Scottish and Southern Energy plc

Loch Long Reconductor Project

Environmental Supporting Information

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EXECUTIVE SUMMARY

Scottish Hydro Electric Transmission (SHE Transmission) is submitting an application for a Marine Licence for the upgrade and reinforcement works of an Overhead Line (OHL) located over Loch Long, known as the 'Loch Long Reconductor Project' (LLRP). The Project will see the Loch Long OHL be reconductored, replacing the six existing conductors and one earth wire which span a 1.4 km stretch across Loch Long.

SHE Transmission also has a statutory duty under the Electricity Safety Quality and Continuity Regulations 2002 to ensure that the electricity transmission network is fit for purpose. The need for the Project has been determined based on capability studies of the existing OHL network which showed that the existing OHL circuits at Loch Long show poor performance in terms of electrical faults. As such, a new 132 kilovolt (kV) double circuit OHL is deemed essential in order to maintain the long-term security of electricity supply to Argyll and Bute.

The purpose of this report is to provide information on the proposed works for the reconductoring of the Loch Long and present the environmental appraisal required in support of the Marine Licence application, in line with Part 4 of the Marine (Scotland) Act 2010.

The findings of the report and on-going consultation with key stakeholders show that the only receptors at risk are those associated with shipping and navigation. As such a High-Level Navigational Risk Assessment (HLNRA) has been undertaken to determine the risk to shipping and navigation users from these works and to identify any additional measures required to ensure risks are minimised.

The HLNRA identifies that the Project passes over, and requires complete closure of, a well trafficked and militarily important navigation channel. The closure presents an obvious risk and source of disruption to vessels using the area during the installation and the height of the electrified OHL presents a potential risk to larger vessels during the operational life of the conductor.

Ultimately, the safety risks present by the LLRP are suitably managed through ensuring that vessels cannot interact with the OHL during the installation or the operational phase of the conductor lifetime. Guard vessel patrol prevents interaction with the OHL during installation and an inherently safe OHL height design prevents interaction during the operational phase.

Disruption to shipping caused by the necessary closure of the channel is suitably addressed by raising awareness through early stakeholder engagement and standard industry measures which ensure promulgation of the operation details to sea users. However, given that complete closure of the militarily and commercially important channel is required, further minimisation of potential disruption is considered necessary. Optimisation of the installation activities with the operations of Finnart Oil terminal, Port authorities, RYA (Royal Yachting Association), MoD (Ministry of Defence) and any other important stakeholders is therefore recommended to further minimise potential disruption. Where practicable the optimisation should include scheduling closures during the quietest times of day whilst avoiding the busiest times of day. Therefore, all risks to navigation associated with the operation can be considered ALARP (as low as reasonably practicable) where this recommendation is implemented or otherwise closed out satisfactorily.

ACRONYMS AND ABBREVIATIONS

Acronym	Definition
AC	Alternating Current
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
AtoN	Aid to Navigation
CES	Crown Estate Scotland
CMPP	Clyde Marine Planning Partnership
CSS	Catenary Support System
CSS	Catenary Support System
DC	Direct Current
DWT	Deadweight Tonnage
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
ENCA	Enabling a Natural Capital Approach
EPZ	Equi-potential Zone
EU	European Union
FSA	Formal Safety Assessment
GIS	Geographic Information System
HAT	Highest Astronomical Tide
HLNRA	High Level Navigational Risk Assessment
IMO	International Maritime Organisation
KHMC	King's Harbour Master Clyde
kV	Kilovolt
LDP	Local Development Plan
LLRP	Loch Long Reconductor Project
MCA	Maritime and Coastguard Agency
MD-LOT	Marine Directorate Licensing and Operations Team
MHWS	Mean High Water Springs
MAIB	Marine Accident Investigation Branch
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MMSI	Maritime Mobile Service Identity
MoD	Ministry of Defence
NAVAREA	Navigational Area
NAVTEX	Navigational telex
NM	Nautical Mile
NMP	National Marine Plan
NPF	National Planning Framework
NRA	Navigational Risk Assessment
NtM	Notice to Mariners
OHL	Overhead Line

OREI	Offshore Renewable Energy Installation
PAC	Pre-application Consultation
PEXA	Practice and Exercise Area
QHMC	Queen's Harbour Master Clyde
RCZ	Recommended Clearance Zone
RNAD	Royal Naval Armament Depot
RNLI	Royal National Lifeboat Institution
ROW	Running Out Wheels
RRM	Risk Reduction Measure
RYA	Royal Yachting Association
SAR	Search and Rescue
SARH	Search and Rescue Helicopter
SHE	Scottish Hydro Electric
SHE Transmission	Scottish Hydro Electric Transmission
SOLAS	Safety of Life at Sea
SPP	Scottish Planning Policy
SSE	Scottish and Southern Energy
SSEN	Scottish and Southern Electricity Networks
UKHO	United Kingdom Hydrographic Office
VHF	Very High Frequency
VTS	Vessel Traffic Service

1 INTRODUCTION

1.1 Introduction

In line with Part 4 of the Marine (Scotland) Act 2010, Scottish Hydro Electric Transmission (SHE Transmission) is submitting an application for a Marine Licence for the upgrade and reinforcement works of an Overhead Line (OHL) electricity cable, known as the 'Loch Long Reconductor Project' (LLRP), over the sea loch, Loch Long. The purpose of this report is to provide information on the proposed works for the reconductoring of the transmission cables, and present the environmental appraisal required in support of the Marine Licence application.

1.2 Project Background

SHE Transmission is a wholly owned subsidiary of the Scottish and Southern Energy (SSE) plc group of companies. SHE Transmission owns and maintains the electricity transmission network across the North of Scotland and holds a license under the Electricity Act 1989 to *'develop and maintain an efficient, co-ordinated and economical electricity transmission system in its licensed area'*.

Dunoon is currently connected to the wider electricity grid network by a twin-circuit 132 kilovolt (kV) double circuit OHL, supported on steel lattice towers between the existing substation north-west of Garelochhead, and the existing Dunoon substation located west of Sandbank, on Holy Loch, a short distance north of Dunoon.

A capability study of the 16 km stretch of the OHL was undertaken in 2014. The outcome of this study showed that almost half of the towers were in an unsatisfactory condition and the existing OHL circuits show poor performance in terms of electrical faults that even refurbishing the existing OHL would not resolve. Therefore, in order to ensure security of supply to Argyll and Bute, and meet current clearance standards, a new 132kV double circuit OHL is proposed to be constructed to replace the existing OHL. The full package of work is known as the Dunoon 132kV OHL Rebuild Project.

As part of the wider Dunoon 132kV OHL Rebuild Project, Scottish and SHE Transmission have now submitted their application for consent under Section 37 of The Electricity Act 1989, to install a 132 kV overhead electric line between Dunoon 132/33kV Substation and existing Tower 15, west of the Loch Long OHL. Following completion of the Dunoon 132kV OHL Rebuild, the existing 132 kV OHL would be dismantled and removed.

In summary, the main elements of the Dunoon 132kV OHL Rebuild Project include the following:

- Construction of a new 132kV OHL from the existing Loch Long crossing to Dunoon Grid Supply Point, located near Sandbank;
- Reconductoring of the Loch Long crossing (i.e. 'the LLRP');
- Decommissioning/removal of the existing 132kV OHL; and
- Associated tie in works at Dunoon Substation.

This report presents only environmental information of relevance to support the Marine Licence application for the reconductoring of the Loch Long crossing (hereafter, referred to as 'the Project').

The Project spans 1.4 km across Loch Long and currently has a vertical clearance of 71 m above Highest Astronomical Tide (HAT). The OHL is supported by four special structures, two either side of the loch, forming the crossing. The Project is located by Garelochhead, some 15km north of Dunoon, as highlighted in Figure 1-1.

The Project will see the existing Loch Long OHL be reconductored, replacing the six existing conductors and one earth wire, which carry the current and the associated fittings and fixtures, but reusing the four existing special structures which support the Loch Long OHL span. As the transmission operator, SHE Transmission will undertake the reconducting of the 1.4 km stretch of existing OHL.

Loch Long is situated within two statutory harbour limits; Clyde Port, under the jurisdiction of Clydeport Operations Ltd, and Clyde Dockyard Port of Loch Long under the jurisdiction of the King's Harbour Master. The area is recognised as being of high vessel traffic density, due to the presence of a major oil terminal, and several military facilities in the upper reaches of the loch, which can only be accessed by transiting beneath the Project area.

Further details of the Project activities and schedule of works is provided in Section 2 of this report.

Any terrestrial works required as part of the wider Dunoon 132kV OHL Rebuild Project are outwith the scope of the Marine Licence, and as such, are not considered further within this document. The environmental information pertaining to these terrestrial elements of the Dunoon 132kV OHL Rebuild Project are provided in the Environmental Impact Assessment (EIA) Report submitted alongside the Section 37 consent application (SSEN Transmission, 2023).

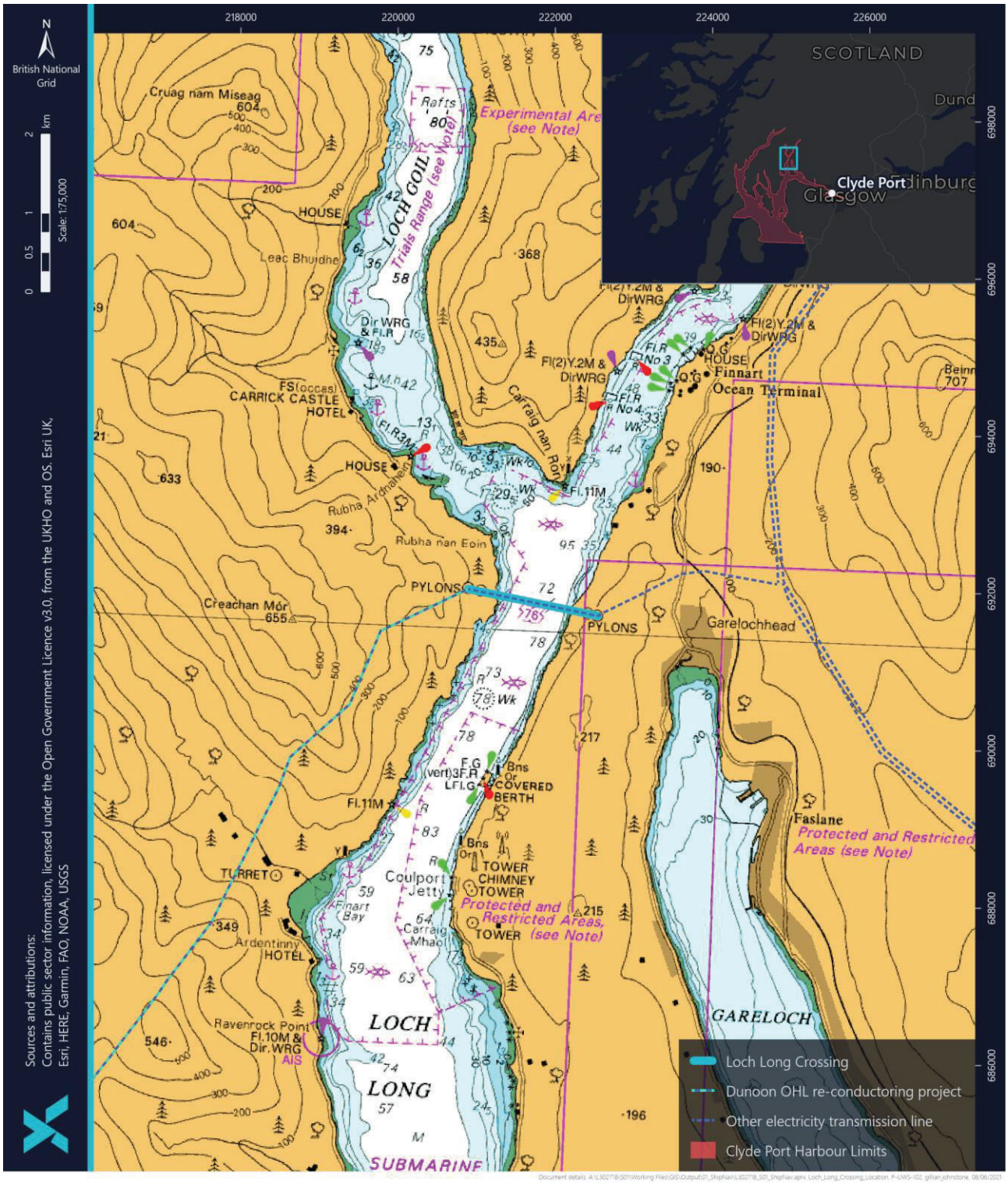


Figure 1-1 Location of the Project

1.3 Marine Licencing and Plans

1.3.1 Marine Licence and Supporting Information

Under Part 4, Paragraph 5 of the Marine (Scotland) Act 2010, a Marine Licence is required to:

- *5) construct, alter or improve any works within the Scottish marine area either—*
  (a) in or over the sea; or
  (b) on or under the seabed.

The Project falls within the remits of the condition (5a) as the works will occur over the sea loch. As such, it is the intention of SHE Transmission to undertake these works under a Marine Licence.

As agreed with Marine Directorate Licencing and Operations Team (MD-LOT) via email on the 8th January 2021, an EIA under the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 specific to the Project is not required as the marine licensable works are above the marine environment and there are no physical works, with the exception of guard vessels in the sea loch (as detailed in Section 1.6).

In keeping with Marine Scotland's Guidance for Marine Licence Applicants (Scottish Government, 2015a), which states that for construction projects:

> *"Applications for certain works may require assessments to be carried out, such as environmental or navigational assessments, where a project does not require a full EIA but certain information is required to process an application."*

As such, this report provides sufficient environmental information to support the Marine Licence application, by identifying the environmental receptors in the area and undertaking an assessment of the potential impacts to those that are considered particularly sensitive to the proposed works.

This document forms part of the Marine Licence application for the Project and will be used to implement environmental management measures for the Project.

1.3.2 Scottish National Marine Plan

The Scottish Government adopted the National Marine Plan (NMP) in 2015 (Scottish Government, 2015b) to provide an overarching framework for marine activity in Scottish waters, with an aim to enable sustainable development and the use of marine areas in a way that protects and enhances the marine environment, whilst promoting both existing and emerging industries. This is underpinned by a core set of general policies which apply across existing and future development and use of the marine environment. Sectoral policies are also outlined in the NMP where a particular industry brings with it issues beyond those set out in the general policies. For the Project, the general planning policies and policies covering offshore wind and marine renewable energy are of particular relevance to marine electricity grid planning and development in Scottish waters.

With respect to transmission infrastructure and OHL projects, the NMP sets out a number of key objectives for Offshore Wind and Marine Renewable Energy. Of relevance to the Project, the following objective is noted:

- *Aligned marine and terrestrial electricity transmission grid planning and development in Scottish waters*.

With regards to the Project, relevant Offshore Wind and Marine Renewables Marine Planning Policies also include:

- *Marine Licencing:*
    - *New and future planned grid connections should align with relevant sectoral and other marine spatial planning processes, where appropriate, to ensure a co-ordinated and strategic approach to grid planning. Cable and network owners and marine users should also take a joined-up approach to development and activity to minimise impacts on the marine historic and natural environment and other users; and*
    - *Marine planners and decision makers should ensure infrastructure is fit for purpose now and in future. Consideration should be given to the potential for climate change impacts on coasts vulnerable to erosion.*

Part 3 of the Offshore Wind and Marine Renewable Energy Planning Policy covers the key issues for marine planning supporting economically productive activities. Of these issues listed, the following is of relevance to the Project:

- *Grid Provision – The full exploitation of Scotland's offshore renewable energy resources, and maximum economic benefit, is dependent on the construction and improvement of both onshore and offshore grid capacity.*

In September 2022, Scottish Ministers announced their intention to update the Scottish NMP (Scottish Government, 2015b). Nevertheless, at present the 2015 NMP is still in force.

1.3.3 Regional Marine Plans

Regional marine plans are currently in the process of being prepared within those Scottish Marine Regions where there is an established Regional Marine Planning Partnership. The planning competence of these Regional Marine Planning Partnerships extends out to 12 nautical miles (NM). Regional marine plans are required to be developed in accordance with the NMP (unless relevant considerations indicate otherwise) and will be required to co-ordinate with any relevant grid requirements and initiatives.

Although the Project is located within the Argyll and Bute province, the Project falls under waters covered by Clyde Region which encompasses the coastal waters from the Mull of Kintyre to Helensburgh. These regions extend from mean high water springs (MHWS) out to 12 NM.

Argyll and Bute Council is a member of the Clyde Marine Planning Partnership (CMPP). Scottish Ministers have given the task of developing a Regional Marine Plan for the Clyde to the CMPP and its Public Authority members. The draft Regional Marine Plan for the Clyde was submitted for consultation in 2019 (CMPP, 2019).

Within the Pre-Consultation Draft Clyde Regional Marine Plan (CMPP, 2019), of particular relevance to the Project are policies covered in Chapter 14: Energy, Subsea Cables and Pipelines, including:

- Policy Enabling a Natural Capital Approach (ENCA) 1 – *Development and activities relating to offshore wind and marine renewable energy development will be supported where:*
    - *connections to shore and National Grid infrastructure have been considered in line with the relevant Local Development Plan(s); and*
    - *detailed restoration and maintenance proposals are included.*

- Policy ENCA 3 – *The laying, replacement and maintenance of communication and power cables and any oil and gas pipelines is supported where:*
    - *proposed land fall is in line with the relevant Local Development Plan(s);*
    - *existing routes and landing points are used where practicable; and*
    - *a Fishing Mitigation Action Plan, considering all legitimate sea users, is completed.*

The draft Clyde Regional Marine Plan was submitted to Marine Scotland for review in July 2020. As of 2023, it is the status of the Regional Marine Plan is unclear.

1.4 National Planning Policy

The Scottish Government has published the revised draft for the National Planning Framework 4 (NPF4) (Scottish Government, 2023), which is was adopted in February 2023 and which supersedes and replaces NPF3 and the Scottish Planning Policy (SPP).

The need for a high voltage electricity transmission network is included within NPF4 as

> *"New and/or replacement upgraded on and offshore high voltage electricity transmission lines, cables and interconnectors of 132kv or more".*

The NPF4 confirms that the Project is required to support the delivery of an enhanced high voltage electricity transmission grid which is identified as vital in meeting national targets for electricity generation, statutory climate change targets and the security of energy supply.

1.5 Local Development Plans

1.5.1 Argyll and Bute Local Planning Policy

The Project is located within the jurisdiction of the Argyll and Bute Council. The council formally adopted the Argyll and Bute Local Development Plan (LDP) on the 26th March 2015. The extant LDP sets out the planning policies for the Council area of the Project. The key policies relevant to the Project are identified below,

- Policy 1 – Sustainable Development;
- Policy 3 – Supporting the Protection, Conservation and Enhancement of our Environment;

- Policy 6 – Supporting the Sustainable Growth of Renewables;
- Policy 10 – Maximising our Resources and Reducing our Consumption;
- Policy 9 – Development Setting, Layout and Design; and
- Policy 11 – Improving our Connectivity and Infrastructure.

Of key relevance to the Project is Policy 11 – Improving our Connectivity and Infrastructure. This Policy highlights the council support for developments which seek to maintain and improve the internal and external connectivity and make best use of existing infrastructure. The justification for this showcases this need:

> *"Good connectivity and infrastructure are of fundamental importance to the way of life, economy and health of the people of Argyll and Bute. The distinctive geography, environmental sensitivities and landscape character of Argyll and Bute present a range of issues related to this. Delivery of connectivity and infrastructure that integrate with the settlement and spatial strategy will help us deliver successful sustainable development of the area for all."*

The Project will ensure the continued transmission of electricity to the Argyll and Bute communities through replacing the OHL at Loch Long and will maintain existing tower structures at either side of the crossing, as such the Project conforms to these principles.

A review is underway and consultation on the Proposed Local Development Plan (LDP2) was completed in January 2020. A delay in progressing LDP2 has arisen due to the National Planning Framework 4 (NPF4) being laid in Parliament. The reporters are currently determining what, if any, further processes are required as a consequence. As a result, the examination report will now likely be issued later in 2023.

It is noted that the general LDP policy support for necessary infrastructure to facilitate sustainable development and to improve connectivity and infrastructure in the area has not materially altered in LDP2.

1.6 Stakeholder Engagement and Consultations

SHE Transmission have engaged with the relevant statuary consultees and key stakeholders of the Project in order to communicate the scope of the Project works and to ascertain any foreseeable issues. An overview of these engagements is summarised below in Table 1-1.

Table 1-1 Engagement conducted for the Project to date

CONSULTEE	DATE	DESCRIPTION OF ENGAGEMENT
MD-LOT	17 Feb 2020	Email to highlight project and engage with MD-LOT to establish consenting needs for crossing works.
Maritime and Coastguard Agency (MCA)	25 Feb 2020	Email notifying MCA of the project and request for any clearance height requirements

CONSULTEE	DATE	DESCRIPTION OF ENGAGEMENT
Queen's Harbour Master Clyde (QHMC)	25 Feb 2020 – 03 Feb 2020	Emails to highlight project and engage with QHMC regarding clearances level requirements of the OHL.
QHMC	10 July 2020 – 24 July 2020	Emails with QHMC to re-establish clearances and organise suitable date for consultation briefing.
Clyde Port (Peel Ports)	24 July 2020	Email with Clyde Port to establish clearances and organise suitable date for consultation briefing.
MCA	24 July 2020	Consultation meeting to update MCA on Dunoon project progress.
QHMC / Clyde Port (Peel Ports)	18 Aug 2020	Consultation meeting with QHMC and Clyde Port regarding the vessel traffic study findings, proposed crossing engineering drawings and discussions of clearances.
MD-LOT	02 Oct 2020	Consultation meeting with MD-LOT to discuss the project, highlight the operation and maintenance purpose for the restringing of the crossing, the engagement undertaken up to that point and the consenting process required for the works.
Members of the Public	03 Nov 2020	Virtual Public Consultation. This exhibition focused on the wider terrestrial Dunoon OHL Rebuild Project; however the consultation did highlight to the public the need for the Loch Long Crossing to be restrung as part of the wider enabling works.
Crown Estate Scotland (CES)	07 Dec 2020	Online briefing to CES to highlight the Loch Long crossing works, discuss any issues arise, and/or fees/licences required by CES for the works.
MD-LOT	8 January 2021	Email from MD-LOT confirming that the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 do not apply to the marine construction works (replacement of the OHL over Loch Long) for this proposal and as such, no EIA considerations are needed before an application can be submitted. MD-LOT confirmed a brief Environmental Appraisal with a focus on shipping and navigation would be required to accompany the Marine Licence application.
Clyde Port (Peel Ports) and QHMC	18 March 2022	Consultation meeting on the proposed crossing methods under development. Also presented a vessel passing study for comment.
MD-LOT	22 March 2022	Presented slides updating on the clearances, engagement, proposed crossing methodology and schedule.
CES	24 March 2022	Remote video call to present project updates including the vessel passing study
MD-LOT	10 January 2023	Email requesting confirmation that the Automatic Identification System (AIS) data used in the vessel passing study, using year 2019-20 would still be valid in the expected 2023 Marine licence application. MD-LOT confirmed this was acceptable.

CONSULTEE	DATE	DESCRIPTION OF ENGAGEMENT
MD-LOT	03 March 2023	Email requesting confirmation that the project meets the criteria for formal Pre-application Consultation (PAC) exemption given it is existing infrastructure and no additional footprint from construction is taking place. No response currently (17/03/2023). Nonetheless, previous communications between SHE Transmission and MD -LOT on other similar OHL projects confirmed that no PAC requirements were necessary.
Kings Harbour Master Clyde (KHMC)	09 March 2023	Consultation meeting to provide an update on the Project with the confirmed clearances of 65m above HAT to the arcing clearance, vessel restrictions and confirmed crossing methodology. No objections or concerns raised with the proposed clearances as they exceed their previous requests or proposed crossing methodology. KHMC state that they are not able to guarantee more than 24 hours' notice prior to requiring passage under the works. KHMC also note they are happy to assist in identifying a 21-day period where requirements for passage are likely to be minimal.
Clyde Port (Peel Ports)	16 March 2023	Consultation meeting to provide an update to Peel Ports on clearance heights, vessel restrictions and confirmed crossing methodology. SHE Transmission confirms Peel Ports requested clearance can be considered as 65m above HAT in line with the request of KHMC, this has been met. The original proposal of 71 m clearance to CD was based on the physical distance to the line, which has also been met. Proposed restrictions to vessel activity during reconductoring works were discussed and accepted with Peel Ports stating that with the given notice they hope to mitigate substantial work interruptions. Day light hours outside of vessel closure time window will allow vessel movements without visible light restrictions to navigation. Peel Ports raised the proposal of a subsea cable in place of an OHL and accepted the technical challenges associated with such an installation in this area. Peel Ports also invited SHE Transmission to their port user groups meeting to provide updates to other water users such as recreational and local commercial operators, SHE Transmission accepts this invitation.
MCA	18 April 2023	Consultation to update MCA on issues relating to the Loch Long crossing. Particular areas of discussion related to navigational safety, crossing heights and wider consultation of smaller local stakeholders. No objections or significant concerns were raised. MCA representative noted the relative proposed decrease in clearance height given the proposal to progress the project under worst case scenario of heavy ice as opposed to normal operating conditions. Issues relating to safe shipping and navigation will be handled by MCA internal navigation safety team. MCA requested further clarity on how the Project will engage local water users other that just industry and governmental bodies. SHE Transmission to attend Peel Ports small harbour users group meeting to engage. SHE Transmission shared summary results of vessel passing study, no objections raised.
MD-LOT	20 April 2023	Updated sessions with MD-LOT on SHE Transmission's portfolio of current and future projects. Summary of this Project provided with projection for licence application period.
Petroineos (Finnart Oil Terminal)	2 May 2023	Engagement with Petroineos as a commercial user of the Loch requiring regular transit of crude oil ships to the Finnart Oil Terminal. SHE

CONSULTEE	DATE	DESCRIPTION OF ENGAGEMENT
		Transmission presented aspects of the loch Long crossing with emphasis on proposed crossing heights, crossing methodology and proposed timings including vessel restrictions. No objections raised. Finnart representative highlighted their current maximum vessel air draught unladen being under the worst case clearance height as well as the fact that the terminal is not likely to ever have vessels larger than present due do depth and navigation restrictions. It was also stated that they were content with the vessel passing restrictions given the advance notice and would be happy to work around proposed closures with SHE Transmission cooperation.

1.6.1 Public Consultation

As part of the wider Dunoon Rebuild Project which contains the proposed LLRP, several public engagement sessions have been held as detailed in Table 1-2.

SHET will attend Peel Ports harbour small users group meetings annually to update local attendees on the Project developments up until construction, specifically in regard to LLRP.

Further project information can be found at: https://www.ssen-transmission.co.uk/projects/project-map/dunoon/.

Table 1-2 Public consultation events

DATE OF SESSION	EVENT TYPE	DESCRIPTION
03 August 2020	Virtual	Routing consultation to highlight the Project route options and preferred routing option
25 August 2021 **26 August 2021** **08 September 2021**	Virtual	Consultation sessions held to discuss the preferred route alignment for the Project.
30 August 2022 **31 August 2022**	In person and virtual	Summer information events where Project staff attended to provide information to the public stakeholder to address any concerns about the upcoming applications to be made for the Project. Brochures, pull up banners and a 3D model were used to highlight the project visualisations for the community.
01 September 2022	Virtual	Winter information session was held to showcase maps and other Project information. Project staff were available live to respond to a chat function between 5-7pm.
14 December 2022	In person	In person community hall event communicated to the public with invitations being sent to councilors and community councils to attend. The event ran from 1pm – 7pm.

2 PROJECT DESCRIPTION

2.1 Overview

SHE Transmission's has a licence obligation to invest in its existing assets to maintain network health and condition; thus improving operational flexibility and resilience in line with SHE Transmission's goal to aim for 100% transmission network reliability for homes and businesses. SHE Transmission also has a statutory duty under the Electricity Safety Quality and Continuity Regulations 2002 to ensure that the electricity transmission network is fit for purpose. This strategic grid reinforcement is deemed to be essential for maintaining long-term security of electricity supply supporting sustainable economic development.

The existing Loch Long OHL is in need of replacement due to its deteriorating age and condition. SHE Transmission is progressing the Project to maintain the necessary transmission capacity in accordance with the National Electricity Transmission System Security and Quality of Supply Standards.

The following sections outline the Project specifications, installation methodology and schedule for works.

2.1.1 Existing OHL

The existing conductor currently in-situ spans a 1.4 km stretch across Loch long. The OHL is secured in place between two steel lattice crossing towers and two anchor towers (which sit behind the crossing towers) at either side of the crossing. The current vertical air draught clearance from the existing bottom conductor is 76 m above HAT, as per charted data.

The crossing and anchor towers will not be replaced but will remain in situ to support the new OHL.

2.1.2 Replacement OHL

The replacement OHL will fully replace the existing OHL conductors. The replacement OHL will have a reduced physical vertical air draught clearance distance of 71.4m to Chart Datum (CD) and 67.4 m to HAT form the new bottom conductor. This incorporates extreme icing events at worst case heavy ice sag conditions and, the sag on the line, while expected to be minimal, has also been designed into the clearance height. The vertical air draught clearance to the 2m arcing distance is 65.4 m above HAT. The clearance distances have been developed in accordance with requirements of key stakeholders such as Clyde Ports (Peel Ports), KHMC and the Ministry of Defence) (MoD) as detailed in Table 1-1. A schematic showing the replacement OHL vertical air draught clearances is shown in Figure 2-1.

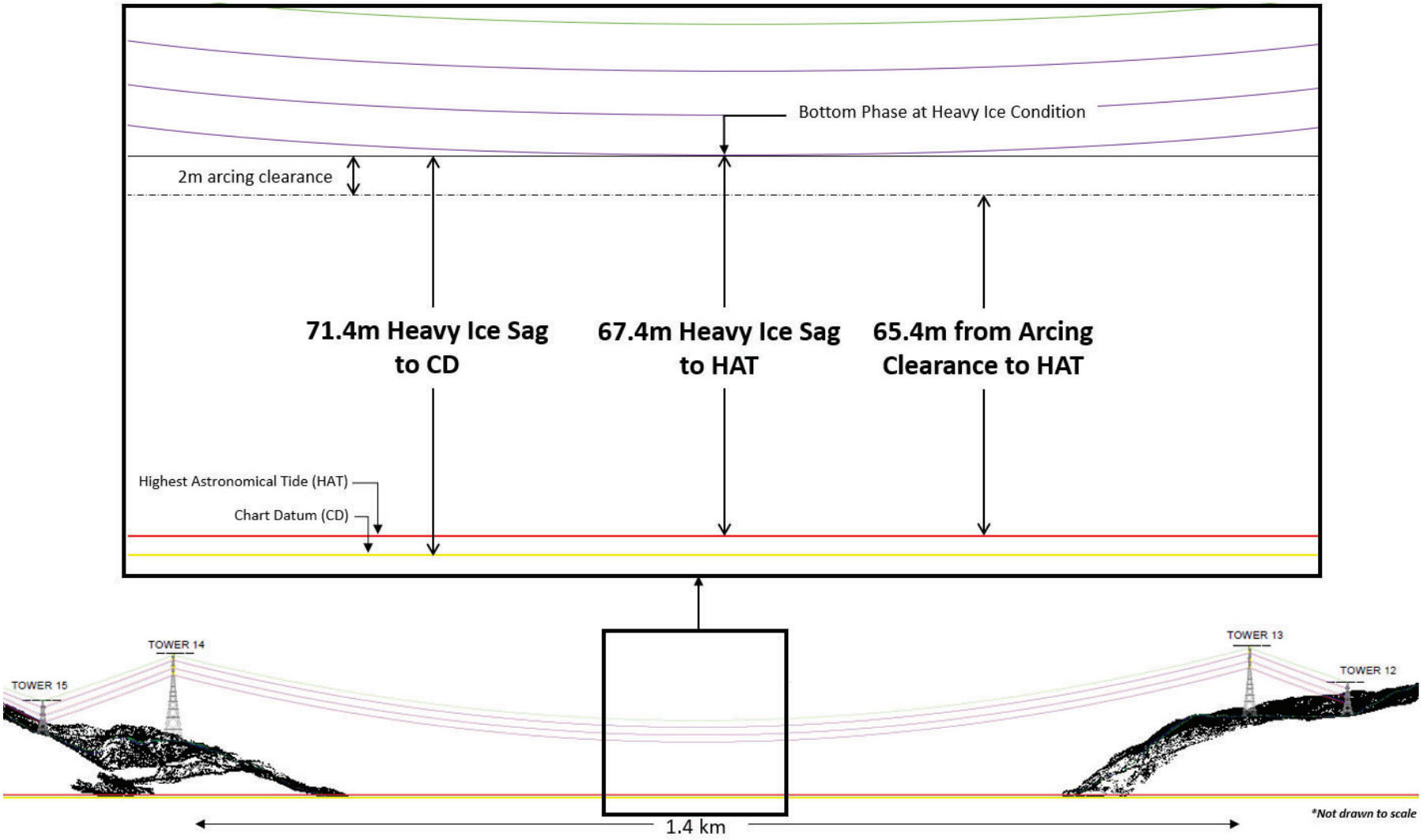


Figure 2-1 Loch Long Clearance Requirements

2.2 Installation Methodology

The proposed installation methodology for reconductoring the OHL is continuous tension stringing. This method is undertaken via aerial operations and no reconductoring works will occur from the water.

Conductor pulling operations can only commence during agreed waterway closures (see schedule of required closures below in Section 2.4). Wind speed and direction will also be checked prior to works, works to cease if wind speed exceeds 15mph or 13 knots. The proposed area to be closed beneath the OHL is 500m either side of the outer most conductors, as shown in Figure 2-2.

The existing conductor will be pulled one phase at a time in sequence (Top, Mid, Bottom). The existing conductor tension is reduced during this operation, but sufficient tension will remain to ensure conductor never comes into contact with the water. A 20m clearance above the waterline is to be aimed for throughout the operation.

The following steps highlight the overarching process which will be followed in order to replace the OHL:

- Equi-potential zones (EPZ) will be set up adjacent to anchor towers (anchor towers sit behind the crossing towers). The EPZ will be Approx 10m x 15m.
- Existing conductor is placed into running out wheels (ROW) on both crossing towers & both anchor towers in preparation for 'continuous tension stringing' works.
- Tensioner (West side of the crossing) – Existing conductor is connected via Tesmec stockings to the Tesmec COY Dyneema rope at the tension end of the pull.
- Puller (East side of the crossing) – Existing conductor is connected to Tesmec puller via Dyneema rope.
- A catenary Support System (CSS) consisting of a number of Catchblocks is to be deployed on the phase/Earthwire conductor to be replaced. The catchblocks are connected using a rope on either side of the conductor and span full span at a pre-determined spacing. This CSS acts as a safeguard and prevents the conductor from dropping into the water in the event of a failure when replacing conductor.
- During the conductor stringing works the Dyneema rope will hold back & tension the conductor. When the existing conductor is fully retrieved the Dyneema rope will be in place having replaced the old conductor.
- The Dyneema rope will then be used for pulling the new conductor across the crossing, the 20m clearance will be maintained throughout this operation. A double circuit outage will be required for this step.
- When the new conductor has been strung, it will be tensioned to the agreed sag requirements (see Section 2.1.2) to ensure clearance to waterway is as per design requirements.
- All towers will be left secured at the end of each working day.

In the unlikely event of a conductor failure, during the operations set out above, the conductor will be retrieved from the CSS using the tesmec puller/ tensioners set up at each end of the pull. This retrieval is expected to take 30 minutes to complete. A helicopter would then be utilised to fly the Dyneema rope across the Project area, tension would be maintained throughout this operation to maintain clearance to the waterway below. This Dyneema rope would then be used to pull out the new conductor as per the steps outlined above. Any failed conductor will be earthed before retrieval works.

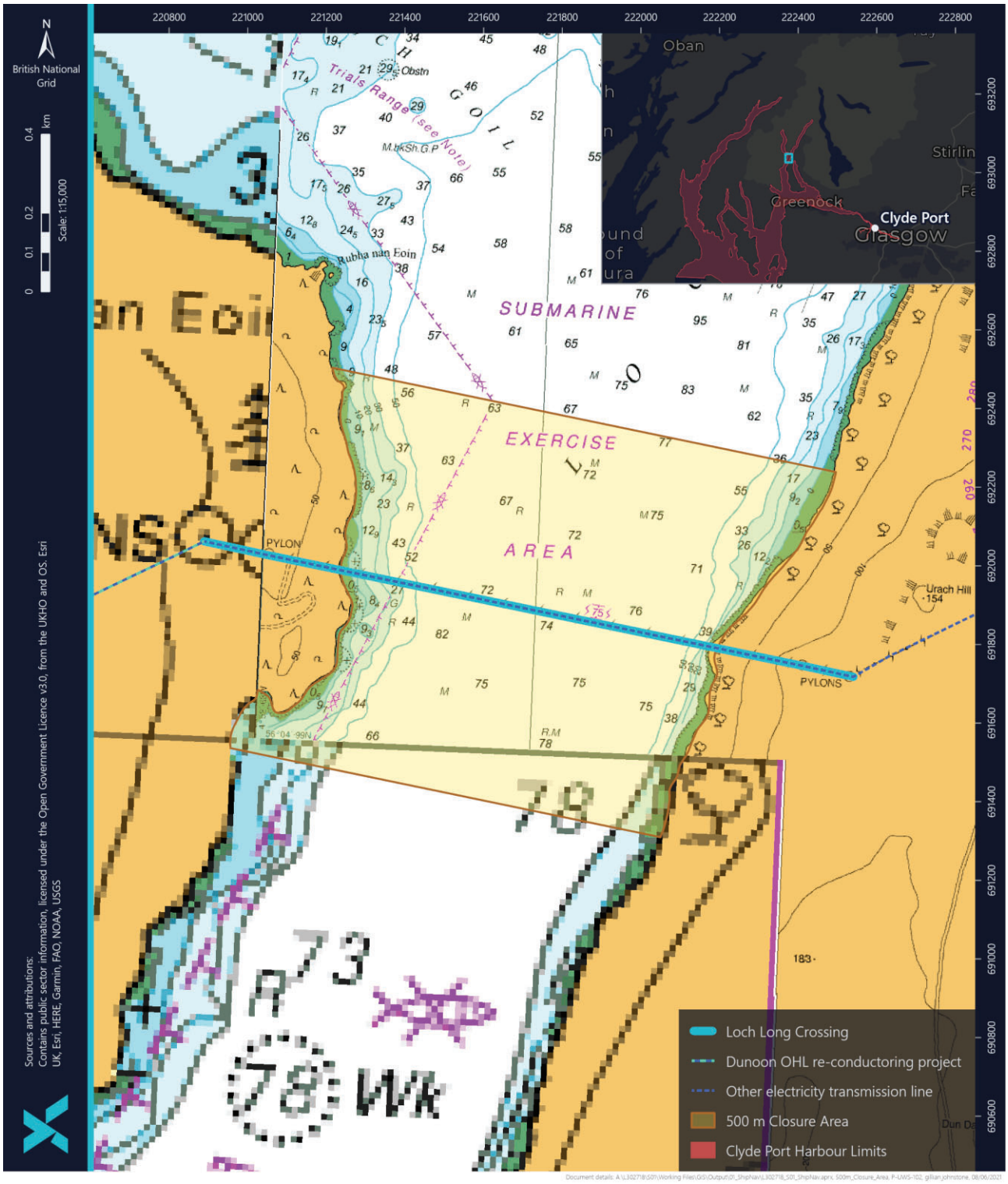


Figure 2-2 500m Closure Zone on either side of the Project

2.3 Vessel Requirements

As the installation methodology is fully aerial, the only vessels proposed for the works are two guard vessels, which will be present within the exclusion zone during the closure to ensure the waterway remains free from any traffic during operations.

In the event of an emergency these will be used to assist recovery of the conductor by maintaining the 500 m exclusion zone. In an emergency where a vessel has to pass under the crossing, all parties will be made aware via agree communication method. Operations will be halted, and provisions made to allow the emergency vessel through. It will take approximately 5 minutes for the works to be halted and made safe to allow an emergency vessel to pass.

2.4 Schedule

It is anticipated that the works will occur during a single continuous 3 week window between June to August of 2025. The initial terrestrial works to secure the EPZ in preparation for the reconductoring works will occur two weeks prior to the first waterway closure. The closure of the loch at the crossing itself is then anticipated to take up to 3 weeks to allow for the full reconductoring works to be completed.

The following closure periods of the loch beneath the OHL works are noted in order to replace the earth wire and 6 cables across the two circuits:

- Circuit 1 & Earth Wire:
  - 6 hr closure (10am-4pm) per day for 3 days for Earth Wire Replacement
  - 6 hr closure (10am-4pm) per day for 3 days for Top Phase Replacement
  - 6 hr closure (10am-4pm) per day for 3 days for Middle Phase Replacement
  - 6 hr closure (10am-4pm) per day for 3 days for Bottom Phase Replacement
- Circuit 2:
  - 6 hr closure (10am-4pm) per day for 3 days for Top Phase Replacement
  - 6 hr closure (10am-4pm) per day for 3 days for Middle Phase Replacement
  - 6 hr closure (10am-4pm) per day for 3 days for Bottom Phase Replacement

2.5 Embedded Mitigation

Certain risk control or mitigation measures are embedded in the project design as is adherence from all operators to standard industry best practices, which is fundamental to how the project will be executed. Details of the embedded mitigation which SHE Transmission are committed to implementing, and hence has been considered within the assessment, are presented in Table 2-1. During the assessment of potential impacts on receptors (see Section 4), all proposed embedded mitigation is considered when assessing the significance of an impact.

Table 2-1 Embedded Mitigation

MEASURE	DETAILS
Aerial Reconductoring Methodology	The methodology for installing the new OHL conductors is fully aerial, with no requirements for works to be undertaken from the marine environment.
Notice to Mariners (NtM)	NtM (including local), Kingfisher bulletins, Radio Navigational Warnings, and/or broadcast warnings will be promulgated in advance of any proposed works. The notices will include the time and location of any work being carried out and contact details for the vessels in order to raise awareness of the operations and to promote navigational safety and to minimises the risk of disruption.
Guard Vessels and Recommended Clearance Zone (RCZ) – 500 m	Guard vessels, marshalling a 500 m RCZ (either side of the crossing) shall be in place during the installation campaign. In the event of an emergency these will be used to assist recover of a conductor by maintaining the 500 m exclusion zone. In an emergency where a vessel has to pass under the crossing, operations will be halted, and provisions made to allow the emergency vessel through. This will take approximately 5 minutes.
Vessel Traffic Service (VTS).	Shore-side systems which range from the provision of simple information messages to ships, such as position of other traffic or meteorological hazard warnings, to extensive management of traffic within a port or waterway.
General Directions & Local Notices to Mariners	Rules and requirements in place to ensure safe and appropriate navigation within Harbour Authority areas. Includes pilotage requirements.
Proactive engagement with Port Authorities	Ongoing consultations with KHMC and Clyde Port authorities ensure continued awareness and communication of installation and harbour specific details relevant to minimising disruption.

3 SCOPING OF ENVIRONMENTAL RECEPTORS

3.1 Scoping Approach

As detailed in Section 1.6, MD-LOT have confirmed that an EIA under the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 is not required due to the scale and nature of the works proposed.

Instead, and as agreed through consultation, the Marine Licence is to be supported by an Environmental Appraisal of the works in relation to key receptors. For completeness, the following section outlines the justification for the receptors to be scoped in or out of the detailed assessment, in line with the proposed Project activities.

3.2 Environmental Receptors Scoped In/Out

Table 3-1 provides details of the receptors which have been subject to the scoping exercise and provides a justification of whether these receptors have been scoped in or out of the assessment as appropriate.

Table 3-1 Receptors scoped in/ out for detailed assessment and justification.

RECEPTOR	SCOPED IN/OUT	JUSTIFICATION
Shipping and Navigation	Scoped in	Due to the nature of the Project works which involves closure of the section of Loch Long located beneath the OHL, and the requirement for the OHL to allow for safe passage of vessels, a more detailed assessment on shipping and navigational users is required. This is particularly relevant with regard to key commercial users of the loch, such as vessels transiting to support operations of the Finnart Oil Terminal and MoD establishments. Additionally, impacts to other loch users such as fishing and recreational users cannot be discounted. As such this receptor is scoped in for further assessment (see Section 4).
Designated Sites	Scoped out	The Project works will be undertaken at proximity to the Loch Lomond and The Trossachs National Park, on the western side of the Loch Long. The park is designated for its exceptional landscape and rural beauty. As the Project is replacing existing infrastructure and does not constitute any major deviations from previous design specifications, there will be no impacts on the National Park above baseline conditions as a result of the Project. The Project does not overlap any other designated sites. As such, this receptor has been scoped out.
Marine Physical Environment **Benthic Ecology** **Fish and Shellfish Ecology** **Marine Mammals** **Marine Archaeology**	Scoped out	With the exception of two temporary guard vessels beneath the crossing area, which will not anchor, the Project works will be located wholly above the marine environment and therefore there will be limited interaction to result in impacts to marine ecology receptors or marine physical processes. Therefore, these receptors have been scoped out for further assessment.

RECEPTOR	SCOPED IN/OUT	JUSTIFICATION
Ornithology	Scoped out	As the Project is an update to the already existing OHL infrastructure and does not constitute any major deviations from previous design specifications, it is considered that there will be no additional impacts to ornithology features above baseline conditions as a result of the Project. As such, this receptor has been scoped out for further assessment.
Commercial Fisheries	Scoped out	Impacts on fishing vessels are discussed as part of impacts to shipping and navigation receptors (see Section 4). In terms of other impacts on commercial fisheries, there are a number of fishing restrictions present within Loch Long. These restrictions include prohibited use of vessels utilising bottom trawls, pelagic trawls and creels and pots (NMPI, 2023d). Due to these restrictions, and as the Project will not interact with the seabed, there is no potential for interaction with fishing gear, as such, this receptor has been scoped out for further assessment.
Other Users of the Marine Environment	Scoped out	Impacts on recreational activities in terms of recreational vessel disturbances are discussed within the shipping and navigation assessment (see Section 4). It is not anticipated that any other users of the loch will be impacted by the works due to the small-scale nature of the works in this particular area. Therefore, this receptor has been scoped out for further assessment.
Landscape and Visual Amenity	Scoped out	As the Project is an update to the already existing OHL infrastructure and does not constitute any major deviations from previous design specifications, it is considered that there will be no additional impacts to landscape and visual amenity features above baseline conditions as a result of the Project. As such, this environmental receptor has been scoped out for further assessment.
Aviation and Radar	Scoped out	As the Project is an update to the already existing OHL infrastructure and does not constitute any major deviations from previous design specifications, it is considered that there will be no additional impacts to aviation and radar features above baseline conditions as a result of the Project. As such, this environmental receptor has been scoped out for further assessment.

4 SHIPPING AND NAVIGATION RISK ASSESSMENT

4.1 Introduction

The following sections presents the assessment of the hazards associated with the Project on shipping and navigation receptors, within and around the Project area as shown in Figure 1-1. This HLNRA assesses recent shipping and navigation activity within Loch Long and includes an assessment of the potential risks to shipping and navigation during construction, operation and decommissioning of the Project.

The HLNRA adheres to both MCA guidelines on NRA, and International Maritime Organisation (IMO) guidelines on Formal Safety Assessments (FSA). Specific details of the approach adopted here are set out later in this section. The identification and appraisal of hazardous outcomes and mitigation measures follow widely adopted risk appraisal frameworks via desk top review and expert judgment. The assessment is also informed by consultation responses from a range of stakeholders. In line with NRA methodology, this appraisal comprises two principal elements:

- Baseline Conditions – summarising navigational baseline characterisation work to establish densities and types of traffic in the marine environment;
- Formal Safety Assessment – Establishing the outcomes of the HLNRA and capturing this in a Hazard Log.

Navigational features and patterns of vessel activity within the study area are assessed to establish baseline conditions and inform the subsequent FSA. Key features located outside of the study were considered as required. Stakeholder consultation also informed the baseline understanding of shipping in the area. The FSA assesses hazards against risk categorisation, mitigation measures, and ultimately, acceptability, as according to the FSA methodology. Potential cumulative impacts have also been given consideration. The outcome of these steps is the formulation of recommendations to inform decision-making for all relevant parties.

4.2 Baseline

The baseline data collected for the Project was originally undertaken in July 2020, utilising AIS data from 2019 -2020. On-going discussions with key stakeholder has confirmed that the use of the 2019/2020 AIS data used to collate the baseline is acceptable to underpin the risk assessment (see Table 1-1).

4.2.1 Data Acquisition

This baseline is based on historical shipping information collated for the study area, utilising AIS data, purchased from a commercial vendor (Marine Traffic; www.marinetraffic.com). AIS is a radio communications system by which vessels continuously broadcast their identity and position using unencrypted Very High Frequency (VHF) radio signals. It was originally developed to increase safety at sea/collision avoidance but has subsequently been used extensively for a range of applications including fishing fleet monitoring and control, VTS, maritime security, search and rescue (SAR), accident investigations and fleet/cargo tracking.

AIS has been a regulatory requirement since 2004 by virtue of Regulation 19 of the International Safety of Life at Sea (SOLAS) Chapter V, which require that AIS be fitted aboard all vessels meeting the following criteria:

- All vessels above 300 gross tonnage engaged in international voyages;
- Cargo ships of 500 gross tonnage and upwards;
- All passenger ships irrespective of size; and
- UK registered fishing vessels and vessels fishing in UK waters longer than 15m.

A large number of smaller fishing vessels and pleasure craft voluntarily carry AIS as an aid to navigation, and as an operational/safety tool; however, it should be noted that AIS data may not accurately represent the distribution of such vessels. Additionally, due to the confidential nature of military operations which take place at the Royal Naval Armaments Depot (RNAD) Coulport and the Glen Mallan Northern Ammunition Jetty, it is likely that the AIS data presents an underestimate of military vessel operations within the study area (further information on these military facilities is provided in Section 4.2.3).

This study area to inform the baseline is focussed on a 55 km^2 area around the Project location, within which AIS data between 07/07/2019 and 06/07/2020 has been analysed. The AIS data covers a rectangle encompassing this zone. It comprised 1,001,270 individual records supplied with all standard parameters (longitude, latitude, vessel Maritime Mobile Service Identity (MMSI), status, speed, course, heading and timestamp) and the following additional parameters:

- Deadweight Tonnage (DWT);
- Displacement;
- Vessel type;
- Vessel length;
- Vessel width;
- Vessel air draught[1] (only supplied for approximately 15% of the vessel records received); and
- Vessel draught.

As detailed above, the use of the 2019- 2020 AIS data to underpin the risk assessment has been communicated and agreed with key consultees, as detailed in Table 1-1.

4.2.2 Data Processing

The AIS data provided by Marine Traffic was received in a raw, point-based table format and quality checked using automated methods in R and Python, including standard checks for formatting inconsistences and duplicate entries. These data tables were then converted to Geographic Information System (GIS) data points based on the longitude and latitude of each vessel position recorded.

The entire point-based dataset was subsequently converted to vessel tracks using a combination of python and ESRI's ArcMap 10.5, using the unique MMSI and the timestamp associated with each individual AIS record. The 9,600 tracks produced from the points were subsequently 'reattached' to the ship-specific attribute database to enable further analysis.

Additionally, the raw AIS point data for each vessel that was closest to the area of the Project was assigned to the corresponding track line to calculate the time of crossing.

[1] *All vessel air draught data received is recorded as maximum elevation of the ship in metres above the waterline.*

Of the 9,600 vessel tracks identified only 1,912 vessel tracks pass beneath the crossing. Additionally, there are only 282 tracks of the 1,912 vessels which contain air draught information. The vessel types which provide this information are military vessels, tankers and tug vessels. As the air draught of vessels is a key factor of the risk assessment, numerous discussions have been conducted with key stakeholders including Clyde Ports (Peel Ports), KHMC and the MoD, in order to ascertain the air draught of vessels utilised by these users in order to feed in to the OHL design, as detailed in Section 1.6.

Nonetheless, vessel air draught is generally recorded whereby it is seen as a significant characteristic of the vessel, and therefore it is likely that where this parameter is missing, the air draught is unlikely to be greater than the maximum noted vessel air draught within AIS data.

4.2.3 Key Navigational Features

Within the study area there are a number of navigational features which influence the vessel traffic within Loch Long, as identified through admiralty charts for the area. These are shown within Figure 4-1 and described in the sections following.

4.2.3.1 Harbour Limits and Ports

Loch Long is situated within two statutory harbour limits; Clyde Port, under the jurisdiction of Clydeport Operations Ltd, and Clyde Dockyard Port of Loch Long under the jurisdiction of the King's Harbour Master.

The major port within the vicinity of Loch Long is Clydeport, located west of Greenock. Major contributing ports within the study area include Finnart Port (north of Garelochhead) and Dunoon and Hunter's Quay Port (located at Dunoon (NMPI, 2023a).

Other ports and harbour features within the study area include those at Glenmallan, Portincaple, Ardentinny, Blairmore, Holy Loch, Gourock McInroy's Point Ferry Terminal, and Kilcreggan (NMPI, 2023a).

4.2.3.2 Finnart Oil Terminal

Finnart Oil Terminal is the destination for the majority of larger vessels transiting through Loch Long. The oil terminal is a petrochemical transfer facility which lies on the A814 road on the eastern shore of Loch Long, about two miles north of Garelochhead. The terminal is currently operated by INEOS Group, a privately-held British-based multi-national chemicals company.

The terminal comprises a series of jetties which extend into the loch, with a deep berth able to accept tankers of up to 324,000 tonnes.

4.2.3.3 Glen Mallan Northern Ammunition Jetty

The Glen Mallan Northern Ammunition Jetty lies on the west side of the A814 road, approximately 6.7km north of the crossing area. The jetty is used to load and unload ammunition in order to serve the Glen Douglas Munitions Depot which is a military munitions depot located approximately 4km north of the jetty. It is operated by Defence Equipment & Support, part of the MoD using a purpose-built road connecting the two and is owned by the MoD.

The jetty and infrastructure at Glenmallan in Loch Long was recently upgraded, due to the previous jetty reaching the end of its economic life. The upgrade work has not only extended the life of the jetty by an estimated fifty years but has also made the site accessible for new Royal Navy's aircraft carriers (Scottish Government, 2022).

Under the Clyde Dockyard Port of Gareloch and Loch Long Order 2011, a number of navigational restrictions are in place within the vicinity of the Glen Mallan Northern Ammunition Jetty including mooring and anchoring restrictions, vessel speed restrictions and fishing exclusion zones (Scottish Government, 2011).

4.2.3.4 Royal Naval Armaments Depot Coulport

The RNAD Coulport site is an extensive armaments depot at the head of the Rosneath Peninsula in Argyll & Bute, approximately 2km south of the Project area at its closest point.

RNAD Coulport operated by the MoD, is responsible for the storage, processing, maintenance and issue of the UK's submarine-borne Trident weapon system. The base covers an area of 3.8 km2 and includes two main jetties on Loch Long, together with numerous workshops, support and administrative buildings. One of the jetties is covered, allowing missiles and warheads to be loaded and unloaded unobserved. Submarines sail the short distance from HM Naval Base Clyde in the Gare Loch to Coulport to be armed (MoD, 1994).

The port has evolved from its early days as a Submarine trials area, use as a military port during World War II (WWII), and later as a depot ship, to the port of today largely handling military vessels (both submarine and surface) and a small amount of commercial traffic. There are approximately 1,400 movements per year, both military and civilian and a significant amount of military training (MoD, 2023).

Under the Clyde Dockyard Port of Gareloch and Loch Long Order 2011, a number of navigational restrictions are in place within the vicinity of RNAD Coulport, including mooring and anchoring restrictions, vessel speed restrictions and fishing exclusion zones (Scottish Government, 2011).

4.2.3.5 Other Navigational Features

Military practice areas

In connection with the RNAD Coulport site, there is one Military Practice and Exercise Area (PEXA) intersecting the immediate Project area. This is a submarine exercise and practice area (NMPI, 2023b), indicating there may be periods of increase military vessel usage within the region.

General Boating Area

There is a Leisure and Recreation Royal Yachting Association (RYA) General Boating Area of approximately 25 km^2 situated 4.5 km south of the Project area (NMPI, 2023c). This may indicate that recreational vessels have the potential to be prevalent within this area.

Fishing Restricted Areas

There are a number of fishing restrictions present within Loch Long. These restrictions include prohibited use of vessels utilising bottom trawls, pelagic trawls and creels and pots (NMPI, 2023d). Due to these restrictions there are a very limited number of fishing vessels tracks identified within the region.

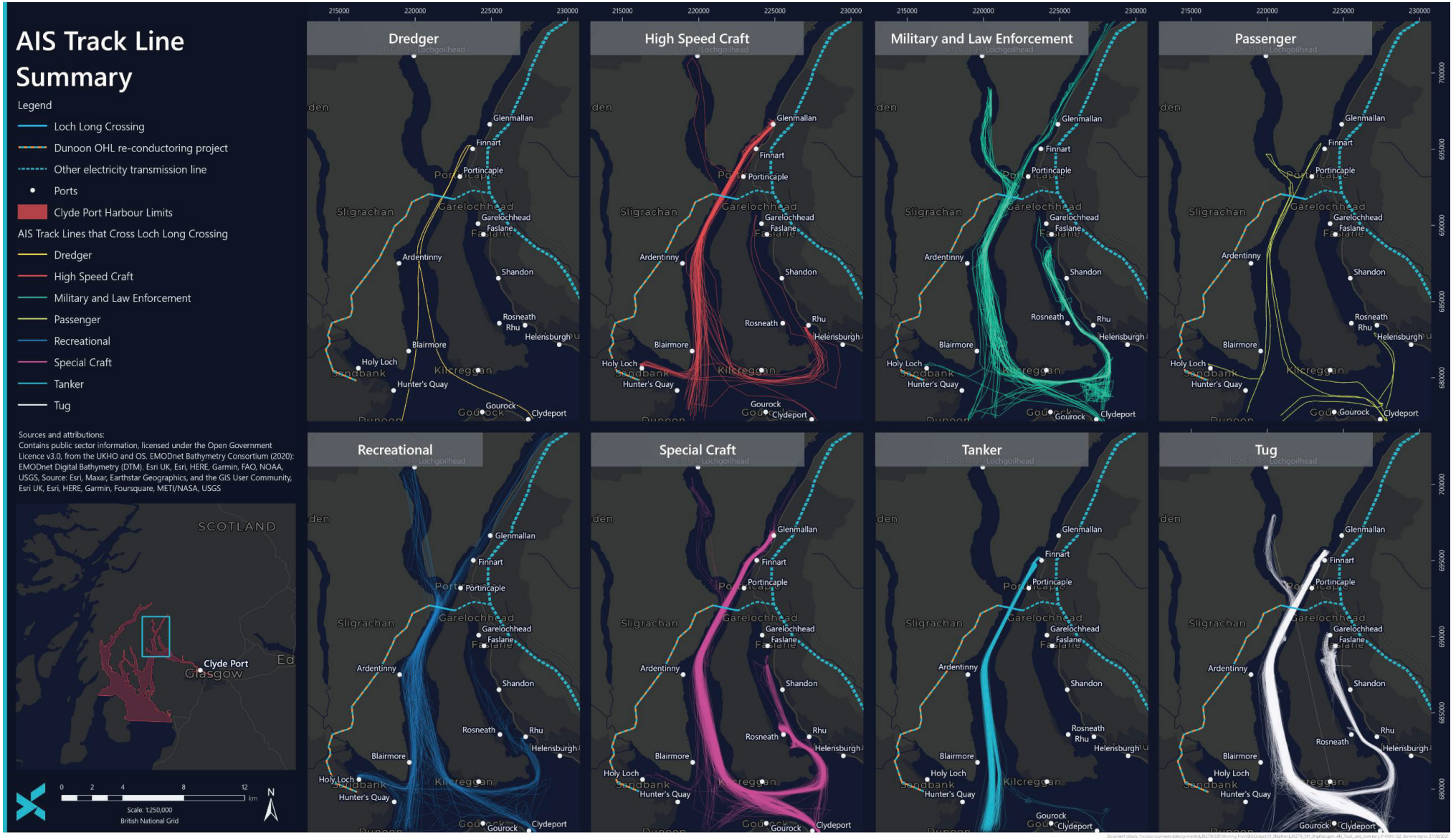


Figure 4-1 AIS track data and navigational features around the study area

4.2.4 Maritime Incidents

Incidents recorded in the Marine Accident Investigation Branch (MAIB) data between 2015 and 2020 within Loch Long show a total of seven recorded incidents. Of the seven records, five are attributed as a "Marine Incident", one as a "Less Serious" incident, and one as a "Serious" incident. Of these, the closest occurred in 2020 at approximately 1 km north of the Project area, and was attributed as a "Marine Incident", noting loss of control of the vessel. Both the "Less Serious" and "Serious" incident were not subsequently investigated and occurred at over 9 km south of the Project area (MIAB, 2021).

A total of 16 incidents were recorded in the Royal National Lifeboats Institution (RNLI) data between 2015 and 2021 within Loch Long (RNLI, 2022). Of these 16 incidents, 62.5% were involving recreational users, whilst 12.5% of incidents were commercial users and 25% were unknown users. The reason for call out were attributed as follow: "Unknown" (56%), "Machinery Failure" (19%), "Collision" (13%), "Vessel Dragging Anchor" (6%) and "Other" (6%). The closest to the Project was recorded in 2019 at 1.3 km north of the crossing, this particular incident involved a powered boat and was attributed as an "Unknown" incident, Helensburgh Lifeboat Station responded to all 16 incidents.

A total of nine Search and Rescue Helicopter (SARH) taskings were undertaken for incidents within Loch Long between 2015 and 2022 (Department of Transport, 2022). Of the records, 45% of the taskings were attributed to "Rescue/Recovery", whilst the remainder were attributed to "Support" (33%), "Pre-arranged Transfer" (11%) and "Search Only" (11%), The nearest incident was recorded 0.3 km north of the Project area and the tasking is attributed to "Support". All SAR taskings were undertaken from Prestwick.

4.2.5 Vessel Review

4.2.5.1 Vessel Type

From the AIS data, a total of 25 specific vessel types were recorded within the study area. These were subsequently grouped into 8 distinctive of vessel categories, as detailed in Table 4-1 and shown in Figure 4-1.

Table 4-1 Vessel Type Groupings

GROUP	CRAFT
Military and law enforcement	Law Enforcement Military Ops Minesweeper Naval/Naval Auxiliary Vessel Patrol Vessel
Passenger	Passenger Passenger Ship
Recreational	Inland, Pleasure Craft, >20 metres Pleasure Craft Sailing Vessel
High Speed Craft	High Speed Craft
Special craft	Dive Vessel

GROUP	CRAFT
	Offshore Supply Ship Pilot Ship Special Vessel Utility Vessel Work Vessel
Dredger	Dredger
Tanker	Chemical Tanker Crude Oil Tanker Oil Products Tanker Oil/Chemical Tanker Shuttle Tanker
Tug	Pusher Tug Tug

A total of 1,912 vessel tracks were recorded as crossing beneath the Project area. The most frequently recorded vessels in the transiting under the Project area were tug vessels (55 %), followed by special craft vessels (19.1%), tanker vessels (17.2%), recreational vessels (4.6%), high speed craft vessels (2.2%), military and law enforcement (1.6%), and finally passenger (0.2%) and dredging vessels (0.1%). Passenger and dredging vessels account for <1% of total vessel tracks. This is illustrated in Table 4-2 and Figure 4-2 below. Further detail on the most important vessel categories in relation to the project are provided in the following sections.

Table 4-2 Vessel Tracks by Vessel Type

VESSEL TYPE	VESSEL TRACKS	% OF TOTAL
Tug	1,052	55.0
Special craft	365	19.1
Tanker	329	17.2
Recreational	87	4.6
High Speed Craft	43	2.2
Military and law enforcement	30	1.6
Passenger	4	0.2
Dredger	2	0.1
Total	*1,912*	*100.0*

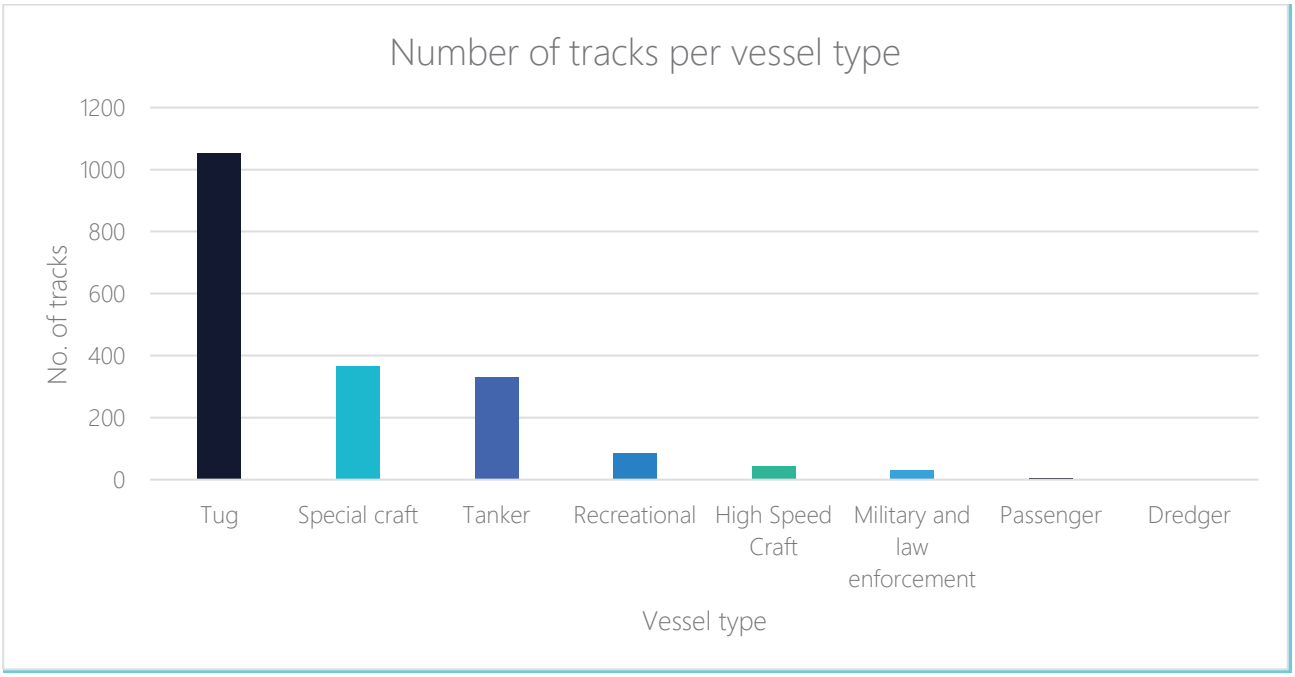


Figure 4-2 AIS Tracks be vessel category

4.2.5.2 Tug Vessels

Tug vessels record the most vessel tracks in Loch Long, equating to 55% of the vessel tracks identified as crossing the OHL area. Tug vessels within the Loch Long area are anticipated to be manoeuvring larger tanker vessels to and from the Finnart Oil Refinery. Due to the DWT of some of these tanker vessels, a number of tugs may be required to guide a single tanker and therefore result in the increased number of tug vessel tracks recorded within the area.

4.2.5.3 Special Craft Vessels

Special craft vessels contributed 19.1% of vessel tracks crossing the OHL area. This vessel group include a number of specific vessels, including: Dive Vessels, Offshore Supply Ships, Pilot Ships, Special Vessels, Utility Vessels, and Work Vessels. The majority of these vessels are interpreted as transiting mainly to and from the Finnart Oil Refinary and the Glen Mallan Northern Ammunition Jetty (Figure 4-1).

4.2.5.4 Tanker Vessels

Tanker vessels contribute to 17.2% of track lines recorded as crossing the OHL area. All tanker vessels are seen to transit to and from the Finnart Oil Refinary port which they service through shipping oil and chemical loads, as shown in Figure 4-1.

4.2.5.5 Recreational Vessels

Recreational vessels contribute 4.6% of track lines recorded as crossing the OHL area. These were recorded in the summer months only. The number of tracks recorded for recreational vessels may be underrepresented as these vessels are not required to fit AIS.

4.2.5.6 Fishing Vessels

Fishing vessels were not individually attributed within the AIS data set. It is noted that there are a number of fishing restrictions for vessels utilising bottom trawls, pelagic trawls and creels and pots in Loch Long (NMPI, 2023d). Due to

these restrictions there is little evidence of fishing within the crossing area, however some fishing vessels may be present. Fishing vessel AIS tracks from 2012-2017 (NMPI, 2023d) highlighted fishing within the southern reaches of Loch Long but not directly at the crossing area. Approximately 25-50 fishing vessels were recorded weekly within this area.

4.2.5.7 Aircraft Carrier Vessel

While military and law enforcement vessels are only recorded as contributing to 1.6% of the AIS data vessels tracks which pass beneath the Project area, early consultation between SHE Transmission and the MoD indicate that military aircraft carrier vessels may transit through the study area during the upgrade activities and after their completion. Aircraft carrier vessels are generally very large by nature, and during consultation the MoD stated that the maximum vessel air draught of an aircraft carrier transiting in the area during future operation of the powerline would be 65m, which would make them the tallest vessels to pass beneath the existing OHL, and therefore the most likely to be affected by the proposed upgrade. Continuous consultation with the MoD will be undertaken to ensure that any updates relevant to the Project are captured in a timely manner.

4.2.6 Vessel Air Draught Data

Vessel size characteristics for vessels utilising the study area is an important aspect to consider when reconductoring an overhead power line across an area of transiting vessels. Vessel air draught is, essentially, the distance from the top of a vessel's highest point to its water line. Analysis of vessel air draught in particular has contributed to the construction specification of the Project, to ensure that the cables provides sufficient vertical clearance to allow vessel traffic to pass safely under the asset without risk of collision or arcing.

As previously described, only 282 out of 1,912 vessels contained air draught information from the AIS data. The vessel types which provide this information are military vessels, tankers and tug vessels, pointedly the largest vessels identified within the AIS data for the Project area ranged between 18.5 – 58.5m.

As can be seen in Figure 4-3 tanker vessels account for the maximum air draughts recorded within the study area. The tallest vessel at 58.5m air draught, documented two tracks within the AIS data set. This vessel is named below:

- HEATHER KNUTSEN (MMSI 257032850, IMO 9273064) Norwegian crude oil tanker. This tanker is recorded as transiting to service the Finnart Oil Refinery.

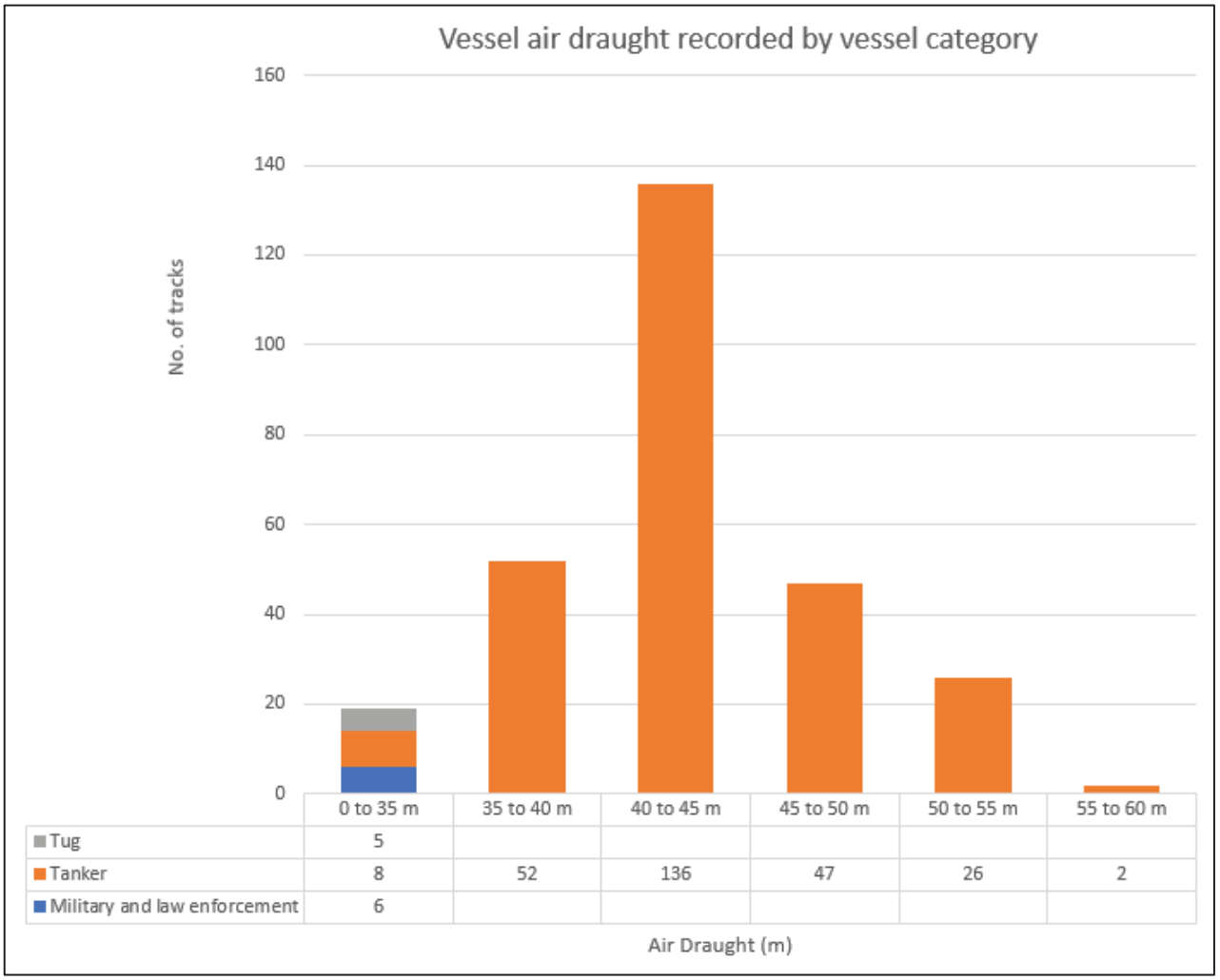


Figure 4-3 Vessel air draught by vessel category

Furthermore, consultation between SHE Transmission and the MoD determined that aircraft carrier vessels with an air draught of up to 65m may be operational within the study area. From all the consultation undertaken to date, as discussed in Section 1.6, this is the largest air draught conveyed to SHE-Transmission which may utilise the Project area.

4.2.7 Vessel Temporal Variations

Temporal vessel analysis is required in order to determine if there is an optimal time to carry out the installation works associated with the Project.

Vessel activity was analysed per vessel type on a monthly, weekly, and daily timeframes, in order to precisely interpret the temporal information. The findings from this analysis are discussed in greater detail in the following sections.

4.2.7.1 Monthly vessel variations

The percentage of the total vessel tracks which cross the study area were calculated for each type of vessel per month as shown in Figure 4-4 and Table 4-3. Tug, tanker and special craft vessels were most abundantly recorded as crossing the study area.

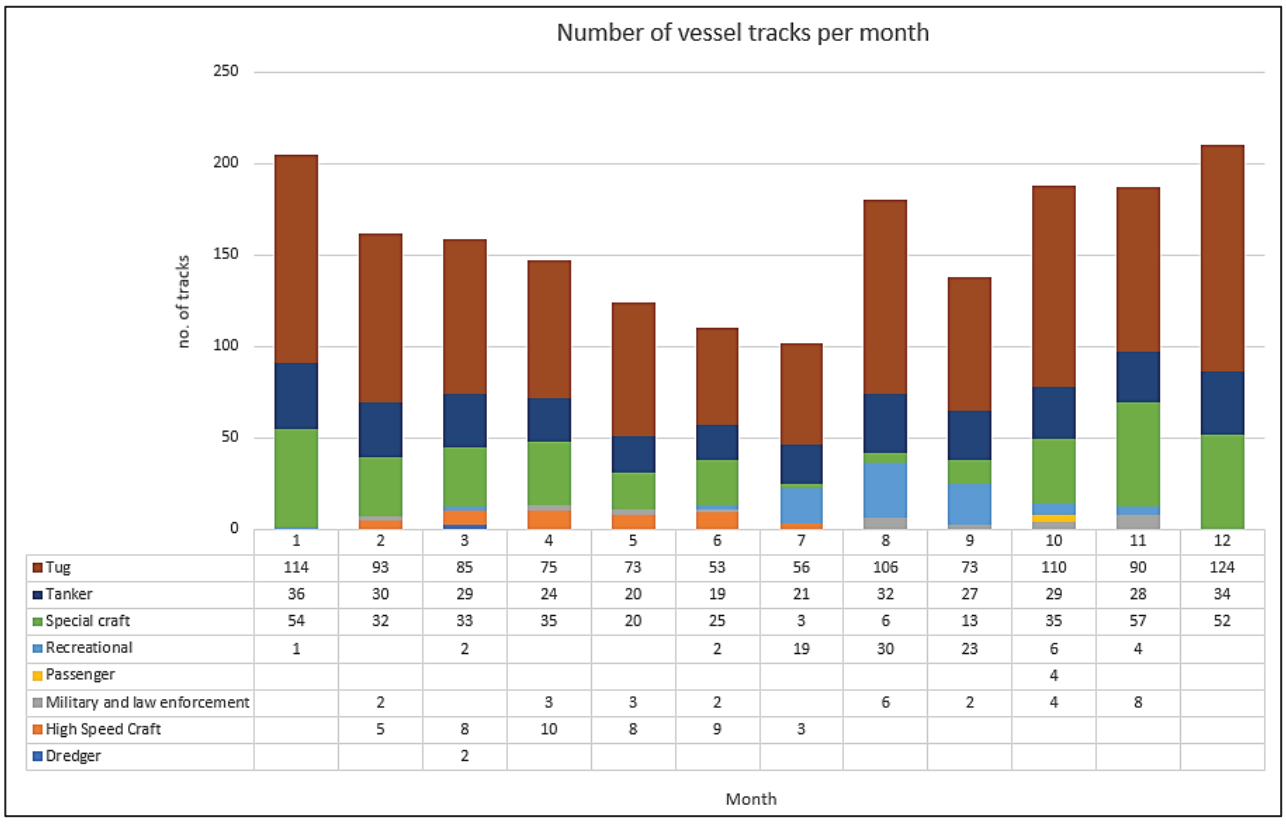
Tanker vessels demonstrated very limited variation across the year, however, they show a slight decrease through the summer months from April to July, and a nominal increase in December and January. In line with these findings, tug vessels demonstrate a noticeable decrease in vessel usage within the area during the summer months of up to 50% – especially across June and July, whereas the months of January and December show the highest tug activity. A similar pattern can be seen in special craft vessels, as in the summer and early autumn from July to September there is a very small percentage of special craft vessels operating in the study area. Potentially, this pattern could be due to an increase in demand for crude oil during winter months, and a decrease in the summer months.

In contrast to this, and as anticipated, recreational vessels are almost entirely present during the summer and autumn months of June through to September.

High speed craft vessels are only found to cross the study area during the months of February through to July.

Military and law enforcement vessels have a relatively low usage across all months, with the highest usage present in August and November. However, the AIS data is likely to underrepresent the presence of military vessels due to the confidential nature of their operations.

Overall, vessel usage is lowest during the summer months, especially in July, where only 5.3% of the total vessel tracks are recorded in the vicinity of the project, and highest during winter, particularly in December, where 11% of the total vessel tracks are recorded as shown in Table 4-3.



	1	2	3	4	5	6	7	8	9	10	11	12
Tug	114	93	85	75	73	53	56	106	73	110	90	124
Tanker	36	30	29	24	20	19	21	32	27	29	28	34
Special craft	54	32	33	35	20	25	3	6	13	35	57	52
Recreational	1		2			2	19	30	23	6	4	
Passenger										4		
Military and law enforcement		2		3	3	2		6	2	4	8	
High Speed Craft		5	8	10	8	9	3					
Dredger			2									

Figure 4-4 Number of vessels tracks by vessel type per month

Table 4-3: Percentage of vessel tracks by vessel type per month

VESSEL TYPE	MONTH											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Dredger	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High speed craft	0.0	0.3	0.4	0.5	0.4	0.5	0.2	0.0	0.0	0.0	0.0	0.0
Military and law enforcement	0.0	0.1	0.0	0.2	0.2	0.1	0.0	0.3	0.1	0.2	0.4	0.0
Passenger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0
Recreational	0.1	0.0	0.1	0.0	0.0	0.1	1.0	1.6	1.2	0.3	0.2	0.0
Special craft	2.8	1.7	1.7	1.8	1.0	1.3	0.2	0.3	0.7	1.8	3.0	2.7
Tanker	1.9	1.6	1.5	1.3	1.0	1.0	1.1	1.7	1.4	1.5	1.5	1.8
Tug	6.0	4.9	4.4	3.9	3.8	2.8	2.9	5.5	3.8	5.8	4.7	6.5
TOTAL	10.7	8.5	8.3	7.7	6.5	5.8	5.3	9.4	7.2	9.8	9.8	11.0

4.2.7.2 Weekly vessel variations

The percentage of vessel tracks per day of the week which cross the study area were calculated for each type of vessel as shown in Figure 4-5 and Table 4-4.

As expected, both tanker and tug vessels are seen to transit largely in tandem both showing lowest percentage of vessel use on a Thursday and a highest percentage of vessel tracks on a Monday. However, these vessels show broadly constant activity across the entire week.

In conjunction with this, military and law enforcement vessels show a significant increase in vessel use on a Thursday, in comparison to all other days. This may potentially be related to military training exercises taking place at Coulport specifically on Thursdays, which in turn may prevent larger tankers and tugs from transiting as readily.

Special craft vessels predominantly operate during the week, recording almost double the number of vessels in comparison with the weekend. In contrast to this, both recreational and high-speed craft vessels are prevalent during the weekend as expected, and only show minor activity throughout the week.

Both passenger and dredger vessels do not provide enough data to accurately assess weekly variations in vessel activity.

Overall, no major variation is seen in vessel traffic across the week. Thursdays are attributed to lowest total percentage of vessel use within the vicinity of the project, equating to only 13.5% of vessels. However, Tuesdays, Saturdays and Sundays also present relatively low vessel traffic, each equating to only 13.8% of the total vessel use. Wednesdays, by contrast are the busiest in terms of vessel traffic, contributing 15.6% of the weekly vessel traffic.

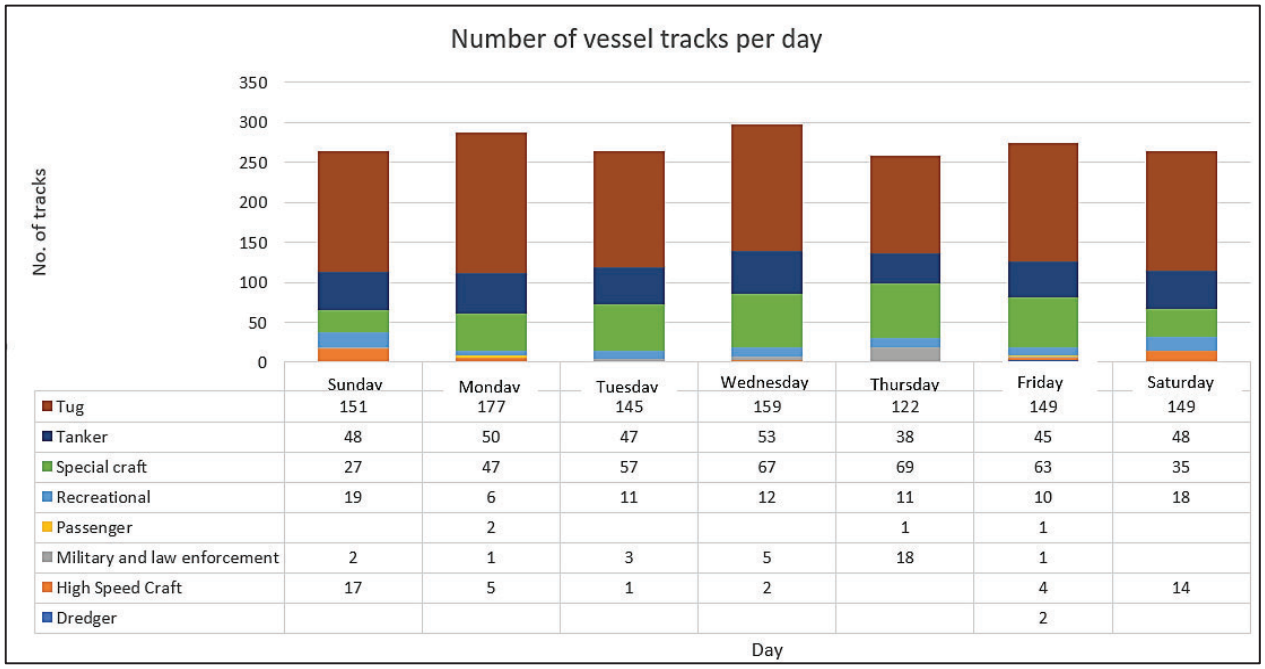


Figure 4-5 Number of vessels tracks by vessel type per day

Table 4-4 Percentage of vessel tracks by vessel type per day

VESSEL TYPE	DAY						
	MON	TUE	WED	THU	FRI	SAT	SUN
Dredger	0.0	0.0	0.0	0.0	0.1	0.0	0.0
High speed craft	0.3	0.1	0.1	0.0	0.2	0.7	0.9
Military and law enforcement	0.1	0.2	0.3	0.9	0.1	0.0	0.1
Passenger	0.1	0.0	0.0	0.1	0.1	0.0	0.0
Recreational	0.3	0.6	0.6	0.6	0.5	0.9	1.0
Special craft	2.5	3.0	3.5	3.6	3.3	1.8	1.4
Tanker	2.6	2.5	2.8	2.0	2.4	2.5	2.5
Tug	9.3	7.6	8.3	6.4	7.8	7.8	7.9
TOTAL	15.1	13.8	15.6	13.5	14.4	13.8	13.8

4.2.7.3 Daily vessel variations

The percentage of the total vessel tracks which cross the area of study were calculated for each type of vessel as shown in Figure 4-6.

Tanker vessels demonstrate only minor variations in activity throughout the day, although are notably lower during 3 – 4 am. Activity is marginally higher for tanker activity between 12 - 1 am, and 12 pm. In accordance with this, tug vessels also demonstrate elevated activity during the hours of 10 pm and 1 am. However, the highest tug activity is recorded at 2 pm and the lowest tug activity is recorded at 2 am.

Vessels which operate predominantly through the day include special craft vessels which are operational from 4 am until 11 pm. These vessels display elevated activity at 1 pm and lower levels of activity late evening between 8 - 11 pm. Additionally, high speed craft vessels and military and law enforcement vessels show consistent activity during daylight hours between 4 am and 7 pm, and 5 am – 5 pm, respectively.

As expected, recreational vessels are also only active during the day and early evening, between 8 am and 6 pm. However, activity levels are most elevated at 11 am, and lowest between 5 – 6 pm.

Both passenger and dredger vessels do not provide enough data to accurately assess daily variations in vessel activity.

Overall, vessel activity is most elevated at 1 pm and 3 pm, recording 6.6% of all vessel activity during these hours and lowest between 2 – 3 am, where vessel activity only accounts for 1.5% of the daily total within the project area.

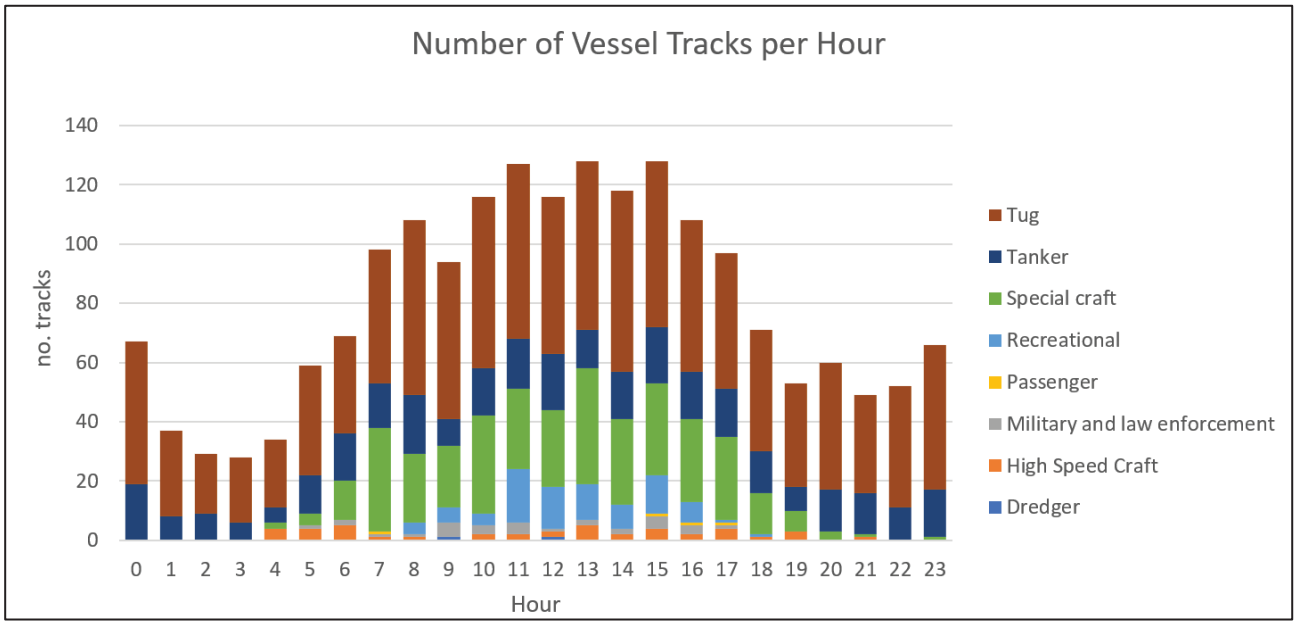


Figure 4-6 Number of vessels tracks by vessel type per hour

4.2.8 Summary of Baseline Findings

A summary of the findings from the study are detailed below:

4.2.8.1 Vessel Types

There were 1,912 vessel tracks recorded as crossing the project area. Of these tracks the most abundant vessels present within the study area consisted of Tug vessels (55%), special craft vessels (19.1%), and tanker vessels (17.2%). All other vessels contributed to less than 9% of the total vessel tracks.

4.2.8.2 Vessel Air Draught Data

Vessel air draught was recorded for approximately 15% of the vessels which transit beneath the Project area. In all cases, tankers vessels attributed to the tallest vessels present in the study area and therefore likely to be most sensitive to reduction in vertical clearance, although it is noted that military vessels and particularly aircraft carriers transiting to the Glen Mallan Northern Ammunition Jetty are likely to have the greatest air draughts in the area. Vessel air draught findings are summarised as:

- The maximum air draught recorded for a vessel in the AIS data set was a 58.5m crude oil tanker.
- Early consultation between SHE Transmission and the MoD determined that aircraft carrier vessels with an air draught of up to 65m may be operational within Loch Long.

4.2.8.3 Vessel Temporal Variations

Temporal variations in vessel activity in the vicinity of the OHL project area were assessed at a monthly, weekly and daily scale. Vessel temporal variations are summarised as:

- Monthly variations - The lowest overall vessel activity is recorded in the summer months between May – July, with July demonstrating the lowest recorded activity at 5.3% of the total yearly activity. Subsequently, the highest recorded vessel activity is found between November – January, with December recording the highest vessel activity contributing to 11% of the total vessel activity.
- Weekly variations - The lowest overall vessel activity is recorded on a Thursday where vessels recorded the lowest activity at 13.5% of the total weekly activity. The highest recorded vessel activity takes place on a Wednesday where vessel activity contributes to 15.6% of the total vessel activity.
- Daily variations - Vessel activity is lowest between 2 – 3 am, where vessel activity only accounts for 1.5% of the daily total within the project area. In contrast, the most elevated activity levels are seen at 1 pm and 3 pm, each recording 6.6% of total daily vessel activity.

4.3 Formal Safety Assessment Approach

The FSA process provides a structured and systematic method for evaluating and controlling risk within a defined framework. The process is implemented using a classic risk matrix approach broadly in line with the IMO FSA Guidelines (IMO, 2018). And the MCA Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of Offshore Renewable Energy Installations (OREI).

This approach is qualitative and comprises the following principal elements:

- Hazard / impact identification;

- Identification of existing risk control measures;
- Risk assessment;
- Identification of additional risk control measures; and
- Cost benefit considerations.

The outcome of these elements is the formulation of recommendations to inform decision-making for all relevant parties. Further detail on each element is provided below.

4.3.1 Hazard/Impact Identification

Taking into account the Project components and activities, baseline information, expert judgement/industry experience, a list of all relevant hazards, as well as their worst potential outcomes is compiled. The hazards are categorised according to project phase with the operational phase referring to the condition where the OHL is installed, and sea surface activities have ceased. Installation and decommissioning phases translate ongoing reconductoring operations over the loch with associated vessel traffic closures and the presence of guard vessels below the OHL.

4.3.2 Identification of Existing Risk Control Measures

All existing risk control measures are identified, as detailed in Section 2.5, such that they can be incorporated into the risk assessment process. These include any mandatory requirements and good industry practice as well as project specific measures that are prescribed / predefined as forming part of the Project design.

4.3.3 Risk Assessment

Each risk is individually evaluated against specific criteria and assigned categories for severity of the hazardous outcome consequences and likelihood or frequency of the occurrence. The definitions used in the FSA to evaluate the consequence and frequency of impacts are shown below in Table 4-5 and Table 4-6. Note that there is no established consensus for risk matrix category definitions within the IMO, MCA or across wider industry. The categories applied here are considered appropriate for this HLNRA.

Table 4-5 Consequence Severity

SEVERITY / MAGNITUDE	CRITERIA DESCRIPTION
High	Loss of a crew member, or multiple serious injuries / Major/Severe damage to infrastructure or vessel / Operations / activities halted indefinitely
Medium	Serious injury to person / Notable damage to infrastructure or vessel / Protracted operational delays
Low	Minor injury(s) to person / Minor/Local damage to equipment or vessel / Minor operational delays
Negligible	No significant operational impacts

Table 4-6 Likelihood Criteria

LIKELIHOOD	CRITERIA DESCRIPTION
Remote	Never occurred during Company's activities but has been known to occur in the wider industry.
Unlikely	Has occurred in Company's activities in the past but as an isolated incident under exceptional circumstance.
Occasional	Has occurred on more than one occasion during Company's activities in the past.
Likely	Occurs regularly during Company's activities.

The likelihood and consequence categories are combined for each hazard/impact using the risk matrix shown in Table 4-7, which is used to derive a risk tolerability level of either Unacceptable, Tolerable or Broadly Acceptable. Definitions of each risk tolerability level are provided in Table 4-8.

Table 4-7 Risk Matrix

FREQUENCY/ LIKELIHOOD					
	Likely	Broadly Acceptable	Tolerable	Unacceptable	Unacceptable
	Occasional	Broadly Acceptable	Tolerable	Tolerable	Unacceptable
	Unlikely	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable
	Remote	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable
	-	Negligible	Low	Medium	High
	SEVERITY OF CONSEQUENCE / MAGNITUDE				

Table 4-8 Tolerability Definitions

TOLERABILITY	DEFINITION
Broadly Acceptable (Low Risk - not significant)	Generally regarded as acceptable and adequately controlled. At these risk levels the opportunity for further reduction is limited.
Tolerable if ALARP (Moderate Risk - significant)	Typical of the risks from activities which people are prepared to tolerate to secure benefits. There is however an expectation that such risks are properly assessed, appropriate mitigation measures are in place, residual risks are ALARP and that risks are periodically reviewed to monitor if further controls are appropriate.
Unacceptable (High Risk - significant)	Generally regarded as unacceptable whatever the level of benefit associated with the activity. Significant risk mitigation or design modification required to reduce to tolerable (ALARP).

4.3.4 Identification of Additional Mitigation Measures

Where risks are assessed as being unacceptable or tolerable after factoring in the embedded mitigation measures already identified, further additional risk mitigation measures are considered and identified where necessary and practicable.

4.3.5 Cost-Benefit Considerations

To formulate recommendations for decision-making, any additional risk mitigation measures identified are assessed via qualitative cost-benefit comparison in order to justify the measure and establish a residual risk categorisation and basic ALARP position (these results are captured in the Hazard Log Section 4.4.1.5).

4.3.6 Risk Assessment Table / Hazard Log

The Risk Assessment output has been presented in a table, such that the hazards for each of the project phases and their associated mitigation measures (embedded and additional) are captured to provide a single auditable hazards and effects log. The output of the assessment can be seen in Section 4.4.1.5.

4.4 Formal Safety Assessment

The HLNRA uses the baseline shipping data to inform a high-level desk-top FSA process which identifies and assesses hazards to all relevant navigation or shipping activities, from the Project. The process provides a hazard log which ultimately demonstrates that suitable risk management measures have been applied to the development and that risks are both reduced to ALARP and trackable.

4.4.1 FSA Results

The Loch Long OHL installation passes through a well trafficked and marked navigation channel, predominantly carrying vessels to and from Finnart Oil Terminal. 1912 vessels were recorded across the year in the baseline study period. Therefore, the required closure of the channel on a number of days represents a significant hazard or impact to shipping in the area. Additionally, the available clearance beneath the OHL presents a potential hazard to vessels

with larger air draughts. The assessment identified four distinct hazards to shipping from the development across the installation maintenance and decommissioning phases:

- Vessel interaction (Third party vessel interacts with reconductoring operation);
- Temporary closure of established vessel route and Port access;
- Reduction in over-head clearance; and
- Electromagnetic field (EMF) effects disturb magnetic compass navigation.

Of the four risks, two were assessed as being 'Broadly Acceptable'. Vessel interaction and EMF disturbance, therefore, require no further consideration of risk reduction measures (RRMs). The remaining two were assessed as Tolerable if ALARP and therefore required further consideration. Only one additional RRM was considered appropriate, and one recommendation has therefore been made following the assessment. It is recommended to optimise the operation schedule in order to minimise the impact on vessels and operators most affected by the closures. Key stakeholders such as the Finnart Oil terminal, Port authorities, RYA and the MoD, should therefore be engaged/consulted appropriately. Given that this measure is purely procedural and requires no equipment or design changes the cost of the measure is not considered to be grossly disproportionate to the benefit gained and is therefore justified.

The assessment ultimately determined that all risks to navigation associated with the development can be considered ALARP provided the recommendation for additional risk reduction is implemented or otherwise closed out satisfactorily. A brief summary of the key considerations of each impact included in the section below and are also summarised in the Hazard Log in Section 4.4.1.5.

4.4.1.1 Vessel interaction – Installation and Decommissioning

Vessel interaction with the reconductoring operations is considered to be highly unlikely. The pull-in operation is essentially executed above the water via land based pulling apparatus. No personnel or equipment is required beneath the existing or replacement conductors during the puling operation or indeed the operational phase of the conductors. The unelectrified lines are expected to hang at approximately 20 m above the sea level. Guard vessel(s) as appropriate will therefore be in place to patrol the scheduled temporary closure of an exclusion zone 500 m either side of the OHLs (as shown in Figure 2-2). Their attendance will be principally for the purpose of communicating the presence of the operation and otherwise preventing vessels from approaching it. In addition, both Clyde Port and KHMC authorities, the MCA and the United Kingdom Hydrographic Office (UKHO) will be aware of the operation and its schedule of activities and will further raise and maintain awareness of the operation to vessels using the channel via both VTS communication, NtM, Navigational Areas (NAVAREA) and others. Furthermore, General Directions in place stipulate compulsory pilotage for a wide range of vessels using the channel further minimising any potential for interaction with the operation.

Considering the extremely limited potential for interaction between vessels using the channel and the reconductoring operations, due to the robust embedded mitigation measures described above, the likelihood is considered to be 'Remote'. The worst-case credible outcome of any interaction is considered to be no worse than injury and or equipment or vessel damage. Therefore, consequence severity is assessed as 'Medium'. This results in overall assessment of 'Broadly Acceptable'. As such no further consideration is necessary.

4.4.1.2 Temporary closure of established vessel route and Port access – Installation and Decommissioning

The temporary closure of the navigation channel presents an obvious risk of disruption to vessels using the area. The reconductoring requires full passage restriction for periods of up to 6 hours per day and for a total duration of 3 weeks, between June and August 2025. Military vessels, vessels requiring access to the ports and vessels associated with Finnart Oil terminal, among others, may all be affected.

The risk of disruption is generally highest at either or both the busiest time of day and busiest time of the year. The timings of military operations or other activities scheduled in the general location also present increased risk of disruption. The baseline data shows that tugs, tankers, and special craft are most likely to be affected; these being the most frequently recorded vessel types across the study period. The baseline shipping data shows that vessels use the channel more frequently in the winter months, where summer months showed the least channel usage. However, it is noted that recreational channel usage is highest in summer months.

The project has initiated engagement and consultation with stakeholders including the MCA, KHMC and Clyde Ports (Peel Ports) among others. Ongoing communication including participation in Peel Ports user group sessions raise and maintain awareness of the operation details. Embedded mitigation measures promulgating the channel closure schedule and timings provide substantial reduction in the potential for disruption. Port authorities' communications, NtM and NAVAREA broadcasts give prior notice of the operation to sea users. VTS communications and guard vessel communications provide communications to inform vessels of the ongoing operations. Additionally, the wide range of vessels requiring pilotage in the channel will be informed of restrictions when organising pilot services, who, along with the Port authorities and operators will be well aware of the operation details. Furthermore, the operation will be executed between June and August months, which will reduce the number of vessels likely to be affected.

Nonetheless, in cannot be assumed that all vessels requiring to use the channel will become aware of the channel closure with enough prior warning to prevent significant disruption to their activities. KHMC can provide no more than a 24 hour notice prior to requiring passage under the works, and recreational vessel types are less likely to be aware of the closure and may suffer significant disruption. Finnart oil terminal also remains at risk of some disruption from potential delays in tanker and tug movements, due to the closures.

Nonetheless, as described in Section 2.5, SHE Transmission have committed to ensuring that if emergency access through the closure area is required e.g. for search and rescue assets or military operations, that installation of the OHL can be halted and the area can be made safe for vessels to pass within approximately 5 minutes.

However, given that the channel is a busy shipping route and requires to be completely closed, disruption is considered to be 'likely'. Given the importance of the channel to Finnart Oil terminal and the Naval bases in the area, the severity of disruption is assessed as 'medium' as it may lead to protracted operational delays. This results in overall assessment of 'Tolerable if ALARP' and further risk reduction should be considered.

To mitigate the disruptions, it is recommended to optimize the operation schedule in order to minimise the impact on vessels and operators most affected by the closures. To achieve this, proactive engagement with key stakeholders such as the Finnart Oil terminal, Port authorities, RYA, and the MoD is crucial. By involving these entities well in advance of the operations, a preferable or optimised schedule for channel closures can be established. This proactive

approach can further minimise disruption and allow all parties involved to make necessary preparations for any potential effects that the closures may have on their activities or operations.

4.4.1.3 Reduction in vertical clearance – Normal Operations

Due to the nearby presence of Naval bases and the Finnart oil terminal, large vessels are required to use the channel and pass beneath the OHLs. The channel experiences some 4 m in depth variations due to tidal effects and as such there may be the potential for vessel with particularly large air draughts to either touch the OHL or pass within arcing distance (2 m design case) of the electrified lines.

The baseline data shows the largest recorded air draught of any vessel was 58.5 m. However, consultation with the MoD identified that the largest military vessels using the area may have an air draught of up to 65 m. In line with this, consultation with port authorities (Clyde Ports (Peel Ports) and KHMC) confirmed that 65 m distance between HAT and the 2 m electrical arcing distance, at the worst-case ice load cable sag height, would provide acceptable clearance.

The clearance of the OHL, following the reconductoring operation can be seen in Figure 2-1. The figure shows 67.4m between HAT and the lowest OHL location, at worst case heavy ice condition sag. This height is sufficient to provide the requested 65 m and additional 2 m arching clearance. As per Section 2.5, NtMs will be promulgated to notify users of Loch Long of the reduction in air draught from the existing scheme, and admiralty charts will be updated to show the new vertical clearance once the Project is installed. Therefore, vessels masters will be aware of the vertical clearance under new OHL.

Given that the overall clearance between the highest seal level (HAT), lowest OHL location (worst case heavy ice sag condition) and design case arcing distance is greater than the highest expected vessel air draught, the arrangement is considered to be inherently safe. The likelihood of risk of injury or damage to the vessel due to OHL fouling or electrical discharge is conservatively considered to be 'remote'. The potential consequences of such an incident are expected to result in serious injury and or equipment damage. This is considered to have a consequence severity of 'medium' and as such results in an assessment of 'tolerable if ALARP'. Further RRM should be considered however the design and clearances are based on worst case icing assumptions and effectively eliminate the possibility of any issues, under all normal or foreseeable conditions. Additionally, given the wide opportunity for passage beneath the charted OHL at lower sea levels no further risk reduction above those already embedded in Section 2.5, is considered necessary in this case.

4.4.1.4 EMF and compass deviation effects – Normal Operations

Magnetic compasses are designed to work with the earth's stationary geomagnetic fields and can therefore be affected by other stationary magnetic fields such as ones generated by direct current (DC) cables. Alternating current (AC) cables such as the cable in this Project generate an oscillating sinusoidal EMF with respect to time within the same period. In this case, the resulting EMF fluctuates with a period of 20ms (f= 50Hz), and the average value is zero micro-Tesla (the average value is the one which may influence magnetic compasses). The deviation effect on ships' compasses will therefore be zero, and hence compass deviation is not therefore considered further in this HLNRA.

4.4.1.5 HLNRA Hazard Log Output

The following table captures the results of the FSA process and results of the HLNRA. All hazards are ultimately assessed as being Broadly Acceptable or ALARP with one recommendation for additional risk reduction considered to be justified.

Table 4-9 Hazard Log

PHASE / ACTIVITY	HAZARD	EMBEDDED MITIGATION		WORSE CASE OUTCOME	LIKELIHOOD	CONSEQUENCE	INITIAL RISK	FURTHER RRMS	RESIDUAL RISK	COST / BENEFIT	NOTES
		Mandatory / Industry Practice	Project Specific Measures								
Installation / Decommissioning	Vessel Interaction Third party vessel interacts with reconductoring operation	VTS Communications (From Ports) NtM / NAVAREA / NAVTEX Pilotage	Guard Vessels patrolling RCZ Early engagement with KHMC and Clyde Port	Serious injury / Damage to vessel and equipment	Remote	Medium	Broadly Acceptable	None Identified	Broadly Acceptable	NA	Given that embedded mitigations ensure awareness of the operation among sea users and include guard vessel patrol, the likelihood of interaction between third party vessels and the operation is expected to be remote.
Installation / Decommissioning	Temporary closure of established vessel route and Port access	VTS Communications (From Ports) NtM / NAVAREA / NAVTEX Pilotage	Guard Vessels patrolling RCZ Early engagement with KHMC and Clyde Port Operation scheduled in quietest season (Summer)	Protracted operational delays	Likely	Medium	Tolerable if ALARP	Schedule optimisation	ALARP	Measure Justified	Given the potential for significant disruption caused by closure of the channel, minimisation of the disruption through schedule optimisation against stakeholder activities and prevailing traffic patterns is considered an appropriate, cost effective RRMs and is therefore justified.
Normal Operations	Reduction in over-head clearance Fouling with OHL / electrical discharge	Pilotage OHL charting	Worst-case overhead clearance greater than largest identified vessel air draught. Worst-case clearance meets requirements of Port authorities	Serious injury / Damage to vessel and equipment	Remote	Medium	Tolerable if ALARP	None Identified	ALARP	NA	The baseline data shows that given worst-case ice loading and with sea level at HAT, no vessels had sufficient air draught to touch the cable. Additionally, all large vessels, and military vessels, are subject to compulsory pilotage and will necessarily sail under the OHL by a ships master familiar with the hazard and the restrictions placed on his vessel. No further risk reduction is therefore considered necessary.
Normal Operations	EMF effects disturb magnetic compass navigation	Recommended electrical clearance / arching distance	EMFs from AC cables do not affect magnetic compasses	No significant operational impacts	NA	NA	No Risk	NA	No Risk	NA	NA

5 CONCLUSIONS

The Project passes over and requires closure of a well trafficked and militarily important navigation channel. The baseline data shows that the channel predominantly carries commercial vessels to and from the Finnart Oil terminal however military activity may be underreported and therefore vessels using the naval bases in the area may also be significantly affected. The temporary but complete closure of the navigation channel presents an obvious hazard and source of disruption to vessels using the area during the installation, and the height of the electrified OHL presents a potential risk of interaction with larger vessels.

The conductor pull-in operation is executed above the water via land based pulling apparatus. No personnel or equipment is required beneath the existing or replacement conductors during the puling operation or indeed the operational phase of the conductors. Guard vessels will be in place to patrol the scheduled temporary closure of an exclusion zone 500 m either side of the low hanging overhead, lines during the pull in. Their attendance will be principally for the purpose of communicating the presence of the operation and otherwise preventing vessels from approaching it. The risk of vessel interaction with the pull in operation has been assessed as 'Broadly Acceptable' particularly as the OHL will not be electrified during this phase of the project. No risk reduction, further to that offered by guard vessel is therefore considered necessary.

However, given that the channel requires to be completely closed during the pull in operation, disruption is considered to be a substantial risk. The assessment determined that the risk of disruption is 'tolerable if ALARP' and requires to be further reduced if practicable. Recommendation is therefore made to optimise the installation schedule with the activities of key stakeholders, likely to be affected by the closure, including Finnart Oil terminal, Port authorities, RYA and the MoD.

Given that the overall clearance between the highest sea level, lowest OHL location and 2 m design case arching distance is greater than the highest expected vessel air draught of 65 m, the arrangement has considerable inherent safety. The likelihood of risk of injury or damage to the vessel due to OHL fouling or electrical discharge is conservatively considered to be 'remote'. The potential consequences of such an incident are considered to have a consequence severity of 'medium' and as such results in an assessment of 'tolerable if ALARP'. Further RRMs should be considered however given the inherent safety offered by the OHL height and appreciably limited potential for electrical discharge or fouling of the charted OHL, no further risk reduction is deemed necessary or appropriate.

Ultimately, the safety risks presented by the Project are suitably managed by ensuring that vessels cannot interact with the OHL. During the pull in operation safety is maintained by virtue of a guard vessel patrol and during the operational phase by an inherently safe OHL height design. Disruption to shipping caused by the necessary closure of the channel is suitably addressed by early stakeholder engagement and standard industry measures ensuring promulgation of the operation details to sea users. However, given that complete closure of the militarily and commercially important channel is required, further minimisation of potential disruption is considered necessary. Optimisation of the installation activities with the operations of Finnart Oil terminal, Port authorities, RYA, MoD and any other important stakeholders is recommended to further minimise potential disruption. Where practicable the optimisation should include scheduling closures during the quietest times of day whilst avoiding the busiest times of day as identified in the study baseline data. Therefore, all risks to navigation associated with the operation can be considered ALARP where this recommendation is implemented or otherwise closed out satisfactorily.

6 RECOMMENDATIONS

The following recommendation has been made as a result of the HLNRA:

It is recommended to optimise the installation schedule of the LLRP by engaging in consultations with key stakeholders, including Finnart Oil Terminal, the MoD, Peel Ports, KHMC, RYA, and any other relevant parties. The aim is to minimise potential disruptions to their activities or operations resulting from the closure of Loch Long.

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