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## NKT Rock Dump Method Statement for new ML application

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Caithness-Moray HVDC Link: Outline Method  
Statement for Additional Rock Placement  
Works  
for  
NKT



Project Ref: J/7/54/17	Originator: Claire Griffiths
Date: November 2017	Circulation: Restricted - commercial in-confidence

## Caithness-Moray HVDC Link: Cable Remediation Marine Licence Application – Outline Method Statement

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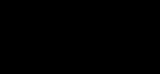
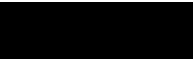
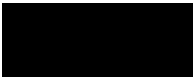




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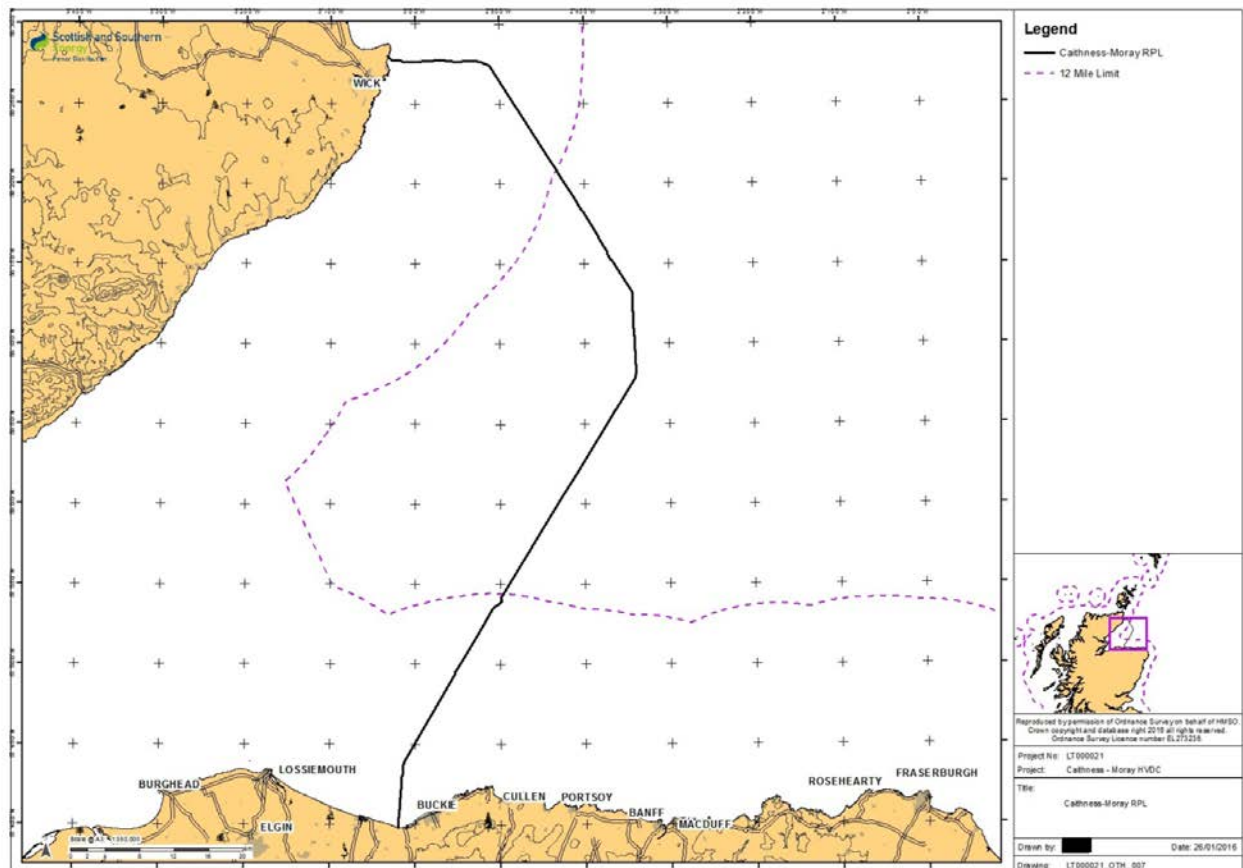
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# 1. Introduction

## 1.1. Project background

Scottish Hydro Electric Transmission Plc (SHET) have developed a High Voltage Direct Current (HVDC) electricity transmission link between Caithness (Noss Head) and Moray (Portgordon), collectively known as the Caithness HVDC Reinforcement (C-M) project.

**Figure 1.1: Location of the Caithness-Moray HVDC link (SSE, 2011)**



## 1.2. Status of project

Offshore installation of the cables commenced in Q2 2017 and is currently ongoing. Initial offshore works involved trenching along the cable route so that the cable could then be laid in the trench and backfilled. The trenching works were undertaken over the course of summer 2017. The cable laying and backfill operations were subsequently undertaken in late summer. At the time of writing it is understood that the cable has been successfully laid in the trench along parts of the route but in other areas it is surface laid, due to the initial trenching works not being able to create a suitably sized trench. Additional jet trenching works are ongoing as are rock placement works over areas of the cable where burial is judged to be not possible.

### 1.3. Purpose of this document

Additional amounts of rock placement over and above amounts currently consented are required to provide the necessary level of protection to the C-M cables. SHET have been advised by Marine Scotland that new Marine Licences will be required to permit the deployment of this increased amount of rock placement. **All of the proposed additional rock placement will be within the 12 nm limit at both the Portgordon and Noss Head ends of the cable.**

To accompany the Marine Licence application Marine Scotland have requested that SHET provide a method statement that provides details of the proposed additional rock placement works. This document represents the method statement requested by Marine Scotland and includes the following information:

- Details of the methods of installation of the additional rock protection (plus any associated activity e.g. post-deployment surveying etc;
- Charts detailing profiles of all proposed rock deposits, including information on heights above sea bed (for berm features), areas of backfill and areas of backfill over rock etc; and
- Details of the type of vessels that will be used to undertake the works along with information on how they will operate.

This method statement document is one of a set of documents that have been prepared on behalf of SHET to support this Marine Licence application (see list below) and, as such should be read alongside these other reports.

#### ***Other Reports produced to support this Marine Licence Application***

- **Environmental Appraisal** – appraisal of the potential environmental impacts of the increased rock placement activities on the C-M project. This includes a review of original impact assessments related to rock dumping/protection presented in the project Environmental Statement (SSE, 2011) vs new (larger) amounts of rock proposed as well as a standalone Appendix that presents a detailed Marine Protected Area (MPA) assessment; and
- **Environmental Management Plan** – Updated subsea cable installation phase EMP (ABB, 2015) to ensure that any additional impacts/control measures relevant to the additional rock placement works are covered. The updated EMP also includes details of emergency procedures, including an organogram of staff and how emergency situations will be managed and notified.

## 2. Scope of Proposed Works

### 2.1. Introduction

The following section of this method statement sets out the scope of proposed works being applied for via this new Marine Licence application along with details of installation methods, areas of seabed where the works are proposed, the spatial extent and heights of proposed rock dumping and any other relevant information, such as surveys.

### 2.2. Overview of works

The planned rock placement campaign comprises stabilisation and protection works at various locations along the C-M route, **all of which are within the 12 nm limit**. The rock placement is required in (a) areas where no trenching is foreseen; (b) where the soil conditions are deemed unsuitable for trenching and (c) in areas where the required Depth of Lowering (DOL) was not met during the trenching campaign.

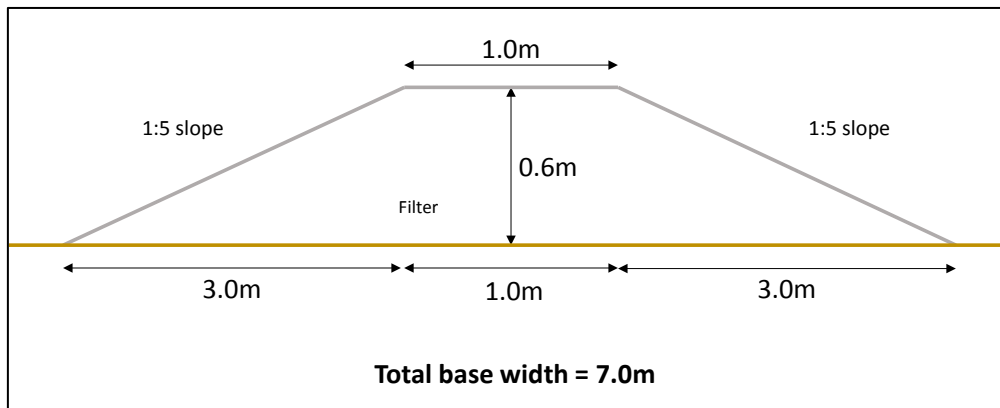
In order to reach sufficient cover of the cable in all sections and to fulfil the hydraulic stability requirements, six different design types have been defined with respect to the rock placement.

- **Type A:** Trench fill, DOL >0.8m <1.0m;
- **Type B:** Trench fill, DOL >0.7m <0.8m;
- **Type C:** Trench fill, DOL >0.7m;
- **Type D:** Single layer above Mean Sea Bed Level (MSBL), DOL < 0.6 m or no trench;
- **Type E:** 2 layer berm above MSBL, DOL < 0.6 m or no trench; and
- **Type F:** 2 layer berm above MSBL, DOL < 0.6 m or no trench.

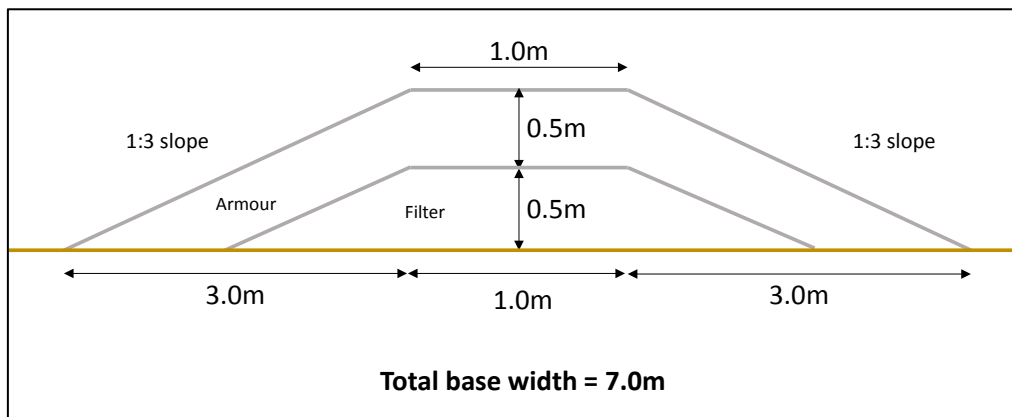
Cross-sectional profiles of Types D, E and F (berms that will be above seabed level) are shown below in Figure 2.1.

Figure 2.1: Proposed rock berm types

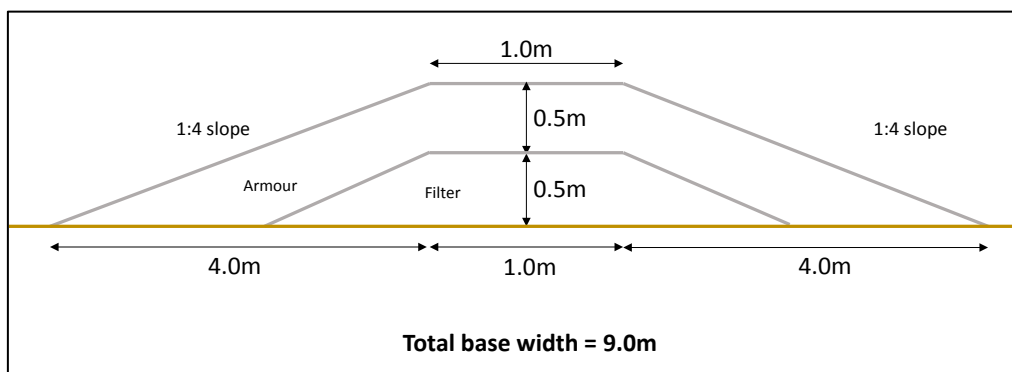
Type D:



Type E:



Type F:





## 2.3. Quantities and Locations of Rock Placement

The quantities and locations of additional rock placement being applied for by these current Marine Licence applications have been determined via a series of engineering studies and assessments, including, but not limited to the following reports:

- Technical report rock berm stability and impact calculations;
- Technical report rock losses by settlement and penetration;
- Technical report carrying capacity of soil; and
- Quantity estimate report.

**Table 2.1: Summary of rock placement amounts/type being proposed in new Marine Licence applications**

Area	Rock amounts (Te) already permitted (existing ML's)	ML Ref	Known amount required *	Additional amount estimated to be required (following jet trenching)	TOTAL amount required	Amount to be included in new Marine Licence Application ***	Length of berms that will be above Mean Sea Bed Level (MSBL)	Footprint of berms above MSBL (assuming 5m base width)
<b>Noss to 12nm (North Cable)</b>	18,000	<b>04368/17/2</b> Noss Head to Hub	127, 187	5,000	109,937	<b>109,937</b>	9.5 km	0.047 km <sup>2</sup>
<b>Offshore</b>	122,369	<b>06043/16/0</b> outwith 12 nm	86,043	15,000	101,043	<b>0</b>	5.04 km **	0.025 km <sup>2</sup>
<b>Portgordon to 12nm (South Cable)</b>	67,260	<b>04878/13/0</b> Portgordon to Marine Cable	71,450	40,000	111,450	<b>44,190</b>	6.07 km	0.030 km <sup>2</sup>

\* Based on a range of engineering studies and assessments

\*\* Additional rock placement within the 12 nm to 12 nm (offshore) zone is not being applied for in these two new Marine Licence applications.

Figure 2.2: Location of proposed cable protection along the Caithness-Moray HVDC (Portgordon to 12nm limit)

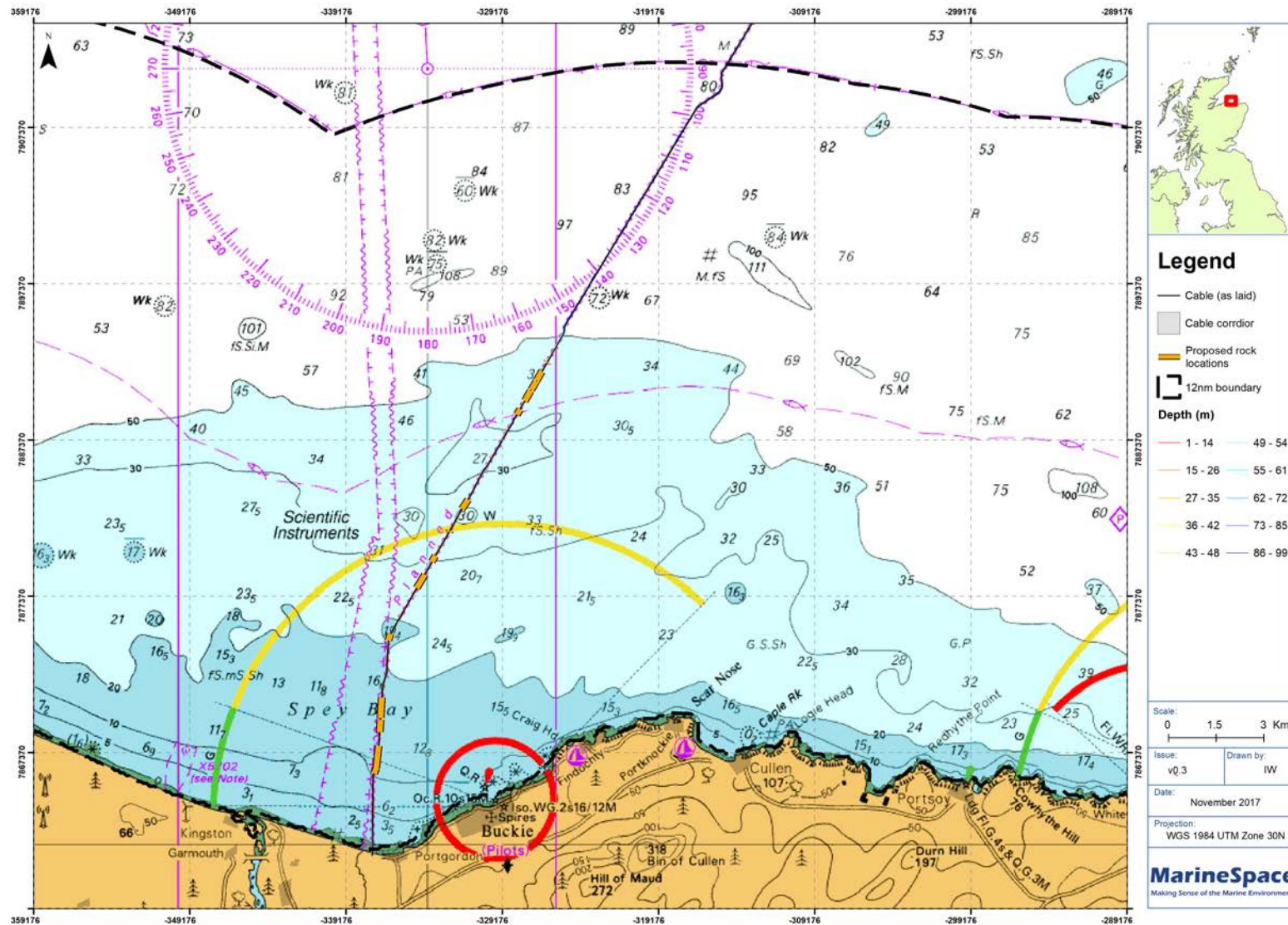
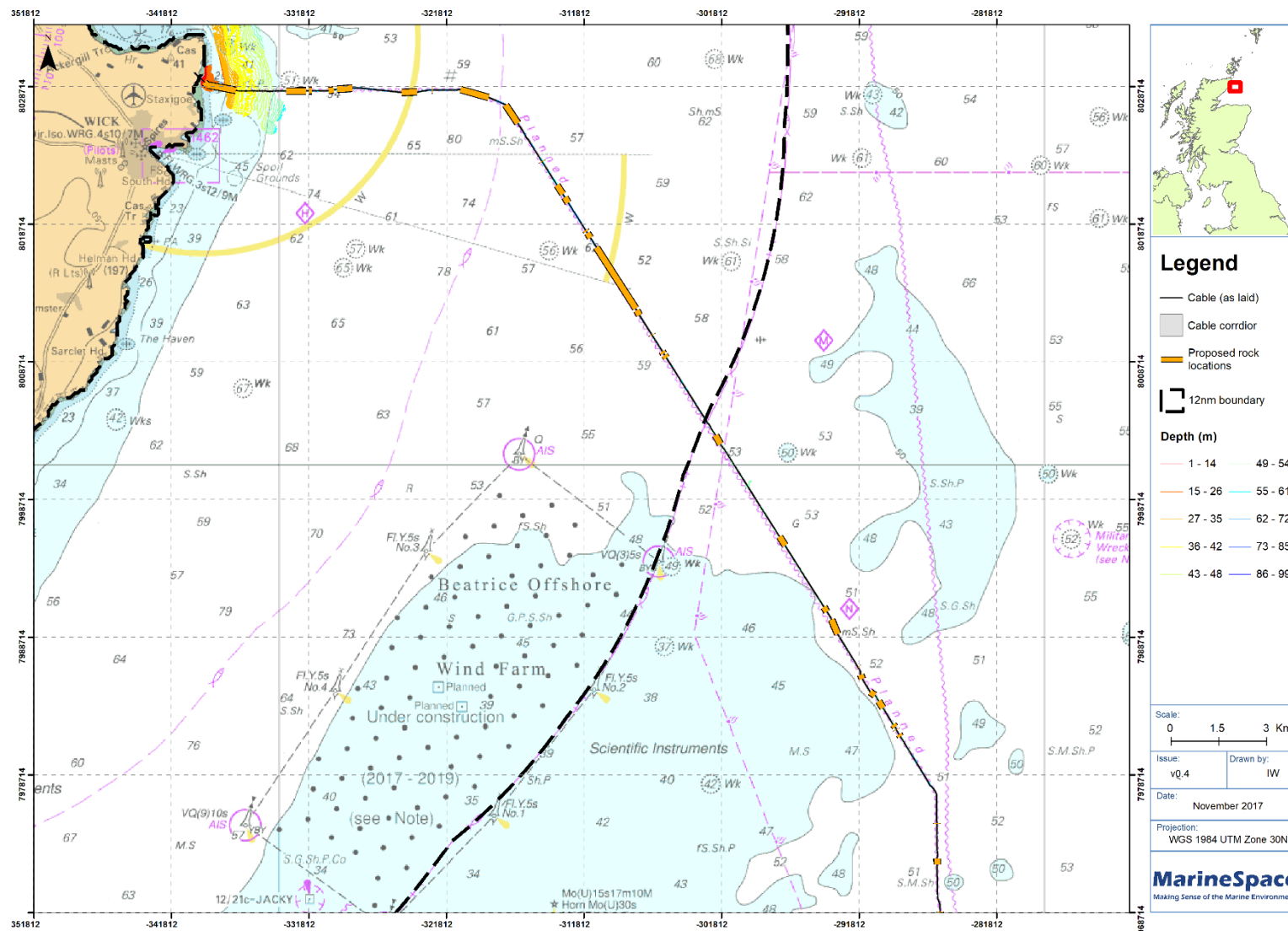


Figure 2.3: Location of proposed cable protection along the Caithness-Moray HVDC (Noss Head to 12nm limit)



## 2.4. Source and Type of Rock

The rock proposed to be used in the additional rock placement works will be the same as that used for the rock protection works that are already consented. As way of summary, the specifications of rock will comply with the requirements and specifications as defined in CIRIA Publication C683, The Rock Manual. This publication refers to European standards for testing of aggregates, more specifically EN 13383.

It is anticipated that rock will be source from a series of quarries in Norway. Only crushed fresh and un-weathered rock will be used and all the rock shall be of sound origin, chemically stable, strong, hard, durable, and of limited porosity. Furthermore, all the rock will be free of adhering coatings, clay lumps, coal/coal residue, contamination from hazardous materials and organic materials in such quantities that the constructive application of the quarried rock and/or environment is compromised.

## 2.5. Offshore Methodology

### 2.5.1. Overview

The rock placement activities will be executed with Dynamic Positioned Fall Pipe Vessels (DPFPV's) such as the *Flintstone*, *Tideway Rollingstone* or *Seahorse*. This type of vessel is positioned by suitable Differential Global Positioning Systems (DGPS) that are used as input to the vessel's Dynamic Positioning (DP) system. The DP system controls all propulsors present on the respective vessel. In general this consists of two main thrusters, retractable thrusters and bow thrusters. By controlling the forces generated by these propulsion systems, the vessel can be kept in a precise position or programmed to sail along a pre-set track at a specified speed while placing the rock.

This type of DPFPV are purpose built vessels for the accurate placement of rock/gravel material in a controlled manner by using a fall pipe. The fall pipe is deployed through a "Moonpool" in the centre of the vessel. A remotely operated vehicle (ROV) operates at the bottom end of the fall pipe. Additionally, some DPFPV's (such as *Tideway Rollingstone* and *Seahorse* are also equipped with an inclined fall pipe system (IFPS) or Rock Side Dumping Unit (RSDU). The inclined systems are used for hard to reach location in shallow waters or close to structures.

### 2.5.2. Work Sequence

#### **Fall Pipe Set-Up**

1. Upon arrival of the DPFPV in the field, the integrity of the positioning system and survey system will be verified;
2. For safety reasons deployment of the Fall Pipe (and recovery of the Fall Pipe) will be done, where possible, at a minimum distance equal to the water depth away from any subsea asset (subject to seabed topography);
3. After the Fall Pipe has been built up to the required water depth, the vessel will move into the work area.

### ***On-Site Preparation***

1. Upon each arrival on site the operational systems (including positioning equipment) will be checked and environmental conditions will be monitored;
2. Once the results of these checks are satisfactory the Fall Pipe will be launched;
3. During the Central Fall Pipe work when the vessel is in position, the Fall Pipe Remote Operated Vehicle (FPROV) will be positioned at working depth i.e. approx. 10-20 metres above the seabed for survey and approx. 6-12 metres for rock placement. A minimum height of 3 m and a maximum height of 25m above any subsea asset will be kept at all times during rock placement.

### ***Pre-Rock Placement Survey***

1. Prior the start of any rock placement activities pre-rock placement survey will be carried out, which will include all operations, which contribute to establish the undisturbed seabed, or any other object within the work area topography;
2. Each pre-rock placement survey will be performed using the FPROV as a stable platform. For a pre-survey the FPROV may be launched independently from the fall pipe. The typical height of the FPROV above seabed depends on the required data resolution, rock berm design width and height of subsea structures;
3. For inclined fallpipe works the survey will be performed using the side survey boom as a stable platform;

### ***Rock Placement Operations***

1. Rock placement will follow a carefully developed task plan which will be based on the results of the pre-rock placement survey data. This plan will function as a guideline for all personnel involved in the rock placement operations and will show typical information such as: start and stop KP, amount of runs, quantity to be dumped, etc;
2. After completion of the required trials, the excavators in the bunkers will start loading the rock onto longitudinal conveyor belts located along the starboard side of the vessel. These two conveyor belts feed a central “buffer” hopper located adjacent to the Stone Dumping Unit (SDU) on the same side of the vessel. A feeder, underneath the central “buffer” hopper, controls the rate at which material is fed into the fall pipe by a central conveyor belt. The rock is guided to its destination by the fall pipe;
3. The amount of rock placed per linear meter is a function of the rock flow rate and the vessel tracking speed. The rate can be controlled by adjusting the outflow of the central hopper feeder, whereas with the DP system the tracking speed can be adjusted. In this way the rock placed per linear meter can be controlled;
4. Monitoring of placed quantities will be done by means of a Belt Weighing System. This system registers continuously how much weight of rock is being placed in certain sections. These registered weights are being corrected at the end of each trip by comparing the total output over all sections as measured by the belt weighing system, to the 3rd Party draft survey of the vessel for the whole load of rock. In this, the draft survey is leading;



5. During rock placement operations, outputs from the vessel mounted Multi-Beam Echo-sounder (MBE) and the vessel navigation screen will provide sufficient information to the FPROV pilot to enable it to compare the actual rock berm deployed with the theoretical design in a continuous way. This allows the FPROV pilot / DP operator to monitor the progress and build-up of the rock material in real time;
6. The thrusters on the FPROV will also allow positioning of the Central Fall Pipe end precisely above the rock placement location. For larger movements in lateral direction to the sailed track the vessel's DP system will be used.

#### ***Post-Rock Placement Survey***

1. After execution of the rock placement operations, a post-survey will be executed and will be compared to the pre- and eventual intermediate surveys to establish the fulfilment of the specifications (and the consented parameters/locations);
2. The key output of the post-rock placement survey will be a Digital Terrain Model (DTM) chart which will be matched onto the pre-rock placement DTM survey using appropriate reference points.

## **2.6. Health Safety and Environmental Management**

The proposed rock placement installation contractor have Company-Level Health and Safety Manual and Environmental Manuals which describe the safety, environmental and security management system for the execution of Rock Placement Works with a Fall Pipe Vessel. However, the rock placement contractor will adhere to project-specific Health, Safety and Environmental Management documents prepared and managed by the lead offshore contractor, NTK.

With specific reference to environmental controls, all vessels that will potentially be used in these activities will possess Shipboard Oil Pollution Emergency Plans (SOPEP's) as well as Waste Management Plans. However, as per Health and Safety, the key document related to environmental management of these proposed rock placement activities will be the project-level Construction Environmental Management Plan (ABB, 2015<sup>1</sup>).

Noting that the C-M project is located in an area that supports populations of marine mammals, due consideration of these species is required during all works. A European Protected Species (EPS) risk assessment and consent application has been lodged to cover these proposed works. The supporting Environmental Appraisal report also contains a standalone Appendix that presents a detailed MPA assessment.

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<sup>1</sup> ABB, 2015. Caithness to Moray HVDC Transmission Appendix 11 - Subsea Cable Environmental Management Plan. Prepared on behalf of ABB by Natural Power Ltd. Document Number 1JND14006D000231.