

SCOTTISH HYDRO ELECTRIC POWER DISTRIBUTION PLC

PH003762 Skye - Uist Cable Replacement

Project Description: Ardmore - Loch Pooltiel Distribution Cable



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Project Description: Ardmore - Loch Pooltiel Distribution Cable

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GLOSSARY

ASV

Autonomous Surface Vehicle

BS

Basking Shark

BT

British Telecoms

CBRA

Cable Burial Risk Assessment

CEMP

Construction Environmental Management Plan

CFE

Controlled Flow Excavator

CLV

Cable Lay Vessel

CPS

Cable Protection System

CR

Client Representative

DP

Dynamic Positioning

DSE

Direct Shore End

DSV

Dive Support Vessel

DTS

Desktop Study

EPS

European Protected Species

FLMAP

Fisheries Liaison Mitigation Action Plan

FO

Fibre Optic

HVAC

High Voltage Alternating Current

km

Kilometres

LIDAR

Light Detection and Ranging

M

Meters

MBR

Minimum Bend Radius

MCA

Maritime and Coastguard Agency

MEA

Marine Environmental Appraisal

MHWS

Mean High Water Springs

MLWS

Mean Low Water Springs

NAVTEX

Navigational telex

NtM

Notice to Mariners

OBS

On-Bottom Stability

OiQ

Ocean iQ

OCT

Open Cut Trench

OOS

Out of Service

PLGR

Pre-Lay Grapnel Run

ROV

Remotely Operated Vehicle

RPL

Route Position List

SHEPD

Scottish Hydro Electric Power Distribution plc

SLD

Straight Line Diagrams

SSEN

Scottish & Southern Electricity Networks

TDM

Touch Down Monitoring

TJP

Transition Joint Pit

UKHO

United Kingdom Hydrographic Office

USBL

Ultra Short Baseline

UXO

Unexploded Ordnance

VIV

Vortex Induced Vibration

WD

Water Depth

XLPE

Cross-linked polyethylene

3D

Three Dimensional

1. INTRODUCTION

1.1 Overview

Scottish and Southern Electricity Networks (SSEN) operating under licence as Scottish Hydro Electric Power Distribution plc (SHEPD) is responsible for monitoring and maintaining the efficiency and integrity of the subsea electricity cable networks which provide power supplies to 60 Scottish islands.

The existing Skye to South Uist subsea electricity cable has been in operation for 34 years and is due for replacement during the Electricity Distribution Price Control Period 2 (2023–2028).

To facilitate this, the replacement cable is being progressed through two separate projects:

- A new cable interlinking Ardmore, Skye and Loch Pooltiel, Skye, which is the subject of this application.
- A separate project connecting Skye to South Uist, which will be subject to its own Marine Licence application.

The route discussed in this document will be a 33kV cable interlinking Loch Pooltiel, Skye and Ardmore. The cable will be approximately 20 Kilometres (km) in length.

This project description sets out the methodology proposed to undertake the cable replacement works, as well as details on cable protection and deposits. Burial is planned along the route where seabed conditions allow, and additional cable protection will be used in areas of no or low burial, where required. The installation works are scheduled to take place between Q2 and Q3 2026. The estimated duration for each activity is presented below in Table 1-1, not including any weather downtime the project may experience.

The yellow highlighted text represents information that has yet to be confirmed by the installation contractor.

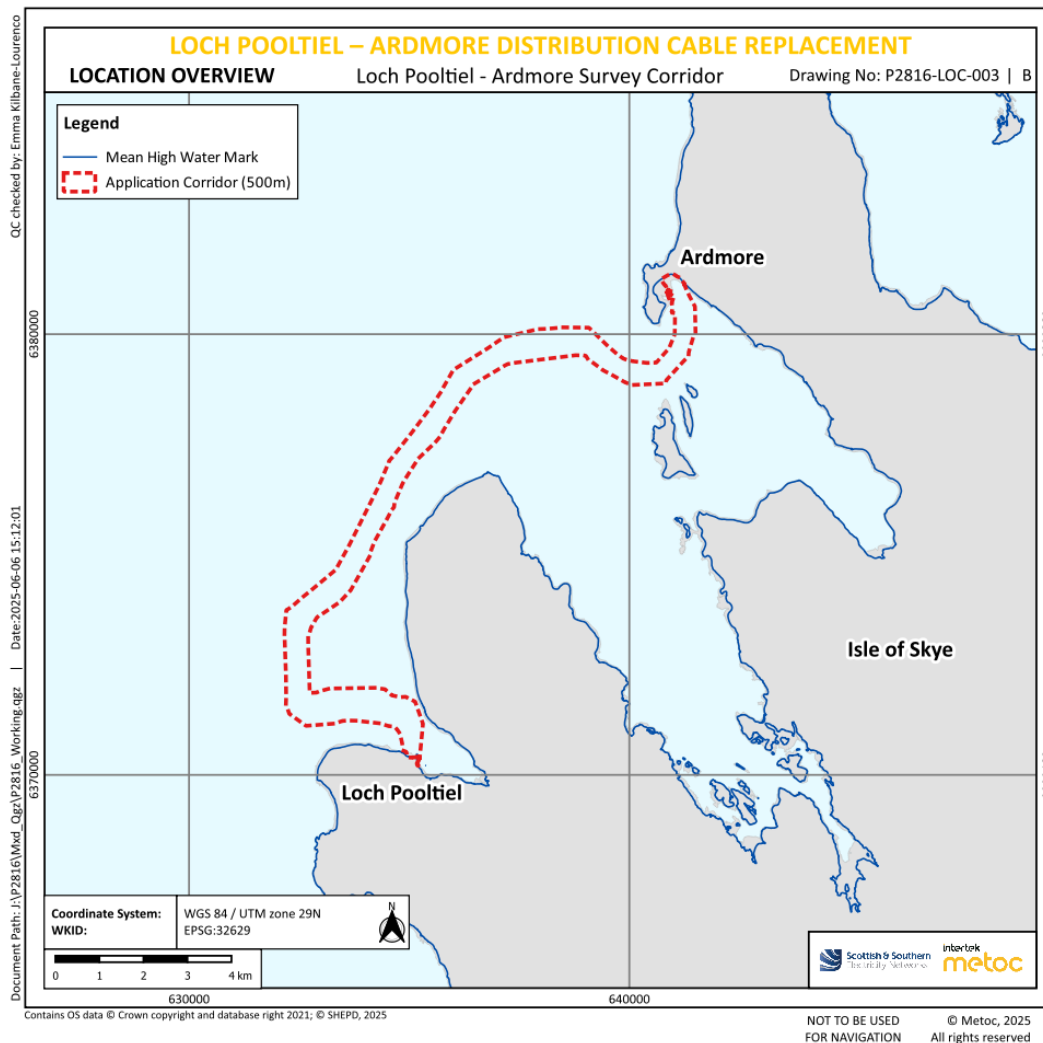
Table 1-1 Estimated Installation Schedule (Exclusive of Weather Downtime)

Activity	Estimated time period (Weeks)
Route Clearance and pre-lay grapnel run (PLGR) (including boulder clearance)	3 weeks
Onshore and landfall works (per landfall but operated concurrently)	8 weeks
Cable lay	2 weeks
Installation of protection and stabilisation measures, post lay inspections	4 weeks
Post lay survey	1 week

1.2 Replacement Cable Corridor

The Application Corridor for the replacement cable is shown in red in Figure 1-1 (Drawing reference: P2816-LOC-003). The Application Corridor within which the cable will be installed is 500 meters (m) wide. The Marine Licence Application is for installation of the replacement cable within the boundary of this Application Corridor.

Figure 1-1 Loch Pooltiel – Ardmore Cable Installation Application Corridor



1.2.2 Cable Route Design

HydroFix were commissioned by SHEPD to undertake a Cable Route Desktop Study (DTS) (HydroFix (2024), Report Reference: H24007-REP-001). The aim of this study was to review anticipated ground conditions and propose an optimal route. This study presents the potential risks to the replacement cable along the entire route and the alternative routes that have been considered and provides a summary of the perceived issues with each cable route with respect to engineering and installation of the cable.

Route Position Lists (RPL) and Straight-Line Diagrams (SLD's) have been developed that comprise the compound knowledge gained from data collected by SHEPD and DTS research.

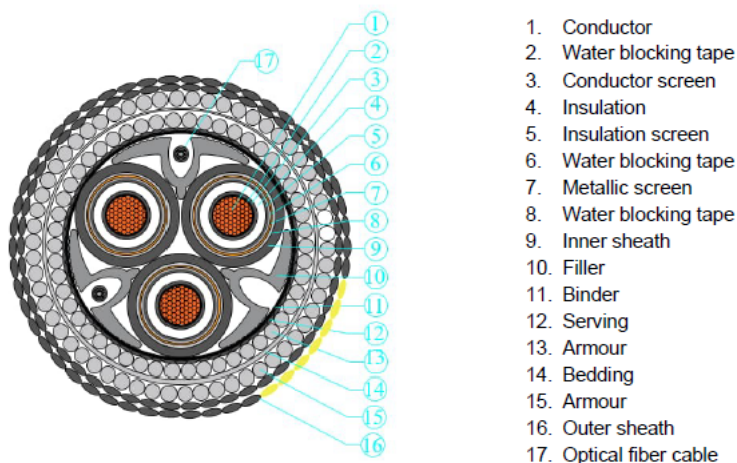
- The recommendations for Ardmore – Loch Pooltiel are to follow the Skye – South Uist report Cable Route DTS recommendations, carried out by OceaniQ (OiQ) (Report Reference: 4103-GMSL-G-RD-0003) and concluded the following: Consult with fisheries representatives on the cable route and inform them with adequate notice of any geophysical and geotechnical survey spatial extents and timescales. Undertaken a marine offshore liaison program with them before, during and after installation to ease permitting and reduce the chances of damage to the cable.

- Bury the cable to a target burial depth of 1m throughout the entire route where the seabed allows in order to protect the cable from the effects of the intensive fishing activity noted in The Minch and Little Minch.
- Ensure the cable route survey includes high resolution bathymetry, and ensure the installer has competent planning software to be able to plan the installation tension thoroughly and so reduce the risk of suspensions and chafing.
- Ensure that the cable is clearly marked on navigational charts by the United Kingdom Hydrographic Office (UKHO). This will reduce the risk of ships accidentally anchoring over the cable.
- Erect an Aid to Navigation marker at each landing point to ensure that mariners close to shore are aware of the location of the cable.
- Cast iron split pipe should be applied to the cable where burial is not possible in the shore ends to protect against rock outcrops or dense boulder fields.
- Review the cable route during and following the marine survey to optimise security, with particular attention to the location of boulders and rock outcrops detected by side scan sonar. A survey corridor of $\pm 250\text{m}$ is recommended to provide adequate space for postsurvey route engineering.
- Ensure the survey contractor shares locations of surface boulders (including items in the boulder fields) as part of the survey deliverables to aid with installation and cable burial.
- Conduct a burial assessment and consider carrying out a Cable Burial Risk Assessment (CBRA) and any other assessments as required to further optimise the future security of the cable route.
- Carry out an Unexploded Ordnance (UXO) risk assessment ahead of marine operations.
- Perform marine survey and main cable lay during the annual good weather window from May to September.
- Carry out an environmental screening exercise for the project and perform an otter survey prior to the commencement of work.
- Consider using Light Detection and Ranging (LiDAR) and/or Autonomous Surface Vehicle (ASV) technologies in order to gain maximum survey coverage with minimal data gaps.
- Begin application for permits with plenty of time to spare.

2. PROPOSED CABLE CONSTRUCTION

Electricity will be transmitted using High Voltage Alternating Current (HVAC) submarine cable technology. The typical cable structure is shown below in Figure 2-1.

Figure 2-1 Typical XLPE (Cross-linked Polyethylene) HVAC Submarine Cable Structure - Cross Sectional Drawing



Source: Jan De Nul (2025)

The subsea cable that is proposed for installation is a three-core design with copper conductors, polyethylene insulation and two integrated Fibre Optic (FO) cables encased in double wired armour protection. FOs are integral to the submarine cable for cable condition monitoring, control and power system protection.

The subsea cable conductor cores specification and power rating has been selected through the assessment of historic demand on the existing network and with consideration given to future demand growth on the network.

A summary of the key mechanical properties of the replacement cable is provided in Table 2-1.

Table 2-1 Proposed Cable – Key Mechanical Properties

Parameter	Value
Cable weight (in air)	~55.36kg/m
Cable weight submerged	~38.74kg/m
Max tension at minimum bend radius (MBR) (directly pulling)	200kN
Max tension at MBR	122kN
MBR	4.0m
Cable diameter	153.3mm
Maximum crush resistance	30kN/m

Prior to installation, analysis of the proposed installation methodology will be conducted considering the mechanical parameters of the submarine cable shown in Table 2-1. The outputs of this analysis will inform a set of operational parameters that the installation will adhere to.

An On-Bottom Stability (OBS) assessment will be conducted to ascertain whether the cable will be stable on the seabed for its design life and inform any additional stability measures that may be required.

3. SURVEY WORKS

3.1 Routing Survey

Initial routing survey works were undertaken during late 2024 and included the following:

- Offshore geophysical survey (including magnetometer survey);
- Offshore geotechnical survey;
- Offshore environmental survey;
- Offshore UXO survey;
- Landfall topographic survey;
- Onshore geotechnical survey; and
- Intertidal ecological survey.

The key outputs of the surveys were as follows:

- Seabed bathymetry and land topography;
- Soil classification and strength along the proposed cable route in the form of geophysical, geotechnical reports and alignment charts;
- Identification of archaeological features along the proposed cable route;
- Identification of hazards (debris, existing cables, ship wrecks, boulders, etc.) along the route;
- Identification of magnetic targets and UXOs along the route; and
- Classification of benthic habitats.

The survey works have informed selection of the Application Corridor. The data was used to engineer the route for the new cable. The survey works have also informed the environmental assessment provided in the Marine Environmental Appraisal (MEA) report (Intertek Report reference: P2816_R6690).

4. CABLE PROTECTION AND STABILISATION

4.1 Overview

SHEPD have compiled a deposits plan based on initial designs for the cable system, which is detailed in Table 4-1 below. This conservatively outlines the type and number of seabed deposits required for stabilisation and protection and is the basis of the assessment made in the MEA. The deposits will be placed where is considered most appropriate along the cable route. Burial is planned along the route where possible.

Engineering studies are ongoing which may alter the final quantity of deposits required and the information provided is therefore based upon worst-case scenarios. More information on the types of protection and stabilisation that could be utilised is provided in Section 5.2.7.

4.2 Cable Protection and Stabilisation

Table 4-1 conservatively outlines the type and number of seabed deposits needed for cable protection and stabilisation.

Table 4-1 Cable Protection and Stabilisation

Type of Deposit/ Removal	Deposits			Removal	
	Description	Quantity & Dimensions (Metric)	Maximum Seafloor Area Coverage (m ²)	Description	Quantity & Dimensions (Metric)
Cast Iron split pipe	Articulated cast iron shell design that interlocks around the cable and is fixed with bolted end clamps. For nearshore approaches where cable cannot be buried	Dimensions: Diameter: 263mm Total length: 1000m	263	N/A	N/A
		Weight (in water): 52.6kg/m			
Concrete mattresses	Concrete mattresses may be required for any crossings and shallow water protection.	Quantity: No. 6	108	N/A	N/A
		Dimensions: Width: ~3m Length: ~6m Height: ~0.3m			
		Weight 8.75 tonnes each			
Rock bags	Rock bags may be required to stabilise the cable, subject to discussion with the Maritime and Coastguard Agency (MCA) regarding the limit for depth reduction.	Quantity: No. 54	244.1	N/A	N/A
		Dimensions: Diameter: ~2.4m Height: ~0.6m			
		Weight: ~4 tonnes each			
Grout bags	Grout bags may be used to stabilise the cable.	Quantity: No. 20	12.8	N/A	N/A
		Dimensions:			

Type of Deposit/ Removal	Deposits			Removal	
	Description	Quantity & Dimensions (Metric)	Maximum Seafloor Area Coverage (m ²)	Description	Quantity & Dimensions (Metric)
	Each bag contains 40x25kg bags	Diameter: ~0.9m Height: ~0.9m Weight: 1 tonne each			
Cable sea earthing deposits - conductors	Two copper conductors going from the TJP back into the sea - one for the cable and one for the fibre. Connected to these conductors, there will be up to 12 copper rods up to 3m in length installed to a depth of 2.4m. These quantities would apply at both ends of the cable.	Quantity: No. 4 (not including contingency) Dimensions: Cross section: 95mm ² (based on 25mm diameter) Length: 4 x 150m Weight: 8.2kg/m 4920kg total weight	15	N/A	N/A
Cable sea earthing deposits - rods	12 copper rods per landfall plus 10 contingency.	Quantity: No. 24 (not including contingency) Dimensions: Diameter: 20mm Length: 3m each Weight: 3kg/m 216kg total weight	1.44	N/A	N/A
Earthing clump weight	Concrete clump weight to stabilise earthing wires.	Quantity: No.4 Dimensions: Diameter: 1m Height: 0.5m Weight: Up to 60kg each	3.1	N/A	N/A
Rock anchors	Stainless steel threaded rod, plus bolt fixing and marine grade resin to provide additional stabilisation if required.	Quantity: No. 20 Dimensions: Diameter: ~0.02m Height: 0.3m Weight: 2kg each	0.006	N/A	N/A

5. PROJECT DESCRIPTION

5.1 Proposed Route

The proposed cable route has been assessed from an engineering perspective within the desktop study reports and by the installation contractor. These include the Cable Route DTS (HydroFix (2024), HyrdoFix Report Reference: H24007-REP-001) and Ocean IQ (2023) (Ocean iQ Report reference: 4065-GMSL-G-RD-0003). The Loch Pooltiel (Meanish Pier) landfall has also been assessed in the Skye-South Uist Subsea Cable Environmental Desk Study (Jacobs Document Number: B2430803a), various marine survey reports, and fisheries considerations outlined as part of the Fisheries Liaison Mitigation Action Plans (FLMAPs) for the Outer Hebrides and West Highlands. The final route engineering will be subject to ongoing studies prior to installation.

The location of the replacement cable Application Corridor in relation to the existing in-service cable is shown in Figure 5-1. The cable routing decisions taken as part of the development of the route are outlined in Table 5-1.

5.1.1 Route Decision Making Process

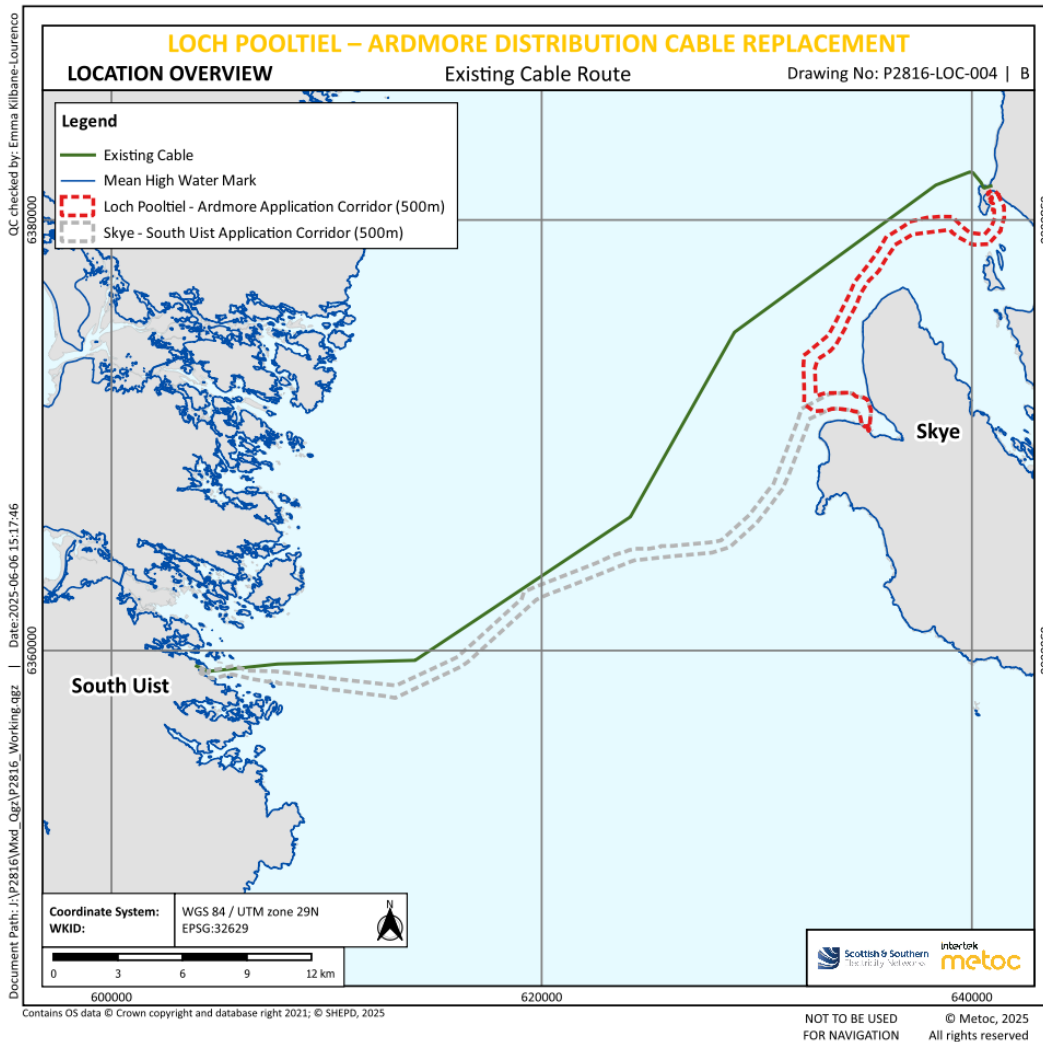
Table 5-1 Key Route Engineering

Stage	Date	Description
Desktop Survey	May 2023	Preliminary RPL based on existing cable
Post route survey	Q3 – Q4 2024	Collection of survey data based on desktop study RPL and indicative installation corridor
Final design	Ongoing until installation	RPL for cable installation

5.1.2 Route Description

The proposed Application Corridor lies between Loch Pooltiel and Ardmore, Isle of Skye as shown in Figure 5-1 (Drawing Reference: P2816-LOC-004). The existing operational cable and proposed Skye (Loch Pooltiel) to South Uist application corridor are also shown.

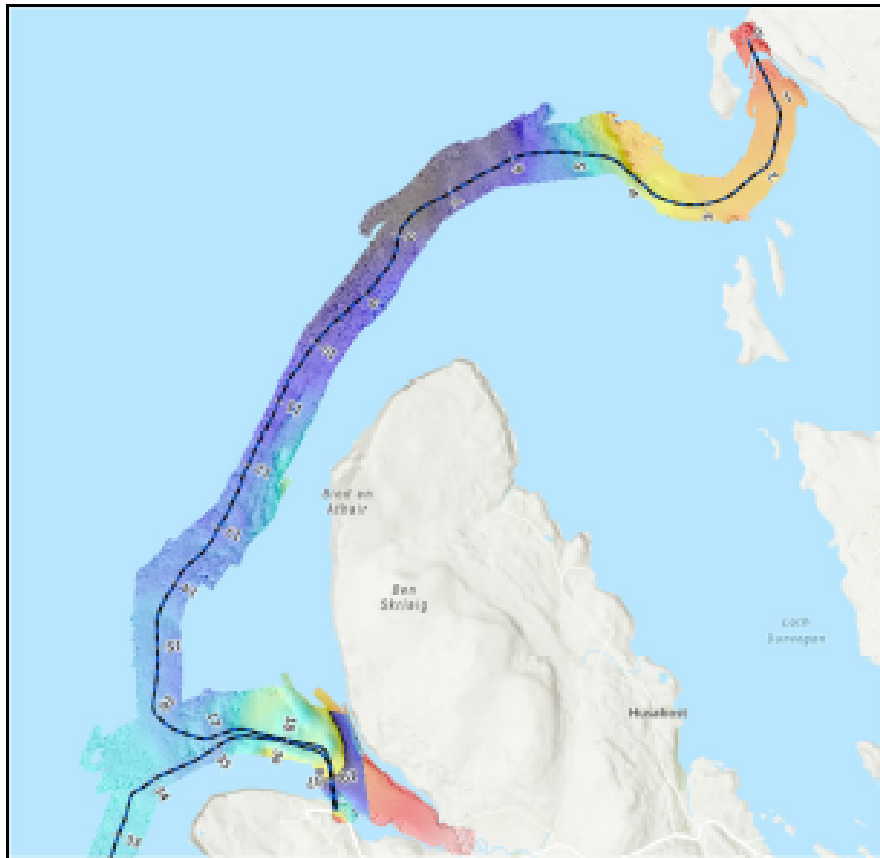
Figure 5-1 Application Corridor and Current Operating Cable



The cable route will be within the boundary of the Application Corridor and commences at the Transition Joint Pit (TJP) (57.5398°N, -6.8222° W) at Meanish Pier, Loch Pooltiel and runs along the coastline of Isle of Skye and across the seabed of Little Minch and onto the beach at Ardmore to the TJP (57.552988° N, -6.645232° E).

The route description below is described from Ardmore South to Loch Pooltiel (Meanish Pier), owing to the bathymetry and the topography at the landfalls the direction of cable installation will be likely from Ardmore South to Loch Pooltiel (Meanish Pier). The survey corridor bathymetry for the existing and proposed cable route is presented below in Figure 5-2.

Figure 5-2 Bathymetry Map of the Survey Corridor



Source: Jan De Nul (2025)

The proposed cable route begins at Loch Pooltiel, where the Skye–Uist South cable will land on Skye, and continues north to Ardmore, where existing substation infrastructure is located. Starting from the head of the beach at Meanish, Loch Pooltiel, the route descends from approximately 5m above chart datum to a depth of 15m over a distance of 300m. From there, it continues on a north-westerly trajectory for another 550m toward the centre of the Loch Pooltiel entrance, reaching a depth of 75m. One potential challenge in this section is the slope gradient, which may reach up to 10°. Additionally, due to the local geological setting, a boulder field may be present along this slope. To ensure comprehensive data acquisition across Loch Pooltiel, the survey corridor was designed with a wide alignment control (AC) from the landing point. Localised pockets of mobile sediment were evident within the higher-resolution survey bathymetric data (Figure 5-3), notably across the subtidal entrance to Loch Pooltiel.

On exit of Loch Pooltiel bay, the route must stay on the southern side to avoid steeper gradients known on the northern side. As the route turns eastward, it maintains a depth of approximately 75 to 90m over a 1km stretch. In this area, an increase in superficial sediment deposition is expected, influenced by adjacent Quaternary deposits and observed mobile seabed features. The route alters course to the southwest and gradually deepens to ~123m, after which water depths remain relatively stable for the remainder of the area. North–south oriented sand waves cross the mouth of Loch Pooltiel (Figure 5-4) and a channel-like feature is crossed within vicinity of the sand waves also.

Beyond the loch entrance, water depth increases beyond 120m before levelling off. Here, the route transitions into a series of northerly alterations designed to shift the cable toward a northeasterly heading towards Ardmore. The route also aligns with the prevailing sand wave orientations as it continues descending from 120m to 135m depth. The steepest slope encountered along the RPL was

69.3°, with other significant gradients recorded at 23.4° and 27.7°. Further sand waves were observed along the central section of the route.

In the northern section of this turn, the route and its associated corridor intersect with known sand wave features exceeding 10m in height. Higher-resolution geophysical surveys in this region will reveal finer-scale seabed characteristics, which will be critical for route engineering. While the corridor avoids the most prominent features, it also delineates their spatial extent in relation to the engineered cable path.

The route then changes direction by roughly 45°, aligning with a corridor of relatively flat seabed that forms a natural "ramp" leading into deeper waters. Over a 5km stretch, the route transitions to its maximum depth of 196m. This deep section corresponds with the route clearing the headland and entering Loch Dunvegan. Here, the route is aligned to cross the British Telecom (BT) fibre optic cable at an appropriate angle, and this 2km section is expected to experience a gentle decrease in water depth.

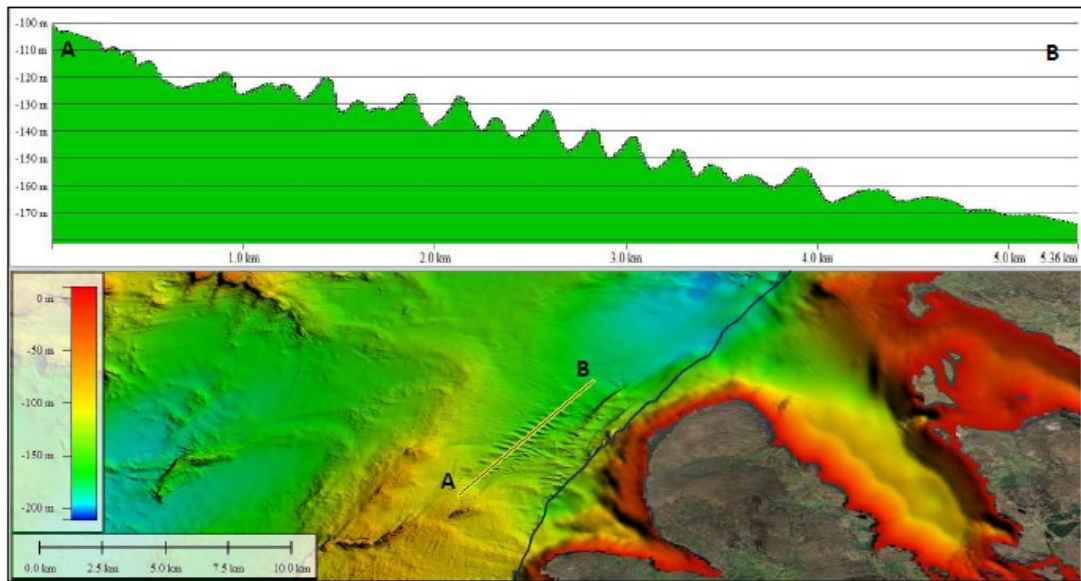
On the northern side of Loch Dunvegan Bay, the route turns eastward, utilising a gradually sloping gradient toward the shallower waters of Ardmore Point. Over a 2.6km stretch, depths decrease from 160m to 35m. The primary challenge in this section is the anticipated change in seabed composition. The deeper areas are expected to consist of stiff clays or shallow rock with a soft superficial layer, while the approach to Ardmore Point likely includes a dense boulder field, similar to conditions observed at Ardmore North. This terrain reflects the scree-covered slopes of Skye's volcanic landscape.

At the shallower end of the slope, the seabed is expected to consist of coarse sediments, including gravel, cobbles, and sand. The seabed north of the Ardmore landing site is likely to continue through the planned course alterations around Ardmore Point, with minimal presence of large boulders or mobile sediment features. A series of four course alterations, over a 2.5 km stretch, will guide the cable through the centre of the bay as depths decrease from 35m to 10m.

The nominal 10-meter depth position lies roughly 800m from shore, situated just outside the enclosed bay and aligned directly with the TJP. The route must favour the northern side of the bay to ensure a smoother transition to the beach and avoid the foundations of historical stone fishing traps. The survey corridor is expected to transverse slightly deeper waters (around 13m) just offshore of the alteration path to allow for a potential Direct Shore End (DSE) location for large vessels.

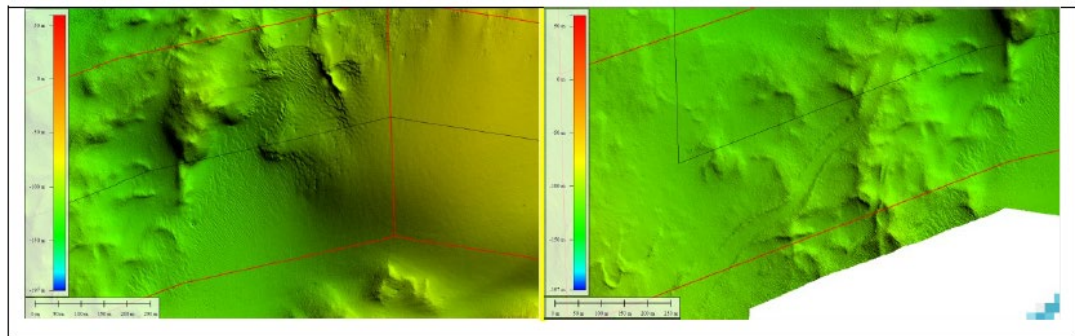
Ardmore itself has a gently sloping profile and is composed of coarse materials. Several linear, likely man-made, features were identified in the shallow zone. A 100-meter-wide clear area, centred on the intended landing site, is anticipated to be available for use.

Figure 5-3 Bathymetry Profile Over Mobile Sediment, Loch Pooltiel Approaches (Admiralty Maritime Data Solutions, 2024)



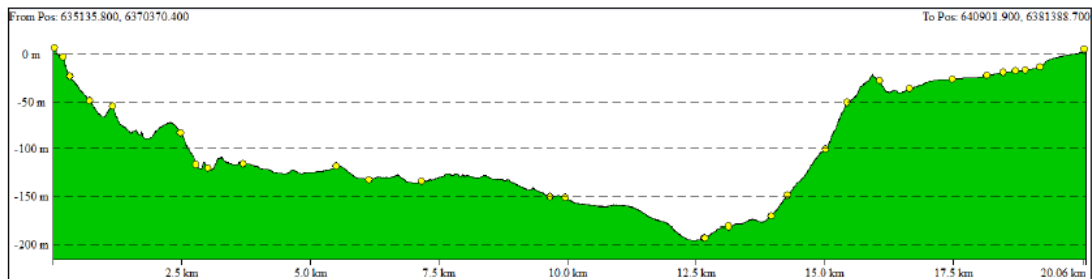
Source: (HydroFix, 2024)

Figure 5-4 Sand Waves and Channel Features at Loch Pooltiel



(OceaniQ, 2025)

Figure 5-5 Bathymetric Survey RPL Profile (Loch Pooltiel to Ardmore from Left to Right)



(OceaniQ, 2025)

5.1.2.2 Loch Pooltiel

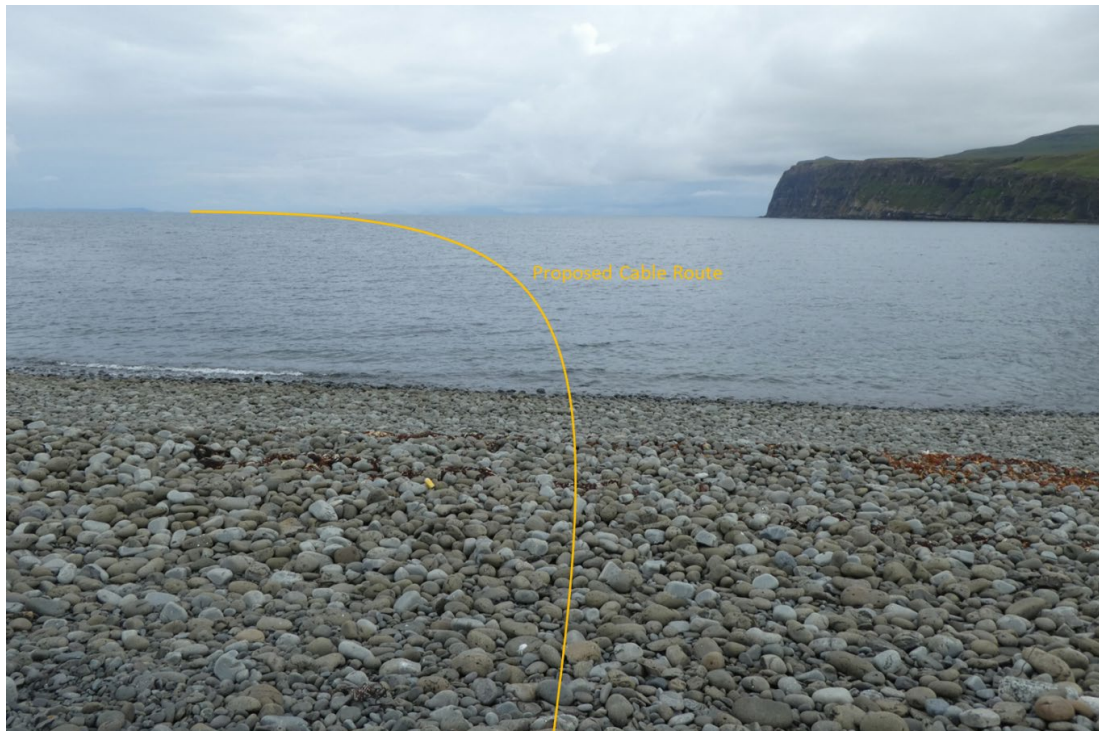
It is planned to utilise the Meanish Pier landfall for the landfall at Loch Pooltiel. The landfall is located to the north of the Meanish Community Pier and will be co-located with the planned Skye (Loch Pooltiel) – South Uist cable. This new landfall is located on a north-oriented beach, with a headland located to the east.

A site visit to the new landing site was undertaken in October 2023 and the following points were outlined in the Site Visit Report (4065-GMSL-G-RD-0003):

- The beach mostly consists of gravel and cobbles with boulders and rock outcrop located to the east and west of the beach;
- The distance between the two rock outcrops is 100m, which is enough space to land multiple cables; and
- A fish farm is located in close proximity to the landfall, however this can be avoided through routeing.

This landfall was selected due to a suitable amount of room for new infrastructure and the ability for two cables to landfall at the same location, as well as a reduced marine route length. Figure 5-6 and Figure 5-7 show the Skye (Loch Pooltiel) landfall location, taken during the site visit in October 2023. Figure 5-6 shows the view offshore from the beach at the Meanish Pier landfall site. Figure 5-7 shows an aerial view of the Meanish Pier landfall at Loch Pooltiel, Skye, with the proposed TJP location.

Figure 5-6 Loch Pooltiel Landfall Site Looking Seawards



Source: Ocean iQ, 2023

Figure 5-7 Ariel View of Loch Pooltiel Landfall



Source: Ocean IQ, 2023

5.1.2.3 Ardmore South

Ardmore South was evaluated as an alternative landing site for the Skye–Uist Replacement and Skye–Uist North cables. It has been identified as having the potential to accommodate multiple cables, in contrast to Ardmore West, which had previously been considered the preferred site for a single cable installation. This route avoids crossing existing SSEN cable infrastructure.

Access to the Ardmore South landing is provided by the same road network serving the current and proposed landing sites to the north. The most likely path for the cable to come ashore would follow the north-eastern edge of the Ardmore area. Figure 5-8 shows satellite imagery of overhead Ardmore Bay and Figure 5-9 shows the potential Ardmore Bay landfall location using satellite imagery. The design of the approach will require careful consideration to ensure a suitable DSE position can be safely established for the installation vessel, as the immediate bay is less than 1 km wide with expected water depths ranging from approximately 8–20 m within the survey corridor.

Aerial imagery highlights a number of low walls and linear features and some natural rock outcrops, there is also a small craft anchorage at the entrance of Ardmore Bay.

Reviewing publicly available seabed and bathymetric datasets the seabed at Ardmore South is expected to be:

- Mixture of sand and gravel through shallow water.
- Boulders and cobbles also present.
- This seabed type will be a mixture of sand and gravel through the shallow water areas, but boulders and cobbles are also anticipated and will be found throughout the turn/circumference of the headland until the cable reaches approximately 30m water depth.
- It is expected boulder density will increase in water depths >100m.

Figure 5-8 Overhead image of Ardmore Bay



Source: HydroFix 2024, (Carnmore, 2024)

Figure 5-9 Ardmore South Landing Point



Source: HydroFix 2024, (Carnmore, 2024)

5.2 Proposed Installation Method

The indicative methodology is intended to give an overview of the options available to the cable installation contractor and has been used to inform the environmental assessment provided in the MEA, so that the worst-case impact scenarios of the installation have been considered. The final methodology will be subject to detailed route engineering and any requirements of the installation analysis.

Vessels and equipment proposed to be utilised during the installation are summarised in the subsequent sections. All equipment used will be within the requirements set out within the European Protected Species (EPS) and Basking Shark (BS) Licences provided for the works.

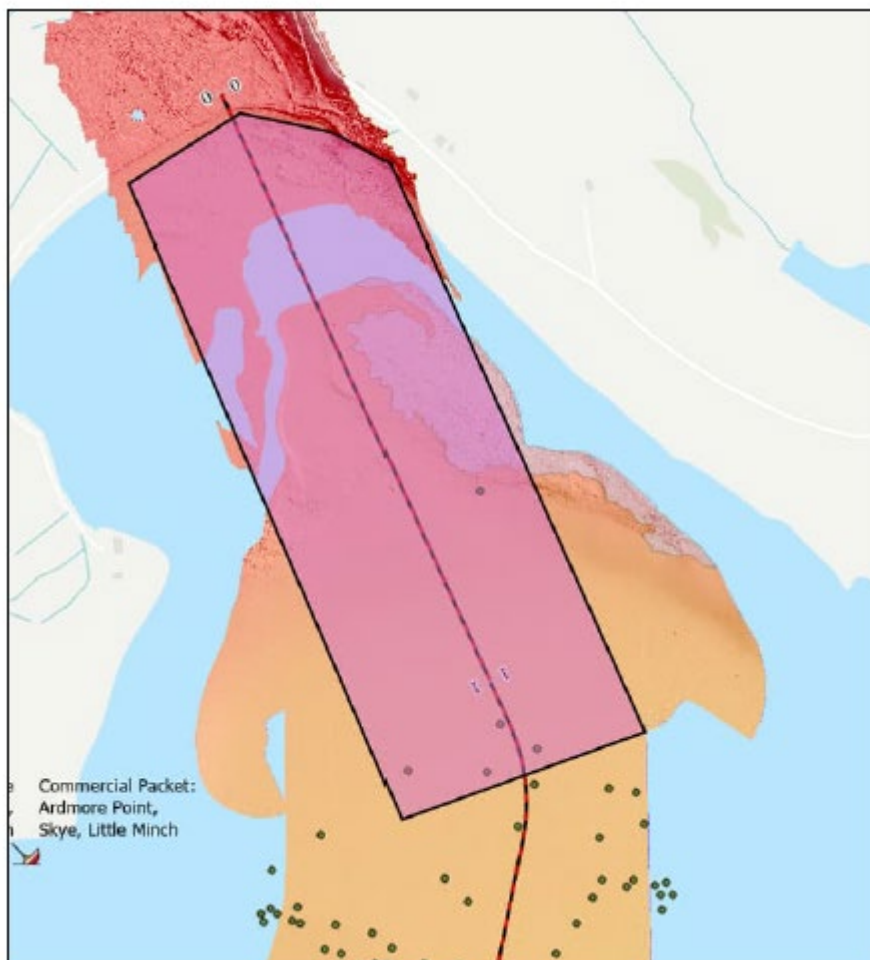
5.2.1 Vessels

Table 5-2 below provides an overview of the types of vessels that will be deployed during the installation of the cable, these vary from Cable Lay Vessels (CLV), Dive Support Vessels (DSV) and other support vessels. These specific vessels or vessels with similar specifications will be used in the installation of the replacement cable.

The CLV will be positioned using dynamic positioning (DP), whilst the DSV will be positioned using an anchoring solution. Potential options available include using clump weights/chains, delta flippers or spud legs. An anchoring corridor has been defined at each proposed location, which stretches from low water springs (MLWS) to the start of the offshore lay using the CLV at approximately 15m water depth and is 200m wide (Figure 5-10 and Figure 5-11).

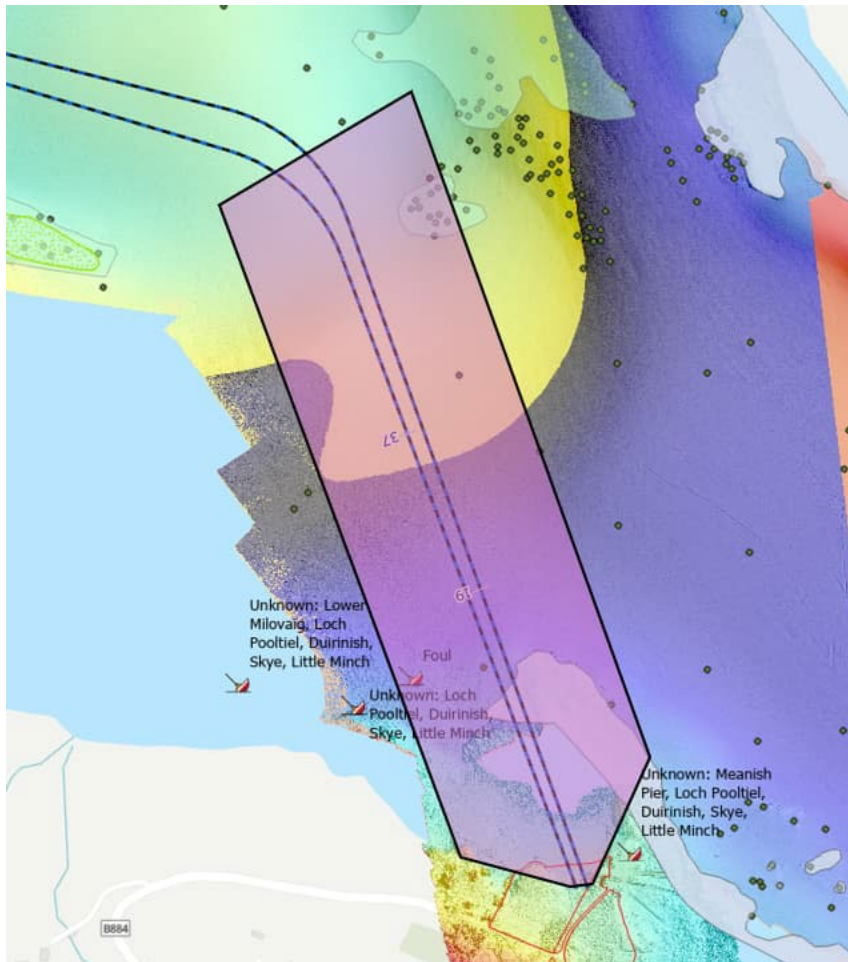
Vessels will typically use four anchors, however two heavy weight anchors may be used instead. It is estimated up to 10 relocations of the anchors within the corridor may be required for each shore end. The anchoring corridor will be located within the Application Corridor.

Figure 5-10 Anchorage Corridor for Ardmore South (Indicative)



Source: Jan De Nul 2025

Figure 5-11 Anchorage Corridor for Loch Pooltiel (Indicative)



Source: Jan De Nul 2025

Table 5-2 Example Installation Vessels

Name of Vessel	Type of Vessel	Vessel Specification	Positioning System/ Spud Information	Minimum Working Water Depth
CLV Connector	Cable Lay Vessel (CLV)	GT – 20,190Te DL – 156.9m	DP 3	6.5m
TSV Symphony	Trenching support vessel	GT – 11,324Te DL – 130.2m	DP 2	7.5m
Unknown at this stage	DSV	GT – TBC DL – 16m	Anchor spread / spud legs	Unknown at this stage
Unknown at this stage	Multicat	GT – TBC DL – 26m	Potential for spud legs to be deployed	3m
Unknown at this stage	Crew transfer vessel	GT – TBC DL – 17.8m	Unknown at this stage	Unknown at this stage

GT- Gross Tonnage – DL – Dimension Length

5.2.2 Seabed Preparation

5.2.2.1 Pre-lay Survey

Prior to lay operations commencing, a pre-lay survey may be conducted. This will be undertaken using camera mounted on a work-class Remotely Operated Vehicles (ROV). The objective of the survey is to:

- Identify and investigate possible debris;
- Note any changes that have occurred since the previous survey; and
- Identify any obstructions on the proposed route including the presence of boulders which may impede the safe installation of the cable.

A summary of the survey equipment that may be used during the pre-lay survey is outlined in Table 5-3.

Table 5-3 Examples of Proposed Survey Equipment

System / Survey Equipment	Description
Geophysical	
Ultra-Short Baseline (USBL)	USBL systems are used to determine the position of subsea survey items, including ROVs. This involves the emission of sound from a vessel-mounted transducer to a subsea transponder, thereby introducing sound into the marine environment. A USBL system consists of a transducer, which is mounted on the vessel and a transponder attached to the ROV. The transducer transmits acoustics through the water and the transponder sends a response which is detected by the transducer. The USBL calculates the bearing and time taken for the transmissions to be completed and thus the position of the subsea equipment is determined. These systems can either be used continuously or intermittently through the operation they are supporting.
Seabed Imagery	
Hi-Resolution Camera	An ROV mounted camera will be utilised to acquire imagery of the seabed.

5.2.2.2 Boulder Removal

If required, boulders will be relocated within the marine licence survey corridor using a grab tool deployed from a suitable crane, as shown below in Figure 5-12. An ROV will assist with positioning of the boulder grab. The requirement for boulder removal will be dependent on the results of detailed route engineering.

If debris or an obstruction cannot be removed from the planned route, the offshore surveyors will micro-route around the debris/obstruction in consultation with the onboard Client Representative (CR). Any micro-routing will always remain within the licenced installation corridor.

Debris identified and removed along the route will be disposed of as outlined in the marine Construction Environmental Management Plan (CEMP) (Intertek document reference P2816_R6691).

Figure 5-12 Example of Boulder Grab



Source: Jan De Nul, 2025

5.2.2.3 Pre-lay Grapnel Run (PLGR)

Any obstructions or debris which cannot be avoided will be removed, if possible. A Pre-lay Grapnel Run (PLGR) may be undertaken to remove debris from the proposed installation corridor. A PLGR may be required to remove debris for example cables, chains, wires, ropes, and fishing gear. Therefore, it is expected that this activity will be completed prior to the cable installation activities to ensure that the installation corridor remains free of debris prior to installation. A typical grapnel train is shown below in Figure 5-13. Multiple PLGRs both end to end or perpendicular to the route may be required within the licenced installation corridor to remove debris. In the event that Out Of Service (OOS) cables are required to be cleared the cut ends will be secured with clump weights if required to prevent cable movement.

Figure 5-13 Grapnel Train (Typical Example)

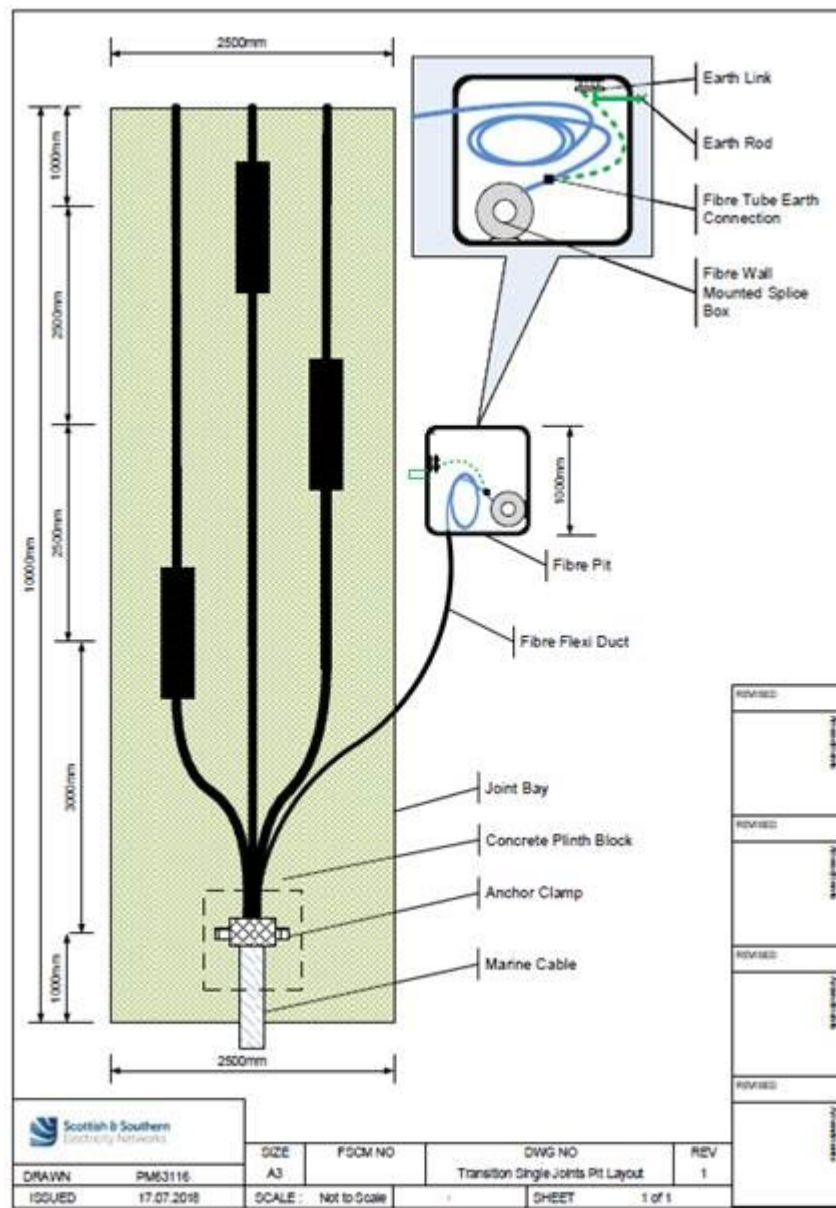


Source: Jan De Nul, 2025

5.2.3 Transition Joint Pit (TJP)

The TJP will be the location where the subsea cable is split out into its individual cores and terminated to a land cable. The TJP at each landfall is located above mean high water springs (MHWS) and will utilise a sea earth. As the Marine Licence Application Corridor only covers up to MHWS details on the TJP are only included in this report to provide further information on the Project. Figure 5-14 outlines the TJP plan for both landfalls on Loch Pooltiel and Ardmore.

Figure 5-14 SSEN Provided TJP Plan (Typical)



5.2.4 Intertidal Cable Installation

5.2.4.1 Open Cut Trench

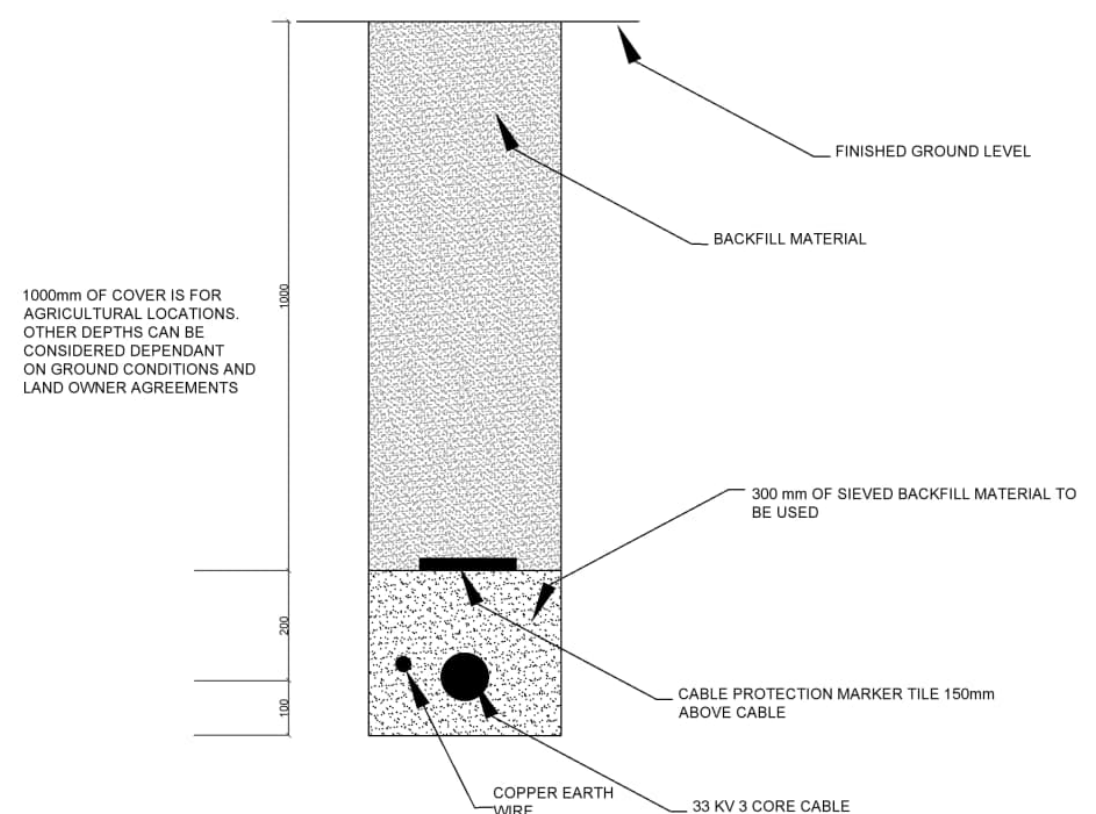
At both landfalls, the cable will be buried within the intertidal area using an Open Cut Trench (OCT) (Figure 5-15) method, from the MHWS to mean low water springs (MLWS). Each landfall will have two trenches excavated, one trench will be for the subsea cable and armour earth, while the other trench is for a FO cable earth. There is the potential for one trench to be used instead, however this is subject to final design and is therefore not yet confirmed. Trenching will be undertaken using 1 x 20 tonne and 1 x 8 tonne excavators (complete with rock pecker attachment, for areas of bedrock).

The trenches will be approximately 1m in width, and the target depth of the trench will be approximately 0.8m from ground level to the top of the cable. However, this is subject to ground conditions at the landfall such as the soil stability and the nature of subsurface sediments. Excavators complete with rock pecker attachment will be utilised to reach the depths required to bury the cable

in the intertidal zones of each landfall. Split pipe will be used to protect the cable in the intertidal where burial cannot be achieved.

Each landfall's OCT will require a 20m corridor width to conduct the works which will be sufficient space to operate the excavator and temporarily store the excavated material. The length of the intertidal excavation sites will extend to approximately 100m at Loch Pooltiel and 200m at Ardmore. Additional groundworks and boulder relocation may be required due to the nature of the local area, which will ensure accessibility as well as to facilitate the positioning, moving and anchoring of pull-in equipment in the intertidal area. Once the groundwork activities are completed, the excavated material will be backfilled into the trench (potentially alongside additional sediment if required), returning the intertidal area to pre-works conditions.

Figure 5-15 Indicative Trench Section View



Source: Jan De Nul, 2025

5.2.5 Marine Cable Installation

5.2.5.1 First End Pull In

The CLV will position at the first end pull-in site (South Uist), generally stationed at the 15m water depth (WD) contour. Deck handling equipment will be used to direct the cable to the over-boarding chute.

A winch wire will be taken from the shore to the CLV via a support vessel. This will be connected to the shore winch line at MLWS. The small support craft will then pull back the mooring line and pull-in winch wire from the shore to the CLV where it will be connected to the cable end. The shore end winch will commence pulling in the cable with buoyancy units attached onto the cable as it leaves the vessel to float the cable ashore (Figure 5-16) – these units are removed once the cable has been fully pulled in onshore. The cable may be pulled in with cable protection already applied, such as cast-iron shell protections.

Figure 5-16 Cable During First End Pull-In Operations



Source: Jan De Nul, 2025

Cables will be pulled onto land using one winch per landfall (Figure 5-17) along with a combination of rollers and quadrants (Figure 5-18). This equipment will allow the cable to be safely pulled ashore without any damage. Rollers will be used to support the flow of the cable as it is pulled in using the winches, and the quadrants are used to ensure that the cable is pulled into the intertidal area in the correct alignment. Anchor plates may hold the rollers and quadrants in place while the process of the pull in takes place (alternatively an excavator can hold the rollers in place). All rollers and quadrants are temporary installations and will be removed once the cable has been fully pulled ashore. Additional pull-in aids may consist of temporary route deviation structures which can be gravity based and/or anchored if required, which will assist to bring the cable onshore as per the RPL. The expected footprint of these structures is approx. 20m² per landfall.

The cable will be secured at the TJP and surface swimmers and/or divers (if required) will gradually remove any remaining buoyancy units, allowing the cable to come to rest on the seabed and completing the first end pull-in operations.

Figure 5-17 Example of Pull-In Winch



Source: Jan De Nul, 2025

Figure 5-18 Example Images of Pull-In Setup



Source: Jan De Nul, 2025

5.2.5.2 Cable Lay Operations

Following successful completion of the first end pull in, the CLV will commence laying the cable on the seabed from the first end to the second end. Expected cable laying speed will be between 200m/h and 450m/h. DSV (utilising either spud legs or anchors), nearshore and guard vessels may also be required during cable lay operations. This will continue until the CLV reaches the 15m water depth contour at Loch Pooltiel.

During cable lay operations, the vessel crew will monitor the lay to ensure the cable is laid within the consented installation corridor and that the mechanical parameters of the cable are adhered to. A work class ROV may be used for Touch Down Monitoring (TDM) during installation, which contains a camera and USBL system to ensure accurate images of the installation are sent to the crew on the CLV for assessment.

During these operations, the vessel structure may be outside the licenced corridor however all deposits will be installed within the allocated boundary. Vessel movements will be notified by Notices to Mariners (NtM) to inform other sea users as outlined in the FLMAP.

5.2.5.3 Second End Pull In

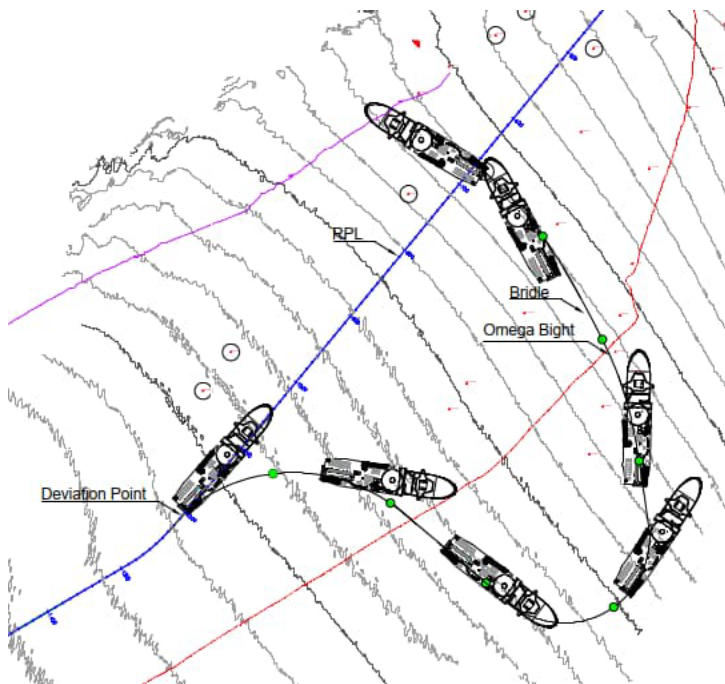
Once the cable is laid across the seabed, the vessel will either manoeuvre off the RPL and float the cable off the vessel or remain in position on the RPL and pay out cable into a floated omega bight (Figure 5-19). This is to allow the cable to be cut at the required length prior to pulling the cable into the second end landing point at Loch Pooltiel. Support vessels will ensure the cable is held within its design limits to prevent any damage.

The bight may be outside of the cable installation corridor whilst in the water column at certain points during deployment, however final installed position will be within the boundary of the licenced area. The supporting FLMAP and MEA references the notifications issued to sea users to inform which activities are taking place. Navigational broadcasts will be issued via Navigational telex (NAVTEX) and NtMs.

As per the first end, buoyancy units will be attached to the cable as it is being paid out from the vessel to float the cable ashore. Once the cable is floated out into a bight and is long enough to reach the TJP, it is cut and sealed.

The cable end is then taken to shore by a support vessel where a winch wire is connected. The cable will then be pulled into the second end landing point. The same equipment as discussed in Section 5.2.5.1 will be utilised for the second end pull in. Surface swimmers and/or divers (if required) will then gradually remove the buoyancy units allowing the cable to come to rest on the sea floor. The shore winch will pull in any slack to complete installation operations.

Figure 5-19 Example of a Second End Omega Bight



Source: Jan De Nul, 2025

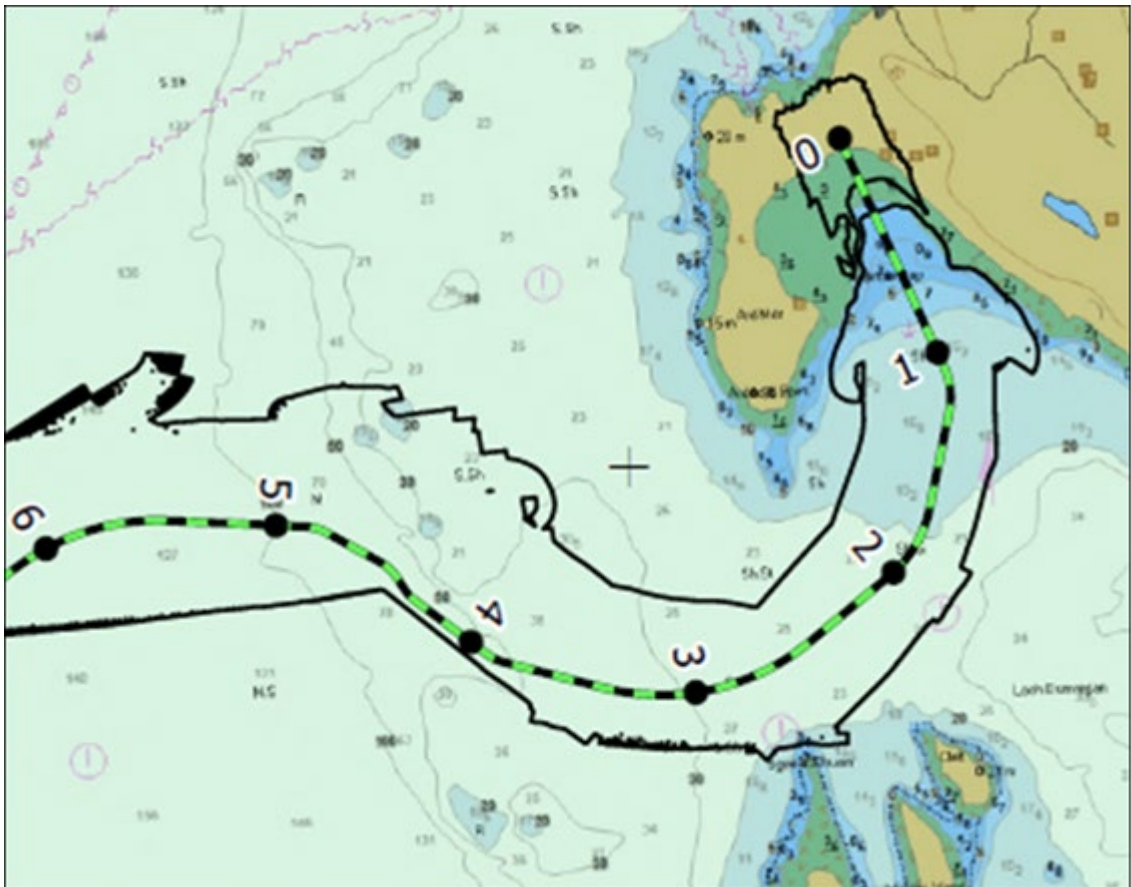
5.2.5.4 Proposed Cable Installation Methodology, Ardmore Bay

In order to minimise impact on protected habitats, at Ardmore Bay the cable will be installed via open cut trench from the TJP out to 200m along the cable route as described in Section 5.2.4. From the 200m point, cast iron split pipe will be installed on the cable to KP 1 (all KPs in relation to the proposed cable route are shown in Figure 5-20). From this point onwards, trenching will be attempted for the route heading seawards. The success of trenching is dependent on soil conditions, and should trenching not be completed the following stabilisation measures are likely to be required:

- KP 1.0 – 1.2 – 4 x 4 tonnes rock bags with 50m spacing between each; and
- KP 1.2 – 1.6 – 3 x 4 tonnes rock bags with 100m spacing between each.

Beyond this point within Ardmore Bay the cable has been modelled as stable without any additional protection measures, even if trenching is unsuccessful.

Figure 5-20 Proposed Cable Routeing with KP Markers in Ardmore Bay



Source: Jan De Nul, 2025

5.2.6 Cable Protection Methods

This section outlines the envelope of all potential marine cable stabilisation and protection methods for which consent is being sought.

Upon completion of the OBS Assessment for the Loch Pooltiel to Ardmore route it will be possible to better identify the quantities of cable protection and stabilisation to be employed along the route.

Split pipes and Sea Earths will be utilised to provide protection for the replacement cable. Worst case scenario quantities, dimensions and weight for each protection method is provided Table 4-1 in Section 4.2, and is the basis of the assessment made in the MEA.

5.2.6.1 Post-Lay Trenching

Once the cable has been laid, burial will be attempted along the entire route where seabed conditions allow. This will be completed using a trenching ROV which is launched from a support vessel. The ROV will bury the cable using either a jetting or cutting tool or a combination of both (hybrid tool). Table 5-4 provides the specifications for each burial option.

A controlled flow excavator (CFE) may also be used to bury the cable in areas of steep slopes where trenching is not feasible. A high-pressure water jet is used to disperse seabed sediment to give a flatter area for the cable to be laid through.

Table 5-4 Burial Option Specifications

Mode	Maximum Width	Maximum Length	Weight in Air	Capability
Jetting	9m	12.5m	Order of 45 tonnes	Sand and clays up to 125kPa
Cutting / hybrid	10m	12.5m	Order of 45 tonnes	Cemented sand and clays up to 400kPa
Controlled Flow Excavator	N/A	Up to 4m	Order of 10 tonnes	CFE may be used for burial in areas of steep slopes and areas where challenging soil conditions and boulders are present.

5.2.6.2 Split Pipe (Articulated Pipe)

The cable protection strategy includes the installation of cast-iron articulated pipe or Uraduct. Generally, this is installed following the cable pull-in operations by divers or from the CLV during lay, or by a combination of both methods. This protects and helps stabilise the cable in the nearshore and intertidal section of the cable route.

See the cable protection and stabilisation plan detailed in Table 4-1 for the length of anticipated articulated pipe installation.

Figure 5-21 Example Cast Iron Shell Installation



Source: Jan De Nul, 2025

5.2.6.3 Concrete Mattresses

Concrete mattresses may be used in areas of low/ no burial (Figure 5-22). One FO cable will be crossed during the installation. At the BT FO crossing location, concrete mattresses are proposed to protect both assets. It is anticipated that four mattresses will be used pre-lay and one post-lay.

Figure 5-22 Concrete Mattress Prior to Installation

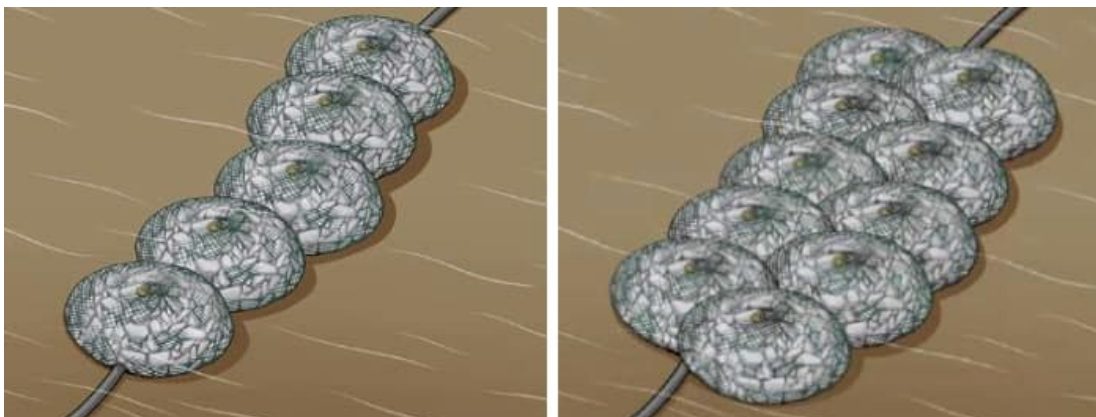


Source: Jan De Nul, 2025

5.2.6.4 Rock Bags

The cable protection strategy may include the installation of rock bags onto the cable to provide stability if required (Figure 5-23). The rock bags will be stored on the vessel and lifted into position using the vessel's crane. The vessel's ROV will monitor the installation and detaches the crane wire from the rock bag once in position. Where practicable, the rock bags will be filled with rock local to the Application Corridor. The rock bags may be installed as soon as the cable is laid using an additional vessel.

Figure 5-23 Example rock bag configuration



Source: Jan De Nul, 2025

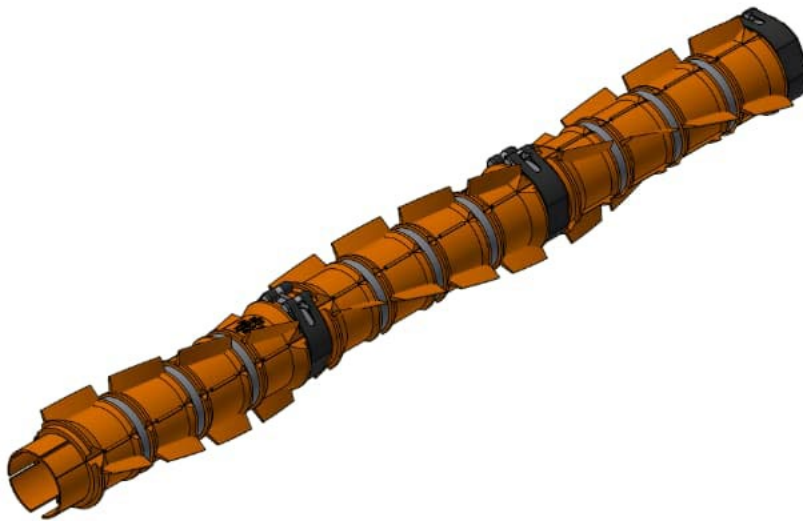
5.2.6.5 Grout Bags

Grout bags may be used to rectify any cable free spans that are observed once the cable has been installed. These would be installed similarly to rock bags, but may require a diver to position individual bags.

5.2.6.6 Cable Protection System

Vortex-induced vibration (VIV) protection may be used as a type of cable protection system (Figure 5-24). Each VIV until is clamped onto the cable along sections with a risk of excessive fatigue because of expected cable free spans. This type of CPS had strakes (“fins”) in their design to mitigate the VIV.

Figure 5-24 Visualisation of a VIV Protection System



Source: Jan De Nul, 2025

5.2.7 As-built Survey and Site Reinstatement

Following completion of the cable installation, a post-installation survey of the installed cable and associated protection measures will be conducted utilising a similar survey spread as listed in Section 5.2.2.1. The purpose of the survey is to confirm the as-built positions, as well as ensuring that the design and marine licence requirements have been met. The survey will record the as-installed position of the cable from TJP to TJP and the deposits utilised to stabilise and/or protect the cable given (i.e. rock bags, mattresses, articulated pipe etc.). The landfall sites will also be reinstated as agreed with landowners. The replacement cable will subsequently be electrically jointed to the land HV infrastructure. The routing and installation of the land HV infrastructure is not covered as part of this Project Description which supports the marine licence application.

Details of the as-built locations of the cable and associated protection measures will be provided to the UK Hydrographic Office and the Kingfisher Information Service for inclusion on Admiralty Charts, and Offshore Renewable and Cable Awareness Charts, respectively.

REFERENCES

1 HydroFix (2024) SSEN Skye Loop Cable – Desk Top Study Cable Route Assessment, Rpl & Survey Area (H24007-REP-001)

2 Jan De Nul (2025). Consenting Support Information.

3 Ocean IQ (2023). Skye to South Uist Desk Top Study (4065-GMSL-G-RD-0003).

4 A2Sea (2025). Skye Interlink Results Report - Geophysical & Geotechnical

5 SSEN (2018). Transition Single Joint Pits layout.
