i>)	50

Species	Range (km)
Teal (<i>Anas crecca</i>)	2
Tufted duck (<i>Aythya fuligula</i>)	Unknown
Turnstone (<i>Arenaria interpres</i>)	Unknown
Twite (<i>Linaria flavirostris</i>)	Unknown
Velvet scoter (<i>Melanitta fusca</i>)	20
Wheatear (<i>Oenanthe</i> spp.)	Unknown
Whimbrel (<i>Numenius phaeopus</i>)	Unknown
Whooper swan (<i>Cygnus cygnus</i>)	5
Wigeon (<i>Mareca</i> spp.)	16

Sources: Woodhall *et al.* (2019); Hudson (1989); The Irish Government (2020); Sim *et al.* (2017); Savard & Dupuis (1999); Madsen *et al.* (2001); Doyle *et al.* (2022); MacArthur Green (2021); Scottish Government (2019); ADW (2021); Ballard (2020).

5.3.6 Other protected sites

There are no National Scenic Areas (NSA), Nature Reserves (NR), Marine Conservation Areas or World Heritage Sites (WHS) which transect the Application Corridor. Therefore, these are not discussed further as part of this report.

5.4 Potential pressures and zones of influence

Table 5-2 below summarises the protected sites in the vicinity of the replacement cable Application Corridor and details which sites have been assessed further to determine whether there is potential for likely significant effect (LSE). Those sites or pressures for which no LSE is expected have not been considered further in this assessment.

Table 5-2 Impact assessment of protected sites in the vicinity of the Application Corridor

Protected site	Distance from Application Corridor (km)	Features of designated site most likely to be affected	Potential pressures	Potential pressure-receptor pathway	Require further assessment?
North Orkney SPA	Within	Red-throated diver (<i>Gavia stellata</i>) Great northern diver (<i>Gavia immer</i>) Slavonian grebe (<i>Podiceps auritus</i>) Velvet scoter (<i>Melanitta fusca</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and proves a collision risk for bird species.	Yes
Scapa Flow SPA	6.52	Great northern diver (<i>Gavia immer</i>) Red-throated diver (<i>Gavia stellata</i>) Slavonian grebe (<i>Podiceps auritus</i>) Common eider (<i>Somateria mollissima</i>) Long-tailed duck (<i>Clangula hyemalis</i>) Common goldeneye (<i>Bucephala clangula</i>) Velvet scoter (<i>Melanitta fusca</i>) Red-breasted merganser (<i>Mergus serrator</i>) European shag (<i>Phalacrocorax aristotelis</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and proves a collision risk for bird species.	Yes
Orkney Mainland Moors SPA	8.22	Hen harriers (<i>Circus cyaneus</i>) Short-eared owl (<i>Asio flammeus</i>) Red-throated diver (<i>Gavia stellata</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and proves a collision risk for bird species.	Yes
Keelylang Hill and Swartaback Burn SSSI	8.22	Short-eared owl (<i>Asio flammeus</i>) Golden plover (<i>Pluvialis apricaria</i>) Great skua (<i>Stercorarius skua</i>) Great black-backed gull (<i>Larus marinus</i>) Lesser black-backed gull (<i>Larus fuscus</i>)	Visual (and above water noise) disturbance Vessel presence	Physical presence at the landfall site may potentially disturb species at the Orkney landfall site and the presence of the installation vessels can potentially cause disturbance and proves a collision risk for bird species.	Yes
West Mainland Moorlands SSSI	10.31	Red-throated diver (<i>Gavia stellata</i>) Golden plover (<i>Pluvialis apricaria</i>) Wigeon (<i>Mareca spp.</i>) Arctic skua (<i>Stercorarius parasiticus</i>)	Visual (and above water noise) disturbance Vessel presence	Physical presence at the landfall site may potentially disturb species at the Orkney landfall site and the presence of the installation vessels can potentially cause disturbance	Yes

Protected site	Distance from Application Corridor (km)	Features of designated site most likely to be affected	Potential pressures	Potential pressure-receptor pathway	Require further assessment?
		Great skua (<i>Stercorarius skua</i>) Ravens (<i>Corvus corax</i>)		and proves a collision risk for bird species.	
Muckle and Little Green Holm SSSI	11.07	Grey seal (<i>Halichoerus grypus</i>)	Underwater noise changes Vessel presence Visual (and above water noise) disturbance	Underwater noise changes have the potential to disturb seals from the site. Vessels also pose a collision risk. Visual (and above water noise) disturbance has the potential to disturb seals in haul out locations.	Yes
Copinsay SPA	13.70	Fulmar (<i>Fulmarus glacialis</i>) Great Black-backed Gull (<i>Larus marinus</i>) Kittiwake (<i>Rissa tridactyla</i>) Guillemot (<i>Uria aalge</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and proves a collision risk for bird species.	Yes
Orphir and Stenness Hills SSSI	13.77	Golden plover (<i>Pluvialis apricaria</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and proves a collision risk for bird species.	Yes
Rousay SPA	14.41	Arctic skua (<i>Stercorarius parasiticus</i>) Arctic tern (<i>Sterna paradisaea</i>) Fulmar (<i>Fulmarus glacialis</i>) Kittiwake (<i>Rissa tridactyla</i>) Guillemot (<i>Uria aalge</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and proves a collision risk for bird species.	Yes
Lochs of Harray and Stenness SSSI	15.72	Common goldeneye (<i>Bucephala clangula</i>)	Visual (and above water noise) disturbance Vessel presence	Foraging activities are unlikely to extend to the Application Corridor, as discussed in Section 5.3.5.5. As such there is no potential for pressure-receptor pathway between this feature and the cable installation activities given the distance of this site from the Application Corridor.	No

Protected site	Distance from Application Corridor (km)	Features of designated site most likely to be affected	Potential pressures	Potential pressure-receptor pathway	Require further assessment?
Eynhallow SSSI	16.08	Harbour seal (<i>Phoca vitulina</i>) Fulmar (<i>Fulmarus glacialis</i>) Arctic skua (<i>Stercorarius parasiticus</i>) Great skua (<i>Stercorarius skua</i>) Puffin (<i>Fratercula arctica</i>) Black guillemot (<i>Cephus grylle</i>) Arctic tern (<i>Sterna paradisaea</i>)	Underwater noise changes Vessel presence Visual (and above water noise) disturbance	Underwater noise changes have the potential to disturb seals from the site. The presence of the installation vessels can potentially cause disturbance to bird species and hauled out seals. Vessels prove a collision risk for bird species and seals.	Yes
Glims Moss and Durka Dale SSSI	16.08	Hen harriers (<i>Circus cyaneus</i>) Short-eared owl (<i>Asio flammeus</i>)	Visual (and above water noise) disturbance Vessel presence	Foraging activities are unlikely to extend to the Application Corridor, as discussed in Section 5.3.5.7. As such there is no potential for pressure-receptor pathway between this feature and the cable installation activities given the distance of this site from the Application Corridor.	No
Doomy and Whitemaw Hill SSSI	16.72	Arctic skua (<i>Stercorarius parasiticus</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and proves a collision risk for bird species.	Yes
Auskerry SPA	19.17	Storm petrel (<i>Hydrobates pelagicus</i>) Arctic tern (<i>Sterna paradisaea</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and proves a collision risk for bird species.	Yes
Faray and Holm of Faray SAC	19.18	Grey seal (<i>Halichoerus grypus</i>)	Underwater noise changes Vessel presence Visual (and above water noise) disturbance	Underwater noise changes have the potential to disturb seals from the site. Vessels also pose a collision risk and potential disturbance risk to hauled out seals.	Yes
Loch of Banks SSSI	19.88	Hen harriers (<i>Circus cyaneus</i>) Wigeon (<i>Mareca spp.</i>)	Visual (and above water noise) disturbance	Foraging activities are unlikely to extend to the Application Corridor, as discussed in Section 5.3.5.9. As	No

Protected site	Distance from Application Corridor (km)	Features of designated site most likely to be affected	Potential pressures	Potential pressure-receptor pathway	Require further assessment?
		Teal (<i>Anas crecca</i>) Shoveler (<i>Spatula clypeata</i>) Mallard (<i>Anas platyrhynchos</i>) Mute swan (<i>Cygnus olor</i>) Ringed plover (<i>Charadrius hiaticula</i>) Redshank (<i>Tringa tetanus</i>)	Vessel presence	such there is no potential for pressure-receptor pathway between this feature and the cable installation activities given the distance of this site from the Application Corridor.	
Hoy SPA	20.89	Arctic skua (<i>Stercorarius parasiticus</i>) Fulmar (<i>Fulmarus glacialis</i>) Great Black-backed Gull (<i>Larus marinus</i>) Guillemot (<i>Uria aalge</i>) Kittiwake (<i>Rissa tridactyla</i>) Puffin (<i>Fratercula arctica</i>) Red-throated diver (<i>Gavia stellata</i>) Great skua (<i>Stercorarius skua</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and proves a collision risk for bird species.	Yes
Loch of Isbister and the Loons SSSI	22.00	Arctic tern (<i>Sterna paradisaea</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and proves a collision risk for bird species.	Yes
Mill Loch SSSI	22.06	Red-throated diver (<i>Gavia stellata</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and proves a collision risk for bird species.	Yes
Calf of Eday SPA	22.49	Fulmar (<i>Fulmarus glacialis</i>) Great Black-backed Gull (<i>Larus marinus</i>) Cormorant (<i>Phalacrocorax carbo</i>) Guillemot (<i>Uria aalge</i>) Kittiwake (<i>Rissa tridactyla</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and proves a collision risk for bird species.	Yes
Marwick Head SPA	25.08	Kittiwake (<i>Rissa tridactyla</i>) Guillemot (<i>Uria aalge</i>)	Visual (and above water noise) disturbance	The presence of the installation vessels can potentially cause	Yes

Protected site	Distance from Application Corridor (km)	Features of designated site most likely to be affected	Potential pressures	Potential pressure-receptor pathway	Require further assessment?
		Puffin (<i>Fratercula arctica</i>) Razorbill (<i>Alca torda</i>) Fulmar (<i>Fulmarus glacialis</i>) Herring gull (<i>Larus argentatus</i>)	Vessel presence	disturbance and proves a collision risk for bird species.	
Switha SPA	25.16	Greenland barnacle goose (<i>Branta leucopsis</i>).	Visual (and above water noise) disturbance Vessel presence	Foraging activities are unlikely to extend to the Application Corridor, as discussed in Section 5.3.3.10. As such there is no potential for pressure-receptor pathway between this feature and the cable installation activities given the distance of this site from the Application Corridor.	No
West Westray SPA	25.32	Arctic skua (<i>Stercorarius parasiticus</i>) Arctic tern (<i>Sterna paradisaea</i>) Razorbill (<i>Alca torda</i>) Kittiwake (<i>Rissa tridactyla</i>) Fulmar (<i>Fulmarus glacialis</i>) Guillemot (<i>Uria aalge</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and proves a collision risk for bird species.	Yes
Sanday SAC	26.32	Harbour seal (<i>Phoca vitulina</i>)	Underwater noise changes Vessel presence Visual (and above water noise) disturbance	Underwater noise changes have the potential to disturb seals from the site. Vessels also pose a collision risk to seals and potential disturbance risk to hauled out seals.	Yes
East Sanday Coast SPA	28.35	Purple sandpiper (<i>Calidris maritima</i>)	Visual (and above water noise) disturbance Vessel presence	Foraging activities are unlikely to extend to the Application Corridor, as discussed in Section 5.3.3.12. As such there is no potential for pressure-receptor pathway between this feature and the cable installation activities given the	No

Protected site	Distance from Application Corridor (km)	Features of designated site most likely to be affected	Potential pressures	Potential pressure-receptor pathway	Require further assessment?
				distance of this site from the Application Corridor.	
Pentland Firth Islands SPA	29.80	Arctic tern (<i>Sterna paradisaea</i>)	Visual (and above water noise) disturbance Vessel presence	Foraging activities are unlikely to extend to the Application Corridor, as discussed in Section 5.3.3.13. As such there is no potential for pressure-receptor pathway between this feature and the cable installation activities given the distance of this site from the Application Corridor.	No
Papa Westray NCMPA	32.94	Black guillemot (<i>Cepphus grylle</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and proves a collision risk for bird species.	Yes
North Caithness Cliffs SPA	34.14	Guillemot (<i>Uria aalge</i>) Kittiwake (<i>Rissa tridactyla</i>) Fulmar (<i>Fulmarus glacialis</i>) Puffin (<i>Fratercula arctica</i>) Razorbill (<i>Alca torda</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and proves a collision risk for bird species.	Yes
North-west Orkney NCMPA	34.69	Sandeels (<i>Ammodytes tobianus</i>)	Seabed disturbance Siltation	The disturbance to the seabed resulting from the proposed activities has the potential to damage sandeel nursing and spawning grounds.	Yes
Holm of Papa Westray SSSI	35.09	Black guillemot (<i>Cepphus grylle</i>) Storm petrel (<i>Hydrobates pelagicus</i>) Fulmar (<i>Fulmarus glacialis</i>) Lesser black-backed gull (<i>Larus fuscus</i>) Herring gull (<i>Larus argentatus</i>) Great Black-backed Gull (<i>Larus marinus</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and proves a collision risk for bird species.	Yes

Protected site	Distance from Application Corridor (km)	Features of designated site most likely to be affected	Potential pressures	Potential pressure-receptor pathway	Require further assessment?
Papa Westray (North Hill and Holm) SPA	35.09	Arctic skua (<i>Stercorarius parasiticus</i>) Arctic tern (<i>Sterna paradisaea</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and poses a collision risk for bird species.	Yes
Stroma SSSI	36.75	Sandwich tern (<i>Thalasseus sandvicensis</i>) Guillemot (<i>Uria aalge</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and poses a collision risk for bird species.	Yes
Northwall SSSI	37.28	Purple sandpiper (<i>Calidris maritima</i>) Grey plover (<i>Pluvialis squatarola</i>) Whooper swan (<i>Cygnus cygnus</i>)	Visual (and above water noise) disturbance Vessel presence	Foraging activities are unlikely to extend to the Application Corridor, as discussed in Section 5.3.5.14. As such there is no potential for pressure-receptor pathway between this feature and the cable installation activities given the distance of this site from the Application Corridor.	No
North Hill SSSI	37.41	Arctic skua (<i>Stercorarius parasiticus</i>) Guillemot (<i>Uria aalge</i>) Kittiwake (<i>Rissa tridactyla</i>) Razorbill (<i>Alca torda</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and poses a collision risk for bird species.	Yes
Duncansby Head SSSI	41.13	Guillemot (<i>Uria aalge</i>) Kittiwake (<i>Rissa tridactyla</i>) Razorbill (<i>Alca torda</i>) Fulmar (<i>Fulmarus glacialis</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and poses a collision risk for bird species.	Yes
Caithness and Sutherland Peatlands SPA	44.60	Black-throated diver (<i>Gavia arctica</i>) Common scoter (<i>Melanitta nigra</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause	Yes

Protected site	Distance from Application Corridor (km)	Features of designated site most likely to be affected	Potential pressures	Potential pressure-receptor pathway	Require further assessment?
		Hen harriers (<i>Circus cyaneus</i>) Red-throated diver (<i>Gavia stellata</i>) Dunlin (<i>Calidris alpina</i>) Golden eagle (<i>Aquila chrysaetos</i>) Golden plover (<i>Pluvialis apricaria</i>) Merlin (<i>Falco columbarius</i>)		disturbance and proves a collision risk for bird species.	
Caithness Lochs SPA	44.89	Whooper swan (<i>Cygnus cygnus</i>) Greenland white-fronted goose (<i>Anser albifrons</i>) Greylag goose (<i>Anser anser</i>)	Visual (and above water noise) disturbance Vessel presence	Foraging activities are unlikely to extend to the Application Corridor, as discussed in Section 5.3.3.17. As such there is no potential for pressure-receptor pathway between this feature and the cable installation activities given the distance of this site from the Application Corridor.	No
Loch of Mey SSSI	44.89	Greenland white-fronted goose (<i>Anser albifrons</i>)	Visual (and above water noise) disturbance Vessel presence	Foraging activities are unlikely to extend to the Application Corridor, as discussed in Section 5.3.5.17. As such there is no potential for pressure-receptor pathway between this feature and the cable installation activities given the distance of this site from the Application Corridor.	No
Dunnet Head SSSI	45.93	Guillemot (<i>Uria aalge</i>) Razorbill (<i>Alca torda</i>) Fulmar (<i>Fulmarus glacialis</i>)	Visual (and above water noise) disturbance Vessel presence	The presence of the installation vessels can potentially cause disturbance and proves a collision risk for bird species.	Yes

5.5 Assessment of likely significant effects

5.5.1 Underwater noise changes

Underwater noise changes generated by installation vessels and installation equipment may pose a risk to pinniped and fish species. Such noise has the ability to impact species in two ways as follows:

- Injury - physiological damage to an individuals' auditory or other internal organs; and
- Disturbance – either temporary or continuous. While this factor does not result in injury, disruptions to behavioural patterns such as migration, nursing, breeding, foraging, socialising and/or sheltering may occur.

To determine the potential impact of noise generated by the Project on pinnipeds and fish, the sound levels that will be produced have been compared to the species available estimated thresholds for injury and disturbance. If frequencies of the sound produced fall outside the predicted auditory bandwidth for a species, then disturbance is unlikely. Sufficiently high intensity noise sources, however, can still cause damage to an individuals' auditory or other internal organs. For details on the typical auditory bandwidths of pinnipeds and fish, see Table 5-3 below.

Table 5-3 Auditory bandwidths estimated for pinnipeds

Hearing Group	Estimated Auditory Bandwidth
Phocid pinnipeds (true seals, e.g. grey and harbour seal)	50Hz to 86kHz
Fish species lacking a swim bladder (for example, sandeel <i>Ammodytes tobianus</i>)	85Hz to 405Hz

Source: NMFS (2018); Vetter and Sisneros (2020)

The main sources of underwater noise that will be generated by the cable installation activities are:

- Noise from installation vessels utilised during the works; and
- Noise from cable laying activities.

However, the presence of the installation vessels in the North Coast and Orkney Islands region is not deemed to constitute a change from baseline conditions and the noise levels associated with the vessels are likely to be too low to result in injury (Xodus, 2023). Furthermore, modelling conducted to support the EPS and Protected Sites and Species Risk Assessment concluded that for injury to occur animals would need to be within metres to tens of metres of the sound source. The likelihood of a marine mammal being this close to vessels, operational equipment or the installation activities is extremely low (Xodus, 2023). Furthermore, the cable installation activities will be a continuous but temporary occurrence and as such nearby animals will not be subject to lasting or prolonged periods of noise. Therefore, noise and associated temporary disturbance from the proposed activities will not result in a significant adverse effect on nearby individuals.

5.5.1.2 Muckle and Little Green Holm SSSI

Conservation objectives

The conservation objective of the Muckle and Little Green SSSI is to avoid deterioration of the habitats of grey seal or disturbance to the species thus ensuring the site is maintained and makes a contribution to achieving favourable conservation status for the species.

Assessment against conservation objectives

Within the Application Corridor grey seal density is moderate at 10 – 50 individuals per 25km² (Figure 5-2, drawing reference: P2663D-HAB-002). Therefore, seals within the water could be potentially disturbed by the installation operations.

However, given the short-term, localised and temporary nature of the installation activities, the distribution of grey seals within the Muckle and Little Green Holm SSSI will be maintained and no significant disturbance of the grey seal species is expected to occur. The population of grey seals will therefore remain a viable component of the site. Underwater noise changes and associated cable installation activities will not affect the distribution, extent, structure and function of the supporting habitat for grey seal, ensuring they are maintained for use by grey seal into the future.

5.5.1.3 Eynhallow SSSI

Conservation objectives

The conservation objective of the Eynhallow SSSI is to ensure the following are maintained in the long term:

- Population of harbour seal as a viable component of the site
- Distribution of harbour seal within the site
- Distribution and extent of habitats supporting harbour seal
- Structure, function and supporting processes of habitats supporting harbour seal
- No significant disturbance of harbour seal

Assessment against conservation objectives

Within the Application Corridor harbour seal may be present at moderate densities of 10 – 50 individuals per 25km² (Figure 5-3, drawing reference: P2663D-HAB-001). Therefore, harbour seals in the water could be susceptible to disturbance from the installation activities.

However, recent studies have shown that individuals will quickly return to an area that was subjected to even high-intensity noise emissions within a short period of time (Russell *et al.*, 2016), and given that the installation activities will be short-term and temporary, significant disturbance to harbour seals in the Eynhallow SSSI is unlikely. Therefore, the population and distribution of harbour seals within the site will be maintained.

5.5.1.4 Faray and Holm of Faray SAC

Conservation objectives

To avoid deterioration of the habitats of grey seal or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying feature.; and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Assessment against conservation objectives

As presented in Figure 5-2 (drawing reference: P2663D-HAB-002) grey seal density within the Application Corridor is moderate at 10 – 50 individuals per 25km². Therefore, although disturbance to individuals within the immediate waters surrounding the proposed operation may experience disturbance, given the limited grey seal density in the area and the temporary nature of the installation activities, no significant disturbance of grey seals will occur as a result of installation activities.

5.5.1.5 Sanday SAC

Conservation objectives

- To avoid deterioration of the habitats of harbour seal or significant disturbance to the species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying feature.
- To ensure for the qualifying species that the following are maintained in the long term:
 - Population of the species as a viable component of the site
 - Distribution of the species within site
 - Distribution and extent of habitats supporting the species
 - Structure, function and supporting processes of habitats supporting the species
 - No significant disturbance of the species

Assessment against conservation objectives

Within the Application Corridor harbour seal may be present at moderate densities of 10 – 50 individuals per 25km² (Figure 5-3, drawing reference: P2663D-HAB-001). Therefore, harbour seals in the water could be susceptible to disturbance from the installation activities.

However, given that recent studies have shown that individuals will quickly return to an area that was subjected to even high-intensity noise emissions within a short period of time (Russell *et al.*, 2016), as well as that the installation activities will be short-term and temporary, significant disturbance to harbour seals within the Sanday SAC is unlikely. Therefore, the population and distribution of harbour seals within the site will be maintained into the future.

5.5.1.6 North-west Orkney NCMPA

Conservation objectives

The Conservation Objective for the North-west Orkney Nature Conservation Marine Protected Area is that the protected features:

- So far as already in favourable condition, remain in such condition; and
- So far as not already in favourable condition, be brought into such condition, and remain in such condition.

Assessment against conservation objectives

Sandeels protected within the North-west Orkney NCMPA may be present within the Application Corridor where they may be subjected to injurious effects resulting from vessel noise and noise resulting from the installation activities. However, vessel noise is known to be around 190 dB and as such does not cross the auditory threshold for adult sandeels or their eggs and larvae, with mortality and potential injury to eggs and larvae occurring at a threshold of 207 dB or greater (NRDC, 2023; Popper, 2019). Furthermore, given that the installation activities will be short-term and temporary, significant disturbance to sandeels within the North-west Orkney NCMPA is unlikely. Therefore, the population and distribution of sandeels within the site will be maintained into the future.

ORKNEY TO SHAPINSAY CABLE DISTRIBUTION REPLACEMENT


PELAGIC HABITATS

Density of Grey Seals Between 1991 and 2016







Drawing No: P2663D-HAB-002

A


Legend

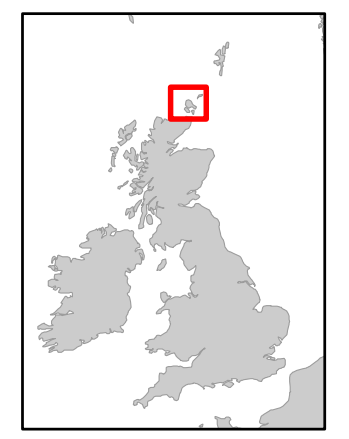
 Application Corridor

Grey Seal Density (5 km x 5 km)

-  <=1
-  1 - 5
-  5 - 10
-  10 - 50
-  50 - 100
-  >=100

Environmental Designations

 Protected Seal Haul-out Site

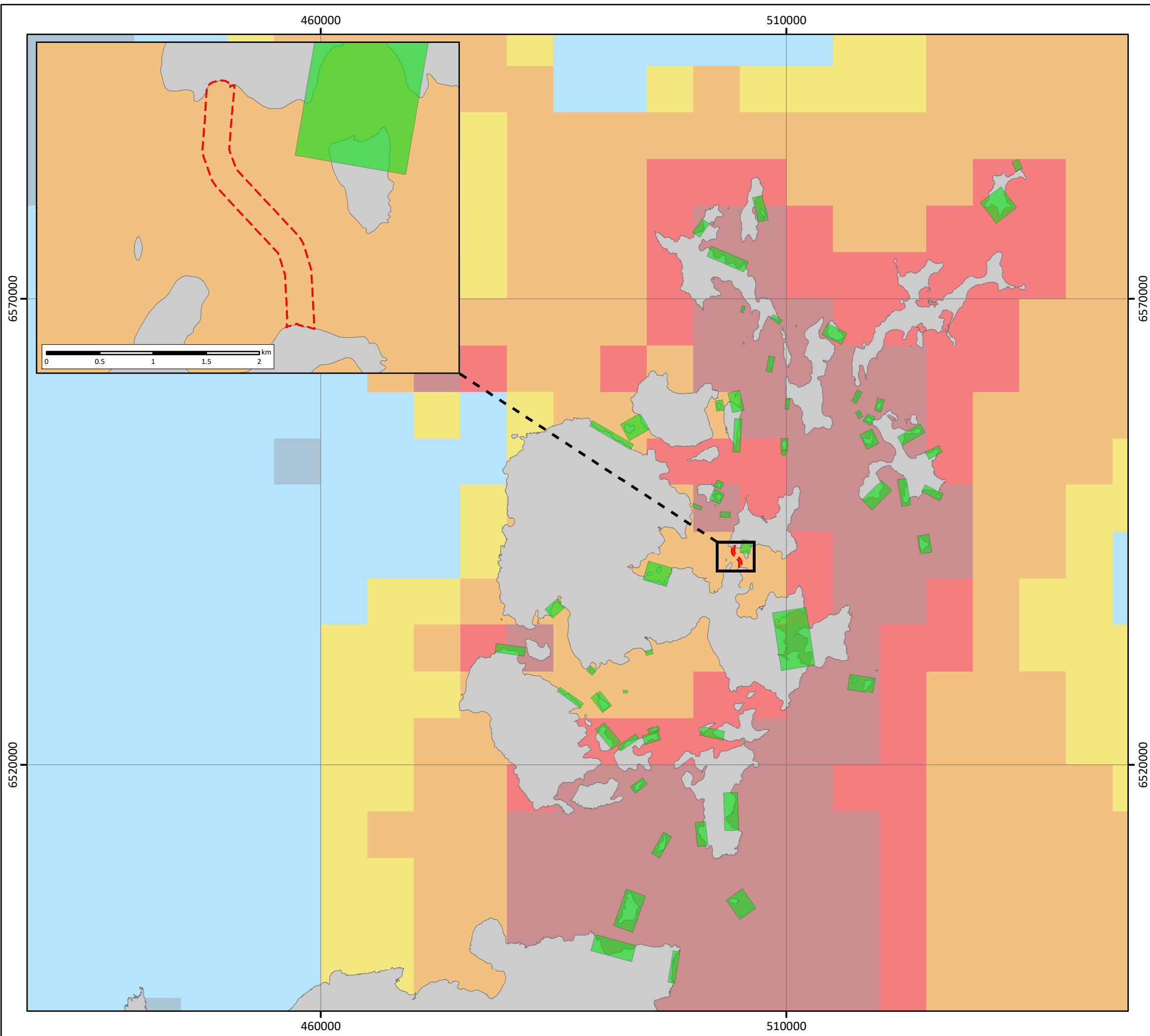


NOTE: Not to be used for Navigation

Date	09 November 2023
Coordinate System	WGS 1984 UTM Zone 30N
Projection	Transverse Mercator
Datum	WGS 1984
Data Source	OS; GEBCO; SMRU; ESRI
File Reference	J:\P2663\P2663D\Mxd_QGZ\03_HAB\ P2663D-HAB-002.mxd
Created By	Oliva Bula
Reviewed By	Emma Langley
Approved By	Vicky Fisk



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ORKNEY TO SHAPINSAY CABLE DISTRIBUTION REPLACEMENT


PELAGIC HABITATS

Density of Common Seals Between 1991 and 2016







Drawing No: P2663D-HAB-001

A


Legend

 Application Corridor

Common Seal Density (5 km x 5 km)

-  <=1
-  1 - 5
-  5 - 10
-  10 - 50
-  50 - 100
-  >=100

Environmental Designations

 Protected Seal Haul-out Site

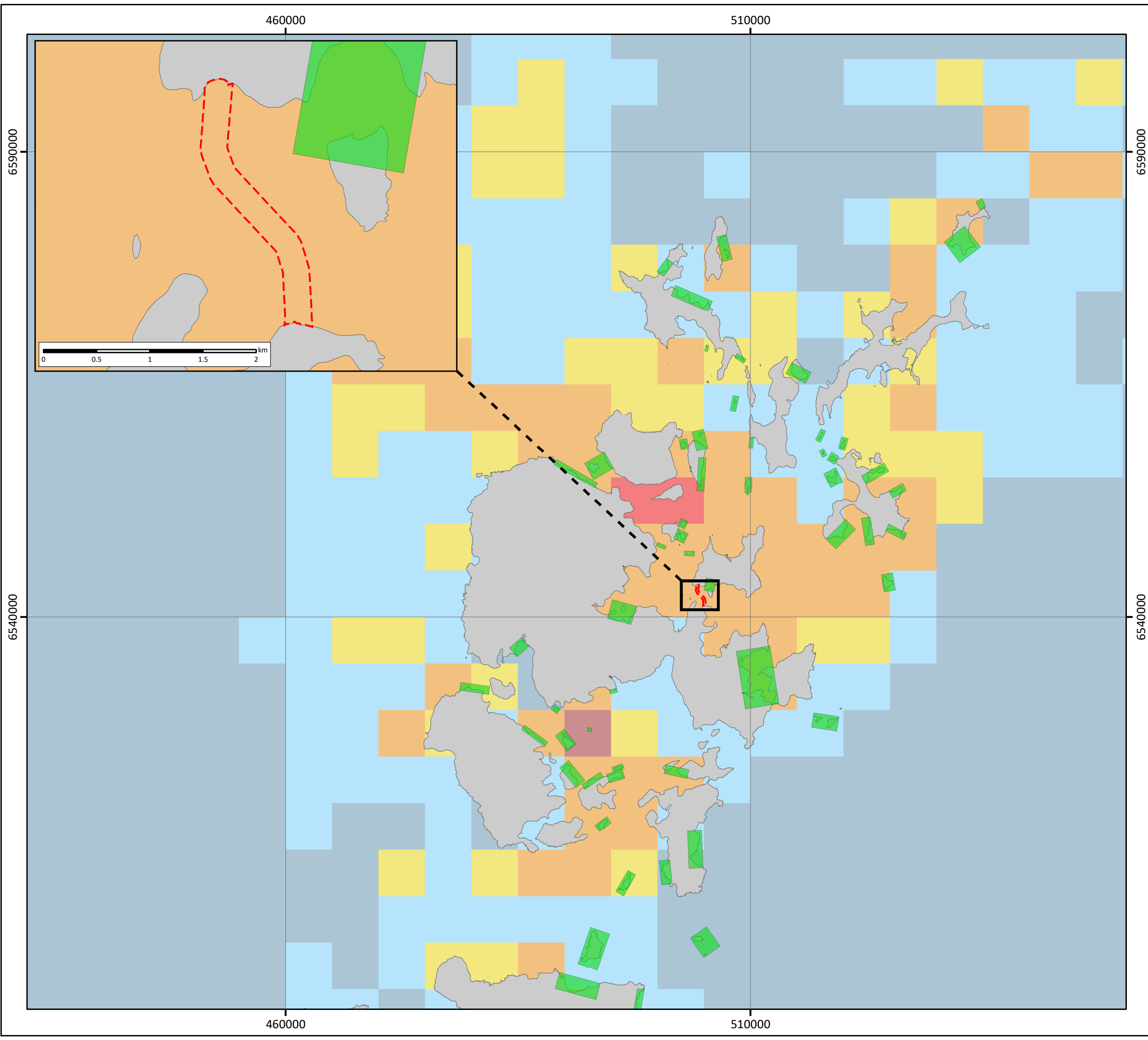


NOTE: Not to be used for Navigation

Date	09 November 2023
Coordinate System	WGS 1984 UTM Zone 30N
Projection	Transverse Mercator
Datum	WGS 1984
Data Source	OS; GEBCO; SMRU; ESRI
File Reference	J:\P2663\P2663D\Mxd_QGZ\03_HAB\ P2663D-HAB-001.mxd
Created By	Oliva Bula
Reviewed By	Emma Langley
Approved By	Vicky Fisk



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5.5.2 Vessel presence

The presence of the installation vessels may pose a hazard of injury to bird and pinniped species as a result of collision risk. During the operation a maximum of six vessels are likely to be utilised including three installation vessels and three support vessels. Due to the potential presence of pinnipeds and seabirds within the Application Corridor these vessels therefore pose a hazard. However, all vessels utilised during this operation will adhere to the SMWWC such that any risks resulting from vessel presence are minimised where possible.

5.5.2.1 North Orkney SPA

Conservation objectives

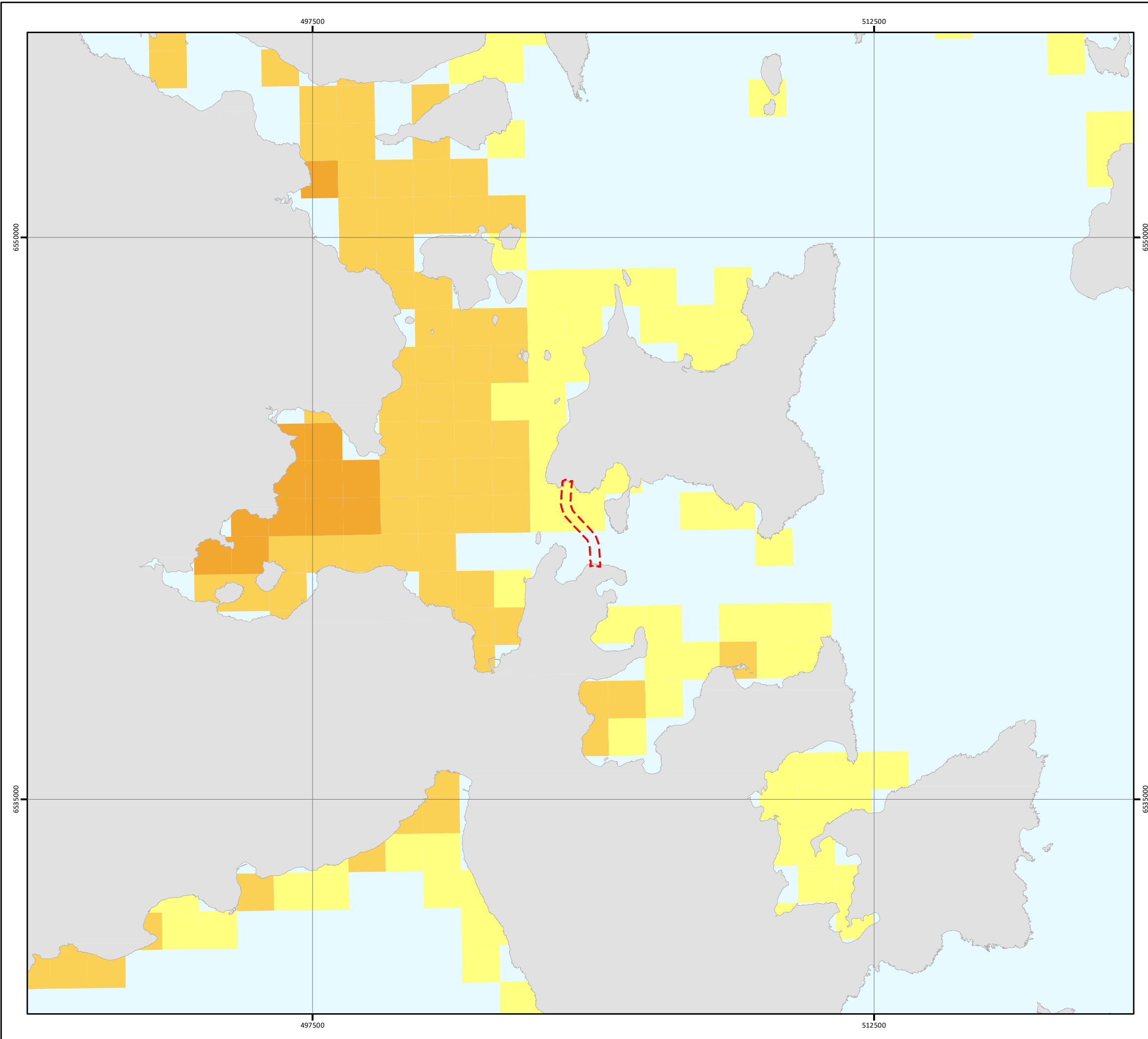
The conservation objectives of the North Orkney SPA are:

- To ensure that the qualifying features of the North Orkney SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.
- To ensure that the integrity of the North Orkney SPA is maintained in the context of environmental changes by meeting the objectives for each qualifying feature:
 - The populations of qualifying features are viable components of the site.
 - The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.
 - The supporting habitats and processes relevant to qualifying features and their prey/food resources are maintained.

Assessment against conservation objectives

Due to the overlap between the Application Corridor and the North Orkney SPA there are likely to be individuals protected within this site present within the Application Corridor where they may be at risk of collision with installation vessels and disruptions to their foraging activities may occur. Of the protected features of the North Orkney SPA, red-throated diver are known to be highly sensitive to vessel presence and exhibit avoidance behaviour to areas of fast moving and high density vessel traffic (Burger *et al.*, 2019; Schwemmer *et al.*, 2011). However, within the Application Corridor predicted red-throated diver distribution is low (Figure 5-4, drawing reference: P2663D-BIRD-001). Furthermore, although the exact route of vessels transiting to and from the Application Corridor during the operation is not available, the vessels used during the proposed operation are expected to follow established vessel routes within the North Orkney SPA, with vessels expected to initially transit out of Kirkwall.

Given the evidence of habituation of bird species, including red-throated diver, to vessel presence, as outlined by Schwemmer *et al.* (2011), the addition of the installation vessels to the baseline levels of shipping traffic in the area will be negligible and red-throated diver are expected to show a degree of habituation such that significant impacts to the species from vessel presence are unlikely. Furthermore, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring. Furthermore, red-throated diver are observed to resettle rapidly follow the transit of a vessel through the area (Burger *et al.*, 2019). Given the above, as well as the application of embedded mitigation measures outlined in Section 4, the North Orkney SPA is expected to remain unaffected.



ORKNEY TO SHAPINSAY CABLE DISTRIBUTION REPLACEMENT

BIRD ACTIVITY

Maximum Curvature and Predicted Feeding Distribution of the Red-Throated Diver

Drawing No: P2663D-BIRD-001

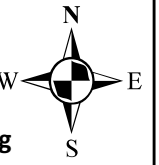
A

Legend

Application Corridor

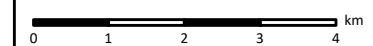
**Maximum Curvature and Predicted Feeding
Distribution of the Red-Throated Diver**

- < 4
- 4 - 12
- 12 - 24
- 24 - 40
- > 40



NOTE: Not to be used for Navigation

Date	26 January 2024
Coordinate System	WGS 1984 UTM Zone 30N
Projection	Transverse Mercator
Datum	WGS 1984
Data Source	OS; MS; ESRI
File Reference	J:\P2663\P2663D\Mxd_QGZ\09_BIRD\ P2663D-BIRD-001.mxd
Created By	Oliver Bula
Reviewed By	Lewis Castle
Approved By	Vicky Fisk



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5.5.2.2 Scapa Flow SPA

Conservation objectives

The conservation objectives of the Scapa Flow SPA are:

- To ensure that the qualifying features of the Scapa Flow SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.
- To ensure that the integrity of the Scapa Flow SPA is maintained in the context of environmental changes by meeting the objectives for each qualifying feature:
 - The populations of qualifying features are viable components of the site.
 - The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.
 - The supporting habitats and processes relevant to qualifying features and their prey/food resources are maintained.

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Scapa Flow SPA will remain unaffected.

5.5.2.3 Orkney Mainland Moors SPA

Conservation objects

The conservation objectives of the Orkney Mainland Moors SPA are:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained, and to ensure for the qualifying species that the following are maintained in the long term:
 - Population of the species as a viable component of the site
 - Distribution of the species within site
 - Distribution and extent of habitats supporting the species
 - Structure, function and supporting processes of habitats supporting the species
 - No significant disturbance of the species

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Orkney Mainland Moors SPA will remain unaffected.

5.5.2.4 Keelylang Hill and Swartaback Burn SSSI

Conservation objectives

The Conservation objectives of the Keelylang Hill and Swartaback Burn SSSI are:

To restore the upland (habitat) assemblage to favourable condition by:

- Maintaining grazing at levels which provide a sward of mixed height and avoid damage from trampling.
- Replacing turfs during peat cutting with vegetation side uppermost.
- Ensuring that muirburn does not spread onto blanket bog where the bog mosses which sustain the habitat could be lost (as set out in the Muirburn Code).
- Ensuring that muirburn does not spread on to short, patchy vegetation where the peat or shallow soils are exposed.
- Locating stock feeding points on firm dry ground, where poaching or enrichment of surrounding ground will be limited.

To maintain the assemblage of moorland breeding birds in favourable condition by:

- Avoiding disturbance of nesting birds.
- Maintaining the moorland habitat in good condition. (range of vegetation heights, including short sward areas for feeding and taller patches for cover for ground nesting birds. Maintaining the water table at the current level).

To maintain the breeding population of hen harriers in favourable condition by:

- Avoiding disturbance of nesting birds.
- Maintaining the moorland habitat in good condition. The Natural Care Orkney Hen Harrier Scheme had a beneficial impact on the population of hen harriers nesting on the site. Beneficial environmental measures included limited or removal of grazing and, the creation of bird feed and cover crops outwith the SSSI. Future funding for beneficial environmental measures is available under the Scottish Rural Development Programme, Rural Priorities scheme.

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Keelylang Hill and Swartaback Burn SSSI will remain unaffected.

5.5.2.5 West Mainland Moorlands SSSI

Conservation objectives

The conservation objective of the West Mainland Moorlands SSSI is to avoid deterioration of the habitats of the protected features or disturbance to these species thus ensuring the site is maintained and makes a contribution to achieving favourable conservation status for the species.

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the West Mainland Moorlands SSSI will remain unaffected.

5.5.2.6 Muckle and Little Green Holm SSSI

Conservation objectives

The conservation objective of the Muckle and Little Green SSSI is to avoid deterioration of the habitats of grey seal or disturbance to the species thus ensuring the site is maintained and makes a contribution to achieving favourable conservation status for the species.

Assessment against conservation objectives

Grey seal density within the Application Corridor is moderate at 10 – 50 individuals per 25km² (Figure 5-2, drawing reference: P2663D-HAB-002). These individuals are therefore at risk of collision with the vessels during the proposed operations. However the installation vessels will be moving slowly at the rate of cable lay (less than 4 knots) and as such grey seals within the Application Corridor will have ample time to move out of the way therefore reducing the risk of collision. Therefore, the likelihood of collisions occurring are such that the Muckle and Little Green Holm SSSI will remain unaffected.

5.5.2.7 Orphir and Stenness Hills SSSI

Conservation objectives

The conservation objective of the Orphir and Stenness Hills SSSI is to avoid deterioration of the habitats of the protected features or disturbance to the species thus ensuring the site is maintained and makes a contribution to achieving favourable conservation status for the species.

Assessment against conservation objectives

There is the possibility for golden plover protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Orphir and Stenness Hills SSSI will remain unaffected.

5.5.2.8 Copinsay SPA

Conservation objectives

The conservation objectives of the Copinsay SPA are:

- To maintain the site as a suitable breeding habitat for the species present and the distribution and extent of the habitats which support these species.
- To maintain the distribution of the species within the site and ensure that no significant disturbance to the breeding species is caused.

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Copinsay SPA will remain unaffected.

5.5.2.9 Rousay SPA

Conservation objectives

The conservation objectives of the Rousay SPA are:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

- To ensure for the qualifying species that the following are maintained in the long term:
 - Population of the species as a viable component of the site
 - Distribution of the species within site
 - Distribution and extent of habitats supporting the species
 - Structure, function and supporting processes of habitats supporting the species
 - No significant disturbance of the species

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Rousay SPA will remain unaffected.

5.5.2.10 Eynhallow SSSI

Conservation objectives

The conservation objective of the Eynhallow SSSI is to ensure the following are maintained in the long term:

- Population of harbour seal as a viable component of the site
- Distribution of harbour seal within the site
- Distribution and extent of habitats supporting harbour seal
- Structure, function and supporting processes of habitats supporting harbour seal
- No significant disturbance of harbour seal.

Assessment against conservation objectives

Harbour seal density within the Application Corridor is moderate at 10 – 50 individuals per 25km² (Figure 5-3, drawing reference: P2663D-HAB-001). These individuals are therefore at risk of collision with the vessels during the proposed operations. However the installation vessels will be moving slowly at the rate of cable lay (less than 4 knots) and as such harbour seals within the Application Corridor will have ample time to move out of the way therefore reducing the risk of collision. Therefore the likelihood of collisions occurring are such that the Eynhallow SSSI will remain unaffected.

5.5.2.11 Doomy and Whitemaw Hill SSSI

Conservation objectives

The conservation objective of the Doomy and Whitemaw Hill SSSI is to avoid deterioration of the habitats of the protected features or disturbance to the species thus ensuring the site is maintained and makes a contribution to achieving favourable conservation status for the species.

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Doomy and Whitemaw SSSI will remain unaffected.

5.5.2.12 Faray and Holm of Faray SAC

Conservation objectives

- To avoid deterioration of the habitats of grey seal or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying feature.
- To ensure for the qualifying species that the following are maintained in the long term:
 - Population of the species as a viable component of the site
 - Distribution of the species within site
 - Distribution and extent of habitats supporting the species
 - Structure, function and supporting processes of habitats supporting the species
 - No significant disturbance of the species Assessment against conservation objectives

Assessment against conservation objectives

Grey seal density within the Application Corridor is moderate at 10 – 50 individuals per 25km² (Figure 5-2, drawing reference: P2663D-HAB-002). These individuals are therefore at risk of collision with the vessels during the proposed operations. However the installation vessels will be moving slowly at the rate of cable lay (less than 4 knots) and as such grey seals within the Application Corridor will have ample time to move out of the way therefore reducing the risk of collision. Therefore the likelihood of collisions occurring are such that the Faray and Holm of Faray SAC will remain unaffected.

5.5.2.13 Aukerry SPA

Conservation objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
 - Population of the species as a viable component of the site
 - Distribution of the species within site
 - Distribution and extent of habitats supporting the species
 - Structure, function and supporting processes of habitats supporting the species
 - No significant disturbance of the species

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Aukerry SPA will remain unaffected.

5.5.2.14 Hoy SPA

Conservation objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species Assessment against conservation objectives

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Hoy SPA will remain unaffected.

5.5.2.15 Loch of Isbister and the Loons SSSI

Conservation objectives

The conservation objectives of the Loch of Isbister and the Loons SSSI are:

- To maintain the extent and structure of the habitat
- To avoid significant disturbance to typical species within the site specifically to the breeding bird populations
- To maintain the distribution of typical species throughout the habitat by ensuring that the conditions and processes required to support them are sustained

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Loch of Isbister and the Loons SSSI will remain unaffected.

5.5.2.16 Mill Loch SSSI

Conservation objectives

The conservation objective of the Mill Loch SSSI is to avoid deterioration of the habitats of the protected features or disturbance to the species thus ensuring the site is maintained and makes a contribution to achieving favourable conservation status for the species.

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Mill Loch SSSI will remain unaffected.

5.5.2.17 Calf of Eday SPA

Conservation objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

- To ensure for the qualifying species that the following are maintained in the long term:
 - Population of the species as a viable component of the site
 - Distribution of the species within site
 - Distribution and extent of habitats supporting the species
 - Structure, function and supporting processes of habitats supporting the species
 - No significant disturbance of the species

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Calf of Eday SPA will remain unaffected.

5.5.2.18 Marwick Head SPA

Conservation objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
 - Population of the species as a viable component of the site
 - Distribution of the species within site
 - Distribution and extent of habitats supporting the species
 - Structure, function and supporting processes of habitats supporting the species
 - No significant disturbance of the species

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Marwick Head SPA will remain unaffected.

5.5.2.19 West Westray SPA

Conservation objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
 - Population of the species as a viable component of the site
 - Distribution of the species within site
 - Distribution and extent of habitats supporting the species
 - Structure, function and supporting processes of habitats supporting the species
 - No significant disturbance of the species

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the West Westray SPA will remain unaffected.

5.5.2.20 Sanday SAC

Conservation objectives

- To avoid deterioration of the habitats of harbour seal or significant disturbance to the species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying feature.
- To ensure for the qualifying species that the following are maintained in the long term:
 - Population of the species as a viable component of the site
 - Distribution of the species within site
 - Distribution and extent of habitats supporting the species
 - Structure, function and supporting processes of habitats supporting the species
 - No significant disturbance of the species

Assessment against conservation objectives

Harbour seal density within the Application Corridor is moderate at 10 – 50 individuals per 25km² (Figure 5-3, drawing reference: P2663D-HAB-001). These individuals are therefore at risk of collision with the vessels during the proposed operations. However the installation vessels will be moving slowly at the rate of cable lay (less than 4 knots) and as such harbour seals within the Application Corridor will have ample time to move out of the way therefore reducing the risk of collision. Therefore the likelihood of collisions occurring are such that the Sanday SAC will remain unaffected.

5.5.2.21 Papa Westray NCMPA

Conservation objectives

The conservation objective of the Papa Westray NCMPA is to avoid deterioration of the habitats of the protected features or disturbance to the species thus ensuring the site is maintained and makes a contribution to achieving favourable conservation status for the species.

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Papa Westray NCMPA will remain unaffected.

5.5.2.22 North Caithness Cliffs SPA

Conservation objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
 - Population of the species as a viable component of the site

- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the North Caithness Cliffs SPA will remain unaffected.

5.5.2.23 Holm of Papa Westray SSSI

Conservation objectives

The conservation objectives of the Holm of Papa Westray SSSI are:

- To maintain and enhance the population and distribution of black guillemots
- To avoid significant disturbance to black guillemots and other seabirds, especially during the breeding season

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Holm of Papa Westray SSSI will remain unaffected.

5.5.2.24 Papa Westray (North Hill and Holm) SPA

Conservation objectives

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained, and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Papa Westray (North Hill and Holm) SPA will remain unaffected.

5.5.2.25 Stroma SSSI

Conservation objectives

The conservation objectives of the Stroma SSSI are:

- To maintain the condition and extent of the maritime cliff habitat
- To maintain the size and distribution of the populations of breeding seabirds (including terns) and breeding peregrine and to avoid significant disturbance to these birds during the breeding season

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Stroma SSSI will remain unaffected.

5.5.2.26 North Hill SSSI

Conservation objectives

The conservation objectives of the North Hill SSSI are:

- To maintain the maritime cliff habitat in favourable condition by maintaining stocking at a level that is not damaging to vegetation from over-grazing or trampling.
- To restore the populations of breeding terns and skuas to favourable condition by avoiding significant disturbance during breeding season and maintaining the habitat.

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the North Hill SSSI will remain unaffected.

5.5.2.27 Duncansby Head SSSI

Conservation objectives

The conservation objective of the Duncansby Head SSSI is to avoid deterioration of the habitats of the protected features or disturbance to the species thus ensuring the site is maintained and makes a contribution to achieving favourable conservation status for the species.

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Duncansby Head SSSI will remain unaffected.

5.5.2.28 Caithness and Sutherland Peatlands SPA

Conservation objectives

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained, and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Caithness and Sutherland Peatlands SPA will remain unaffected.

5.5.2.29 Dunnet Head SSSI

Conservation objectives

The conservation objectives of the Dunnet Head SSSI are:

- To maintain the condition, distribution and extent of the maritime cliff vegetation
- To maintain the size and distribution of the populations of breeding seabirds and to avoid significant disturbance to these birds during the breeding season
- To maintain the size and distribution of the populations of breeding peregrine and to avoid significant disturbance to these birds during the breeding season

Assessment against conservation objectives

There is the possibility for individuals protected within this site to be present within the Application Corridor where they may be at risk of collision with vessels and disruptions to their foraging activities may occur. However, the slow movement of the installation vessels (less than 4 knots) and the short-term, localised and temporary nature of the installation activities will reduce the likelihood of such impacts occurring as such that the Dunnet Head SSSI will remain unaffected.

5.5.3 Visual (and above water noise) disturbance

The presence of the installation vessels can result in potential impacts to bird and pinniped species both within the waters of the Application Corridor and at the landfall sites. The potential impacts include disturbances to foraging, nesting and breeding behaviours as well as consequential affects to the species reproductive success and fitness.

5.5.3.1 North Orkney SPA

Conservation objectives

The conservation objectives of the North Orkney SPA are:

- To ensure that the qualifying features of the North Orkney SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.
- To ensure that the integrity of the North Orkney SPA is maintained in the context of environmental changes by meeting the objectives for each qualifying feature:
 - The populations of qualifying features are viable components of the site.
 - The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species.

- The supporting habitats and processes relevant to qualifying features and their prey/food resources are maintained.

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. Displacement of seabirds from foraging grounds can lead to reduced survival of offspring during the breeding season, and reduced body mass of adults leading to lower survival in the following winter. Of the protected features of the North Orkney SPA, red-throated diver are known to be easily disturbed by visual and above water noise and are highly sensitive to disturbances from shipping traffic (Burger *et al.*, 2019; Schwemmer *et al.*, 2011). As discussed by Burger *et al.*, (2019), the disturbance distance for red-throated divers from the presence of vessels is 2km. Given the length of the proposed Application Corridor (2.84km) there is therefore potential for this species to be temporarily displaced from foraging areas out to a maximum of 35.69km². Considering the North Orkney SPA covers an area of 211.7km², this represents 16.86% of impacted SPA area for red-throated diver.

However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, it is expected that red-throated diver and other protected species of the North Orkney SPA will show a degree of habituation to the vessels involved in this operation. Therefore, the likelihood of significant impacts occurring are low such that the North Orkney SPA will remain unaffected.

5.5.3.2 Scapa Flow SPA

Conservation objectives

The conservation objectives of the Scapa Flow SPA are:

- To ensure that the qualifying features of the Scapa Flow SPA are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.
- To ensure that the integrity of the Scapa Flow SPA is maintained in the context of environmental changes by meeting the following objectives for each qualifying feature:
 - The populations of qualifying features are viable components of the site
 - The distribution of the qualifying features is maintained throughout the site by avoiding significant disturbance of the species
 - The supporting habitats and processes relevant to qualifying features and their prey/food resources are maintained

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and

from Kirkwall, the likelihood of significant impacts occurring are low such that the Scapa flow SPA will remain unaffected.

5.5.3.3 Orkney Mainland Moors SPA

Conservation objectives

The conservation objectives of the Orkney Mainland Moors SPA are:

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained, and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Orkney Mainland Moors SPA will remain unaffected.

5.5.3.4 Keelylang hill and Swartaback Burn SSSI

Conservation objectives

The Conservation objectives of the Keelylang Hill and Swartaback Burn SSSI are:

To restore the upland (habitat) assemblage to favourable condition by:

- Maintaining grazing at levels which provide a sward of mixed height and avoid damage from trampling.
- Replacing turfs during peat cutting with vegetation side uppermost.
- Ensuring that muirburn does not spread onto blanket bog where the bog mosses which sustain the habitat could be lost (as set out in the Muirburn Code)
- Ensuring that muirburn does not spread on to short, patchy vegetation where the peat or shallow soils are exposed.
- Locating stock feeding points on firm dry ground, where poaching or enrichment of surrounding ground will be limited.

To maintain the assemblage of moorland breeding birds in favourable condition by:

- Avoiding disturbance of nesting birds.

- Maintaining the moorland habitat in good condition. (range of vegetation heights, including short sward areas for feeding and taller patches for cover for ground nesting birds. Maintaining the water table at the current level).

To maintain the breeding population of hen harriers in favourable condition by:

- Avoiding disturbance of nesting birds
- Maintaining the moorland habitat in good condition. The Natural Care Orkney Hen Harrier Scheme had a beneficial impact on the population of hen harriers nesting on the site. Beneficial environmental measures included limited or removal of grazing and, the creation of bird feed and cover crops outwith the SSSI. Future funding for beneficial environmental measures is available under the Scottish Rural Development Programme, Rural Priorities scheme.

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. Furthermore, given that some protected features of this site are primarily terrestrial the activity at the Orkney landfall also has the potential to disturb these species from chosen nesting and feeding areas in the vicinity of the landfall site. However, since installation activities will be temporary, only transit through foraging areas for a short period of time and activity at the landfall kept to a minimum where possible, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding and nesting areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Keelylang Hill and Swartaback Burn SSSI will remain unaffected.

5.5.3.5 West Mainland Moorlands SSSI

Conservation objectives

The conservation objective of the West Mainland Moorlands SSSI is to avoid deterioration of the habitats of the protected features or disturbance to these species thus ensuring the site is maintained and makes a contribution to achieving favourable conservation status for the species.

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. Furthermore, given that some protected features of this site are primarily terrestrial the activity at the Orkney landfall also has the potential to disturb these species from chosen nesting and feeding areas in the vicinity of the landfall site. However, since installation activities will be temporary, only transit through foraging areas for a short period of time and activity at the landfall kept to a minimum where possible, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding and nesting areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Keelylang Hill and Swartaback Burn SSSI will remain unaffected.

5.5.3.6 Muckle and Little Green Holm SSSI

Conservation objectives

The conservation objective of the Muckle and Little Green SSSI is to avoid deterioration of the habitats of grey seal or disturbance to the species thus ensuring the site is maintained and makes a contribution to achieving favourable conservation status for the species.

Assessment against conservation objectives

Seals were observed both hauled out and within the water during the Shapinsay landfall visit (OceaniQ, 2023) and grey seals protected within the Muckle and Little Green Holm SSSI may be present within the Helliar Holm North & Elwick protected seal haul out site located 490m north east of the Application Corridor. Given that seals located within haul out sites have a typical disturbance range of 900m the visual disturbance of the installation vessels within the Application Corridor, have the potential to cause seals to flush from the site into the sea (Brassuer and Reijnders, 1994). However, the installation activities will be short-term, localised and temporary and thus disturbance to hauled out seals will be minimal. There is also evidence of habituation behaviours in seals, with seals observed to be less likely to flush into the water from haul out sites in areas with a high density of passing vessels (Olsen *et al.*, 2017). Given the relatively high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, disturbance to seals is not expected to be significant. Furthermore, given that the grey seal pupping season runs from October to December disturbance to seal pups is unlikely and thus prolonged significant impacts occurring are low, such that the Muckle and Little Green Holm SSSI will remain unaffected (Scottish Wildlife Trust, 2023). Further assessment of the impacts to seal haul-out sites within the vicinity of the Application Corridor is provided in Section 7.

5.5.3.7 Orphir and Stenness Hills SSSI

Conservation objectives

The conservation objective of the Orphir and Stenness Hills SSSI is to avoid deterioration of the habitats of the protected features or disturbance to the species thus ensuring the site is maintained and makes a contribution to achieving favourable conservation status for the species.

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Orphir and Stenness Hills SSSI will remain unaffected.

5.5.3.8 Copinsay SPA

Conservation objectives

The conservation objectives of the Copinsay SPA are:

- To maintain the site as a suitable breeding habitat for the species present and the distribution and extent of the habitats which support these species.
- To maintain the distribution of the species within the site and ensure that no significant disturbance to the breeding species is caused.

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Copinsay SPA will remain unaffected.

5.5.3.9 Rousay SPA

Conservation objectives

The conservation objectives of the Rousay SPA are:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
 - Population of the species as a viable component of the site
 - Distribution of the species within site
 - Distribution and extent of habitats supporting the species
 - Structure, function and supporting processes of habitats supporting the species
 - No significant disturbance of the species

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Rousay SPA will remain unaffected.

5.5.3.10 Eynhallow SSSI

Conservation objectives

The conservation objective of the Eynhallow SSSI is to ensure the following are maintained in the long term:

- Population of harbour seal as a viable component of the site
- Distribution of harbour seal within the site
- Distribution and extent of habitats supporting harbour seal
- Structure, function and supporting processed of habitats supporting harbour seal
- No significant disturbance of harbour seal

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring to bird species is low.

Seals were observed both hauled out and within the water during the Shapinsay landfall visit (OceaniQ (2023) and harbour seals protected within the Eynhallow SSSI may be present within the Helliar Holm North & Elwick protected seal haul out site located 490m north east of the Application Corridor. Given that seals located within haul out sites have a typical disturbance range of 900m the visual disturbance of the installation vessels within the Application Corridor, have the potential to cause seals to flush from the site into the sea (Brassuer and Reijnders, 1994). There is also evidence of habituation behaviours in seals, with seals observed to be less likely to flush into the water from haul out sites in areas with a high density of passing vessels (Olsen *et al.*, 2017). Given the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, disturbance to seals is not expected to be significant. The harbour seal pupping season occurs in early summer from June to July and therefore overlaps the planned installation period (The Scottish Government, 2023). However, the installation activities will be short-term, localised and temporary and thus disturbance to hauled out seals will be kept to a minimum. Therefore, significant disturbances to seals occurring are unlikely. The Eynhallow SSSI will therefore remain unaffected. Further assessment of the impacts to seal haul-out sites within the vicinity of the Application Corridor is provided in Section 7.

5.5.3.11 Doomy and Whitemaw Hill SSSI

Conservation objectives

The conservation objective of the Doomy and Whitemaw Hill SSSI is to avoid deterioration of the habitats of the protected features or disturbance to the species thus ensuring the site is maintained and makes a contribution to achieving favourable conservation status for the species.

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Doomy and Whitemaw Hill SSSI will remain unaffected.

5.5.3.12 Faray and Holm of Faray SAC

Conservation objectives

To avoid deterioration of the habitats of grey seal or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying feature; and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species Assessment against conservation objectives

Assessment against conservation objectives

Seals were observed both hauled out and within the water during the Shapinsay landfall visit (OceaniQ (2023) and grey seals protected within the Faray and Holm of Faray SAC may be present within the Helliar Holm North & Elwick protected seal haul out site located 490m north east of the Application Corridor. Given that seals located within haul out sites have a typical disturbance range of 900m the visual disturbance of the installation vessels within the Application Corridor, have the potential to cause seals to flush from the site into the sea (Brassuer and Reijnders, 1994). However, the installation activities will be short-term, localised and temporary and thus disturbance to hauled out seals will be minimal. There is also evidence of habituation behaviours in seals, with seals observed to be less likely to flush into the water from haul out sites in areas with a high density of passing vessels (Olsen *et al.*, 2017). Given the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, disturbance to seals is not expected to be significant. Furthermore, given that the grey seal pupping season runs from October to December disturbance to pups is unlikely and thus prolonged significant impacts occurring are low such that the Faray and Holm of Faray SAC will remain unaffected (Scottish Wildlife Trust, 2023). Further assessment of the impacts to seal haul-out sites within the vicinity of the Application Corridor is provided in Section 7.

5.5.3.13 Auskerry SPA

Conservation objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
 - Population of the species as a viable component of the site
 - Distribution of the species within site
 - Distribution and extent of habitats supporting the species
 - Structure, function and supporting processes of habitats supporting the species
 - No significant disturbance of the species

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Auskerry SPA will remain unaffected.

5.5.3.14 Hoy SPA

Conservation objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
 - Population of the species as a viable component of the site
 - Distribution of the species within site
 - Distribution and extent of habitats supporting the species
 - Structure, function and supporting processes of habitats supporting the species
 - No significant disturbance of the species Assessment against conservation objectives

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Hoy SPA will remain unaffected.

5.5.3.15 Loch of Isbister and the Loons SSSI

Conservation objectives

The conservation objectives of the Loch of Isbister and the Loons SSSI are:

- To maintain the extent and structure of the habitat
- To avoid significant disturbance to typical species within the site specifically to the breeding bird populations
- To maintain the distribution of typical species throughout the habitat by ensuring that the conditions and processes required to support them are sustained

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Loch of Isbister and the Loons SSSI will remain unaffected.

5.5.3.16 Mill Loch SSSI

Conservation objectives

The conservation objective of the Mill Loch SSSI is to avoid deterioration of the habitats of the protected features or disturbance to the species thus ensuring the site is maintained and makes a contribution to achieving favourable conservation status for the species.

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Mill Loch SSSI will remain unaffected.

5.5.3.17 Calf of Eday SPA

Conservation objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
 - Population of the species as a viable component of the site
 - Distribution of the species within site
 - Distribution and extent of habitats supporting the species
 - Structure, function and supporting processes of habitats supporting the species
 - No significant disturbance of the species

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Calf of Eday SPA will remain unaffected.

5.5.3.18 Marwick Head SPA

Conservation objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Marwick Head SPA will remain unaffected.

5.5.3.19 West Westray SPA

Conservation objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
 - Population of the species as a viable component of the site
 - Distribution of the species within site
 - Distribution and extent of habitats supporting the species
 - Structure, function and supporting processes of habitats supporting the species
 - No significant disturbance of the species

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the West Westray SPA will remain unaffected.

5.5.3.20 Sanday SAC

Conservation objectives

- To avoid deterioration of the habitats of harbour seal or significant disturbance to the species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying feature.

- To ensure for the qualifying species that the following are maintained in the long term:
 - Population of the species as a viable component of the site
 - Distribution of the species within site
 - Distribution and extent of habitats supporting the species
 - Structure, function and supporting processes of habitats supporting the species
 - No significant disturbance of the species

Assessment against conservation objectives

Seals were observed both hauled out and within the water during the Shapinsay landfall visit (OceaniQ (2023) and harbour seals protected within the Eynhallow SSSI may be present within the Helliar Holm North & Elwick protected seal haul out site located 490m north east of the Application Corridor. Given that seals located within haul out sites have a typical disturbance range of 900m the visual disturbance of the installation vessels within the Application Corridor, have the potential to cause seals to flush from the site into the sea (Brassuer and Reijnders, 1994). There is also evidence of habituation behaviours in seals, with seals observed to be less likely to flush into the water from haul out sites in areas with a high density of passing vessels (Olsen *et al.*, 2017). Given the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, disturbance to seals is not expected to be significant. The harbour seal pupping season occurs in early summer from June to July and therefore overlaps the planned installation period (The Scottish Government, 2023). However, the installation activities will be short-term, localised and temporary and thus disturbance to hauled out seals will be kept to a minimum. Therefore, significant disturbances to seals occurring are unlikely and the Sanday SAC will remain unaffected. Further assessment of the impacts to seal haul-out sites within the vicinity of the Application Corridor is provided in Section 7.

5.5.3.21 Papa Westray NCMPS

Conservation objectives

The conservation objective of the Papa Westray NCMPS is to avoid deterioration of the habitats of the protected features or disturbance to the species thus ensuring the site is maintained and makes a contribution to achieving favourable conservation status for the species.

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Papa Westray NCMPS will remain unaffected.

5.5.3.22 North Caithness Cliffs SPA

Conservation objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained
- To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the North Caithness Cliffs SPA will remain unaffected.

5.5.3.23 Holm of Papa Westray SSSI

Conservation objectives

The conservation objectives of the Holm of Papa Westray SSSI are:

- To maintain and enhance the population and distribution of black guillemots
- To avoid significant disturbance to black guillemots and other seabirds, especially during the breeding season

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Holm of Papa Westray SSSI will remain unaffected.

5.5.3.24 Papa Westray (North Hill and Holm) SPA

Conservation objectives

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained.
- To ensure for the qualifying species that the following are maintained in the long term:
 - Population of the species as a viable component of the site
 - Distribution of the species within site
 - Distribution and extent of habitats supporting the species

- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Papa Westray (North Hill and Holm) SPA will remain unaffected.

5.5.3.25 Stroma SSSI

Conservation objectives

The conservation objectives of the Stroma SSSI are:

- To maintain the condition and extent of the maritime cliff habitat
- To maintain the size and distribution of the populations of breeding seabirds (including terns) and breeding peregrine and to avoid significant disturbance to these birds during the breeding season

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Stroma SSSI will remain unaffected.

5.5.3.26 North Hill SSSI

Conservation objectives

The conservation objectives of the North Hill SSSI are:

- To maintain the maritime cliff habitat in favourable condition by maintaining stocking at a level that is not damaging to vegetation from over-grazing or trampling
- To restore the populations of breeding terns and skuas to favourable condition by avoiding significant disturbance during breeding season and maintaining the habitat

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily

disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the North Hill SSSI will remain unaffected.

5.5.3.27 Duncansby Head SSSI

Conservation objectives

The conservation objective of the Duncansby Head SSSI is to avoid deterioration of the habitats of the protected features or disturbance to the species thus ensuring the site is maintained and makes a contribution to achieving favourable conservation status for the species.

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Duncansby Head SSSI will remain unaffected.

5.5.3.28 Caithness and Sutherland Peatlands SPA

Conservation objectives

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained, and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Caithness and Sutherland Peatlands SPA will remain unaffected.

5.5.3.29 Dunnet Head SSSI

Conservation objectives

The conservation objectives of the Dunnet Head SSSI are:

- To maintain the condition, distribution and extent of the maritime cliff vegetation
- To maintain the size and distribution of the populations of breeding seabirds and to avoid significant disturbance to these birds during the breeding season
- To maintain the size and distribution of the populations of breeding peregrine and to avoid significant disturbance to these birds during the breeding season

Assessment against conservation objectives

Visual and above water noise disturbance from the presence of vessels has the potential to disrupt feeding behaviours of bird species and reduce access to food resources. Potential disturbances can cause them to alter their feeding behaviour or abandon feeding areas thus impacting their energy intake and overall fitness. However, since installation activities will be temporary and only transit through foraging areas for a short period of time, although individual birds may be temporarily disturbed, they will be able to quickly return to any utilised feeding areas. Furthermore, given the evidence of habituation of bird species to vessel presence, as outlined by Schwemmer *et al.* (2011), and the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, the likelihood of significant impacts occurring are low such that the Dunnet Head SSSI will remain unaffected.

5.5.4 Seabed disturbance

During the installation activities seabed disturbance may result from:

- The cable
- Cast iron split pipe
- Uraduct
- Concrete mattresses
- Rock bags, and
- Clump weights

The potential seabed disturbance resulting from the proposed operation has the potential to impact fish species which use the area for spawning and nursing.

5.5.4.1 North-west Orkney NCMPA

Conservation objectives

The Conservation Objective for the North-west Orkney Nature Conservation Marine Protected Area is that the protected features:

- So far as already in favourable condition, remain in such condition; and
- So far as not already in favourable condition, be brought into such condition, and remain in such condition.

Assessment against conservation objectives

The Orkney area is considered important as an export ground for sandeel with the entire Orkney geographical region identified as having potential for sandeel nursery and spawning grounds (Ellies *et al.*, 2012). Therefore, sandeels protected within the North-west Orkney NCMPA have potential to be

spawning and nursing within the Application Corridor. These species are demersal spawners which lay their eggs on the seabed (Royal HaskoningDHV, 2019). Therefore, physical disturbance to seabed habitat could result in impacts to the spawning rate of sandeels and thus the future recruitment of the species. However, the sandeel spawning period occurs in winter between November and February and as such doesn't overlap with the schedule of the proposed operation (Rossel, 2006). Furthermore, seabed disturbance resulting from this operation is limited to cable lay and stabilisation activities. Therefore, impacts to the species as a result of seabed disturbance resulting from the installation operations are unlikely and thus the North-west Orkney NCMPA will remain unaffected.

5.6 Conclusion

The above assessment has demonstrated that installation activities associated with the cable replacement will not adversely affect the conservation objectives of any designated site within or in the vicinity of the Application Corridor. Any disturbance caused by the installation of the cable will be minor and temporary due to the short-term, localised and temporary nature of the activities.

6. SEABED AND WATER QUALITY

6.1 Introduction

This Section characterises the seabed and water quality conditions characterising the baseline environment, outlines the potential pressures associated with the cable installation activities on the seabed and water quality, and presents the findings of the environmental assessment.

6.2 Data sources

OceaniQ has undertaken geophysical and environmental surveys to provide an overview of the seabed conditions along the Application Corridor. The following reports, which were developed from these surveys, was used to inform this Section:

- Orkney – Shapinsay Cable Route Desktop Study, doc reference: 4063-GMSL-G-RD-0001 Rev 2 (OceaniQ, 2023)
- Environmental Intertidal Survey Report - Orkney, Mull-Iona and Loch a' Choire (Benthic Solutions Ltd, 2023)
- Habitat Assessment Survey Report – Orkney to Shapinsay (Briggs Marine Contractors Ltd., 2023)

In order to establish baseline conditions a desktop review of published information has been undertaken supported by consultation with relevant bodies. Consultations completed as part of this application are summarised in Section 1.5. Any other data sources used are referenced throughout the document.

6.3 Seabed and water quality description

6.3.1 Seabed quality

The water depth in the Shapinsay Sound is 25m at the deepest point (OceaniQ, 2023). Within the Application Corridor water depth ranges from 0 to 20.9m (EMODnet, 2023). Furthermore, the morphology of the Application Corridor has a gradient of around -19° to 72° . Orkney also has a large number of faults running across it however these are not expected to impact the Project (OceaniQ, 2023).

The basement geology under Orkney is Old Red Sandstone. This is a Devonian sedimentary rock that underlies the region from Caithness to southwest Shetland. The sequence is 3,000-5,000m thick across most of this area. The sandstone that outcrops at the proposed landings east of Kirkwall and on southwest Shapinsay is the Rousay Flags strata, part of the Middle Old Red Sandstone which are composed of predominantly fine-grained sandstones with pebbly layers (Mykura, 1976).

Given the remote location of the route the BGS charts of seabed sediment type around the UK do not cover the Orkney-Shapinsay route, but data nearby shows the seabed to be sandy gravel (BGS, 2023). Furthermore, the Habitat Assessment Survey Report (Briggs Marine Contractors Ltd., 2023) identified Application corridor to be 'sandy (coarse) gravel with shells' based on side scan sonar reflectivity with megarippled gravelly sand to be present south of the rocky outcrop in the Shapinsay nearshore area.

An analysis of the bathymetry along the Orkney-Shapinsay route, undertaken during the Cable route Desktop Study (OceaniQ, 2023), showed a significant field of bedforms across the floor of the channel, extending to the northwest and southeast. It was indicated that these were most likely to comprise of gravel waves.

Natural and anthropogenic compounds can result in seabed contamination. Anthropogenic contamination is entirely dependent on the level of development at the nearshore areas of the

Application Corridor. Within the Application Corridor a potential source of contamination has been identified as the active Kirkwall waste disposal site. There are strong tidal currents within Shapinsay Sound, known to be within 3 – 4 knots during spring tides (OceaniQ, 2023). It is therefore anticipated that any discharges at the Kirkwall disposal site will disperse rapidly.

The bathymetry of the Application Corridor is displayed in Figure 6-1 (Drawing reference: P2663D-BATH-001).

6.3.2 Water quality

The European Union (EU) Marine Strategy Framework Directive (MSFD) adopted in 2008 requires that the UK takes “the necessary measures to achieve or maintain “Good Environmental Status” in the marine environment by the year 2020 at the latest” (Buckley *et al.*, 2010). The majority of water across Orkney and Shetland are of good or high environmental status (SEPA, 2015).

The requirement for monitoring UK rivers and near-shore waters has increased as a result of the implementation of the EU Water Framework Directive (WFD), with more stringent criteria for water quality in rivers applied. River Basin Management Plans (RBMP) are being developed as a requirement of the WFD and report on the ‘ecological status’ of surface and ground water in coastal waters (out to 1 nautical mile (nm) from the baseline) and ‘chemical status’ of surface and ground waters in territorial waters (out to 12nm from the baseline). SEPA is responsible for producing RBMPs for the Scotland and the Solway Tweed River Basin Districts. The MSFD assessments are carried out at subregion level, i.e. the Greater North Sea and the Celtic Seas. The MSFD and WFD overlap in coastal waters as the WFD extends to three nm seaward from the Scottish territorial baseline. Any proposed development within these waters must have regards to the WFD and ensure that all surface water bodies achieve ‘Good Ecological Status (GES)’ and that there is no deterioration in status.

SEPA classifies the water quality within and surrounding the Application Corridor to be ‘good’ (SEPA, 2015). There are no known bathing waters located within the vicinity of the Application Corridor, with the closest bathing water located 51km to the south-west.

There are no designated Shellfish Waters within the Application Corridor, the closest is located 7km to the west. However, this site was declassified in 2010 and is no longer an active harvesting site (SEPA, 2011).

6.4 Impact assessment

The Orkney – Shapinsay replacement cable will be entirely surface laid with the exception of the intertidal zone and as such no significant disturbance to underlying geological features in the area is expected and the activities will not result in significant sediment resuspension. The seabed footprint of the works will be minimal, and largely confined to the physical footprint of the cable itself, along with the potential for cable protection measures such as concrete mattresses, Uraduct, split pipe and rock bags, as no seabed modification such as trenching and/or burial will be undertaken. No changes to water flow or levels of suspended solids are expected and as such potential effects on water quality have not been taken forward for further assessment.

Associated impacts on benthic and intertidal features are discussed in Section 8.

6.4.1 Physical change (to another substratum)

Physical change to the seabed within the proposed Application Corridor may arise from installation activities such as cable laying and potential placement of protective deposits on the seabed, which has the potential to lead to permanent seabed substrate (habitat) loss.

This could modify sediment supply and movement of presently occurring bedforms within the Application Corridor. Loss of substrate will result from the footprint of the cable on the seabed, while bedform alteration may occur from laying the cable towards the landfalls on Orkney and Shapinsay.

Given that the cable will be surface laid, disturbance from direct substratum 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 route and use of cable protection deposits have been optimised to minimise their impact on sensitive benthic features, this includes use of cable stabilisation measures and micro-routing around medium resemblance stony reef.

Overall, given the small footprint of the cable installation activities (as defined in Section 4, Table 4-2), significant loss of habitat or features are unlikely to occur.

6.4.2 Abrasion / disturbance at the surface of the substratum

The seabed could be disturbed due to the installation activities, such as cable laying and trenching in the intertidal area, and operational activities, such as cable remedial works, which have the potential to result in damage to the seabed. Use of protective measures such as uraduct and articulated pipe could have an abrasive effect on hard substrate or in sensitive sites in both the subtidal and intertidal zones.

The intertidal 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. As a result of conducting trenching activity in the intertidal area at low tide, it is expected that there will be temporary and localised disturbance.

Suspended sediment will mainly occur in the intertidal section of installation, which may be increased by incoming tide interacting with the cable trenching at the landfall sites. However, the impact of this suspended sediment is not expected to be significantly greater than suspended sediment resulting from wave action which causes low-level erosion of the shoreline sediments.

6.5 Mitigation

Mitigation measures that are embedded in the project design are listed in Table 4-1. Following assessment, there are no additional mitigation measures proposed.

6.6 Conclusion

The above assessment has concluded that the installation and operation of the Orkney to Shapinsay cable will not adversely affect the seabed and water quality within or in the vicinity of the Application Corridor. Any sediment dispersed as a result of the cable installation activities will settle rapidly, likely becoming imperceptible in the water column to levels associated with strong tidal and wave action. Also, given that the cable will be surface laid with the exception of the intertidal area, disturbance from direct habitat loss is expected to be highly localised in extent, limited to the footprint of the cable, uraduct, and any rock bags, split pipe or concrete mattresses (if required), no significant impacts to seabed and water quality features will occur.

7. MARINE MEGAFUNA

7.1 Introduction

This Section characterises the marine megafauna (cetaceans, pinnipeds, otters and basking shark) in the vicinity of the Application Corridor, outlines the potential pressures associated with the proposed cable installation activities on marine megafauna and presents findings of the environmental assessment. Given their mobile nature, and with consideration given to industry guidance (Bennun *et al.*, 2021), a 50km screening distance was used marine megafauna recorded within a 50km radius of the Application Corridor are considered in this section.

7.1.1 Data sources

The baseline has been informed using the following primary sources:

- European Protected Species (EPS) and Protected Sites and Species Risk Assessment – North Coast and Orkney (Appendix D)

In order to establish baseline conditions a desktop review of published information has been undertaken supported by consultation with relevant bodies. Consultations completed as part of this application are summarised in Section 1.5. Any other data sources used are referenced throughout the document.

7.2 Marine megafauna description

7.2.1 Cetaceans

All cetacean species found in the UK are listed under Annex IV of the Habitats Directive as EPS and are protected in Scottish territorial waters under Section 39 of the Conservation (Natural Habitats, &c.) Regulations 1994, with it being an offence to capture, kill or disturb any EPS. Harbour porpoise and bottlenose dolphins are also listed under Annex II of the Habitats Directive, therefore, under Schedule 2 of the Habitats Regulations, the designation of a Special Area of Conservation (SAC) is required to facilitate their conservation. Section 5 “Protected Sites” considers all protected species which are designated features of SACs. According to the SCANS-IV survey undertaken in 2022, the Application Corridor is located within SCANS Block CS-K. Four species of cetacean have been recorded in this Block: harbour porpoise (*Phocoena phocoena*), Risso’s dolphin (*Grampus griseus*), (white-beaked dolphin (*Lagenorhynchus albirostris*) and minke whale (*Balaenoptera acutrostrata*) (Gilles *et al.*, 2023). These species, along with other species classed as infrequent visitors, are detailed in Table 7-1.

Table 7-1 Cetacean species recorded within the Application Corridor

Species	Description of species and occurrence	Density estimates in vicinity of Application Corridor (individuals/km ²)	Management Unit (MU) population estimate
Commonly Observed Species			
Harbour porpoise (<i>Phocoena phocoena</i>)	Harbour porpoise are present year round across the Orkney Islands, with Orkney waters thought to support a likely resident population. During October, an annual aggregation of porpoise utilise an area to the east of the island of Hoy for mating. There are no protected sites for harbour porpoise within 50km of the Application Corridor.	0.28	346,601

Species	Description of species and occurrence	Density estimates in vicinity of Application Corridor (individuals/km ²)	Management Unit (MU) population estimate
Risso's dolphin (<i>Grampus griseus</i>)	Risso's dolphin are widely distributed throughout the Orkney Islands, occurring in all months of the year but peaking in August. There are no protected sites for Risso's dolphin within 50km of the Application Corridor.	0.038	15,895
White-beaked dolphin (<i>Lagenorhynchus albirostris</i>)	White-beaked dolphins are present within Orkney waters most commonly during winter months and are usually observed offshore. They are the most commonly observed dolphin species across Orkney. There are no protected sites for white-beaked dolphin within 50km of the Application Corridor.	0.14	43,951
Minke whale (<i>Balaenoptera acutrostrata</i>)	Minke whale are the most commonly recorded baleen whale in Orkney waters with animals recorded throughout summer and autumn. The species are mainly observed on the south coast of Orkney and in Pentland Firth, occurring in small numbers. There are no protected sites for minke whale within 50km of the Application Corridor.	0.012	20,118
Infrequent visitors			
Bottlenose dolphin (<i>Tursiops truncatus</i>)	Bottlenose dolphin are rarely seen in Orkney waters but empirical evidence indicates their range is expanding into the region. If seen, they are observed alone or small groups. There are no protected sites for bottlenose dolphin within 50km of the Application Corridor.	0.025	2,022

Sources: UK Parliament (2022); Gilles *et al.* (2023); IAMMWG, 2022; SeaWatch (2006)

7.2.2 Pinnipeds

Two seal species inhabit UK waters: the harbour seal (*Phoca vitulina*) and the grey seal (*Halichoerus grypus*). Both species occur year-round throughout the Orkney islands and have been recorded within and around the Application Corridor (Paterson *et al.*, 2015; SCOS, 2021). During the breeding and moulting season, seals are particularly vulnerable to disturbance. For harbour seals, breeding season occurs in June and July, and moulting season in August and September (Paterson *et al.*, 2015). For grey seals, breeding occurs mid-September to December and moulting from December to April (Paterson *et al.*, 2015).

The latest population estimate for harbour seals in Scotland is around 37,300 individuals, with half of those occurring in Orkney and Shetland (Morris *et al.*, 2021). The Application Corridor does not overlap with any SACs for harbour seal, however, as outlined in Section 5 "protected sites" there is the potential for seals protected within a designated site to be present within the Application Corridor.

The latest population estimate for grey seals in Scotland is around 106,300 individuals, and Orkney is identified as one of the main breeding regions for the species (Morris *et al.*, 2021). The Application Corridor does not overlap with any SACs for grey seals; however, as outlined in Section 5 "protected sites" there is the potential for seals protected within a designated site to be present within the Application Corridor.

Within the Application Corridor, at-sea usage for harbour and grey seals is estimated to be between 10-50 individuals (Figure 7-1 and 7-2; (Drawing Reference: P2663-HAB-001 and P2663-HAB-002)). Within the vicinity of the Application Corridor there are also numerous seal haul-out sites (Figure 7-1

and 7-2; (Drawing Reference: P2663-HAB-001 and P2663-HAB-002))). Of note is the Helliar Holm North & Elwick protected seal haul out site is located 490m north east of the Application Corridor.

Multiple harbour seals (*Phoca vitulina*) were observed resting on the furoid covered bedrock and boulders to the west of the Shapinsay landfall. This species is listed as a PMF species, the UK Post-2010 Biodiversity Framework, Bern Convention, Scottish Biodiversity List and is an Annex II and Annex IV species under the Habitats Directive (European Commission, 2021). There has been a decline in *Phoca vitulina* numbers and the species is under threat due to anthropogenic factors such as fishing, gear entrapment, disturbance and toxic chemicals (NatureScot, 2020b).

ORKNEY TO SHAPINSAY CABLE DISTRIBUTION REPLACEMENT


PELAGIC HABITATS

Density of Common Seals Between 1991 and 2016







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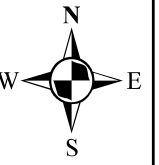
 Application Corridor

Common Seal Density (5 km x 5 km)

-  <=1
-  1 - 5
-  5 - 10
-  10 - 50
-  50 - 100
-  >=100

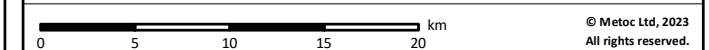
Environmental Designations

 Protected Seal Haul-out Site

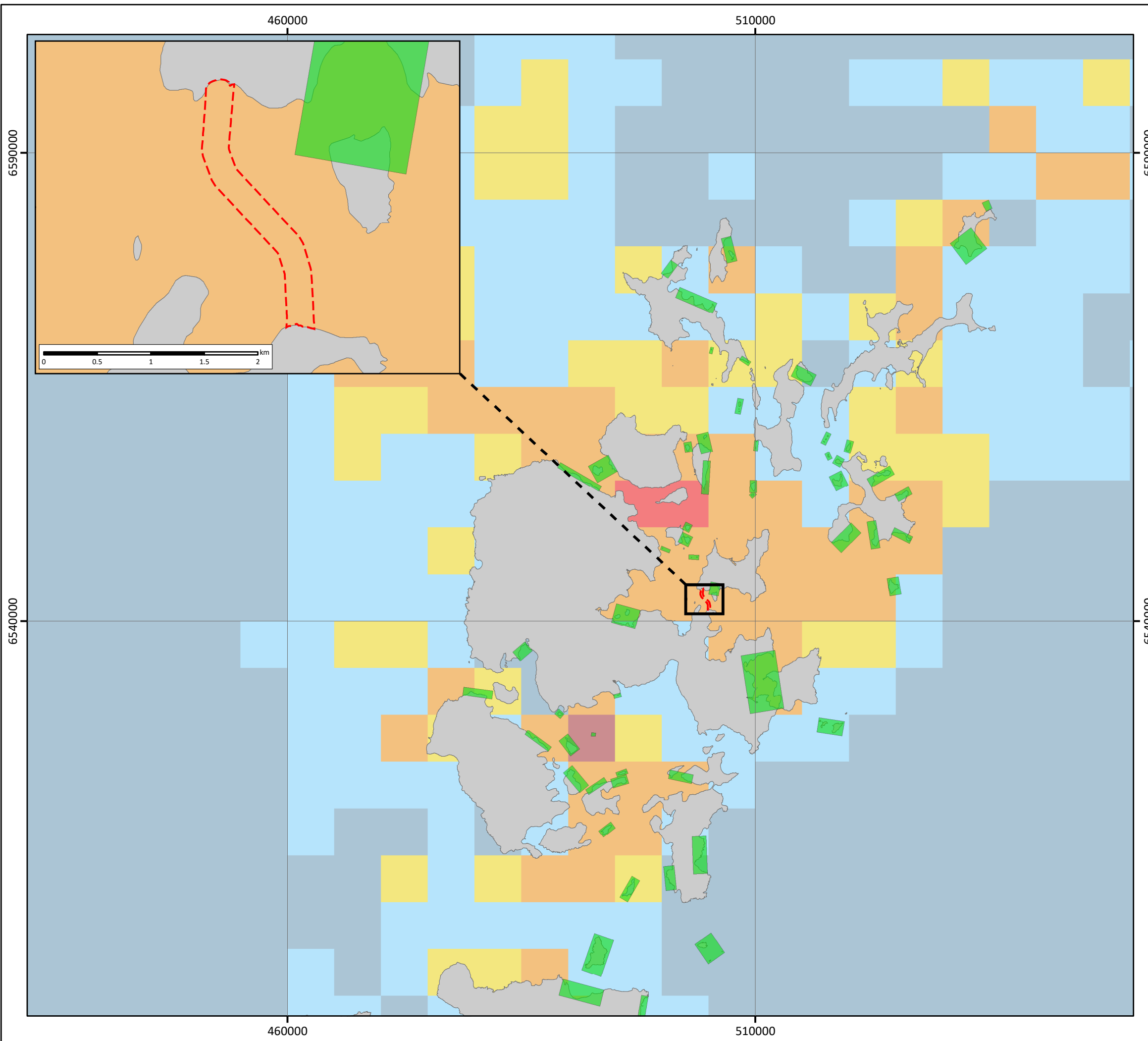


NOTE: Not to be used for Navigation

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Datum	WGS 1984
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Created By	Oliva Bula
Reviewed By	Emma Langley
Approved By	Vicky Fisk



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ORKNEY TO SHAPINSAY CABLE DISTRIBUTION REPLACEMENT


PELAGIC HABITATS

Density of Grey Seals Between 1991 and 2016







Drawing No: P2663D-HAB-002

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Legend

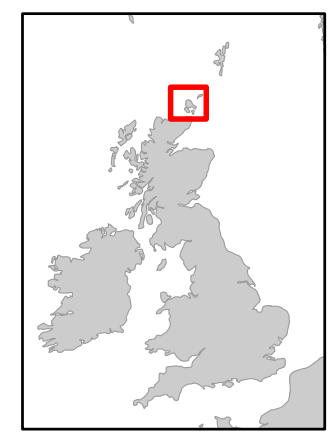
 Application Corridor

Grey Seal Density (5 km x 5 km)

-  <=1
-  1 - 5
-  5 - 10
-  10 - 50
-  50 - 100
-  >=100

Environmental Designations

 Protected Seal Haul-out Site

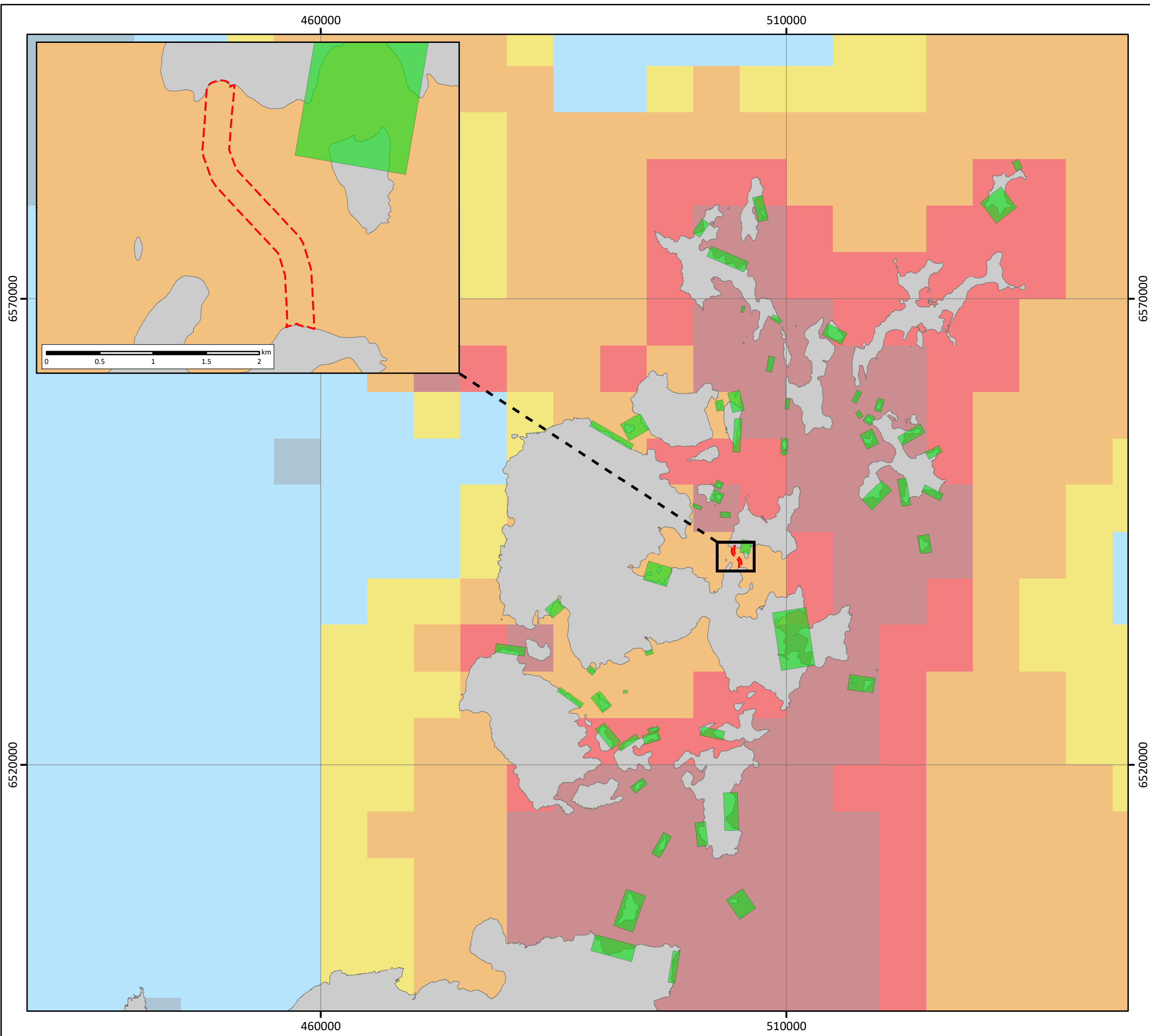


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Created By	Oliva Bula
Reviewed By	Emma Langley
Approved By	Vicky Fisk



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7.2.3 Otters

Otter are semi-aquatic mammals which may inhabit rivers, lakes, coastal areas, and marshy areas some distance from open water. Coastal populations utilise shallow, inshore marine areas for feeding but depend on fresh water for bathing and terrestrial areas for resting and breeding holts. They are commonly seen foraging within a narrow zone close to the shore (<100m) and only rarely cover larger distances, moving between islands (DECC, 2016). Otter prefer low peat-covered coastlines with a strong freshwater supply and shallow, seaweed rich waters offshore.

Otter were observed in the vicinity of the Orkney landfall site during the Environmental Intertidal Survey (Benthic Solutions Ltd, 2023). The presence of otter spraint as well as feeding grounds, identified as crab carcasses and mussel shell debris, were also identified. It should be noted that there are no designated sites which list otter as a primary or qualifying interest feature within 50km of the Application Corridor. Otter was also sighted during subtidal survey operations.

Lutra lutra is listed as a PMF species, on the UK Post-2010 Biodiversity Framework (formally UK BAP) and on the Bern Convention. It is also included in the Scottish Biodiversity List. This species is protected due to its large decline and is becoming increasingly threatened by fishing (NatureScot, 2020a). *Lutra lutra* is an Annex IV species under the Habitats Directive (European Commission, 2021). It is also an Annex II species.

7.2.4 Basking shark


Basking shark are the second largest fish in the world and one of the few species of filter feeding shark (Sims, 2008). They are a wide-ranging species occurring from warm temperate waters of the European continental shelf as far north as the arctic (Sims, 2008). In Orkney, basking shark are observed most commonly between July and September, with peak records in August (Evans *et al.*, 2011). There are no protected sites designated for basking shark within 50km of the Application Corridor however, given the mobile nature of the species there is potential for their presence within the Application Corridor. The NMPi (2023) reports basking shark density is low within the Application Corridor, with 0-0.1 animals/km² (Figure 7-3 drawing reference: P2663D-FISH-004).

**ORKNEY TO SHAPINSAY DISTRIBUTION
CABLE REPLACEMENT**
FISH AND FISHING ACTIVITIES
Observed Adjusted Densities of
Basking Shark (2000-2012)









Drawing No: P2663D-FISH-004

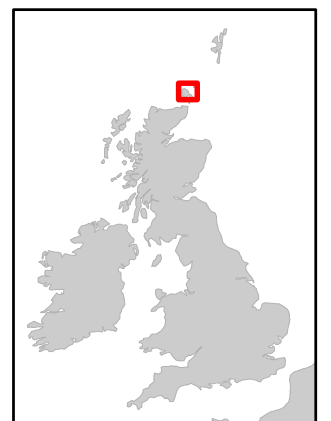
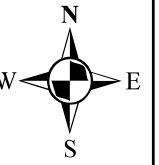
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Legend

 Application Corridor

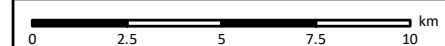
**Observed Adjusted Densities of
Basking Shark (Encounter Rate)**

-  0.0 - 0.1
-  0.1 - 0.2
-  0.2 - 0.5
-  0.5 - 1.0
-  1.0 - 2.0
-  2.0 - 5.0
-  5.0 - 10.0
-  > 10.0

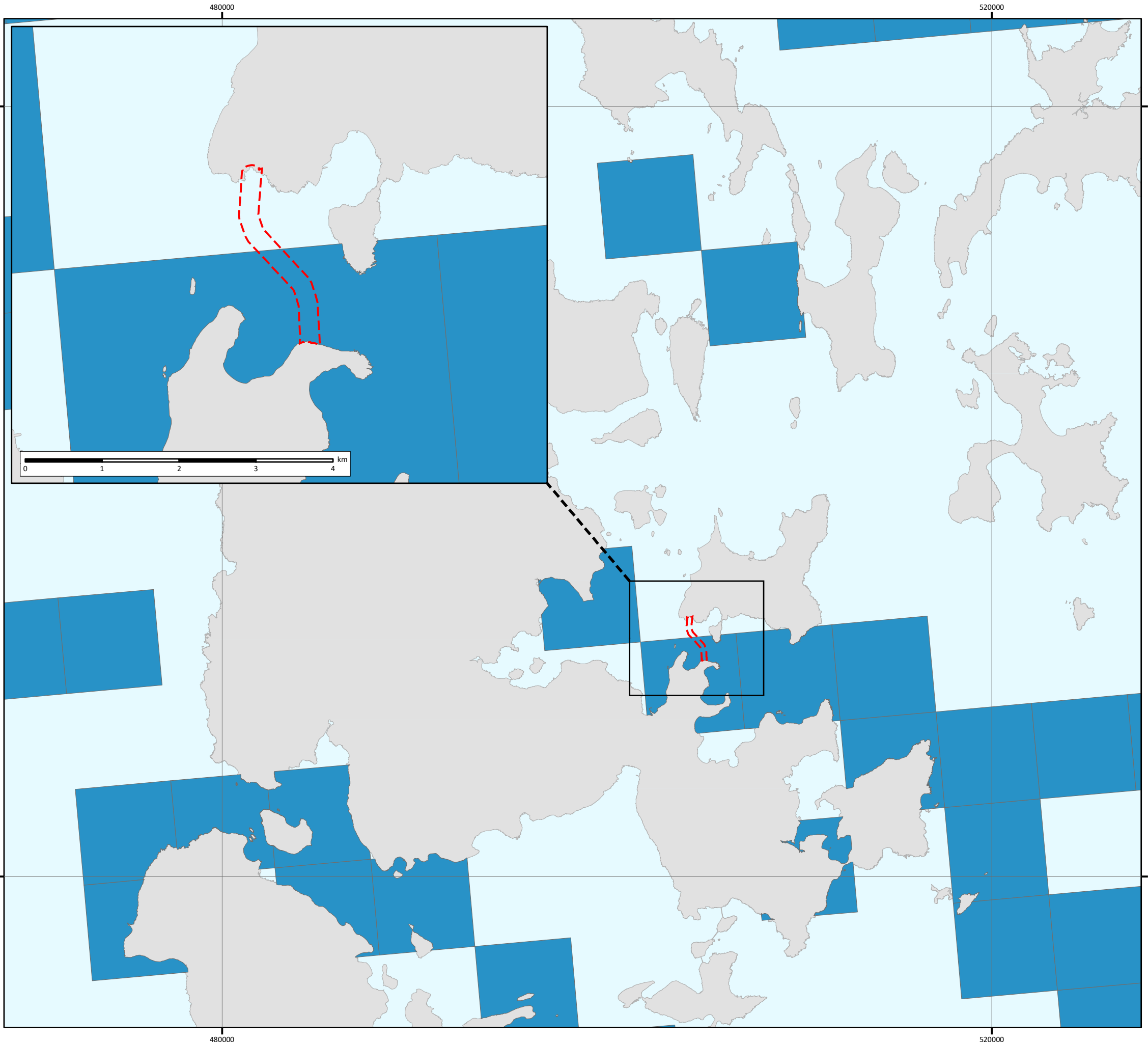


NOTE: Not to be used for Navigation

Date	09 November 2023
Coordinate System	WGS 1984 UTM Zone 30N
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Datum	WGS 1984
Data Source	OS; NS; SHEPD; ESRI
File Reference	J:\P2663\P2663D\Mxd_QGZ\05_FISH\ P2663D-FISH-004.mxd
Created By	Oliver Bula
Reviewed By	Emma Langley
Approved By	Aodhfin Coyle



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7.3 Impact assessment

7.3.1 Underwater noise changes

As described in Section 5 “Protected sites”, the main sources of underwater noise generated during the replacement cable installation will be from the installation vessels and the cable laying activities. Underwater noise changes resulting from the installation activities primarily result from the noise associated with vessels and Ultra-short baseline (USBL). The assessment below focusses on the cetacean and pinniped species in the vicinity of the Application Corridor, and the effects that USBL devices may have on these species.

If frequencies of the sound produced fall outside the predicted auditory bandwidth for a species, then disturbance is unlikely. Sufficiently loud noise sources, however, can still cause damage to an individuals’ auditory or other internal organs. For details on the typical auditory bandwidths of cetaceans, see Table 7-2.

Table 7-2 Auditory bandwidths estimated for hearing groups

Hearing Group	Estimated Auditory Bandwidth
Low-frequency cetaceans (deep diving species e.g. minke whale, pilot whale, etc.)	7Hz to 35kHz, with peak sensitivity around 100-200Hz
Mid-frequency cetaceans (small dolphins e.g. bottlenose dolphin, common dolphin, white-beaked dolphin, etc.)	150Hz to 160kHz, with peak sensitivity above 10kHz (Except for killer whales: 50Hz to 100kHz)
High-frequency cetaceans (harbour porpoise)	180Hz to 200kHz, with peak sensitivity above 4kHz
Phocid pinnipeds (true seals, e.g. grey and harbour seal)	50Hz to 86kHz
Basking shark	20Hz to 1kHz

Source: NMFS, 2018; Southall *et al.*, 2019

7.3.1.2 Cetaceans

Cetaceans present within the Application Corridor may experience impacts from the installation activities such as injury to auditory and internal organs and disturbance to behavioural patterns. USBL in a worst-case scenario would disturb less than 0.1 individuals of any cetacean species per 0.13km² (Xodus, 2023). As such, potential disturbance impacts from USBL on harbour porpoise, white-beaked dolphin, minke whale and bottlenose dolphin would be negligible. Given the regular levels of shipping in the area, with vessels transiting to and from Kirkwall (see Section 13 – Shipping and Navigation), the addition of vessels associated with installation activities will not substantially increase vessel numbers or the existing baseline soundscape in the vicinity of the Application Corridor. Given that the presence of the installation vessels will not result in a significant change to the number of vessels in the area and that cable installation activities will be a temporary occurrence, no adverse effects to cetaceans from the installation activities are expected. There will therefore be no significant disturbance to cetacean species as a result of installation activities.

7.3.1.3 Pinnipeds

While less sensitive to underwater noise emissions than cetaceans, noise from vessels has been shown to elicit behavioural responses in seals (Mikkelsen *et al.*, 2019). For details on the typical auditory bandwidths of pinnipeds, see Table 7-2. Noise emissions from vessels associated with the Project will be short-term, localised and temporary, such that any disturbance to seals will be short-term. Seals in the water could also be susceptible to disturbance from USBL devices however, given the overlap in

their hearing ranges and sound generated by USBL devices (NMFS, 2018). Studies have shown that individuals will quickly return to an area that was subjected to even high-intensity noise emissions within a short period of time (Russell *et al.*, 2016). As such, given the low usage of seals at sea within the Application Corridor and temporary nature of the installation activities, no significant disturbance of seals will occur as a result of installation activities.

7.3.1.4 Otters

Otter are known to possess the ability to detect underwater sounds however, their hearing is primarily air adapted (Ghoul & Reichmuth, 2016). In water their auditory bandwidth is identified as 125Hz to 40kHz (Ghoul & Reichmuth, 2016) however, they are not considered sensitive to noise (Xodus, 2023). Given their specialisation for aerial hearing, the impact of underwater noise changes resulting from the installation vessels and cable replacement operations is not considered to pose a significant risk to the species. Furthermore, operations will be short-term and as such any disturbance to otter will be temporary.

7.3.1.5 Basking shark

Elasmobranchs (sharks and rays) in general are considered to have a low sensitivity to noise given that they do not possess a swim bladder. The hearing capabilities of basking sharks is unknown; however, five species of elasmobranch are known to hear in the range of 20Hz to 1KHz (Macleod *et al.*, 2011). The low frequency noise emissions produced by vessels overlaps with this range, therefore, could be a potential risk to basking sharks should they have similar hearing sensitivity. However, the addition of vessels associated with installation activities will not substantially increase vessel numbers or the existing baseline soundscape in the vicinity of the Application Corridor. As such, no significant disturbance of basking shark is expected.

7.3.2 Vessel presence

The Application Corridor is in close proximity to many active ferry routes transiting to and from Kirkwall, therefore, the addition of vessels associated with the cable installation will not substantially increase overall vessel numbers in the area.

The effects of vessel presence on marine mammals has been assessed in Section 5 “Protected Sites” if species fall within a protected site or are likely to enter the Application Corridor due to proximity of their protected site. The assessment concluding that no significant effects to these species would occur, due to their mobile nature and the short-term, temporary and localised nature of the installation activities. Furthermore, all vessels utilised during this operation will adhere to the SMWWC such that any risks resulting from vessel presence are minimised where possible.

7.3.2.1 Cetaceans

Although cetaceans may transit the Application Corridor their mobile nature and the slow movement of installation vessels (less than 4 knots) means that individuals will have sufficient time to move out of the path of any vessel. Thus, minimising risks of collision and reducing significant risks of injury or death to unlikely. As such, no significant disturbance to cetaceans is expected.

7.3.2.2 Pinnipeds

When hauled out seals have a typical disturbance range of 900m (Brassuer and Reijnders, 1994). Given that the Helliars Holm North & Elwick protected seal haul out site is located 490m north east of the Application Corridor, there is the potential for hauled out seals to be disturbed by the vessels utilised in this operation. Furthermore, given that seals typically forage within 5-10km of their haul out sites their presence within the Application Corridor is possible. However, the installation activities will be short-term, localised and temporary and thus disturbance to hauled out seals will be minimal. There is also evidence of habituation behaviours in seals, with seals observed to be less likely to flush into the water from haul out sites in areas with a high density of passing vessels (Olsen *et al.*, 2017). Given the high shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, disturbance to hauled out seals is not expected to be significant. Furthermore, the slow

speed of the installation vessels (less than 4 knots) provides individuals with sufficient time to move out of the path of any vessel thus reducing the risk of vessel strike. As such no significant disturbance to pinnipeds is expected.

7.3.2.3 Otters

The presence of the installation vessels utilised during this operation may pose a disturbance risk to otter with otter observed in the vicinity of the Orkney landfall site during the Environmental Intertidal Survey (Benthic Solutions Ltd, 2023). Otter are sensitive to visual and above water noise disturbances which may disrupt their foraging behaviour and exclude them from vital areas (The Scottish Government, 2019). However, given the short-term, localised and temporary nature of the installation activities any disturbance to otter will be temporary and not significant.

7.3.2.4 Basking shark

Basking shark are slow to mature and have long gestational periods (HDTW, 2018). As a large, slow-moving species, basking sharks are at risk of collision with vessels, particularly those at higher speeds. However, given the slow speed of the installation vessels (less than 4 knots) no significant risks of injury to basking shark from vessel presence are expected and as such no significant disturbance to basking shark is expected.

7.4 Mitigation

Mitigation measures that are embedded in the project design are listed in Table 4-1. Following assessment, there are no additional mitigation measures proposed.

7.5 Conclusion

The above assessment has determined that the short-term, localised and temporary nature of installation activities in combination with low densities of marine megafauna in the area (harbour and grey seal usage is estimated between 10-50 individuals per km² and minke whale and basking shark encounter rates of up to 0.10 animals per km²) there are unlikely to be any adverse effects to cetacean, pinniped and elasmobranchs as a consequence of planned installation activities.

8. BENTHIC AND INTERTIDAL ECOLOGY

8.1 Introduction

This Section characterises the intertidal and subtidal benthic ecology within the Application Corridor, outlines the pressures associated with the cable installation activities on intertidal and subtidal benthic communities and presents the findings of the environmental assessment.

8.2 Data sources

Baseline conditions have been established by undertaking a desktop review of published data and through interpretation of data provided in a site specific subtidal and intertidal habitat assessment report produced by Benthic Solutions Limited (BSL) for the marine surveys undertaken between August and September 2023. The Marine Scotland Feature Activity Sensitivity Tool (FeAST) tool and the Marine Life Information Network (MarLIN) sensitivity descriptions have been used to inform the impact assessment.

The baseline description and assessment has been informed using the following primary sources:

- Orkney to Shapinsay Habitat Assessment Survey Report (Benthic Solutions Ltd, 2023a)
- Environmental Intertidal Survey Phase 1: Orkney, Mull-Iona and Loch a' Choire (Benthic Solutions Ltd, 2023b)
- Marine Scotland FeAST tool (Marine Scotland, 2023)
- MarLIN – The Marine Life Information Network (MarLIN, 2023)

8.3 Benthic and intertidal ecology description

8.3.1 Intertidal ecology

8.3.1.1 Orkney landfall site

The site was composed of different elevations of bedrock with some areas of coarse gravel, mixed sediment and occasional boulders. The supralittoral zone was characterised by a diverse community of yellow and grey lichens such as *Lecanora* sp. and *Ramalina* spp. (EUNIS habitat classification MA1211) leading into *Hydropunctaria maura* on the upper eulittoral zone (MA12132). This was observed across the whole area of the Orkney landfall. Periwinkles, such as *Littorina* spp., and sparse barnacles occasionally occupied surfaces and crevices between rocks.

Patches of rock (MA12) and patches of shingle, cobbles and pebbles were observed (MA3211) throughout the upper eulittoral zone. The same shingle habitat was also observed towards the centre of the landfall, with small strandline (N212) present. The shingle habitat was also observed in an area of trenched bedrock at the centre of the landfall, which appeared to be existing cable burial locations. Two additional habitats were observed in the trenched bedrock. The first consisted of cobbles, pebbles and sand (MA42). The second was located further down the shore and consisted of pebbles and cobbles with brown algae, *Laminaria saccharina* and *Chorda filum* (MB1233). On the lower extent of the barren shingle, ephemeral green algae were observed (MA4211).

The upper littoral zone was colonised by channelled wrack (*Pelvetia canaliculate*) overgrowing black lichen (MA123B). Mixed areas of *P. canaliculata* (MA123B) and spiral wrack (*Fucus spiralis*; MA123C1) were present on the eastern and western extents of the landfall.

Further down the shore, in the mid-eulittoral zone, knotted wrack (*Ascophyllum nodosum*) on rock was observed along the majority of the landfall, mixed with other habitats (MA123E1). On the eastern

and western extents, *A. nodosum* was intermixed with *F. spiralis* and so a mixture of biotopes were observed (MA123C1, MA123E1). On the eastern extent, *A. nodosum* was intermixed with bladder wrack, *Fucus vesiculosus* (MA123D1, MA123E1). One dominating patch of *F. vesiculosus* was present to the far west of the Orkney corridor with areas on the eastern extent intermixing with serrated wrack (*Fucus serratus*) on the boundary between the mid and lower eulittoral (MA123D1, MA1244).

Rockpools were frequently observed on the eastern and western extent of the landfall. Ephemeral green algae, *Ulva* sp., was present in rockpools observed in the upper and mid eulittoral zone (MA1261). An additional two large rockpools with *F. serratus*, the kelp, *Laminaria digitata*, and fauna such as common mussel (*Mytilus edulis*) and beadlet anemone (*Actinia equina*) were observed (MA1263).

Barnacles and periwinkles on patches of elevated rock were observed throughout the eulittoral zone (MA12231). Along the exposed shoreline of the landfall, rock with canopies of *F. serratus* was observed (MA1244). At the lower water mark, in the lower eulittoral zone of the western extent of the landfall *Himanthalia elongata* algae was observed intermixed with *F. serratus* (MA1233, MA1244). The shore crab (*Carcinus maenas*), hermit crabs (Paguridae), periwinkles (*Littorina* sp.), Actinaria as well as the barnacle, *Semibalanus balanoides*, and the limpet (*Patella* sp.) all inhabit the area beneath the mixed sediment *F. serratus* canopy. In the infralittoral zone, *L. digitata* was observed intermixed with the kelp *Alaria esculenta* (MB12112). *L. digitata* on sublittoral rock was observed across the whole of the shoreline (MB1217).

Evidence of anthropogenic activity was observed at the landfall in the form of trenches between algal mats and bedrock that appeared to be cable burial locations.

Figure 8-1 below displays the broadscale habitats (BSHs) and biotopes observed across the Orkney intertidal survey area.

Potentially sensitive habitats and / or species

Several potentially sensitive habitats or species were identified within the Orkney landfall. These habitats and species are detailed below:

- **‘Yellow and Grey Lichens on Atlantic Supralittoral Rock’ (MA1211)** - The supralittoral habitat contained within Annex I reef habitat (1170) as described within the Habitats Directive (EUR 28, 2013). It is also a UK Post-2010 Biodiversity Framework (formally UK BAP) Priority Habitat and is included in the Scottish Biodiversity List.
- **Dog whelks (*Nucella lapillus*)** - *Nucella lapillus* were observed at the landfall and are listed by OSPAR due to the decline in their population across OSPAR regions and the species high sensitivity to synthetic compound contamination such as tributyltin, as well as changes in nutrient levels and substratum loss (OSPAR, 2008b).

The potential extent of the sensitive habitat features described above is presented in Figure 8-2 below.

Figure 8-1 Map of intertidal habitats recorded at the Orkney landfall site

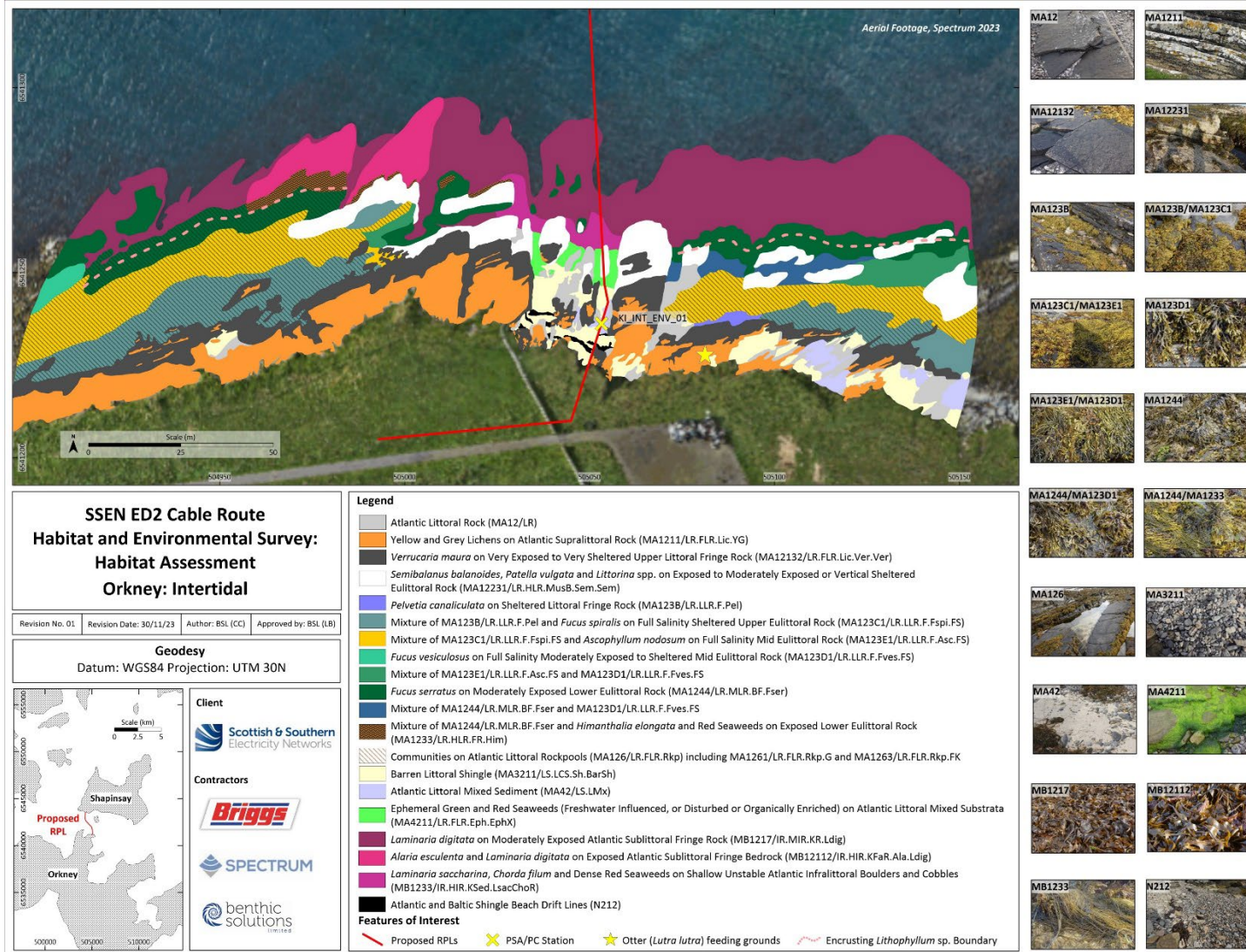
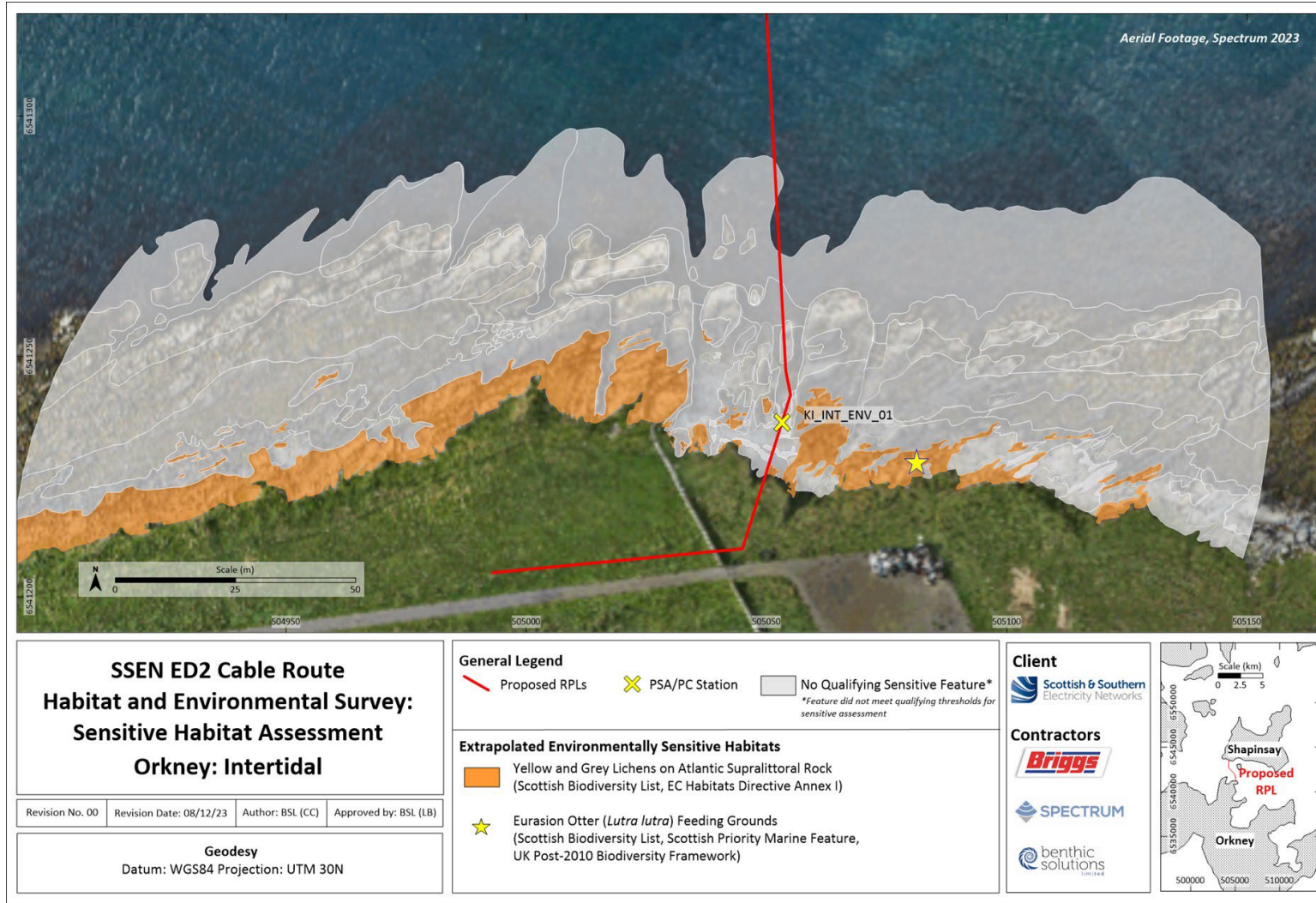


Figure 8-2 Map of sensitive intertidal habitats recorded at the Orkney landfall site



8.3.1.2 Shapinsay landfall site

The far eastern extent of the survey area, around the headland, was composed of bedrock with occasional boulders and was of higher elevation than the remaining survey area. The bay to the west of the headland was composed of shingle and bedrock and was of lower elevation.

The supralittoral zone at the far eastern extent comprised of bedrock with lichen communities (MA1211) with tar lichen identified on the upper eulittoral zone. Black lichen was present in the littoral fringe zone, encrusting exposed bedrock, boulders and cobbles (MA12132). Periwinkles, such as *Littorina spp.*, and sparse barnacles occasionally occupied surfaces and crevices between rocks. Bedrock and stable boulders in the upper littoral were colonised by *P. canaliculata* and a crust of black lichen (MA123B).

The far eastern and central upper eulittoral zone was comprised of habitats dominated by barnacles, limpets, *Patella sp.*, and occasional winkles, *Littorina sp.* (MA12231). Large areas of *F. spiralis* were present on full salinity upper eulittoral rock around the headland and a patch also occurred on the mixed substrata on the far western area. Two habitats were delineated due to the different substrata (MA123C1, MA123C2).

Vegetated mini cliffs were present along the bay leading into barren shingle (N31). The strandline extended across the uppermost area of the shingle beach (N212) and was barren throughout with occasional anthropogenic debris. Trenching was observed at the centre of the landfall between algal mats and bedrock. This appeared to be cable burial locations. A large concrete wall surrounded by fishing debris was observed above the trench in the supralittoral zone. Cobbles and pebbles covered the upper eulittoral area of the bay below the strandline (MA3211), with patches of rock (MA12).

The mid-eulittoral to the infralittoral zone supported furoid species on the western facing bedrock outcrops to the east and on the less stable cobbles and pebbles to the west, with other fauna such as molluscs, gastropods, Serpulidae and Cirripedia dominating the canopies across the survey area. In the mid-eulittoral zone, large areas of *A. nodosum* on rock were found around the eastern headland with *F. spiralis* and *F. vesiculosus* (MA123E1). Furoid canopies were sparse on the eastern facing bedrock at the far east of the corridor and were often dominated by barnacles (Cirripedia) and molluscs lower in the eulittoral zone. Moderately exposed full salinity lower eulittoral rock with canopies of *F. serratus* was found on the shoreline at the low spring tide mark, confined to the eastern extent and on small patches of exposed bedrock within the kelp zone to the west (MA1244). Rockpools were rarely observed and isolated to exposed bedrock on the eastern extent. The rockpools supported a variety of fauna such as brown and green algae (MA126).

Areas of *A. nodosum* with *F. vesiculosus* on mixed substrata were identified along the centre and western extent (MA123E2, MA123D2). Across the central and western bay area, mixed substrata with dense strands of *F. serratus* was present along the shoreline (MA123F2). *L. digitata* on moderately exposed sublittoral fringe rock was observed across the whole of the lower shoreline (MB1217).

Across the centre and west extent, on the upper extent of the *A. nodosum* with *F. vesiculosus* habitat, ephemeral green algae were observed (MA4211). Patches of cobbles and pebbles overlying sand were observed primarily in the west (MA42).

Figure 8-3 below displays the BSH's and biotopes observed across the Shapinsay intertidal survey area.

Potentially sensitive habitats and / or species

- **'Yellow and Grey Lichens on Atlantic Supralittoral Rock' (MA1211)** - The supralittoral habitat contained within Annex I reef habitat (1170) as described within the Habitats Directive (EUR 28, 2013). It is also a UK Post-2010 Biodiversity Framework (formally UK BAP) Priority Habitat and is included in the Scottish Biodiversity List.

- **'Atlantic and Baltic rocky sea cliff and shore' (N31)** – This cliff habitat falls under the 'Vegetated sea cliffs of the Atlantic and Baltic coasts' Annex I habitat (1230) as described within the Habitats Directive (EUR 28, 2013). It is also included in the Scottish Biodiversity List.
- **Dog whelks (*Nucella lapillus*)** – *Nucella lapillus* were observed at the landfall and are listed by OSPAR due to the decline in their population across OSPAR regions and the species high sensitivity to synthetic compound contamination such as tributyltin, as well as changes in nutrient levels and substratum loss (OSPAR, 2008b).

The potential extent of the sensitive habitat features described above is presented in Figure 8-4 below.

Figure 8-3 Map of intertidal habitats recorded at the Shapinsay landfall site

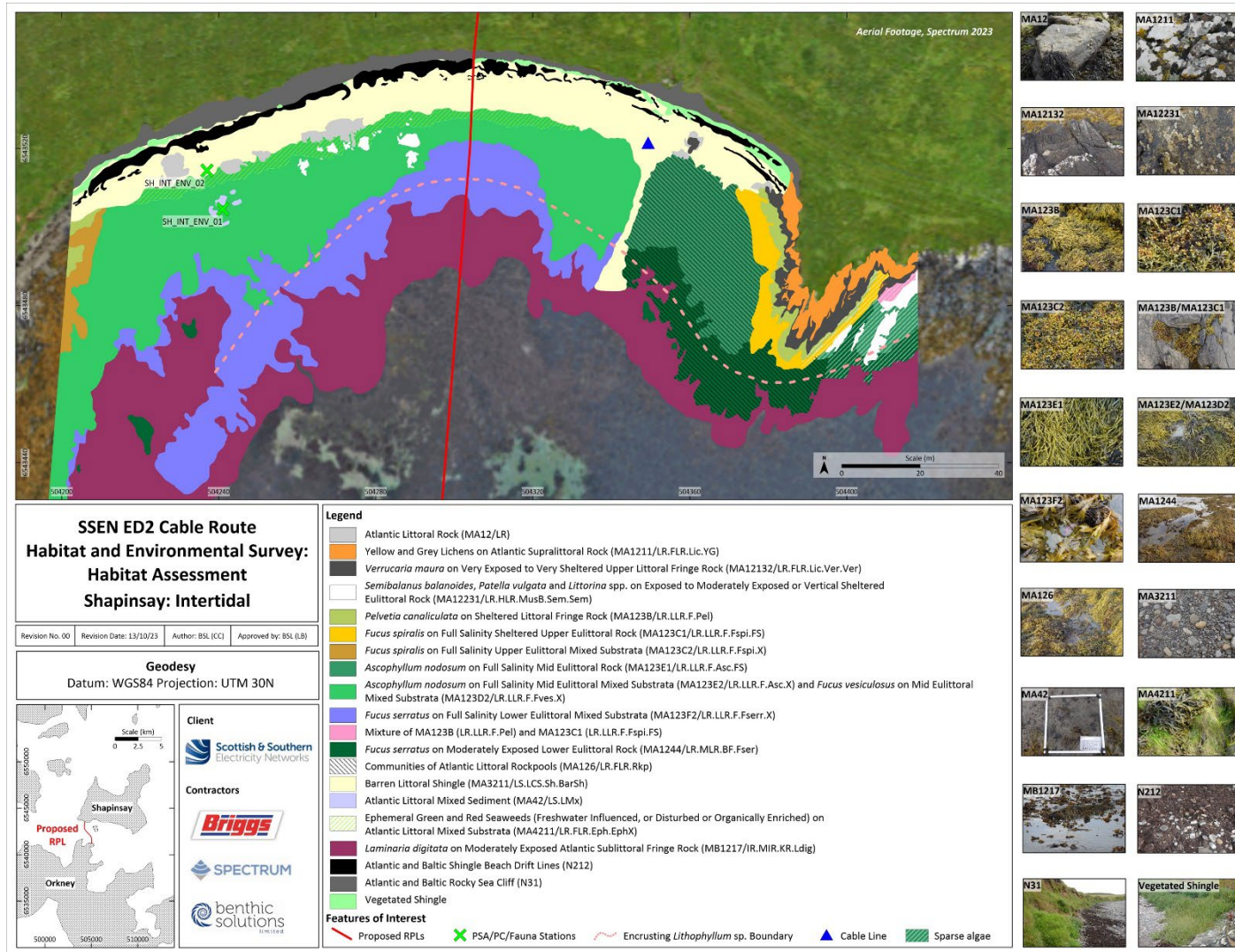
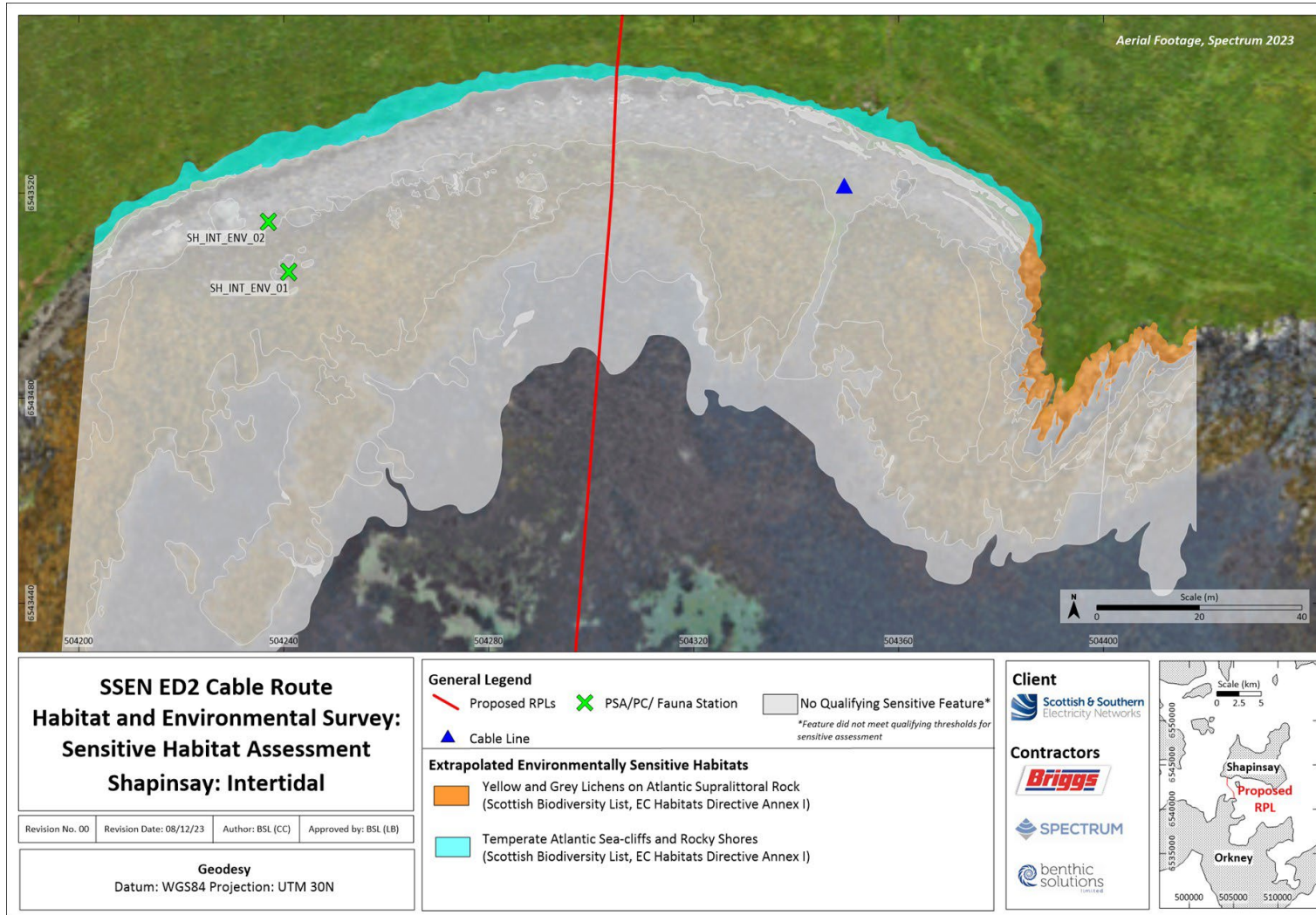


Figure 8-4 Map of sensitive intertidal habitats recorded at the Shapinsay landfall site

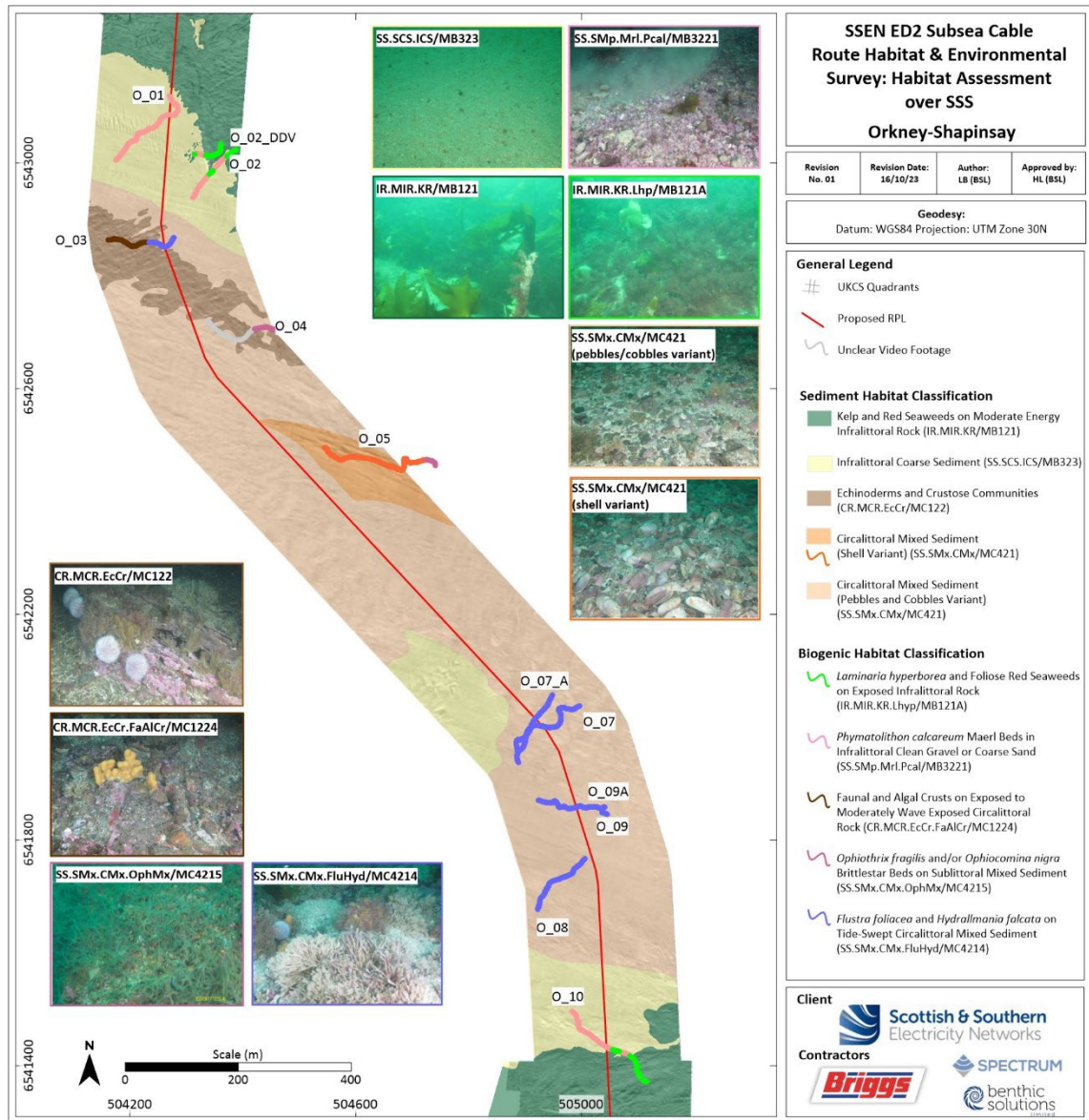


8.3.2 Subtidal ecology

The Orkney to Shapinsay Application Corridor was comprised of widespread areas of bedrock, both exposed and covered in a veneer of sand, in conjunction with the presence of pebbles, cobbles and infrequent boulders. The nearshore areas of each landfall were characterised by the habitat classifications of 'Kelp and Seaweeds on Moderate Energy Infralittoral Rock' (MB121) and '*Laminaria hyperborea* and Foliose Red Seaweeds on Exposed Infralittoral Rock' (MB121A). This consisted of a canopy of kelp with an under-storey of foliose red seaweeds and coralline crusts. The seabed then transitioned to an area of 'Infralittoral Coarse Sediment' (MB323) with patches of '*Phymatolithon calcareum* Maerl Beds in Infralittoral Clean Gravel or Coarse Sand' (MB3221). The distribution of maerl appeared to be related to water depth, with aggregations occurring in shallower areas. Maerl was observed in both the northern and southern extents of the Application Corridor and both *P. calcareum* and *Lithothamnion glaciale* species were observed. The maerl beds were observed in the northern extent, however the coverage of maerl in the southern extent was minimal and not sufficient to classify as the PMF 'Maerl beds'. Dead maerl rubble was present in the form of megaripples in the northern area of the Application Corridor. The majority of the application corridor was dominated by 'Circalittoral Mixed Sediment' (MC421) consisting of a heterogenous mix of shells, gravelling sands and cobbles as well as a patch of shell dominated substrate. Shell debris was observed in this habitat and relic *Modiolus modiolus* shells were noted as a major component of this rubble however no live individuals were observed. The Application Corridor was also characterised by '*Flustra foliacea* and *Hydrallmania falcata* on Tide-Swept Circalittoral Mixed Sediment' (MC4214). Towards the northern extent of the Application Corridor, a patch of mixed sediment with a dense aggregation of brittlestars was observed, described by the biotope '*Ophiothrix fragilis* and/or *Ophiocomina nigra* Brittlestar Beds on Sublittoral Mixed Sediment' (MC4215). Upon approach to the Shapinsay landfall, a linear ridge of sub-cropping rock was observed, described by the biotope 'Echinoderms and Crustose Communities' (MC122). This area was also characterised by 'Faunal and algal crusts on exposed to moderately wave-exposed circalittoral rock' (MC1224) consisting of encrusting red algae on rock surfaces and the occurrence of erect dead men's fingers (*Alcyonium digitatum*).

Figure 8-5 below displays the final habitat interpretation.

Figure 8-5 Map of subtidal habitats recorded at the Orkney to Shapinsay Application Corridor



8.3.2.2 Potentially sensitive habitats and / or species

Several potentially sensitive habitats or species were identified within the Application Corridor. These habitats and species are detailed below:

- **Kelp Beds** – Two sublittoral habitats were identified in the Application Corridor. These habitats were '*Laminaria hyperborea* and Foliose Red Seaweeds on Exposed Infralittoral Rock' (MB121A) and 'Kelp and Red Seaweeds on Moderate Energy Infralittoral Rock' (MB121). These habitats are component biotopes of the Scottish PMF 'Kelp beds'. Both biotopes are potential Annex I habitats. 'Kelp beds' create habitats for many species including sea anemones, sponges, and other seaweeds. *Laminaria hyperborea* is considered as an ecosystem engineer by influencing light levels, physical disturbance, sedimentation rates and water flow and the biotopes created increase the three-dimensional complexity of unvegetated rock (Stamp, 2015).
- **Brittlestars (*Ophiothrix fragilis*)** – Dense aggregation of brittlestars were observed in the Application Corridor, described by the biotope '*Ophiothrix fragilis* and/or *Ophiocolina nigra* Brittlestar Beds on Sublittoral Mixed Sediment' (MC4215). Brittlestar habitats are highly sensitive and have low resilience to the pressures associated with the direct footprint of cable installation activities (De-Bastos *et al.*, 2023). However, where the majority of the population remains, the resilience of the biotope is considered high (De-Bastos *et al.*, 2023). Brittlestars and brittlestar beds are not currently protected in Scotland.
- **Maerl Beds** - Maerl is a calcareous free-living coralline red algae which can remain transient within the marine environment, becoming stable where attached in aggregations forming 'beds' where they are classified as a PMF habitat. Such beds can provide an important habitat for marine fauna and flora as well as an important nursery ground for commercially important fish and shellfish including scallops (*Pecten maximus*). 'Maerl beds' are a Scottish PMF and an OSPAR Threatened and/ or Declining Habitat, with two common species occurring in Scottish waters, both of which were observed in the nearshore areas of the Orkney-Shapinsay Application Corridor. These species are *P. calcareum* and *L. glaciale*. 'Maerl beds' are listed as a UK Post-2010 Biodiversity Framework (formally UK BAP) Habitat. Maerl was observed in both the northern and southern extents of the Application Corridor, however 'Maerl beds' were only observed in the northern extent as the coverage of maerl in the southern extent was minimal and not sufficient to classify as 'Maerl beds'.
- **Annex I reef (rocky) habitats** – Within the Application Corridor, areas of rock were assessed to meet the criteria of a rocky reef (Parry, 2015) thus qualifying as Annex I (1170) – Reef, as described within the Habitats Directive (European Commission, 2021). Rocky reef is also listed as a UK Post-2010 Biodiversity Framework (formally UK BAP) Habitat. Rocky reef can be defined as encompassing hard compact substrata, specifically, rocks (including soft rock, e.g. chalk) of geogenic origin. Annex I rocky reef habitat occurs where soft (e.g., clay) or hard bedrock arises from the surrounding seabed, providing a stable habitat for attachment for a diverse range of epibiota. Rocky reef was observed upon approach to the Shapinsay landfall.
- **Annex I reef (stony) habitats** - Within the Application Corridor, areas of cobbles and boulders were assessed to meet the criteria of "Low resemblance" and "Medium resemblance" to a stony reef (Irving, 2009) thus qualifying as Annex I (1170) – Reef, as described within the Habitats Directive (European Commission, 2021). Stony reef can be defined as encompassing hard compact substrata, specifically, boulders and cobbles (generally >64mm in diameter of geogenic origin). Stony reef habitats occur when stable hard substrata, namely cobbles and boulders > 64mm in diameter arise from the surrounding habitat, creating a habitat colonised by a variety of fauna and flora species. Stony reef was observed in the northern and southern extents of the Application Corridor. Low stony reef dominated with patches of medium stony reef also identified.
- **Offshore Subtidal Sands and Gravels** – 'Offshore Subtidal Sands and Gravels' habitat is a Scottish PMF and is listed as a UK Post-2010 Biodiversity Framework (formally UK BAP) habitat. This habitat

is home to a variety of species including polychaetes, crustaceans and fish which rely on the habitat for breeding, feeding and shelter. Offshore examples of these habitats are considered more diverse due to the reduction in natural disturbance and are characterised by a range of anemones, polychaetes, bivalves, amphipods as well as mobile and sessile epifauna. These areas support internationally important commercial fisheries, including scallops, flatfish and sand eels, and are important nursery grounds for juvenile commercial fish species such as sand eels, flatfish, bass, skates, rays and sharks. They are threatened by demersal trawling and other activities that physically disturb the sea bed (Tyler *et al.*, 2016b). Cable installation activities can alter tidal flow regimes and wave exposure, or result in deposition of sediments that influence the structure of sedimentary habitats (BRIG, 2008). In the Application Corridor, areas of 'Circalittoral Mixed Sediment' (MC421) can be considered as 'Offshore Subtidal Sands and Gravels'.

No other Annex I habitats, OSPAR threatened and/or declining species and habitats or Post-2010 Biodiversity Framework (formally UK BAP) priority habitats and species were observed within the survey area. The potential extent of the sensitive habitat features described above is presented in Figure 8-6, Figure 8-7 and Figure 8-8 below.

Figure 8-6 Map of PMFs and Annex 1 habitats identified throughout the Orkney to Shapinsay Application Corridor

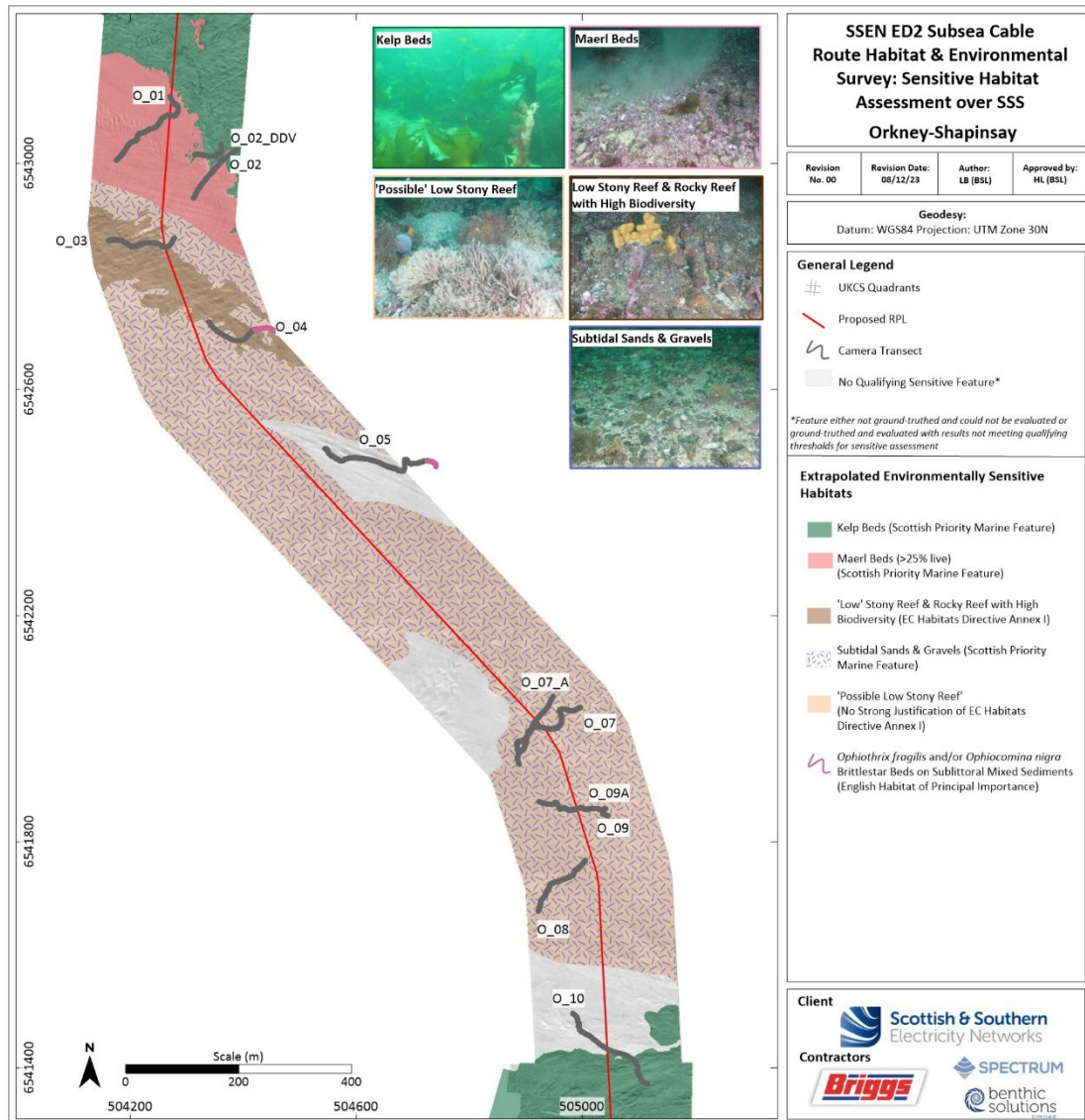


Figure 8-7 Map of maerl habitats and 'Maerl beds' density identified in the Orkney to Shapinsay Application Corridor

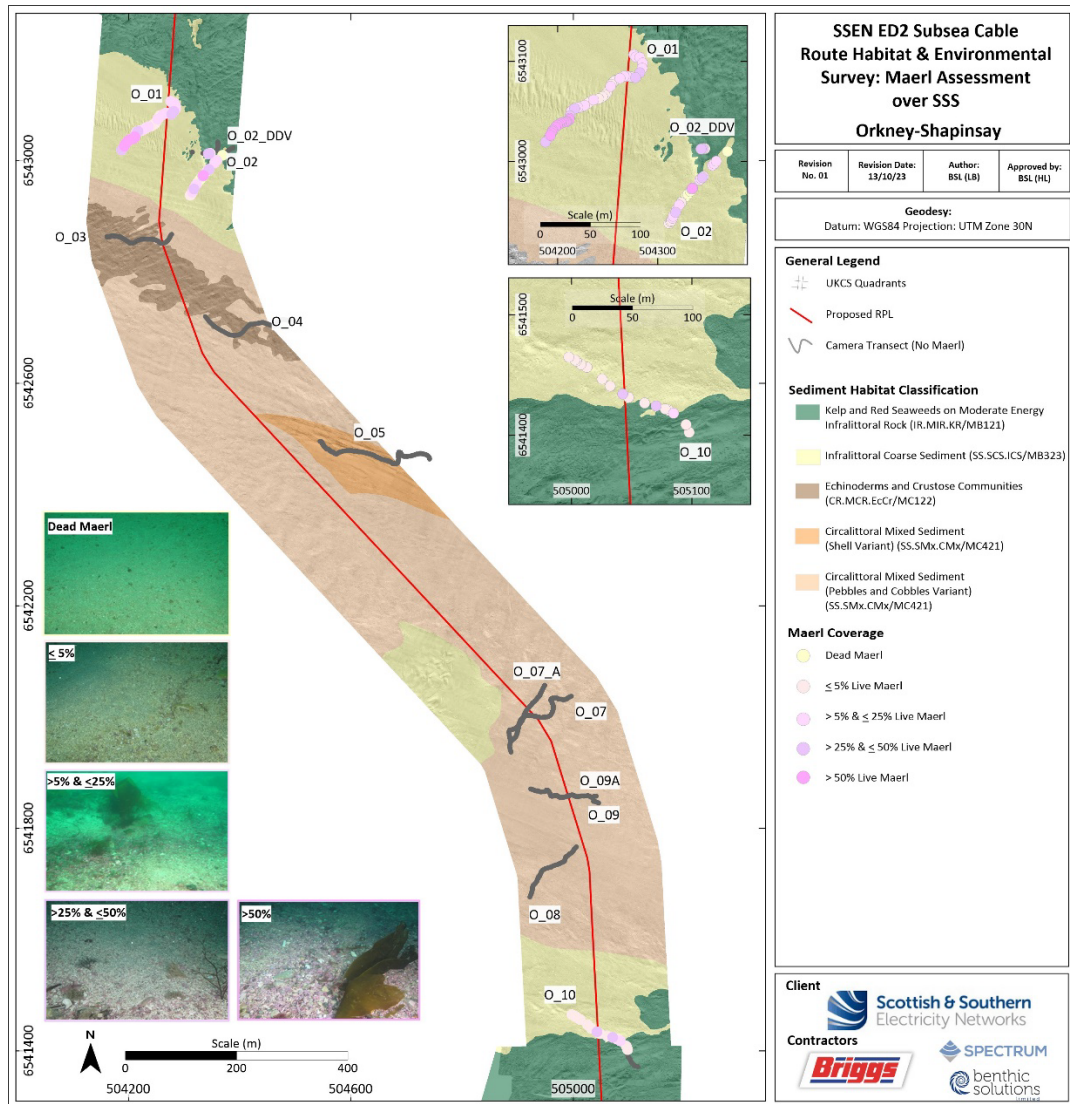
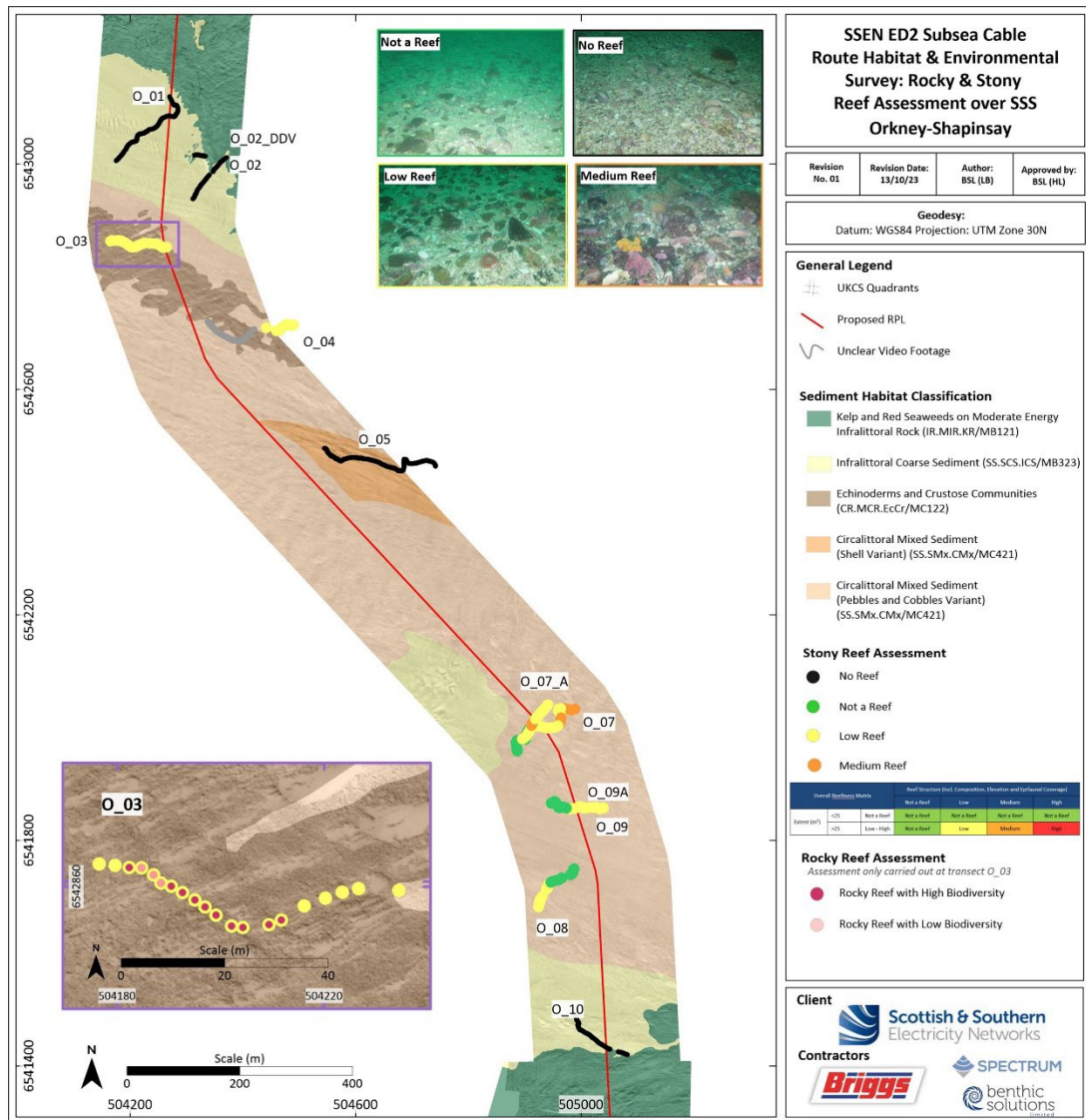


Figure 8-8 Annex I reef identified throughout the Orkney to Shapinsay Application Corridor



8.4 Impact Assessment

8.4.1 Cable Installation Summary

At both landfall sites, an excavator will be used to construct a trench between mean high water springs (MHWS) and mean low water springs (MLWS) in the intertidal zone where the cable will be buried with an armour earth. The length of the trench will be 19m at the Orkney landfall and 10m at the Shapinsay landfall, with both trenches having a width of approximately 1m. Additionally, a second trench will be required for a fibre optic earth with earthing clump weights used to secure the ends at their termination below low water. The trenches will be backfilled with the excavated material such that the intertidal area will be restored to pre-work conditions. The excavator will work within an approximate 20m corridor, during these trenching operations. In areas where the surface is rocky, a rock pecker will be utilised to penetrate rock and achieve burial depth.

The entire length of the 3.098km cable will be surface laid within the subtidal Application Corridor and will cover up to 544m² (0.154m cable diameter, 0.26m cast iron split pipe diameter, 0.35m Uraduct diameter) over the entire cable route, excluding rock bags and concrete mattresses. Cable protection will be required along certain points of the cable route. Where applicable, pressures on sensitive habitats have been assessed to account for the potential presence of cable protection including cast iron and Uraduct articulated pipe, rock bags, concrete mattresses and clump weights.

In a worst-case scenario, up to 34 two tonne rock bags (2.84m² each) and up to 52 eight tonne rock bags (7.07m² each) will be used for stabilisation. For contingency, up to eight concrete mattresses (18m² each) have been included for the Marine Licence application. Therefore, given the design dimensions this represents a total worst-case cable protection coverage area of 96.4m² for two tonne rock bags, 367.6m² for eight tonne rock bags and 144m² for concrete mattresses, if required. Cast iron split shell protection will be used and placed on both shore ends of the cable. This will be used to stabilise and protect the cable and will be surface laid from MHWS to approximately 18m below lowest astronomical tide (LAT) at Orkney and to approximately 10m below LAT at Shapinsay. At Orkney, there may be use of a diver support vessel (DSV) for cast iron split shell protection installation of which may require the use of spud legs, and potentially a four-point mooring spread, for positioning. If required, spud legs will be positioned up to 10m LAT, and the mooring spread will be deployed between 10m LAT and 18m LAT at Orkney, in up to two locations. The number of spud legs expected to be used will be two, with a maximum diameter of 914mm and operational water depth limit of 15m. The mooring spread, if required, will have a worst-case total coverage of 561.6m² of which accounts for the anchor setting and recovery drag distances.

Best practice for cable installation includes micro-routing to avoid sensitive habitats such as Annex I reef and PMFs such as 'Maerl beds' and 'Kelp beds'. This will be practiced where possible, however where these features are unavoidable, micro-routing and the installation techniques proposed have been carefully considered to minimise the impact of operations on these environmentally sensitive receptors. Embedded mitigation is discussed further in sections 4.2 and 4.3.

8.4.2 Physical change (to another substratum)

8.4.2.1 Intertidal

Cast iron split shell protection will be used and placed on both shore ends of the cable. This is an articulated cast iron shell design that interlocks around the cable and is fixed with bolted end clamps. The total (worst case) length of cable protected with cast iron split shell will be up to 900m for both landfalls. This will be buried in a trench in the intertidal zone and be surface laid in the initial subtidal sections of the cable route. In areas where the surface is rocky, a rock pecker will be utilised to penetrate rock and achieve burial depth.

Of the sensitive habitats identified along the Application Corridor, the Annex I habitat 'Atlantic and Baltic rocky sea cliff and shore' (N31) and Annex I reef habitat 'Yellow and Grey Lichens on Atlantic Supralittoral Rock' (MA1211) could be affected. Dog whelk (*Nucella lapillus*) individuals, listed as a OSPAR threatened or declining species, and could also be affected (OSPAR, 2008b).

In soft sediments, trenching activities will lead to a temporary loss of habitat within the direct trenching footprint. Habitat loss in these areas will be localised and temporary and the seabed is expected to begin re-colonisation after several tidal cycles. In hard substrates, where a rock pecker is required, there will be a permanent loss of habitat. This habitat loss will be localised due to the relatively small footprint of the sections of burial proposed at each landfall. While trenching and burial may lead to localised loss in habitat or species, such loss will not be significant in proportion to the scale of the habitats present. To minimise this potential habitat loss, the use of rock peckers will only be utilised where necessary.

8.4.2.2 Subtidal

The cable will be surface laid throughout the subtidal section of the route. Split pipe will be used to stabilise and protect the cable and will be surface laid below MHWS to approximately 18m below LAT at Orkney and 10m below LAT at Shapinsay. Cast iron split pipe shells will change the substrate type where they are used, however it is expected that they will be colonised by sessile encrusting organisms, similar to the surrounding hard substratum and can also attract mobile macrofauna (Taormina *et al.*, 2018). Up to 220m of Uraduct will also be used to protect the cable from abrasion, where necessary, this will change the substrate type where used. Given the relatively small diameter of the cable and its protection systems, the impact on habitats and biological communities in the cable/Uraduct footprint will be localised and short term (Tillin *et al.*, 2010).

Clump weights may be required to secure out of service cable ends. These can be concrete, steel or iron. A maximum of eight clump weights will be used with a footprint of 1m² each. Any loss or change of habitat associated with the use of clump weights will not be significant in proportion to the scale of the habitats present.

Rock bag placement is expected to be required along sections of the Application Corridor, to protect and stabilise the cable. Although cable protection will only be used where necessary, where it is used the seabed habitat within the footprint of the protection will be lost and replaced with, in places, a harder substrate, changing the seabed type. In addition, concrete mattresses may also be used to stabilise the cable and/or for protection at cable crossings. Given the design dimensions, rock bag placement represents a worst-case coverage area of 192.8m² for two tonne rock bags, 735.1m² for four tonne rock bags and 144m² for concrete mattresses, if required. Up to 16 concrete earthing clump weights will also be used for the surface laid section of earthing wires with a footprint each of 1m². Environmentally sensitive habitats recorded in the Application Corridor including the Annex I habitats stony and rocky reef and the PMFs 'Kelp beds', 'Maerl beds' and 'Offshore Subtidal Sands and Gravels', could be present where cable protection may be required.

The Annex I rocky and stony reef habitats are present in the northern and southern extents of the Application Corridor (Figure 8-8) and are comprised of cobbles, boulders and other hard substrate dominated by epifaunal species which are often rapid colonisers, capable of early reproduction and rapid growth (Sebens, 1986). It is therefore expected that epifauna will be able to colonise introduced hard substrates following cable installation and impacts will not be significant. While low resemblance rocky reef is unavoidable, the cable route and rock bag placement will avoid areas identified as medium resemblance rocky reef through ground truthing.

The PMF 'Kelp beds' was found in the northern and southern extents of the Application Corridor (Figure 8-6). The use of concrete mattresses and rock bags may be required in biotopes that constitute this feature. Any species found in the direct footprint of rock bag or concrete mattress placement would likely be lost, however the rock bags may provide additional substrate for re-colonisation of

kelp, in time. The 'Kelp beds' identified consist of kelp species such as *Laminaria hyperborea* which can recover within two to six years (Kain, 1979; Birkett *et al.*, 1998; Christie *et al.*, 1998). As such, while rock bag and concrete mattress placement would lead to a loss of PMF 'Kelp beds' habitat, this would not be a permanent change. Therefore, the effect of physical change on this habitat would be temporary and not significant.

The PMF 'Maerl beds' was found in the northern extent of the Application Corridor (Figure 8-7). To protect and stabilise the cable, cast iron split pipe will be used as the cable crosses the extent of this feature. The cast iron articulated pipe will replace the normal substratum within this biotope and the biotope itself would also be lost (Perry & Tyler-Walters, 2023). However, 'Maerl beds' surrounding the cable may not be significantly negatively impacted. As maerl species within the biotopes recorded are free-living, they are therefore not attached to the substratum. This mobility will ensure some maerl can move with hydrodynamic transport regimes, albeit less so when recorded in dense 'Maerl beds'. To minimise this potential PMF habitat loss, the use of rock bags and concrete mattresses which are required to ensure cable stability and will reduce cable movement, will be minimised within habitat extent. The impact of physical change on this habitat extent is therefore assessed as not significant.

The PMF 'Offshore Subtidal Sands and Gravels' was found throughout the Application Corridor (Figure 8-6). The use of concrete mattresses and rock bags may be required in biotopes that constitute this feature. Any species found in the direct footprint of rock bag or concrete mattress placement would likely be lost. 'Offshore Subtidal Sands and Gravels' are sensitive to physical change (Marine Scotland, 2023). However, as the loss of habitat and the disturbance is spatially highly localised, the overall significance of the installation of the replacement cable has been assessed as not significant.

Best practice for cable installation can include micro-routing around sensitive habitats (Table 4-1). This will be practiced where possible, however where these features are unavoidable, rock protection measures will be used conservatively to have a minimal environmental impact.

8.4.3 Abrasion / disturbance at the surface of the substratum

8.4.3.1 Intertidal

Of the sensitive habitats identified along the Application Corridor, the Annex I habitat 'Atlantic and Baltic rocky sea cliff and shore' (N31) and Annex I reef habitat 'Yellow and Grey Lichens on Atlantic Supralittoral Rock' (MA1211) could be affected. *N. lapillus* individuals, listed by OSPAR, could also be affected (OSPAR, 2008b).

Where the cable will be buried within the intertidal zone, installation activities will take place over a short-time period and any abrasion events will be temporary and will be minimal once installation is complete. In addition, *N. lapillus* are 'Not sensitive' to this pressure (Tyler-Walters, 2007). Therefore the potential impact is expected to not be significant.

8.4.3.2 Subtidal

The pressure 'abrasion/disturbance at the surface of the substratum' will occur in areas where the cable is surface laid, throughout the subtidal route. The use of cast iron split shell protection, Uraduct articulated pipe, rock bags and concrete mattress placement will protect and stabilise the cable to reduce cable movement and abrasion. A PLGR may be required prior to operations commencing. The removal of any boulders or debris may cause abrasion/disturbance.

Of the sensitive habitats identified along the Application Corridor, Annex I rocky and stony reef habitats and PMFs 'Kelp beds', 'Maerl beds' and 'Offshore Subtidal Sands and Gravels' could be affected.

In addition, the use of a mooring spread at Orkney, if required for vessel positioning, may lead to abrasion and disturbance in the direct footprint of anchor's and chains. The four-point mooring spread may be required to be left in place between working days. This said, its use and impact will be

restricted to the duration of cable laying activities and will be temporary. Of the sensitive habitats identified along the Application Corridor, Annex I stony reef habitats and PMFs 'Kelp beds' and 'Offshore Subtidal Sands and Gravels' could be affected. Although anchoring in Annex I stony reef habitats and the PMF 'Kelp beds' is unlikely due to the hard nature of the seabed, which is unsuitable for anchoring, the mooring chains could cause abrasion and disturbance of the seabed in these areas.

The sensitivity of rocky reef biotopes to abrasion is considered to be low due to the habitats high resilience enabling recovery estimated within two years (Jasper & Hill, 2015). Therefore, with consideration to the extent of this feature (Figure 8-8), the pressure will not have a significant impact on subtidal rocky/stony reef within the Application Corridor.

The stony reef biotopes observed in the Application Corridor are considered to have low to medium sensitivity to abrasion. The sedentary species associated with stony reefs in this area would likely suffer from the effects of abrasion, however faunal turf communities do not show large signs of damage from abrasion and are mostly sensitive to repeated abrasion (Boulcott & Howell, 2011). Abrasion events will be temporary and localised in nature, ensuring that a minimal number of individuals would be affected. The use of a mooring spread could lead to abrasion and disturbance in the direct footprint and chain sweep area. The impact of abrasion and disturbance on stony reef biotopes is dependent on the footprint, duration and magnitude of the pressure (Readman & Watson, 2024). The area impacted by the use of a mooring spread will be larger than that of the cable itself. This said, the impact will be confined to the physical footprint and temporary, as it will be limited to the duration of cable laying activities. Deployment of the mooring spread will be kept to a minimum in order to reduce the disturbance to the seabed. The impact should therefore be slight.

The PMF 'Kelp beds' has been assessed to have medium sensitivity to abrasion. Abrasion has the potential to remove the canopy forming kelp *L. hyperborea*, which dominated the 'Kelp beds' observed in the Application Corridor. However, there is evidence that immature kelp are largely unaffected and a new canopy can form within two to six years (Christie *et al.*, 1998). In addition, kelp species are fast-growing with potential to rapidly form a new canopy (Birkett *et al.*, 1998). Abrasion events will be temporary and localised in nature, the narrow cable diameter and careful placement of cable protection measures should ensure that a minimal density of kelp would be affected. The use of a mooring spread in 'Kelp beds' could also impact this habitat, however the impact will be confined to the physical anchor and chain footprint and will be temporary. Deployment of the mooring spread will be kept to a minimum in order to reduce the disturbance to the seabed. The impact would therefore be slight.

The impact of abrasion on the PMF 'Maerl beds' has been studied, finding that the pressure can break up maerl into smaller pieces leading to subsequent death (Kamenos *et al.*, 2003). However, 'Maerl beds' have been observed to remain productive after repeated abrasion events (Hall-Spencer *et al.*, 2003). Many species living in this PMF are buried within the 'Maerl beds' and will receive some protection from abrasion. 'Maerl beds' are assessed to have high sensitivity to abrasion and low recoverability and the abrasion of the PMF 'Maerl beds' may negatively impact the habitat in the immediate vicinity of installation activities. The installation activities, however, will include stabilisation of the cable through such biotopes, to minimise the cable movement and therefore the zone that abrasion can occur. Therefore, the impacts to these biotopes are expected to represent only a small proportion of the habitat extent in this area, and impacts should be mostly limited to installation activity and should be slight.

The PMF 'Offshore Subtidal Sands and Gravels' was found throughout the Application Corridor (Figure 8-6). This habitat can be sensitive to abrasion / disturbance at the surface of the substratum, and this can lead to the disruption and/or minor removal of seabed sediments which structure the communities habitat (Marine Scotland, 2023; NatureScot, 2023). However the disturbance is considered short-term and spatially localised. The use of a mooring spread in this area could cause damage to the biological communities associated with this habitat. The impact, however, will be

confined to the footprint of the mooring spread and will be temporary. Due to the localised footprint the impact is expected to be slight.

8.4.4 Penetration and / or disturbance of the substrate below the surface of the seabed

8.4.4.1 Intertidal

Of the sensitive habitats identified along the Application Corridor, the Annex I habitat 'Atlantic and Baltic rocky sea cliff and shore' (N31) and Annex I reef habitat 'Yellow and Grey Lichens on Atlantic Supralittoral Rock' (MA1211) could be affected. *N. lapillus* individuals, listed by OSPAR, could also be affected (OSPAR, 2008b).

Where the cable will be buried in soft sediments, a single over-turning event is likely to lead to the loss of species present in the intertidal area of the Application Corridor, with damage and mortality of epifauna potentially occurring. However, after the trench material is re-instated it will be re-colonised. Mobile species, such as *N. lapillus*, will be able to relocate back to the area. Therefore, the effects of trenching on the intertidal biotopes and species will be temporary and not result in the permanent loss of habitat, ensuring any impact is not significant.

In areas where the substrate is rocky, a rock pecker will be used to achieve burial depth. This will penetrate rock and cause disturbance of the substrate below the surface of the seabed and any species present may be lost. Only substrate in the direct vicinity of the rock pecker will be impacted and so habitat and species loss will be restricted to a spatially small area, relative to the extent of the surrounding environment. To minimise this potential habitat loss, the use of rock peckers will only be used where necessary.

8.4.4.2 Subtidal

The marine cable will be surface laid in the subtidal area, and no trenching will be required for the installation.

Depending on vessel use, spud legs may be required in the Application Corridor to enable vessels to stay on location. Spud feet stay in place by penetrating the seafloor. The number of spud legs expected to be used will be two, with a maximum diameter of 914mm and operational water depth limit of 15m. Spud legs are expected to be required at Orkney, up to 10m LAT. The sensitive benthic habitats in the Application Corridor are Annex I rocky and stony reef habitats and PMFs 'Kelp beds', 'Maerl beds' and 'Offshore Subtidal Sands and Gravels'. These habitats could all be impacted but due to the relatively small area damaged, this is not likely to be significant to the biotopes encountered.

The use of a mooring spread, anchors and mooring chains, for vessel positioning may lead to penetration and disturbance of the surface below the seabed. The mooring spread area of use overlaps with Annex I stony reef habitats and the PMFs 'Kelp beds' and 'Offshore Subtidal Sands and Gravels'. Of these sensitive habitats identified along the Application Corridor, only 'Offshore Subtidal Sand Gravels' are likely to be affected as anchor positioning is likely to be avoided in rocky substrates.

The PMF 'Offshore Subtidal Sands and Gravels' can be sensitive to penetration and / or disturbance of the substrate below the surface of the seabed as this can lead to the disruption and removal of seabed sediments which structure the communities habitats (Marine Scotland, 2023; NatureScot, 2023). The disturbance, however, is considered short-term and spatially localised. Due to the footprint of the mooring spread, the overall impact is expected to be slight.

No other novel penetration of the seabed will occur.

8.4.5 Smothering and siltation rate changes

8.4.5.1 Intertidal

Any sediment disturbance from installation activities will not be significant in extent due to the relatively low level of sediment disturbed by trenching activities. This pressure will be most evident during a flood tide. Typically, the tidal waters of the intertidal zone will have a high sediment load due to the high energy hydrodynamic regime and close interaction with shore sediments. Therefore, species which inhabit these areas are well adapted to such pressures, including increased sediment load.

8.4.5.2 Subtidal

The impact of smothering and siltation rate changes will be restricted as no trenching activities will be undertaken in the subtidal environment. However as there will be sediments from the intertidal zone, which can be transported into the subtidal zone as well as potential changes in local hydrodynamics resuspending soft sediments, this pressure has been considered.

Cable laying activities will not result in significant sediment resuspension, as discussed in Section 6. The seabed footprint of the works will be minimal, and largely confined to the physical footprint of the cable itself, along with cable protection measures and vessel positioning measures (spud legs and mooring spread). Disturbed sediment from cable installation and vessel tethering activities, as well as the placement of cable protection measures is expected to settle rapidly and will be very localised as no trenching is required for the cable installation. The sensitive benthic habitats in the Application Corridor are Annex I rocky and stony reef habitat and PMFs 'Kelp beds', 'Maerl beds' and 'Offshore Subtidal Sands and Gravels'.

The Annex I rocky reef observed in the Application Corridor consists of species belonging to anthozoan, hydroid, bryozoan, echinoderm, coralline algae, gastropod and sponge communities. Smothering and siltation rate changes can negatively impact largely sessile organisms as they are unable to avoid deposition. Small organisms are also vulnerable to hindered respiration. Larger taxa, such as dead man's fingers (*Alcyonium digitatum*), recorded in this area, are still able to filter feed and can use mucus to slough off deposited material. Sponge communities can be resilient to this pressure, for a relatively short duration of exposure. Rocky reef habitats, particularly in this area, experience very strong to moderately strong tidal streams, meaning sediment is likely to be removed quickly. In addition, many species are tolerant of periodic smothering as this can be a common occurrence in rocky habitats (Holme & Wilson, 1985). Rocky reef habitats are assessed as not sensitive or low sensitivity, with high resilience (MarLIN, 2023). As smothering events are likely to have a small impact area and will be restricted in duration, this habitat has been assessed as not significantly impacted.

The Annex I stony reef biotopes have no or low sensitivity to smothering. This is dependent on the level of smothering and siltation rate changes. In this case, smothering is likely to be light and is unlikely to damage epifauna, however it could negatively impact recruitment processes (Moy & Christie, 2012). Smothering is only likely to impact the upper faces of reef. In addition, stony reef habitats are often exposed to moderately strong tidal streams and so deposited sediment is unlikely to remain for more than a few tidal cycles (MarLIN, 2023). The impact of smothering and siltation rate changes is therefore not significant.

Kelp species found in the PMF 'Kelp beds' are unlikely to be damaged by smothering and siltation rate changes. This pressure, however, can impact gametophyte survival, zoospore settlement and holdfast fauna associated with these biotopes. If smothering occurs as a discrete event, kelp gametophytes can normally resume growth within a month (Dieck, 1993). In addition, if the deposited sediment is cleared rapidly, associated faunal communities can recover. Habitats that are classed as 'Kelp beds' are often high to moderate energy habitats, so sediment is unlikely to remain for more than a few tidal cycles. 'Kelp beds' habitats are assessed as not sensitive with high resilience to this pressure (MarLIN,

2023). As smothering events are likely to have a small impact area and will be restricted in duration, the impact will not be significant.

'Maerl beds' can be intolerant of smothering due to the inability to escape from any elevated sediments (Marine Scotland, 2023). The sediment is likely to penetrate the open matrix of the 'Maerl beds' rather than sit on top of it. The loose and complex consistency of this biotope provides considerable structural diversity utilized by a wide range of species. While any smothering of maerl will potentially result in a major decline in species richness for the area, smothering events, however, are not expected due to the very limited disturbance of sediment from the surface lay of the cable and rock bag placement, and the strong prevailing currents preventing a significant settlement of sediment particles. Therefore, the impact on this habitat by siltation will only be slight and localised to the vicinity of the cable.

'Offshore Subtidal Sands and Gravels' can be sensitive to smothering and siltation rate changes as these pressures can influence the structure of sedimentary habitats (BRIG, 2008; Marine Scotland, 2023). Species associated with 'Offshore Subtidal Sands and Gravels', such as sand eels, are highly susceptible to smothering and siltation due to their dependency on specific substratum (Marine Scotland, 2023). Susceptible species such as sand eels were not observed in the surveys of the Application Corridor and as the cable will be surface laid and not trenched in the subtidal extent, there will be minimised or no resuspension of silts. The relatively low area of impact in relation to the greater habitat area is expected to cause only slight impact and is not significant.

8.4.6 Accidental hydrocarbon or chemical release from installation vessel

8.4.6.1 Intertidal

At both landfall sites, an excavator will be used to construct a trench between MHWS and MLWS in the intertidal zone within area where the cable can be buried. The length of the trench will be approximately 19m at the Orkney landfall and 10m at the Shapinsay landfall, with both trenches having a width of 1m. The excavator will work within an approximate 20m corridor, during these trenching operations. Additionally, a second trench will be required for a fibre optic earth. The use of an excavator risks potential hydrocarbon or chemical release and any vessel-based releases in the subtidal area of operations could potentially wash ashore.

Of the sensitive habitats identified along the Application Corridor, the Annex I habitats 'Yellow and Grey Lichens on Atlantic Supralittoral Rock' (MA1211) and 'Atlantic and Baltic rocky sea cliff and shore' (N31) could be affected. Several of the characterising species of these habitats are sensitive to hydrocarbon and detergent release while others display less severe effects and damage (Tyler-Walters, 2016a). *N. lapillus* individuals, listed by OSPAR, could also be affected (OSPAR, 2008b). While *N. lapillus* is more resistant to hydrocarbon release than most gastropods, evidence indicates that populations are affected by hydrocarbon and detergent release. *N. lapillus* was assessed with low sensitivity to this pressure, intermediate intolerance and high recoverability (Tyler-Walters, 2007). Any evidenced effects are related to extensive spills rather than smaller spills that could be expected from installation vessels and detergents are not likely to be used on vessels in high quantities unless a large oil spill clean-up operation is required. The likelihood of a large oil spill occurring from a project vessel is extremely low and the risk is no greater than that for any other vessel in the region.

Onshore, in the event of an accidental hydrocarbon release occurring, appropriate standard practice management procedures will be implemented accordingly and a suitable medium used to remove the spill. At sea, 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, preventing the transport of any potential spill to the intertidal area.

8.4.6.2 Subtidal

The use of vessels for cable installation has potential for hydrocarbon and chemical release. The sensitive benthic habitats in the Application Corridor are Annex I rocky and stony reef habitats and PMFs 'Kelp beds', 'Maerl beds' and 'Offshore Subtidal Sands and Gravels'. In addition, any releases in the subtidal area of the Application Corridor can potentially wash to intertidal habitats from offshore vessels.

Vessels likely to be used for cable installation activities include Cable Lay Vessels, Boulder Removal Vessel, Dive Support Vessel and other support vessels. The use of such vessels can risk the accidental release of hydrocarbons or chemicals including crude oil, lubrication oil, hydraulic fluid, corrosion inhibitors, control fluid and bunker, diesel, fuel and gas oils (ACOPS, 2017).

The likelihood of a large oil spill occurring from a project vessel is extremely low and the risk is no greater than that for any other vessel in the region. All project vessels will be legally required to adhere to MARPOL Annex I requirements, and the Sea Pollution Acts, which prohibit the discharge of waste and other pollutants, and require the secure storage of fuels and other materials on board.

Annex I rocky and stony reef are sensitive to hydrocarbon and chemical releases. Hydrocarbon release is mainly related to surface waters, and any impact of subtidal turf communities is likely to be limited (Hartnoll, 1998). However, high swell and winds can lead to hydrocarbon mixing with seawater and subsequent impacts on subtidal habitats (Castège *et al.*, 2014). In addition, there have been reports of dead colonies of *A. digitatum*, recorded on the stony and rocky reef, following the release of detergents and oil into the marine environment as well as an increase in developmental abnormalities in common taxa such as echinoderms (Smith, 1968; MarLIN, 2023). These effects are related to extensive spills rather than smaller spills that could be expected from installation vessels and detergents are not likely to be used on vessels in high quantities.

The PMF 'Kelp beds' is often composed of kelp species and red macroalgae. Kelp in this Application Corridor are unlikely to come into contact with freshly released oil as they are subtidal and the mucilaginous slime layer found on kelp can protect them from smothering by hydrocarbon release (Birkett *et al.*, 1998; MarLIN, 2023). Previous hydrocarbon release events have shown little impact on kelp species post event (Rostron & Bunker, 1997). Red algae, often found in biotopes of this PMF, is sensitive to hydrocarbon contamination with evidence of reduced species richness and diversity of the habitat. This said, the habitat has been shown to recover quickly (MarLIN, 2023). 'Kelp beds' are sensitive to chemical release; however, these effects are related to extensive spills rather than small spills expected from installation vessels.

There is not sufficient information available to complete a sensitivity assessment of 'Maerl beds'. However, due to concern over potential impacts, the PMF has been deemed sensitive to the release of hydrocarbons or chemicals from vessels (Marine Scotland, 2023).

'Offshore Subtidal Sands and Gravels' are sensitive to hydrocarbon contamination and there is evidence that this habitat is sensitive to oil exploration, leakages and shipping accidents that lead to localised pollution of sediment organisms such as anemones, polychaetes, bivalves, amphipods as well as mobile and sessile epifauna (BRIG, 2008; Marine Scotland, 2023). Best practice and compliance to standards, however, provide good levels of protection for all living organisms where standards are adhered to (Marine Scotland, 2023).

Best practice and compliance measures will be in place to minimise the likelihood of any accidental releases and minimise any effect should a release occur. 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. Vessels will only be used when necessary and for a relatively short duration

of around two weeks. After such mitigation the risk presented is very low and therefore can be seen as acceptable to the project.

8.4.7 Introduction or spread of invasive / non-native species

8.4.7.1 Intertidal

No invasive non-native species (INNS) were identified in the intertidal survey of the Application Corridor. Screening of the area surrounding the Application Corridor, 40km radius, was also undertaken. No INNS were identified (OneBenthic, 2023).

8.4.7.2 Subtidal

No invasive non-native species (INNS) were identified in the subtidal survey of the Application Corridor. Screening of the area surrounding the Application Corridor, 40km radius, was also undertaken. No INNS were identified (OneBenthic, 2023).

8.5 Mitigation

Mitigation measures that are embedded in the project design are listed in Table 4-1. Following assessment, there are no additional mitigation measures proposed.

8.6 Conclusion

The above assessment has demonstrated that installation and operation activities associated with the cable replacement will not significantly affect the benthic subtidal and intertidal ecology in terms of the spatial extent at which environmentally sensitive habitats were recorded. Any impacts of cable installation on the habitats and species within the Application Corridor will be temporary and habitat loss will be localised. Micro-routing of the installation corridor will be undertaken to (where possible) avoid sensitive habitats and species to ensure they are not significantly affected by the installation activities. Cable installation activities will be short term and the footprint is spatially small relative to the extent of the surrounding benthic environment. Cable protection measures will be used in some areas to ensure cable protection and stability as well as reducing abrasion impacts. The footprint of the deposits will be the minimum required to ensure cable safety and stability. The deployment of any vessel mooring / spud leg positioning will be kept to a minimum in order to reduce disturbance to the seabed.

9. ORNITHOLOGY

9.1 Introduction

This Section characterises the ornithological interests in the vicinity of the Application Corridor, outlines the potential pressures associated with the proposed cable installation activities on bird species and presents the findings of the environmental assessment.

The general ornithological features within/in the vicinity of the Application Corridor are described in the European Protected Species (EPS) and Protected Sites and Species Risk Assessment for the North Coast and Orkney Islands, Xodus 2023 (document reference: Xodus A-302244-S02-REPT-001) (Appendix D). As such, this section discusses only the receptors sensitive to the installation operations and Special Protection Areas (SPAs) that overlap with the Application Corridor.

9.2 Data sources

The baseline has been informed using the following primary sources:

- Mainland Orkney to Shapinsay: Environmental Desk Study Report (ERM, 2022)
- Orkney – Shapinsay Cable Route Desktop Study, doc reference: 4063-GMSL-G-RD-0001 Rev 2 (OceanIQ, 2023)
- EPS and Protected Sites and Species Risk Assessment – North Coast and Orkney (Appendix D)

In order to establish baseline conditions a desktop review of published information has been undertaken supported by consultation with relevant bodies. Consultations completed as part of this application are summarised in Section 1.5. Any other data sources used are referenced throughout the document.

9.3 Ornithology description

Orkney is one of the most important areas in the whole temperate North Atlantic for seabird breeding populations and supports nearly a million seabirds. The fertile soils of the area support large populations of invertebrates, which are the main food supply for many birds (The Orkney Guide, 2005). Bird populations present on the islands vary corresponding to breeding and migratory periods, with the breeding bird season running from the 1st of March to the 31st of August (ERM, 2022).

As described in Section 5 “Protected Sites”, the Application Corridor overlaps the North Orkney Special Protection Area (SPA) designated for the red-throated diver (*Gavia stellata*), great northern diver (*Gavia immer*), Slavonian grebe (*Podiceps auritus*) and velvet scoter (*Melanitta fusca*). Over the winter period the site regularly supports around 12.3% of the Great British population of great northern diver and 10.9% of the Great British population of Slavonian grebe (NatureScot, 2023). During the breeding season it supports 3.7% of the Great British population of red-throated diver. A thorough assessment of the potential pressure associated with the proposed installation activities to the North Orkney SPA is provided in Section 5 “Protected Sites”.

Diving species including red-throated diver and great northern diver are identified as particularly sensitive to disturbances (Xodus, 2023). Given that the proposed operations are scheduled to take place in summer 2024, it is unlikely for wintering populations of great northern diver to be affected. However, red-throated diver may be present within the application corridor during operations and as such, these species are considered a sensitive receptor and have been taken forward for assessment below.

9.4 Impact assessment

The sensitivity of bird populations to human disturbance varies temporally with birds being most vulnerable when at sea during the moulting season when they disperse from their coastal colonies to offshore waters and become flightless, spending more time on the sea surface (Xodus, 2023). During these periods the likeliness of interactions with installation vessels and the potential for collision risk increases as well as the sensitivity of species to visual and above water noise disturbance. Further information on the important life-history periods for seabird species is provided in the EPS and Protect Sites and Species Risk Assessment (Appendix D).

Diving bird species are regarded as highly sensitive to vessel traffic disturbance where they have previously been classified as showing strong escape behaviour at a large response distance (Furness *et al.*, 2013). Red-throated divers are particularly sensitive to vessel traffic disturbances, especially during their breeding period. In Orkney the species arrive at breeding grounds in April where they remain until the end of October (Xodus, 2023). During this period they are at their most sensitive.

Sea users (commercial fisheries, shipping, ferries and others) are likely to be present in the area throughout the year as outlined in Section 11 and the accompanying Navigational Risk Assessment (NRA) (Appendix D). However, it is not envisaged that vessel presence will constitute a significant change from typical baseline conditions. Given the short term and temporary nature of installation activities in combination with mitigation measures embedded as part of the project design, no adverse effects to general ornithological features within the Application Corridor are expected to occur. However, given that red-throated diver are regarded as highly sensitive to disturbances (Furness *et al.*, 2013), a full assessment of vessel presence and visual and above water noise disturbance on red-throated diver populations protected within the North Orkney SPA has been undertaken.

9.4.1 Vessel presence

The presence of installation vessels has the potential to disturb ornithological features within the Application corridor through risk of bird strike. During the operation a maximum of 6 vessels are likely to be utilised including 3 installation vessels and 3 support vessels. These vessels may pose a collision risk to red-throated diver.

However, red-throated diver are known to flush from vessels within a distance of 750 ± 437 m (Fliessbach *et al.*, 2019) and given the slow movement of installation vessels (less than 4 knots) it is expected that the species will have sufficient time to move out of the way of vessels utilised during this operation and as such vessel strike is unlikely. Therefore, no adverse effects to ornithological features as a result of vessel presence are expected to occur.

9.4.2 Visual (and above water noise) disturbance

During the proposed operation there is likely to be an increase in vessel traffic throughout the Application Corridor including in the nearshore area as well as the presence of installation equipment at the landfalls. This has the potential to disturb breeding populations of red-throated diver.

Red-throated diver are known to be highly vulnerable to disturbance by boats (Schwemmer *et al.*, 2011), with known disturbance distances of 2km (Burt *et al.*, 2017). These disturbances may impact foraging and breeding activities, ultimately leading to a reduction in fitness. Given the area of the North Orkney SPA (211.7km²) and the disturbance area across the entire Application Corridor (9.6km²) red-throated diver are expected to only be disturbed from around 4.5% of the available foraging area within the North Orkney SPA.

Furthermore, given the evidence of habituation of seabird species to vessel traffic, as outlined by Schwemmer *et al.*, (2011), and the high baseline shipping density in the vicinity of the Application Corridor from vessels transiting to and from Kirkwall, it is expected that red-throated diver will show

a degree of habituation to the vessels involved in this operation. Therefore, given the short-term, localised and temporary nature of the installation activities any disturbances will be temporary, with operations estimated to take 56 days. Any disturbances are likely to be minimal and species are expected to return to utilised foraging areas upon completion of the operational works. Therefore, no adverse effects to ornithological features as a result of visual (and above water) noise disturbance are expected to occur.

9.4.3 Mitigation measures

Mitigation measures that are embedded in the project design are listed in Table 4-1. Following assessment, there are no additional mitigation measures proposed.

9.5 Conclusion

The above assessment has demonstrated that although breeding red-throated diver within the Application corridor may experience a slight disruption to their foraging activities during the Orkney – Shapinsay cable installation, this will be temporary with the species expected to return to normal foraging behaviour immediately after disturbing activity has ceased. Therefore, given the short-term, localised and temporary nature of the installation activities, there are unlikely to be any adverse effects to breeding red-throated diver as a consequence of the planned installation activities.

10. MARINE ARCHAEOLOGY

10.1 Introduction

This Section describes the key characteristics of the marine historic environment along the Application Corridor, outlines the potential pressures associated with the cable installation activities on marine archaeology, presents the findings of the environmental assessment along with the mitigation and management measures to remove or reduce the effect of any identified pressures.

10.2 Data sources

A review of publicly available information on marine archaeological sites within/in the vicinity of the Application Corridor was conducted to inform this assessment. Key data sources used included:

Marine Historic Environment Constraints Overview of Orkney and Shetland Inter-island cables, commissioned as part of the Environmental Desk Based Assessment for the new Orkney – Shapinsay cable (ORCA Marine, 2019).

The UKHO wrecks database, containing recorded wreck and obstruction data.

Statutory lists, registers and designated areas, including Lists of Scheduled Monuments, Designated Wrecks and Historic Marine Protected Areas (HMPAs).

The National Record of the Historic Environment (NRHE) of Scotland, using the Canmore database website (<https://canmore.org.uk/>).

This information has been supplemented with Historic Environment Records (HER) containing a database of recorded archaeological sites, find spots, and archaeological events; and other publicly available website databases and publications, where used, are cited in the text. Any other data sources used are referenced throughout the document.

10.3 Marine archaeology description

Marine archaeology encompasses not only shipwrecks, but also other evidence of human exploitation of maritime resources, such as shipyards, piers, fish traps, anchor sites and submerged landscapes where human beings and early hominids previously lived or hunted on terrain which was at that time dry land, or where they exploited fish and shellfish on the coast which is now submerged (Marine (Scotland) Act 2010, Section 73, Paragraph 5). Potential heritage sites to consider have been researched as recommended by the Supplementary Guidance: Historic Environment and Cultural Heritage produced by Orkney Islands Council (2017).

The Application Corridor is situated within The String. Notable archaeological findings within the vicinity of the Application Corridor are presented in Figure 10-1 (Drawing ref: P2663D-ARCH-001). There are no marine cultural heritage statutory designations that interact with the Application Corridor. There are no charted wrecks within the Application Corridor and no wrecks were identified during the marine survey campaign (Spectrum Geosurvey, 2023). There are ten charted wrecks located across The String, the wider Shapinsay Sound, the Bay of Kirkwall, the Bay of Elwick and the Bay of Carness, and the distance between the wrecks and the Application Corridor is listed in Table 10-1.

One archaeological record, listed as an obstruction, has been recorded within close proximity (24m) to the Application Corridor. The obstruction (59280) is categorised as a “diffuser”, however no further information regarding the obstruction is available. It was identified in 2001 and is located at 22m water depth (Canmore, 2012).

Table 10-1 Known marine archaeological assets located in The String

Name	Water Depth (m)	Latitude (WGS84 UTM29N)	Longitude (WGS84 UTM29N)	Distance to Application Corridor (km)
ID 59280	22	59 0.77 N	2 54.574 W	0.026
ID 77989	0	59 0.874 N	2 55.717 W	0.78
HMS Endeavour	21	59 1.499 N	2 56.642 W	0.9
HMS Loch Garry	19	59 1.727 N	2 56.897 W	1.2
Ocean Racer	5	59 0.68 N	2 56.42 W	1.5
HMD Lustring	23	59 0.84 N	2 52.897 W	1.5
ID 478	0	59 1.994 N	2 53.757 W	1.6
Disperser	11	58 59.941 N	2 57.696 W	3.0
HMS Albacore	24	59 0.025 N	2 51.095 W	3.6
Busy Bee	1	58 59.594 N	2 58.105 W	3.7

Source: UKHO – wrecks database, 2023

The occurrence of sites with marine archaeological significance (such as drifted debris) within the Application Corridor is thought to be unlikely given the data available. Additionally, there are no known airplane wrecks or submerged peats or woodlands in the vicinity of the Application Corridor that could be affected by the Project.



ORKNEY TO SHAPINSAY CABLE DISTRIBUTION REPLACEMENT

ARCHAEOLOGY

Wrecks in and around the Shapinsay Sound

Drawing No: P2663D-ARCH-001

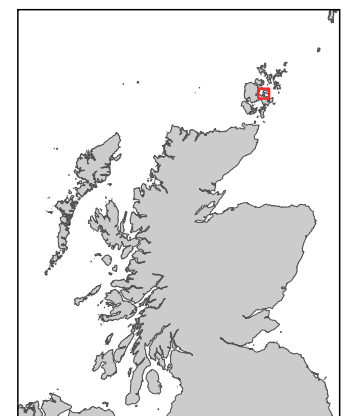
A

Legend

Application Corridor

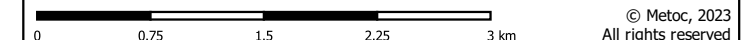
Wrecks

- Dangerous Wreck
- Distributed Remains of Wreck
- Non-dangerous Wreck
- Wreck Showing any Portion of Hull or Superstructure



NOT TO BE USED FOR NAVIGATION

Date	2023-11-09 18:23:30
Coordinate System	WGS 84 / UTM zone 30N
WKID	EPSG:32630
Scale @A3	1:50,000
Data Sources	OS; UKHO; ESRI
File Reference	J:\P2663\P2663D\Mxd_QGZ \P2663D.qgz
Created By	Oliver Bula
Reviewed By	Emma Langley
Approved By	Vicky Fisk



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10.4 Impact Assessment

There are no known wrecks that are present within the Application Corridor, however, it is possible that debris from shipwrecks cannot be ruled out solely from the data available. Notwithstanding this, it cannot be ruled out that the installation of the distribution cable may have the potential to cause damage to historic archaeological artefacts. The potential for damage to occur is limited to cable lay operations. If damage were to occur to a maritime artefact during cable lay operations, this damage would be permanent and there would be no ability to recover, which would cause the impact on historic records to be significant.

10.4.1 Abrasion/disturbance at the surface of the substratum

The proposed replacement cable will be surface laid for the whole marine route, with the exception of the intertidal area, and as such no disturbance to archaeological features in the area is expected. The seabed footprint associated with cable installation activity will be largely confined to the physical footprint of the cable and the potential use of concrete mattresses for cable crossings and rock bags, rock anchors and clump weights as cable stabilisation measures. As the cable will be majority surface laid (excluding planned burial at the landfall sites), the installation activities will not result in significant levels of sediment resuspension. Therefore, effects from offshore sedimentation have been screened out and the archaeological assessment focuses on the potential impacts caused by the surface lay of the cable and deposit of stabilisation material.

As the surface lay and cable stabilisation deposits may cause abrasion or disturbance of the substrate at the surface, there is the potential this could lead to damage of archaeological artefacts in contact with the cable or deposits. There is one artefact located in close proximity to the Application Corridor, however as the artefact is located outside of the Application Corridor, no cable or deposits will come into contact with the artefact. There is the potential for suspended sediment to be disturbed during installation activities and settle over the artefact, however this is considered unlikely to damage the artefact. No reefs are located in the close vicinity of the Application Corridor, and so no interaction will occur. Therefore, no adverse effects to archaeological features as a result of abrasion or disturbance at the surface of the substratum are expected to occur.

Geophysical survey works have been undertaken to inform the cable route design. However, as detailed in the Project Description (Appendix A) and Section 4.2, a pre lay survey will be undertaken as a final check of the cable route for archaeological features and debris.

10.4.2 Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion

During installation, interaction with known and unknown archaeological features or artefacts on the seabed or intertidal area could be caused by activities resulting in the removal of marine material from the intertidal area. Cable trenching activities at landfalls or the deployment of an mooring spread could have the potential to interact with archaeological artefacts below the surface, if present, as this would penetrate the seabed surface. If this were to occur, it could result in the potential destruction of any cultural heritage beneath and in the immediate vicinity of the cable route. Cable burial and trench backfilling in the intertidal areas have the potential to cause direct damage to sites of marine archaeological features and artefacts through compression.

10.5 Mitigation

Mitigation measures that are embedded in the project design are listed in Table 4-1. Following assessment, there are no additional mitigation measures proposed.

The pre lay survey will allow for any potential wrecks (and any other potential sites of archaeological significance) not identified during the route design to be identified prior to any cable installation works

starting. In addition, the following measures were implemented during the route design process to further ensure the protection of marine archaeological receptors.

- All wrecks or features of archaeological significance will be avoided by a buffer of $\geq 50\text{m}$ during detailed route design;
- The locations of wrecks and features of archaeological significance will be identified on electronic charts onboard the installation vessel and will be utilised to guide installation operations;
- The locations of any wrecks or features of archaeological significance will be provided to Historic Environment Scotland and the UKHO; and
- If required by licence, The Crown Estate's 'Protocol for Archaeological Discoveries' (PAD) (The Crown Estate, 2021) will be implemented during installation works.

It is acknowledged that there is the potential that archaeological features could still be present within the Application Corridor, which have not been identified during pre-construction surveys. In order to account for this, and subject to further discussion with Historic Environment Scotland, the Crown Estate's PAD (The Crown Estate, 2021) 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.

10.6 Conclusion

There is one known marine archaeological feature located in close proximity to the Application Corridor, however this will be avoided by a buffer of $\geq 50\text{m}$ during installation to prevent damage to the obstruction. As a result, the assessment has concluded that the installation and operation of the Orkney - Shapinsay cable will not adversely affect the marine archaeology within or in the vicinity of the Application Corridor.

11. COMMERCIAL FISHERIES AND OTHER SEA USERS

11.1 Introduction

This Section provides characterises the commercial fishery and aquaculture activity in and within the vicinity of the Application Corridor. Other sea users in the region, excluding shipping and navigation, are also considered. An NRA has been prepared to cover shipping and navigation in the area (see Appendix B). Potential pressures associated with the cable installation activities and the potential interactions with commercial fisheries and other sea users have been assessed, along with an outline of the mitigation and management measures to remove or reduce any potential effects.

This section should be read in conjunction with the regional FLMAP – North Coast and Orkney (Appendix C) which provides a summary assessment of all the potential marine interactions, including commercial fisheries, which could influence or be affected by the proposed replacement cable works.

11.2 Data sources

A FLMAP was prepared to set out how SHEPD will interact with all legitimate sea users, prior to and during any operational activities associated with the Orkney to Shapinsay cable. This information has been used to inform the baseline overview of this Section, with assessment findings being summarised as well.

The Section has been further supplemented by data sources used to inform the baseline description and assessment including but not limited to the following:

- Mainland Orkney – Shapinsay Scout Survey Observations, (Brown & May Marine, 2023);
- Mainland Orkney to Shapinsay Environmental Desk Study Report, (ERM, 2022);
- Scottish Sea Fisheries Statistics 2022, (Scottish Government, 2023);
- AIS data, EMODnet, 2021; and
- Any other data sources used are referenced throughout the document.

11.3 Commercial fisheries and other sea users description

11.3.1 Commercial fisheries

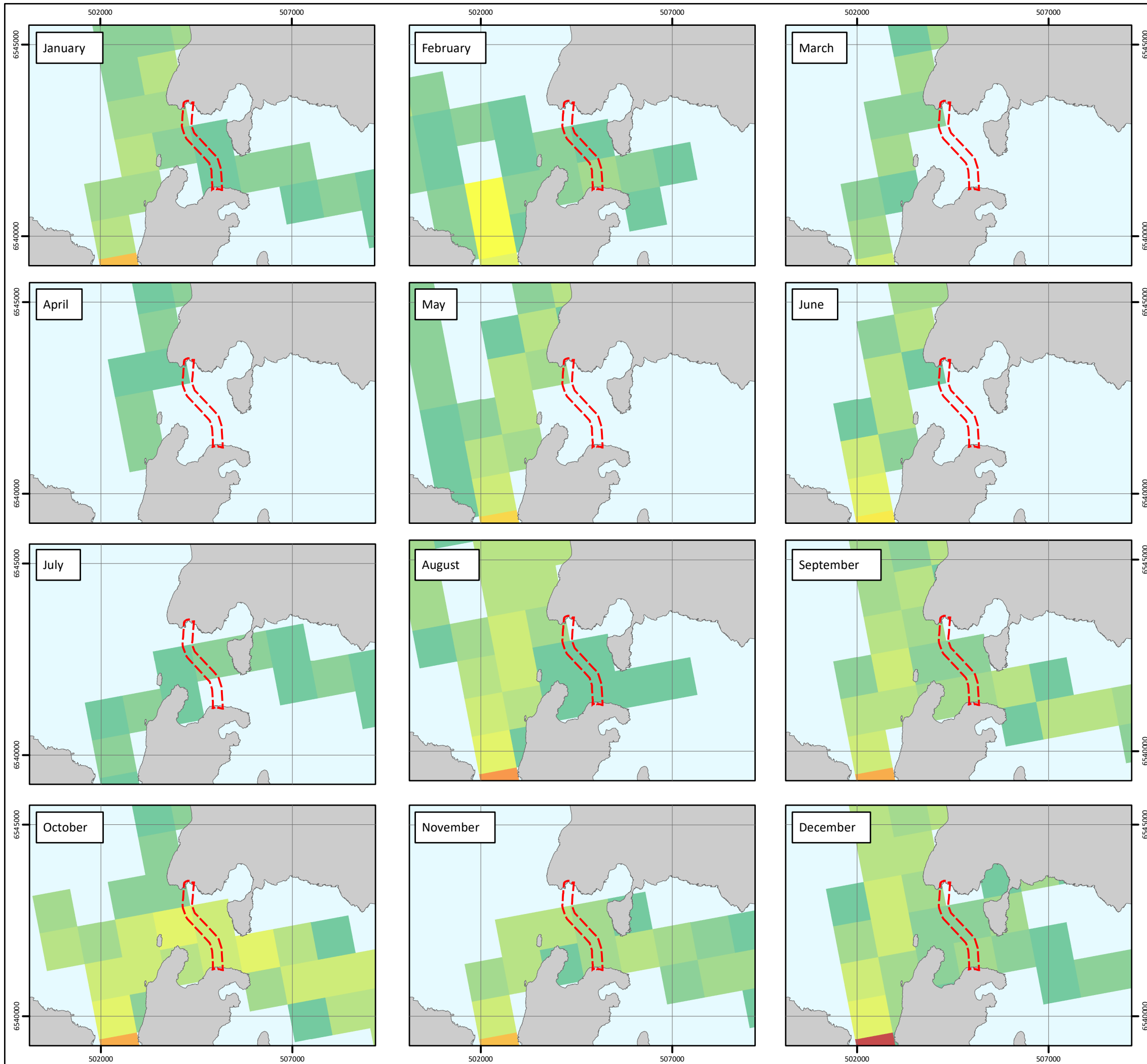
11.3.1.1 Fish and shellfish

The oceanic characteristics in the wider Sound of Shapinsay and The String make the area a prime spawning and/or nursery ground for a number of commercially important species. The installation is scheduled to take place between Q2 of 2024 and Q4 of 2025, therefore overlapping with the spawning and nursing periods of 14 fish and shellfish species (Table 11-1 and Figure 11-1 and 11-2, Drawing reference: P2663D-FISH-002-003).

Table 11-1 Summary of spawning and nursery periods for commercially important fish species within the Application Corridor

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scheduled installation												
Anglerfish (N)	N	N	N	N	N	N	N	N				
Atlantic Cod (N)	N	N	N	N	N	N						
Atlantic herring (SN)								SN	SN			
Atlantic mackerel (N)					N	N	N	N				
Blue whiting (N)				N	N	N						
Common ling		N	N	N	N							
European hake (N)	N	N	N	N	N	N	N	N				
Lemon sole (SN)				SN	SN	SN	SN	SN	SN			
Plaice (N)	N	N	N									N
Sandeel (SN)	SN	SN									SN	SN
Spotted ray (N)					N	N	N					
Sprat (SN)					SN	SN	SN	SN				
Whiting (N)		N	N	N	N	N						
Spurdog	Viviparous species (gravid females can be found all year)											
Key	S = Spawning			N = Nursery			SN = Spawning and Nursery			Blank = No data		

Source: Coull *et al.*, 1998; Ellis *et al.*, 2012



ORKNEY-SHAPINSAY DISTRIBUTION CABLE REPLACEMENT

AIS VESSEL DENSITY

Monthly Vessel Densities (2021) Fishing Vessels

Drawing No: P2663D-AIS-002

A

Legend

Application Corridor

EMODnet Fishing Vessel Density (2021)

Vessel Hours (per km²)

- 0 - 0.05
- 0.05 - 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- 1 - 2
- 2 - 5
- 5 - 10
- 10 - 20
- 20 - 50
- 50 - 100
- 100 - 200
- 200 - 500
- > 500



NOTE: Not to be used for Navigation

Date	13 December 2023
Coordinate System	WGS 1984 UTM Zone 30N
Projection	Transverse Mercator
Datum	WGS 1984
Data Source	OS; GEBCO; EMODnet
File Reference	J:\P2663\P2663D\Mxd_QGZ\06_AIS\ P2663D-AIS-002.mxd
Created By	Oliver Bula
Reviewed By	Lewis Castle
Approved By	Aodhfin Coyle



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11.3.2 Aquaculture

There is one aquaculture site located in the vicinity of the Application Corridor, a finfish farm (operated by Cooke Aquaculture Scotland) which is located within the Bay of Carness, in close proximity to the existing operational Orkney – Shapinsay cable. The site is located approximately 0.3km south-west of the Application Corridor.

11.3.3 Recreational sea users

As discussed in the Navigation Risk Assessment (Appendix B), recreational activity is considered moderate to high across the Application Corridor, with recreational vessels transiting to and from the Bay of Kirkwall. The Orkney Marine and Coastal Recreation Survey (Orkney Islands Council, 2022) shows the Application Corridor is contained within the general sailing area of the Orkney Islands and is located on the edge of the club sailing area, based in the Bay of Kirkwall. There are no RYA clubs or training centres within the Application Corridor. Cruise ships regularly cross The String from March – September to call at the Port of Kirkwall.

As discussed in the FLMAP, there are low levels of canoe and kayak activity, motor boating, long distance swimming, surfing and paddle boarding, chartered and sea angling, yacht racing, coastering and scuba diving across the Application Corridor.

11.3.4 Military areas

There are no Military Practice and Exercise Areas (PEXA) within the vicinity of the Application Corridor. The closest is Moray Firth (North), located approximately 24km east of the Application Corridor.

11.4 Potential impacts

Potential interaction with commercial fisheries and other sea users in the vicinity of the Application Corridor may arise due to:

11.4.1 Loss of fishing ground

There is potential for the presence of installation vessels to restrict access to fishing grounds or to cause fishing vessels to deviate from their typical navigation route, resulting in a loss of earnings, additional fuel costs or disruption of normal fishing activities. Longer term effects relate specifically to reduced fishing effort within traditional fishing grounds, due to the potential risk of gear being snagged on the cable and associated protection measures (e.g. rock bags and concrete mattresses) – see Section 11.4.2.

Regarding the immediate loss of access to fishing grounds and navigation routes due to the presence of installation vessels, the impacts relate to the 500m safety zone that will be enforced around the installation vessel when in operation. When the installation schedule for the cable is finalised, this will be circulated amongst local fishers ahead of the activities to provide as much notice as possible, allowing for temporary changes in routing to be made. Due to the short length of the Application Corridor and the temporary nature of this safety zone however, the duration of time where fishing vessels will be displaced will be minimal. As such, pressures resulting from the loss of access to commercial fisheries and other sea users are not expected to be significant.

11.4.2 Loss of fishing gear and increased snagging risk

The most popular fishing gear used in the vicinity of the Application Corridor is potting (creeling), which has been observed within the Application Corridor. This gear is all commonly used to target benthic species and as such snagging risks resulting from the cable or the stabilisation measures are possible. Based on these observations, there is the potential for interaction between the cable and these types of fisheries activities.

A Project Fisheries Liaison Officer (FLO) will be employed to manage communication between the fisheries operating in the area and the Project. The FLO will communicate the operational plan for the installation campaign with enough notice that any gear will be able to be moved away from the installation area. As there is a risk of snagging on both the surface-laid cable and the cable stabilisation deposits, it is likely that there will be a loss of potential fishing ground in this area. However, due to the small seabed footprint of the installed cable and associated cable stabilisation deposits, combined with the wider availability of fishing grounds for pots in the area, it is expected that this effect will be minor.

While occasional maintenance of the cable may occur in the future, such activities will be clearly communicated ahead of time with typical safety procedures (such as those used in this Project) being followed, thus ensuring impacts to local fishermen are kept to a minimum.

11.4.3 Disruption to recreational sea users

Based on the level of recreational sea users across the Application Corridor, there is the potential for disruption during cable installation. Communication to other sea users regarding the timescales for the Project will be via Notice to Mariners (NtMs) published by Orkney Harbour Authority, who the Project will be in regular contact with to discuss the planning and progress of the installation campaign. As the installation campaign is short-term, the restricted use of The String to any recreational users will be temporary and other areas in the region are available for recreational use during this time. As a result, pressures on recreational sea users from the Project will be minor.

11.4.4 Disruption to military vessels

There are no military PEXA areas located in the vicinity of the Application Corridor as outlined in Section 11.3.4. Due to the distance from the closest PEXA area, and ongoing communication and publishing of NtMs by Orkney Harbour Authority will ensure coordination of any potential conflicting activities that could occur. As such, pressures resulting from disruption to access of military vessels and other sea users are not expected to be significant.

11.5 Conclusion

The assessment demonstrates that there will be no significant effects to commercial fisheries interests or the other sea users (discussed within the Section) within in or in close proximity to the Application Corridor. The wider Shapinsay Sound area supports nursing and spawning grounds for commercially important fish and shellfish species (such as herring and crab). Potting is largely observed in The String, and gear may have to be moved during the installation campaign to allow unrestricted access to the Application Corridor. Gear may also struggle to be placed over the surface laid cable after the installation due to the risk of snagging on either the cable or the cable stabilisation deposits. However, due to the small seabed footprint of the cable once installed, and the wider availability of fishing grounds in the area, this loss of access is considered to be minor.

The String and the surrounding area also supports other users, such as recreational boaters, cruise ships and potential military vessels. Any disruption to other sea users that operate within The String or the surrounding areas will be mitigated against with ongoing communication and publishing of NtM, ensuring coordination of any potential conflicting activities. Ongoing communication between the Project and Orkney Harbour Authority will also minimise disruption. Any disruption to other sea users caused by the installation of the replacement cable will be minor and temporary due to their short-term and localised works.

12. UXO AND EXISTING UTILITIES

12.1 Introduction

This Section details the presence of any existing utilities and the potential for Unexploded Ordnance (UXO) within the vicinity of the Application Corridor, outlines the potential pressures associated with the proposed cable installation activities on these, and presents the findings of the environmental assessment.

For the purpose of this Section:

- UXO refers to explosive weapons that did not detonate when they were deployed and still poses a risk of detonation as it seldom degrades or loses its high explosive effectiveness over time. UXO have been deployed in the marine space worldwide and therefore there is the potential that they could be present within the Application Corridor.
- Utilities refers to existing structures such as cables, oil and gas infrastructure, and offshore renewable energy infrastructure.

12.2 Data sources

To inform the route engineering process, 6 Alpha Associates delivered a desk-based Preliminary UXO Threat Assessment between Mainland Orkney and Shapinsay (6 Alpha, 2019). The assessment identified potential sources of UXO within 5km of a defined UXO study area (within which the Application Corridor is located), the likelihood of contamination from each source and the probability of the threat of the UXO.

Utilities data is available across multiple sources such as Crown Estate Scotland (CES), NSTA, KIS-ORCA, and European Marine Observation and Data Network (EMODNet). All data sources used are referenced throughout this Section.

12.3 Baseline and receiving receptors

12.3.1 UXO

Many explosives were left in the marine environment after World Wars I and II. The explosives might be isolated or in regions where munitions are dumped. Any new marine development or activity must demonstrate that the region is free of UXO or that UXO can be safely avoided before work can begin (UK Government, 2022).

Due to the Orkney Islands' position off the north east coast of Scotland in the North Sea, the area was subject to bombing campaigns during World War II and therefore Luftwaffe targets are a potential threat in the area, particularly in harbour areas. Two World War II airfields are also located within 5km of the UXO study area, which were targets for aerial bombing. The Orkney Islands also installed coastal armaments as defence against German aircraft (also used for training purposes), which resulted in further potential UXO (pUXO) contamination from battery and gun sites located in the vicinity of the UXO study area (the closest is within approximately 100m of the UXO study area). Five munitions related shipwrecks are also located within 5km of the UXO study area, which are classed as merchant or navy vessels sunk in either World War which may contain munitions. There are no historic or current military practice areas, munitions dumping sites or previous UXO encounters within 5km of the UXO study area, so the likelihood of contamination from these sources is considered remote (6 Alpha, 2019).

12.3.2 Existing utilities

Marine utilities include renewable energy infrastructure, telecommunication cables, oil and gas infrastructure and aggregates for marine extraction and disposal. Figure 12-1 (Drawing Reference: P2663D-INFR-001) presents an overview of existing marine utilities in the vicinity of the Application Corridor.

There are two existing cables which will be crossed by the Application Corridor, the existing operational Orkney – Shapinsay power cable operated by SHEPD and one unknown out of service (OOS) cable identified during the marine survey (Spectrum Geosurvey, 2023).

The footprint of a dredge spoil dumping area overlaps with the Application Corridor. The site, Kirkwall (FI015), is classified as disused as of March 2020, which means the site has not been used for at least five years. The site contains spoil as a result of navigational dredging (Marine Scotland, 2022). The Application Corridor crosses the area outside of the intertidal area, and therefore will not disturb the disposed sediment.

There are no aggregate extraction sites located in the vicinity of the Application Corridor.

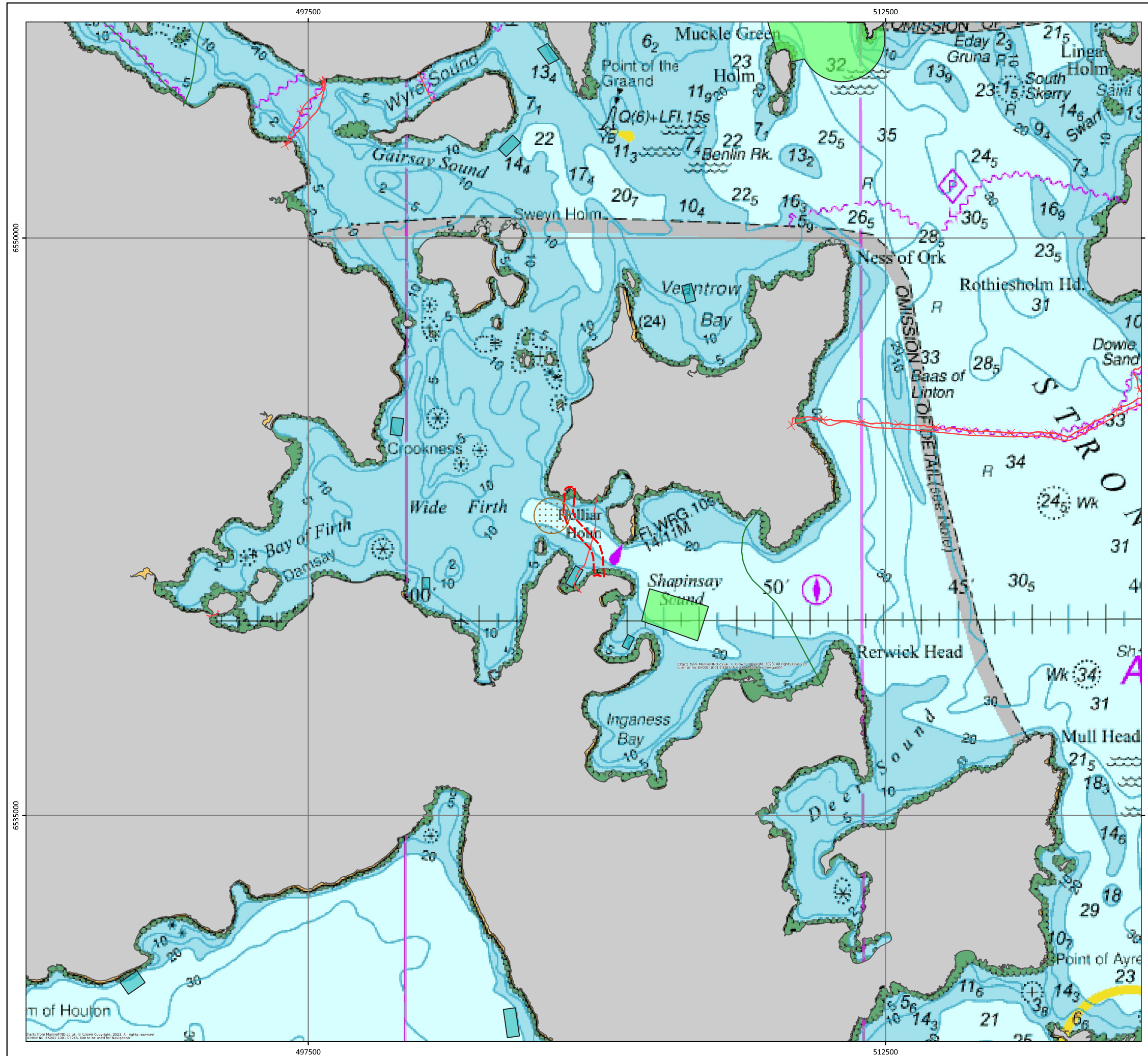
There are four aquaculture sites located in the vicinity of the Application Corridor:

- OR-48-5 is located approximately 0.3km west in the Bay of Carness,
- OR-48-3 is located 1.7km to the south-east in the Bay of Meil,
- OR-47-9 is located 3.8km to the south-west in the Bay of Kirkness, and
- OR-45-2 is located 4.6km to the north-west in the Bay of Puldrite

All sites are licenced by Crown Estate Scotland for finfish aquaculture (Crown Estate Scotland, 2023).

Within Shapinsay Sound, the European Marine Energy Centre (EMEC) have a scale tidal test site which is leased to developers to test their technologies without being connected to the electricity grid. The site is located 1.3km east of the Application Corridor. It is not known if the site will be leased during the proposed installation period.

The closest petroleum blocks are located approximately 19km east of the Application Corridor, however the closest active licenced block is more than 90km away. The closest pipeline, the P/C Tee to Flotta, is located approximately 20km south of the Application Corridor in the south of Scapa Flow and terminates at the Flotta Marine Oil Terminal on Flotta, Orkney (NSTA, 2023).



ORKNEY TO SHAPINSAY CABLE DISTRIBUTION REPLACEMENT

INFRASTRUCTURE

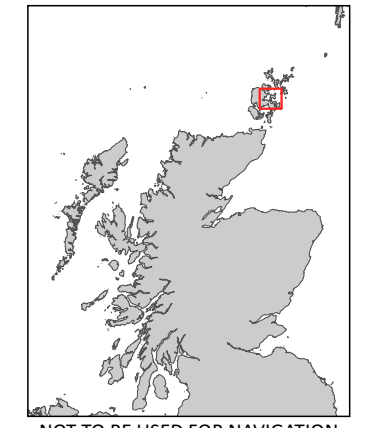
Surrounding Infrastructure and Marine Use Areas

Drawing No: P2663D-INFR-001

A

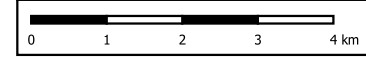
Legend

- Application Corridor
- Power - Active
- ✕ Power - Disused
- Telecom - Active
- Tidal Energy Agreement
- Aquaculture Site
- Dredge Spoil Dump



NOT TO BE USED FOR NAVIGATION

Date	2023-12-06 09:35:57
Coordinate System	WGS 84 / UTM zone 30N
WKID	EPSG:32630
Scale @A3	1:100,000
Data Sources	OS; GEBCO; EMODnet; CES; KISCA; SG
File Reference	J:\P2663\P2663D\Mxd_QGZ P2663D.qgz
Created By	Oliver Bula
Reviewed By	Emma Langley
Approved By	Vicky Fisk



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12.4 Impact assessment

Based on the potential interaction between the Project and UXO and existing utilities, two pressures have been screened into the assessment. There is the potential for abrasion or disturbance at the surface of the substratum when the cable is surface laid or cable stabilisation deposits are placed, which could result in potential interaction with UXO. There is also the potential for damage to third-party assets that cross the Application Corridor, including two existing cables and a dredge spoil dumping area (whilst it is noted that SHEPD own the existing Orkney-Shapinsay power cable which will be crossed by the new cable and is therefore not considered a third part asset, the assessment has been conducted under the pressure “damage to third-part assets” as this pressure best represents any potential risks that installation, operation and maintenance activities pose to the existing cable).

12.4.1 Abrasion / disturbance at the surface of the substratum

The preliminary desk assessment completed by 6 Alpha identified three potential UXO threat sources with a likelihood of contamination beyond remote within 5km of the Application Corridor. The likelihood from coastal armaments was considered to be highly likely (due to the number of armaments and batteries in the vicinity), with the likelihood from munitions related shipwrecks and aircraft considered likely due to the vicinity of the shipwrecks to the Application Corridor. The likelihood of contamination from aerial bombing was rated as possible as evidence was recorded within 3km of the Application Corridor.

The likelihood of a detonation of pUXO is dependent on the kinetic energy from the installation activity as this will be what triggers an explosion. As the cable will be surface laid and no burial will take place in the Application Corridor, the amount of potential kinetic released during the installation works is considered to be reduced.

Within The String and surrounding area, there have been no recorded previous munitions encounters. Anomalies identified during the marine survey campaign in the Application Corridor were identified as existing cables, geological formations or boulders. Any pUXO will be avoided by an exclusion zone of at least 15m during the route engineering process.

Despite this, there is still the potential that the project could encounter pUXO during installation, particularly from coastal armaments. This could result in the loss of equipment, damage to the cable, damage to any vessel working on the project and injury or death of personnel. As such, these risks are considered medium based on the potential for interaction and must be mitigated.

12.4.2 Damage to third-party assets

There are two planned cable crossings within the Application Corridor. One is the existing Orkney – Shapinsay power cable, whilst the other is an unidentified OOS cable. Concrete mattresses will be used at the crossing locations to ensure no damage to the operational or new cables. Crossing designs have also been engineered to ensure no damage to either cable will occur, as SHEPD have an interest in protecting and maintaining both the new and existing cables.

The Application Corridor overlaps with a disused dredge spoil dumping area. As the site is not in use, there will be no restriction to access of the dumping site and the contents of the site will not be disturbed as no burial of the cable will take place.

There is sufficient distance between the Application Corridor and the EMEC scale tidal test site, and as such no interaction is envisaged. Access to the site is not expected to be restricted during installation operations.

Based on the above assessment, there are no adverse effects expected to occur to any third-party (or SHEPD owned) assets as a result of Project activities.

12.5 Mitigation

As recommended by 6Alpha, if pUXO items are discovered during any phase of the project, the location of the item will be recorded and immediate advice sought from relevant authorities. If a UXO is identified during the construction phase, then works will cease immediately until advice and remedial actions are implemented. In addition, munitions awareness briefings will be given to contractor's and ship personnel prior to and during the construction phases. The MoD and emergency services will be consulted as appropriate.

No further mitigation is planned for the cable crossings or other installation works.

12.6 Conclusion

While there exists the potential for UXO to be present within the Application Corridor, the risk of encountering UXO during installation has been mitigated through recommendations from a UXO specialist, including personnel briefings and a 15m exclusion zone around any potential UXO during the route engineering process to reduce the potential for encountering any ordnance.

The Application Corridor crosses two cables (the existing Orkney – Shapinsay distribution cable and an unidentified OOS cable) and overlaps with a closed dredge spoil dumping area. As these assets are either owned by the Applicant or not in use, there are no significant effects envisaged from installation operations.

13. CONCLUSION

This MEA supports the Marine Licence Application that SHEPD is submitting for installation activities associated with the replacement cable between Mainland Orkney and Shapinsay. This MEA includes an assessment of the potential impacts of the cable installation activities on sensitive receptors (Sections 5-12). Table 13-1 below provides a summary of the assessment findings. As a result of the findings, along with the embedded mitigation and best practice measures detailed in Section 4.2, it can be concluded that activities associated with installation of the replacement cable will not result in any significant effect on any relevant receptor.

Table 13-1 Assessment Summary

Environmental Receptor	Assessment Outcome	Additional Mitigation (where required)	Overall Impact Significance
Protected Sites (Section 5)	The protected sites assessment has demonstrated that installation activities associated with the cable replacement will not adversely affect the conservation objectives of any designated site within or in the vicinity of the Application Corridor. Any disturbance caused by the installation of the cable will be minor and temporary due to the short-term, localised and temporary nature of the activities.	N/A	No adverse effect to conservation objectives
Seabed and Water Quality (Section 6)	The evaluation of seabed and water quality has determined that the installation and operation of the Orkney to Shapinsay cable will not have an adverse impact on the seabed and water quality within or in the vicinity of the Application Corridor. Any sediment released during the cable installation process will quickly settle, becoming indistinguishable within the water column to levels typically associated with strong tidal and wave movements. As the cable will be surface laid (except in the intertidal area), any disturbance resulting from direct habitat loss is expected to be highly localised, confined to the specific area covered by the cable, uraduct, and any rock bags, split pipe, or concrete mattresses (if required). Therefore, there will be no significant loss of habitat or natural features as a consequence of these activities.	N/A	Not significant
Megafauna (Section 7)	The marine megafauna assessment has determined that due to the short-term, localised and temporary nature of cable installation activities in combination with the low densities of marine megafauna in the area (harbour and grey seal usage is estimated between 10-50 individuals per km ² and minke whale and basking shark encounter rates of up to 0.10 animals per km ²), there are unlikely to be any adverse effects to cetacean, pinniped and elasmobranchs as a consequence of the planned cable installation activities.	N/A	Not significant
Benthic and Intertidal Ecology (Section 8)	The benthic and intertidal ecology assessment has demonstrated that installation and operation activities associated with the cable replacement will not significantly affect the benthic subtidal and intertidal ecology in terms of the spatial extent at which environmentally sensitive habitats were recorded. Any impacts of cable installation on the habitats and species within the Application Corridor will be temporary and habitat loss will be localised. Micro-routing of the installation corridor will be undertaken to (where possible) avoid sensitive habitats and species to ensure they are not significantly affected by the installation activities. Cable installation activities will be short term and the footprint is spatially small relative to the extent of the surrounding benthic environment. Cable protection measures will be used in some areas to ensure cable protection and stability as well as reducing abrasion impacts. The footprint of the deposits will be the minimum required to ensure cable safety and stability. The deployment of any vessel mooring / spud leg positioning will be kept to a minimum in order to reduce disturbance to the seabed.	N/A	Not significant - Slight
Ornithology (Section 9)	The ornithology assessment has demonstrated that although breeding red-throated diver within the Application corridor may experience a slight disruption to	N/A	Not significant

Environmental Receptor	Assessment Outcome	Additional Mitigation (where required)	Overall Impact Significance
	<p>their foraging activities during the Orkney – Shapinsay cable installation, this will be temporary with the species expected to return to normal foraging behaviour immediately after disturbing activity has ceased. Therefore, given the short-term, localised and temporary nature of the installation activities, there are unlikely to be any adverse effects to breeding red-throated diver as a consequence of the planned installation activities.</p>		
<p>Marine Archaeology (Section 10)</p>	<p>The assessment of marine archaeology concluded that there is one known marine archaeological feature located in close proximity to the Application Corridor, however this will be avoided by a buffer of ≥50m during installation to prevent damage to the obstruction. As a result, the installation and operation of the Orkney - Shapinsay cable will not adversely affect the marine archaeology within or in the vicinity of the Application Corridor.</p>	<p>N/A</p>	<p>Not significant</p>
<p>Commercial Fisheries and Other Users (Section 11)</p>	<p>The assessment demonstrates that there will be no significant effects to commercial fisheries interests or the other sea users (discussed within the Section) within in or in close proximity to the Application Corridor. The wider Shapinsay Sound area supports nursing and spawning grounds for commercially important fish and shellfish species (such as herring and crab). Potting is largely observed in The String, and gear may have to be moved during the installation campaign to allow unrestricted access to the Application Corridor. Gear may also struggle to be placed over the surface laid cable after the installation due to the risk of snagging on either the cable or the cable stabilisation deposits. However, due to the small seabed footprint of the cable once installed, and the wider availability of fishing grounds in the area, this loss of access is considered to be minor.</p> <p>Th String and the surrounding area also supports other users, such as recreational boaters, cruise ships and potential military vessels. Any disruption to other sea users that operate within The String or the surrounding areas will be mitigated against with ongoing communication and publishing of NtM, ensuring coordination of any potential conflicting activities. Ongoing communication between the Project and Orkney Harbour Authority will also minimise disruption. Any disruption to other sea users caused by the installation of the replacement cable will be minor and temporary due to their short-term and localised works.</p>	<p>N/A</p>	<p>Not significant</p>
<p>UXO and Existing Utilities (Section 12)</p>	<p>While there exists the potential for UXO to be present within the Application Corridor, the risk of encountering UXO during installation has been mitigated through recommendations from a UXO specialist, including personnel briefings and a 15m exclusion zone around any potential UXO during the route engineering process to reduce the potential for encountering any ordinance.</p> <p>The Application Corridor crosses two cables (the existing Orkney – Shapinsay distribution cable and an unidentified OOS cable) and overlaps with a closed dredge spoil dumping area. As these assets are either owned by the Applicant or not in use, there are no significant effects envisaged from installation operations.</p>	<p>N/A</p>	<p>Not significant</p>

REFERENCES

- 1 ACOPS (2017). Annual Survey of Reported Discharges and Releases Attributed to Vessels and Offshore Oil and Gas Installations Operating in the United Kingdom's Exclusive Economic Zone (UK EEZ) 2016, Cambridge : Queen's Printer and Controller of HMSO. Available at: <https://www.acops.org.uk/wp-content/uploads/2019/07/ACOPS-Annual-Survey-2016.pdf>. [Accessed: December 2023]
- 2 Animal diversity Web. Available at: <https://animaldiversity.org/> [Accessed October 2023]
- 3 Ballard, D (2020) Wetland use by spring migrating ducks in Iowa's Prairie Pothole Region. Available at: <https://dr.lib.iastate.edu/server/api/core/bitstreams/12bccd31-1371-4be8-9d89-9b4aa2fa35fa/content> [Accessed October 2023]
- 4 Bennun, L. et al. (2021) Industry guidance for early screening of biodiversity risk - offshore wind. Gland, Switzerland: IUCN and Cambridge, UK: The Biodiversity Consultancy.
- 5 Benthic Solutions (2023a). Orkney to Shapinsay Habitat Assessment Survey Report.
- 6 Benthic Solutions (2023b). Environmental Intertidal Survey Phase 1: Orkney, Mull-Iona and Loch a' Choire
- 7 Benthic Solutions Ltd (2023) Environmental Intertidal Survey Report - Orkney, Mull-Iona and Loch a' Choire. Document reference: BSL2338_ED2_INT_FR1
- 8 BGS, 2023. Offshore Geoindex. [Online] Available at: https://mapapps2.bgs.ac.uk/geoindex_offshore/home.html?_ga=2.72903187.1669220908.1678717512-940311906.1673862943 [Accessed November 2023].
- 9 Birkett, D.A., Maggs, C.A., Dring, M.J., Boaden, P.J.S. and Seed, R. (1998). Infralittoral reef biotopes with kelp species. An overview of dynamic and sensitivity characteristics for conservation management of marine SACs, 7.
- 10 Boulcott, P. and Howell, T.R. (2011). The impact of scallop dredging on rocky-reef substrata. Fisheries research, 110(3), 415-420.
- 11 Brassuer, S. and Reijnders, P. (1994). Deprivation indicated necessity for haul-out in harbour seals. *Marine Mammal Science*. 12(4) [Accessed October 2023]
- 12 BRIG (ed. Ant Maddock). (2008). UK Biodiversity Action Plan: Priority Habitat Descriptions.
- 13 Briggs Marine contractors Ltd., (2023) Habitat Assessment Survey Report – Orkney to Shapinsay. Document reference: CB0258-5015
- 14 Buckley, Paul & Connor, David & Cook, David & Cox, Martyn & Dale, Tabitha & Dye, Stephen & Frost, Matt & Hawkrige, Jane & Huthnance, John & Kröger, Silke & Law, Robin & Mackie, Jim & Maes, Thomas & Malcolm, Stephen & Moffat, Colin & Moxon, Richard & Raymond, Katherine & Saunders, Justine & Claire, & Williamson, Phillip. (2010). Charting Progress 2 – The State of UK Seas.
- 15 Burger, C., Schubert, A., Heinänen, S., Dorsch, M., Kleinschmidt, B., Žydelis, R., Morkūnas, J., Quillfeldt, P., & Nehls, G. (2019). A novel approach for assessing effects of ship traffic on distributions and movements of seabirds. *Journal of Environmental Management*, 251, 109511.
- 16 Burt, Mackenzie, Bradbury and Drake (2017), Investigating effects of shipping on common scoter and red-throated diver distributions in Liverpool Bay SPA. Report number: CREEM15198-2017-2. Provided to Natural England (Project ref. 23732) August 2017
- 17 Castège, I., Milon, E. and Pautrizel, F. (2014). Response of benthic macrofauna to an oil pollution: Lessons from the "Prestige" oil spill on the rocky shore of Guéthary (south of the Bay of Biscay, France). *Deep Sea Research Part II: Topical Studies in Oceanography*, 106, 192-197.
- 18 Christie, H., Fredriksen, S. & Rinde, E. (1998). Regrowth of kelp and colonization of epiphyte and fauna community after kelp trawling at the coast of Norway. *Hydrobiologia*, 375/376, 49-58.
- 19 Connor, D.W., Allen, J.H., Golding, N., Howell, K.L., Lieberknecht, L.M., Northen, K.O. & Reker, J.B., 2004. The Marine Habitat Classification for Britain and Ireland. Version 04.05. ISBN 1 861 07561 8. In JNCC (2015), The Marine Habitat Classification for Britain and Ireland Version 15.03. Joint Nature Conservation

- Committee, Peterborough. Available from <https://mhc.jncc.gov.uk/> [Accessed February 2024]
-
- 20** De-Bastos, E.S.R., Hill, J.M., Garrard, S.L., & Watson, A., (2023). *Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment. Tyler-Walters H. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, Plymouth: Marine Biological Association of the United Kingdom. Available at: https://www.marlin.ac.uk/habitats/detail/1068/ophiothrix_fragilis_andor_ophiocomina_nigra_brittlestar_beds_on_sublittoral_mixed_sediment [Accessed: August 2023].
-
- 21** DECC (Department of Energy & Climate Change) (2016). UK Offshore Energy Strategic Environmental Assessment. March 2016.
-
- 22** Dieck, I. (1993). Temperature tolerance and survival in darkness of kelp gametophytes (Laminariales, Phaeophyta): ecological and biogeographical implications. MARINE ECOLOGY-PROGRESS SERIES, 100, 253-253.
-
- 23** Doyle, S. et al. (2022) Home range of a long-distance migrant, the Greenland Barnacle Goose *Branta leucopsis*, throughout the annual cycle. Available at: [Home range of a long-distance migrant, the Greenland Barnacle Goose *Branta leucopsis*, throughout the annual cycle: Bird Study: Vol 70, No 1-2 \(tandfonline.com\)](https://doi.org/10.1093/birdstudy/70.1-2/1-2) [Accessed October 2023]
-
- 24** Ellis, J. R., Milligan, S, P., Readdy, L., Taylor, N. and Brown, M. J. (2012) Spawning and nursery grounds of selective fish species in UK waters. Cefas Report.
-
- 25** EMODnet (2023) EMODnet Map Viewer. Available at: <https://emodnet.ec.europa.eu/geoviewer/>. [Accessed November 2023]
-
- 26** Environment Protection agency (2017). Glossary of impact terminology. Available at: https://epawebapp.epa.ie/licences/lic_eDMS/090151b2802b9357.pdf [Accessed September 2023]
-
- 27** ERM (2022) Mainland Orkney to Shapinsay: Environmental Desk Study Report.
-
- 28** EUR28 (2013). Interpretation Manual of the European Union habitats. European Commission DG Environment. Available at: https://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf. [Accessed: August 2023]
-
- 29** European Commission (2021). Commission notice guidance document on the strict protection of animal species of community interest under the Habitats Directive, Publications Office of the EU. [Online] Available at: <https://op.europa.eu/en/publication-detail/-/publication/a17dbc76-2b51-11ec-bd8e-01aa75ed71a1/language-en/format-PDF/source-search> [Accessed: November 2023]
-
- 30** European Commission (2021). Commission notice guidance document on the strict protection of animal species of community interest under the Habitats Directive, Publications Office of the EU. Available at: <https://op.europa.eu/en/publication-detail/-/publication/a17dbc76-2b51-11ec-bd8e-01aa75ed71a1/language-en/format-PDF/source-search> [Accessed: November 2023]
-
- 31** Evans, P. et al. (2011) Abundance and behaviour of cetaceans and basking sharks in the Pentland Firth and Orkney Waters. Report by Hebog Environmental Ltd & Sea Watch Foundation. Scottish Natural Heritage Commissioned Report No.419
-
- 32** Fließbach, K., Borkenhagen, K., Guse, N., Markones, N., Schwemmer, P., & Garthe, S. (2019). A Ship Traffic Disturbance Vulnerability Index for Northwest European Seabirds as a Tool for Marine Spatial Planning. *Frontiers in Marine Science*. 6. 10.3389/fmars.2019.00192.
-
- 33** Furness, R. et al., (2013). Assessing vulnerability of marine bird populations to offshore wind farms. *Journal of Environmental Management*. 119(1), pp. 56-66.
-
- 34** Ghoul, A. & Reichmuth, C. (2016) Auditory Sensitivity and Masking Profiles for the Sea Otter (*Enhydra lutris*). *Advance in experimental medicine and biology*. 875(3), pp. 49-54.
-
- 35** Gilles, A. et al. (2023) Estimates of cetacean abundance in European Atlantic waters in summer 2022 from the SCANS-IV aerial and shipboard surveys. Available at: https://www.researchgate.net/publication/374504552_Estimates_of_cetacean_abundance_in_European_Atlantic_waters_in_summer_2022_from_the_SCANS-IV_aerial_and_shipboard_surveys

- 36** Hall-Spencer, J.M., Grall, J., Moore, P.G. and Atkinson, R.J.A. (2003). Bivalve fishing and maerl-bed conservation in France and the UK—retrospect and prospect. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 13(S1), S33-S41.
- 37** Hartnoll, R.G. (1998). Circalittoral faunal turf biotopes: an overview of dynamics and sensitivity characteristics for conservation management of marine SACs, Volume VIII. Scottish Association of Marine Sciences, Oban, Scotland. UK Marine SAC Project. Natura 2000 reports.
- 38** Hebridean Whale and Dolphin Trust. (2018). Hebridean marine mammal atlas series [Online] Available at: <https://hwdt.org/hebridean-marine-mammal-atlas> [Accessed November 2023]
- 39** HM Government. (2011). UK Marine Policy Statement. [Online]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69322/pb3654-marine-policy-statement-110316.pdf
- 40** HM Government. (2017). The Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2017. [Online]. Available at: <http://www.legislation.gov.uk/uksi/2017/580/made>.
- 41** Holme, N.A. and Wilson, J.B. (1985). Faunas associated with longitudinal furrows and sand ribbons in a tide-swept area in the English Channel. *Journal of the Marine Biological Association of the United Kingdom*, 65(4), 1051-1072.
- 42** Hudson, A. V., & Furness, R. W. (1989). The diving behaviour, foraging ecology and energetics of Red-throated Divers *Gavia stellata* during chick-rearing. *Journal of Animal Ecology*, 58(3), pp. 961-978.
- 43** IAMMWG (2022). Updated abundance estimates for cetacean Management Units in UK waters (Revised 2022). JNCC Report No. 680, JNCC Peterborough, ISSN 0963-8091.
- 44** Irving, R. (2009). The identification of the main characteristics of stony reef habitats under the Habitats Directive: Summary report of an inter-agency workshop 26–27 March 2008, JNCC Report No. 432, JNCC, Peterborough, ISSN 0963-8091.
- 45** Jasper, C. and Hill, J.M. (2015). *Laminaria digitata* on moderately exposed sublittoral fringe bedrock.
- 46** JNCC (2015) Calf of Eday SPA Standard Data Form. Available at: <https://jncc.gov.uk/jncc-assets/SPA-N2K/UK9002431.pdf> [Accessed October 2023]
- 47** JNCC (2017) North-west Orkney NCMPA. Available at: <https://jncc.gov.uk/our-work/north-west-orkney-mpa/> [Accessed October 2023]
- 48** JNCC (2018a) Easy Sanday Coast SPA Standard Data Form. Available at: <https://jncc.gov.uk/jncc-assets/SPA-N2K/UK9002331.pdf> [Accessed October 2023]
- 49** JNCC (2018b) North Caithness Cliffs SPA standard data form. Available at: <https://jncc.gov.uk/jncc-assets/SPA-N2K/UK9001181.pdf> [Accessed October 2023]
- 50** JNCC (2022) Marine Pressures-Activity Database (PAD) V1.5. Available at: Marine Pressures-Activities Database (PAD) v1.5 | JNCC Resource Hub [Accessed September 2023]
- 51** JNCC (2022a) Copinsay SPA Standard Data Form. Available at: <https://jncc.gov.uk/jncc-assets/SPA-N2K/UK9002151.pdf> [Accessed October 2023]
- 52** JNCC (2022b) Marwick Head SPA Standard Data Form. Available at: <https://jncc.gov.uk/jncc-assets/SPA-N2K/UK9002121.pdf> [Accessed October 2023]
- 53** JNCC (2023a) Faray and Holm of Faray SAC. Available at: <https://sac.jncc.gov.uk/site/UK0017096> [Accessed October 2023]
- 54** JNCC (2023b) Sanday Sac. Available at: <https://sac.jncc.gov.uk/site/UK0030069> [Accessed October 2023]
- 55** JNCC. (2019b). Special Areas of Conservation – overview. [Online]. Available at: <https://jncc.gov.uk/our-work/special-areas-of-conservation-overview/> [Accessed November 2023]
- 56** JNCC. (2019c). Special Protection Areas – overview. [Online]. Available at: <https://jncc.gov.uk/our-work/special-protection-areas-overview/> [Accessed June 2023]
- 57** Kain, J.M. (1979). A view of the genus *Laminaria*. *Oceanography and Marine Biology: an Annual Review*, 17, 101-161.

- 58** Kamenos, N.A., Moore, P.G. and Hall-Spencer, J.M. (2003). Substratum heterogeneity of dredged vs undredged maerl grounds. *Journal of the Marine Biological Association of the United Kingdom*, 83(2), 411-413.
- 59** MacArthur Green (2021) Bhlaraidh Wind Farm extension Habitats Regulations Appraisal Appendix 6.4. Available at: <https://www.sserenewables.com/media/3t0pjica/bhlaraidh-extension-eiar-volume-4-appendix-6-4-habitats-regulation-appraisal.pdf>. [Accessed October 2023]
- 60** Macleod, K., Lacey, C., Quick, N., Hastie, G. and Wilson J. (2011). Guidance on survey and monitoring in relation to marine renewables deployments in Scotland. Volume 2. Cetaceans and Basking Sharks. Unpublished draft report to Scottish Natural Heritage and Marine Scotland.
- 61** Madsen, J., Cracknell, G., & Fox, T. (2001). The Greenland white-fronted goose *Anser albifrons flavirostris* in Ireland: numbers, distribution, diet, foraging behaviour and breeding success. *Bird Study*, 48(1), pp. 14-27.
- 62** Marine Scotland (2021). Scottish Government - FEAST. [Online]. Available at: <https://marine.gov.scot/data-source-types/feast#:~:text=FEAST%20is%20a%20Feature%20Activity,marine%20environment%20may%20be%20required>. [Accessed September 2023].
- 63** Marine Scotland (2023). Scottish Government - FeAST. Available at: <https://www.marine.scotland.gov.uk/FEAST/FeatureReport.aspx#0> [Accessed: September 2023].
- 64** Marine Scotland. (2015). Scotland's National Marine Plan. [Online]. Available at: <https://www.gov.scot/publications/scotlands-national-marine-plan/pages/2/>
- 65** MarineScotland (2013) Observed adjusted densities of Basking shark all seasons 2000 to 2012. Available at: <https://www.marine.gov.scot/maps/982> [Accessed December 2023]
- 66** MarineScotland (2017) Estimated at-sea Distribution of Grey and Harbour Seals - updated maps 2017. doi: 10.7489/2029-1
- 67** MarLIN (2023). MarLIN - The Marine Life Information Network - Home. Available at: <https://www.MarLIN.ac.uk/> [Accessed: September 2023].
- 68** Mikkelsen, L., Johnson, M., Wisniewska, D.M., van Neer, A., Siebert, U., Madsen, P.T. and Teilmann, J. (2019). Long-term sound and movement recording tags to study natural behavior and reaction to ship noise of seals. *Ecology and evolution*, 9(5), pp.2588-2601.
- 69** Morris et al. (2021) Aerial surveys of seals in Scotland during the harbour seal moult, 2016-2019. Available at: https://www.nature.scot/sites/default/files/2021-07/research_reports_-_sample_report_4.docx [Accessed November 2023]
- 70** Moy, F.E. and Christie, H. (2012). Large-scale shift from sugar kelp (*Saccharina latissima*) to ephemeral algae along the south and west coast of Norway. *Marine Biology Research*, 8(4), 309-321.
- 71** Mykura, W., 1976. British Regional Geology: Orkney and Shetland. 1st ed. Edinburgh: HMSO.
- 72** NatureScot (2020a). Otter. [Online] Available at: <https://www.nature.scot/plants-animals-and-fungi/mammals/land-mammals/otter> [Accessed: November 2023]
- 73** NatureScot (2020a). Otter. Available at: <https://www.nature.scot/plants-animals-and-fungi/mammals/land-mammals/otter> [Accessed: November 2023]
- 74** NatureScot (2020b). Seals. [Online] Available at: <https://www.nature.scot/plants-animals-andfungi/mammals/marine-mammals/seals> [Accessed: November 2023]
- 75** NatureScot (2020b). Seals. Available at: <https://www.nature.scot/plants-animals-andfungi/mammals/marine-mammals/seals> [Accessed: November 2023]
- 76** NatureScot (2020d) NCMPA selection. Available at: <https://www.nature.scot/professional-advice/protected-areas-and-species/protected-areas/marine-protected-areas/background-ncmpa-selection>. [Accessed November 2023]

-
- 77** NatureScot (2022) Rousay SPA. Available at: <https://sitelink.nature.scot/site/8573> [Accessed October 2023]
-
- 78** NatureScot (2023) Circalittoral Sands and mixed sediment communities. Available at: <https://www.nature.scot/landscapes-and-habitats/habitat-types/coast-and-seas/marine-habitats/circalittoral-sands-and-mixed-sediment-communities> (Accessed: December 2023).
-
- 79** NatureScot (2023) North Orkney SPA. Available at: <https://sitelink.nature.scot/site/10481> [Accessed November 2023]
-
- 80** NatureScot (2023a) Papa Westray SPA. Available at: <https://sitelink.nature.scot/site/10412> [Accessed October 2023]
-
- 81** NatureScot (2023b) Sites of Special Scientific Interest. Available at: <https://www.nature.scot/professional-advice/protected-areas-and-species/protected-areas/national-designations/sites-special-scientific-interest-ssis#:~:text=Site%20of%20Special%20Scientific%20Interest,or%20fauna%2C%20geology%20or%20geomorphology.> [Accessed October 2023]
-
- 82** NatureScot (2023c) West Westray SPA. Available at: <https://sitelink.nature.scot/site/8589> [Accessed October 2023]
-
- 83** NatureScot (2023d) North Orkney SPA. Available at: <https://sitelink.nature.scot/site/10481> [Accessed November 2023]
-
- 84** NatureScot (2023e) Orkney Mainland Moors SPA. Available at: SiteLink - Orkney Mainland Moors SPA (nature.scot). [Accessed January 2024]
-
- 85** NatureScot (2023f) Switha SPA. Available at: SiteLink - Switha SPA (nature.scot) [Accessed January 2024]
-
- 86** NatureScot (2023g). Available at: SiteLink - Pentland Firth Islands SPA (nature.scot) [Accessed January 2024]
-
- 87** NatureScot (2023h) Papa Westray (North Hill and Holm) SPA. Available at: SiteLink - Papa Westray (North Hill and Holm) SPA (nature.scot) [Accessed January 2024]
-
- 88** NatureScot (2023i) Caithness and Sutherland Peatlands SPA. Available at: SiteLink - Caithness and Sutherland Peatlands SPA (nature.scot) [Accessed January 2024]
-
- 89** NatureScot (2023j) Caithness Lochs SPA. Available at: SiteLink - Caithness Lochs SPA (nature.scot) [Accessed January 2024]
-
- 90** NatureScot (2023k) Mill Loch SSSI. Available at: SiteLink - Mill Loch SSSI (nature.scot) [Accessed January 2024]
-
- 91** NatureScot (2023l) Loch of Mey SSSI. Available at: SiteLink - Loch of Mey SSSI (nature.scot)[Accessed January 2024]
-
- 92** NMFS. (2018). 2018 Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0). p.178.
-
- 93** NRDC (2023) Why all the concern about underwater ship noise. Available at: [Why All the Concern About Underwater Ship Noise? \(nrdc.org\)](https://www.nrdc.org/underwater-ship-noise) [Accessed October 2023]
-
- 94** OceanIQ (2023) Orkney – Shapinsay Cable Route Desktop Study. Document reference: 4063-GMSL-G-RD-0001
-
- 95** OceanIQ (2023) Orkney – Shapinsay Cable Route Desktop Study. Document reference: 4063-GMSL-G-RD-0001
-
- 96** Olsen, J. *et al.*, (2017) Influence of human exposure on the anti-predator response of harbour seals (*Phoca vitulina*). *Encyclopedia of Puget Sound*. Available at: <https://www.eopugetsound.org/articles/influence-human-exposure-anti-predator-response-harbor-seals-phoca-vitulina#:~:text=Harbor%20seals%2C%20for%20example%2C%20are,even%20beneficial%20response%20to%20humans.> [Accessed November 2023]
-
- 97** OneBenthic database (2020). Available at: <https://openscience.cefas.co.uk/OneBenthicExtraction/> [Accessed: December 2023]
-
- 98** Orkney Islands Council (2023) Sites of special Scientific Interest (SSSI). Available at: <https://www.orkney.gov.uk/Service-Directory/S/Sites-of-Special-Scientific-Interest-SSSI.htm#keelylang> [Accessed October 2023].
-

- 99** OSPAR Commission (2016) OSPAR Intersessional Correspondence Group on Cumulative Effects. The Netherlands
- 100** OSPAR. (2008a). Description of habitats on the OSPAR list of threatened and/or declining species and habitats. Available at: https://qsr2010.ospar.org/media/assessments/p00358_case_reports_species_and_habitats_2008.pdf [Accessed: November 2023].
- 101** OSPAR. (2008b). Case Reports for the OSPAR List of Threatened and/or Declining Species and Habitats: *Nucella lapillus*. Available at: https://qsr2010.ospar.org/media/assessments/p00358_case_reports_species_and_habitats_2008.pdf [Accessed: December 2023].
- 102** Parry, M.E.V., K.L. Howell, B.E. Narayanaswamy, B.J. Bett, D.O.B. Jones, D.J. Hughes, N. Piechaud, H. Ellwood, N. Askew, C. Jenkins And E. Manca. (2015). A Deep-sea Section for the Marine Habitat Classification of Britain and Ireland. JNCC report 530. JNCC. The Marine Habitat Classification for Britain and Ireland, Version 15.03.
- 103** Paterson, W., Russell, D. J. F, Wu, M., McConnell, B. J. and Thompson, D. (2015). Harbour seal haul-out monitoring, Sound of Islay. Scottish Natural Heritage Commissioned Report No. 894.
- 104** Perry, F. & Tyler-Walters, H. (2023) Maerl beds. In Tyler-Walters H. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [Online]. Plymouth: Marine Biological Association of the United Kingdom. Available from: https://www.MarLIN.ac.uk/habitat/detail/255/maerl_beds [Accessed: December 2023]
- 105** Popper, A. (2019) An overview of fish bioacoustics and the impacts of anthropogenic sounds on fishes. *Fish Biology*. 94(5).
- 106** Readman, J.A.J., & Watson, A., 2024. *Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment. In Tyler-Walters H. Marine Life Information Network: Biology and Sensitivity Key Information Reviews. Plymouth: Marine Biological Association of the United Kingdom. Available at: <https://www.marlin.ac.uk/habitat/detail/74> [Accessed February 2024]
- 107** Rossel (2006) Northern Ireland Priority species - *Ammodytes marinus*. Available at: <https://www.habitas.org.uk/priority/species.asp?item=100014#:~:text=Spawning%20usually%20takes%20place%20in,2%2D5%20months%20after%20hatching.> [Accessed October 2023]
- 108** Rostron, D.M. & Bunker, F. St P.D. (1997). An assessment of sublittoral epibenthic communities and species following the Sea Empress oil spill. A report to the Countryside Council for Wales from Marine Seen & Sub-Sea Survey., Countryside Council for Wales, Bangor, CCW Sea Empress Contact Science, no. 177.
- 109** Russell, D. J., Hastie, G. D., Thompson, D., Janik, V. M., Hammond, P. S., Scott-Hayward, L. A., Matthiopoulos, J., Jones, E. L. and McConnell, B. J. (2016). Avoidance of wind farms by harbour seals is limited to pile driving activities. *Journal of Applied Ecology*, 53 (6), Wiley Online Library., pp.1642–1652
- 110** Savard, J. P. L., & Dupuis, L. (1999). Foraging habitat characteristics of nesting Common Loons (*Gavia immer*) in Atlantic Canada. *Canadian Journal of Zoology*, 77(5), pp. 679-687
- 111** Schwemmer, P., Mendel, B., Sonntag, N., Dierschke, V. & Garthe, S. (2011) Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning *Ecological Applications*, 21, 1851-1860
- 112** Schwemmer, P., Mendel, B., Sonntag, N., Dierschke, V. & Garthe, S. (2011) Effects of ship traffic on seabirds in offshore waters: implications for marine conservation and spatial planning *Ecological Applications*, 21, 1851-1860.
- 113** SCOS. (2021). Scientific advice on matters related to the management of seal populations: 2021. NERC: Special Committee on Seals (SCOS) Main Advice Report
- 114** Scottish Government (2019) Offshore wind energy - draft sectoral marine plan: habitat regulations appraisal. Available at: <https://www.gov.scot/publications/draft-sectoral-marine-plan-offshore-wind-energy-habitat-regulations-appraisal/pages/23/> [Accessed October 2023]
- 115** Scottish Wildlife Trust (2023) Grey seal *HALICHOERUS GRYPUS*. Available at: <https://scottishwildlifetrust.org.uk/species/grey-seal/#:~:text=Behaviour,seen%20between%20October%20and%20December.> [Accessed October 2023]

- 116** SeaWatch (2006) Cetaceans of Orkney. Available at: <https://seawatchfoundation.org.uk/wp-content/uploads/2012/07/Orkney2.pdf> [Accessed November 2023]
- 117** Sebens, K.P. (1986). Spatial relationships among encrusting marine organisms in the New England subtidal zone. *Ecological Monographs*, 56(1), 73-96.
- 118** SEPA (2011) Bay of Firth, Orkney Mainland shellfish water. Available at: <https://www2.sepa.org.uk/shellfish/pdf/23.pdf> [Accessed November 2023]
- 119** SEPA (2015) Improving the quality of Scotland's water environment - Orkney and Shetland area management plan 2010–2015. Available at: <https://www.sepa.org.uk/media/76259/doc-5-orkney-shetland-amp-overview.pdf> [Accessed November 2023]
- 120** Sim, I. M. W., Pearce-Higgins, J. W., & Grant, M. C. (2017). Modelling the foraging distribution of Hen Harrier *Circus cyaneus* in relation to habitat and prey availability. *Ibis*, 159(1), pp. 57-70.
- 121** Sims, D. W. (2008). Sieving a living: a review of the biology, ecology and conservation status of the plankton-feeding basking shark *Cetorhinus maximus*. *Advances in marine biology*, 54, 171-220.
- 122** Smith, J.E. (1968). 'Torrey Canyon' pollution and marine life. A report by the Plymouth Laboratory of the Marine Biological Association of the United Kingdom. Cambridge University Press
- 123** SNH (2009a) Hoy SPA. Available at: <https://apps.snh.gov.uk/sitelink-api/v1/sites/8513/documents/16> [Accessed October 2023]
- 124** SNH (2009b) Stroma SSSI. Available at: [https://apps.snh.gov.uk/sitelink-api/v1/sites/1498/documents/3#:~:text=Stroma%20Site%20of%20Special%20Scientific%20Interest%20\(SSSI\)%20is%20located%20on,the%20colonies%20of%20breeding%20seabirds.](https://apps.snh.gov.uk/sitelink-api/v1/sites/1498/documents/3#:~:text=Stroma%20Site%20of%20Special%20Scientific%20Interest%20(SSSI)%20is%20located%20on,the%20colonies%20of%20breeding%20seabirds.) [Accessed October 2023]
- 125** SNH. (2018). Dunnet Head SSSI. [Online]. Available at: <https://sitelink.nature.scot/site/571> [Accessed October 2023].
- 126** Stamp, T.E. (2015). *Laminaria hyperborea* and foliose red seaweeds on moderately exposed infralittoral rock. In Tyler-Walters H. *Marine Life Information Network: Biology and Sensitivity Key Information Reviews*, Plymouth: Marine Biological Association of the United Kingdom. Available at: https://www.marlin.ac.uk/habitats/detail/292/laminaria_hyperborea_and_foliose_red_seaweeds_on_moderately_exposed_infralittoral_rock [Accessed: November 2023].
- 127** Taormina, B., Bald, J., Want, A., Thouzeau, G., Lejart, M., Desroy, N. and Carlier, A. (2018). A review of potential impacts of submarine power cables on the marine environment: Knowledge gaps, recommendations and future directions. *Renewable and Sustainable Energy Reviews*, 96, 380-391.
- 128** The Highland Council (2011) Assessment of Highland Special Landscape Areas - Duncansby Head SSSI. Available at: <https://www.highland.gov.uk/download/downloads/id/2937/assessment-of-highland-special-landscape-areas.pdf> [Accessed October 2023]
- 129** The Irish Government (2020) Bird foraging distances table. Available at: <https://assets.gov.ie/96741/2601fdb4-420a-45da-948a-ac2b5b0babe3.docx> [Accessed October 2023]
- 130** The Orkney guide (2005) Birds - seabirds. Available at: <https://www.orkneyguide.com/ogbpdf/Birds.pdf> [Accessed November 2023]
- 131** The Scottish Government (2019) Offshore wind energy - draft sectoral marine plan: habitat regulations appraisal. Available at: <https://www.gov.scot/publications/draft-sectoral-marine-plan-offshore-wind-energy-habitat-regulations-appraisal/pages/12/> [Accessed November 2023]
- 132** The Scottish Government (2023) Responsible wildlife watching around seals. Available at: <https://blogs.gov.scot/marine-scotland/2023/09/19/responsible-wildlife-watching-around-seals/#:~:text=Harbour%20seals%20usually%20give%20birth,the%20pups%20have%20been%20weaned.> [Accessed October 2023]
- 133** The Scottish Government. (2015). Regional Boundaries. [Online]. Available at: <http://www2.gov.scot/Topics/marine/seamanagement/regional/Boundaries>

134 Tillin, H.M., Hull, S.C. and Tyler-Walters, H. (2010). Development of a sensitivity matrix (pressures-MCZ/MPA features).

135 Tyler-Walters, H. (2007). *Nucella lapillus* Dog whelk. In Tyler-Walters H. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. Available from: <https://www.marlin.ac.uk/species/detail/1501> [Accessed: December 2023].

136 Tyler-Walters, H. (2016a). Yellow and grey lichens on supralittoral rock. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. Available from: <https://www.marlin.ac.uk/habitat/detail/96> [Accessed: December 2023].

137 Tyler-Walters, H., James, B., Carruthers, M. (eds.), Wilding, C., Durkin, O., Lacey, C., Philpott, E., Adams, L., Chaniotis, P.D., Wilkes, P.T.V., Seeley, R., Neilly, M., Dargie, J. & Crawford-Avis, O.T. (2016b). Descriptions of Scottish Priority Marine Features (PMFs). Scottish Natural Heritage Commissioned Report No. 406.

138 UK Parliament (2022) Orkney Marine Mammal Research Initiative (MM0023). Available at: <https://committees.parliament.uk/writtenevidence/108936/pdf/> [Accessed November 2023]

139 Vetter, B. and Sisneros, J. (2020) Swim bladder enhances lagenar sensitivity to sound pressure and higher frequencies in female plainfin midshipman (*Porichthys notatus*). *Journal of Experimental Biology*, 223(14).

140 Woodward, I., Thaxter, C.B., Owen, E. & Cook, A.S.C.P. 2019. Desk-based revision of seabird foraging ranges used for HRA screening, Report of work carried out by the British Trust for Ornithology on behalf of NIRAS and The Crown Estate, ISBN 978-1-912642-12-0.

141 Xodus (2023) EPS and Protected Sites and Species Risk Assessment - North Coast and Orkney. Document reference: A-302244-S02-REPT-001.
