

SSEN

Pentland Firth East (2) Decommissioning Plan



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DOCUMENT RELEASE FORM

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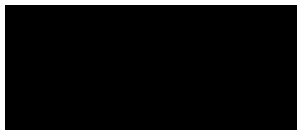
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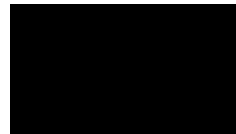
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CONTENTS

	DOCUMENT RELEASE FORM	I
	GLOSSARY	V
1.	INTRODUCTION	1
1.1	Overview	1
1.2	Requirement for a Decommissioning Plan	1
1.3	Relevant Qualifications / Experience of Authors	2
2.	BASELINE INFORMATION	3
2.1	PFE (2) Description	3
2.2	Description of Items to be Decommissioned	3
2.3	Physical Environment	4
2.4	Protected Sites	5
2.5	Biological Environment	7
2.6	Anthropogenic Environment	10
3.	STAKEHOLDER ENGAGEMENT	14
4.	DECOMMISSIONING	15
4.1	Guiding Principals	15
4.2	Decommissioning Approaches	17
5.	CONSIDERATION OF FACTORS INFLUENCING APPROACH SELECTION	19
5.1	Environmental Review and Impacts of Removal Methods	19
5.2	Interaction With Other Sea Users	32
5.3	Decommissioning Option Appraisal Conclusion	32
6.	DECOMMISSIONING SURVEY AND VERIFICATION	34
6.1	Survey Requirements	34
6.2	Disposal Costs	34
6.3	Decommissioning Verification	34
7.	HEALTH, SAFETY, SECURITY & ENVIRONMENT (HSSE)	35
	REFERENCES	36

APPENDIX A As-built Pentland Firth RPL

A-1

LIST OF TABLES AND FIGURES

Tables

Table 2-1	Summary of PFE (2)	4
Table 5-1	Environmental Impact of Operations	20
Table 5-2	Potential impacts of cable removal – intertidal	26
Table 5-3	Potential impacts of cable removal – subtidal	27
Table 5-4	Option Appraisal	32

Figures

Figure 2-1	Installed cable structure (Global Marine 2019)	3
Figure 4-1	Guiding Principles for Pentland Firth East (2) Decommissioning	15
Figure A-1	As-built Pentland Firth RPL	A-2

GLOSSARY

AFL

Agreement For Lease

AIS

Automatic Identifications Systems

BAP

Biodiversity Action Plan

BPEO

Best Practice Environmental Option

CFE

Controlled Flow Excavator

CPS

Cable Protection System

DWA

Double Wired Armour

EMF

Electromagnetic Fields

ESCA

European Subsea Cables Association

ESI

Environmental Supporting Information

FLMAP

Fishing Liaison Mitigation Action Plan

HDD

Horizontal Directional Drilling

HSSE

Health, safety, Security and Environment

ICES

International Council for the Exploration of the Seas

ICPC

International Cable Protection Committee

IMO

International Maritime Organisation

INNS

Invasive Non-Native Species

MFE

Mass Flow Excavator

MLA

Marine Licence Application

MMO

Marine Management Organisations

NCMPA

Nature Conservation Marine Protected Area

OOS

Out Of Service

PFE (2)

Pentland Firth East (2), installed 2020

ROV

Remote Operated Vehicle

RPL

Route Position List

RSPB

Royal Society for the protection of Birds

RYA

Royal Yachting Association

SAC

Special Area of Conservation

SNH

Scottish Natural Heritage

SHEPD

Scottish Hydro Electric Power Distribution

pSPA

proposed Special Protection Area

SPA

Special Protection Areas

SSEN

Scottish and Southern Electricity Networks

SSSI

Site of Special Scientific Interest

UK

United Kingdom

UNCLOS

United Nation Convention on the Law of the Sea

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.

Two cables (Pentland Firth East and Pentland First West) form the subsea connections from Orkney to the Scottish mainland. Both cables make landfall at Murkle Bay on the Scottish Mainland and Rackwick Bay on Hoy. The Pentland Firth East (1) cable was replaced with PFE (2) and de-energised in 2020, however, a fault occurred in January 2021 on the PFE (2) cable, and it has been determined a new cable will be required to ensure security of supply. At present the previously de-energised Pentland Firth East (1) cable has been reconnected pending installation of a new Pentland Firth East (3) cable. It is proposed that the PFE (2) cable will be decommissioned in as far as this is required in order to facilitate installation of Pentland Firth East (3). SHEPD are applying to Marine Scotland for a marine licence to carry out these works.

This Decommissioning Plan presents the proposed approach to decommissioning regarding the marine elements of the faulted PFE (2) cable.

1.2 Requirement for a Decommissioning Plan

On 8th July 2020 Marine Scotland granted Marine Licence 07207/20/0 to SHEPD for the installation of the Pentland Firth East (2) cable. Licence Condition 32 of this consent states:

“The licensee must, two years prior to the predicted end of life of the cable or immediately in the case of cable faulting, submit a decommissioning plan to the licensing authority for approval. The plan must be based on best practice at that time. The licensee shall be liable for all costs.”

As described above the PFE (2) cable has faulted and will not be brought back into service. This document presents the decommissioning plan proposed by SHEPD for this cable.

Decommissioning Plans should be a statement of:

1. The measures, methods, and timescales for decommissioning the cable including:
 - a. the parts of the cables to be removed and the methods of removal;
 - b. the parts of the cables to remain in-situ and the measures to make them safe; and
 - c. the necessary measures for the clearance of debris and the restoration of the seabed.
2. The methods of providing post-decommissioning verification that the decommissioning has been completed satisfactorily; and
3. The necessary measures for post decommissioning monitoring, maintenance, and management of the seabed.

The Decommissioning Plan should take account of the following principles:

1. The measures and methods will comply with any legal obligations which will apply to the decommissioning of the cables when it takes place;
2. All sections of the cables will be removed except for any section or sections which it is preferable to leave in situ having regard to the principles in 3. below;
3. The measures and methods will be those which are the best for or minimise the risks to:
 - a. the safety of surface or subsurface navigation;
 - b. other users of the sea;

- c. the marine environment including living resources; and
 - d. health and safety.
4. The seabed will be restored, as far as possible, to the condition that it was in before the cables were installed.

The Decommissioning Plan has been informed by the following guidance:

- International Cable Protection Committee (ICPC) Recommendation No 1 – Management of Redundant and Out-of-Service Cables (Issue 13) (May 2011);
- Decommissioning of offshore renewable energy installation under the Energy Act 2004: Guidance notes for industry (DTI, 2006);
- Decommissioning of Offshore Renewable Energy Installations in Scottish Waters or in the Scottish Part of the Renewable Energy Zone under the Energy Act 2004 Guidance notes for industry (in Scotland);
- Guidance notes for industry: Decommissioning of Offshore Oil and Gas Installations and Pipelines under the Petroleum Act (DTI, 1998);
- ESCA Guideline No. 8 – Guidelines for Submarine Cable Decommissioning, Issue 5, March 2016; and
- Guidelines for environmental risk assessment and management (DEFRA, 2002).

Other guidance and legislation includes:

- United Nation Convention on the Law of the Sea (UNCLOS);
- International Maritime Organisation (IMO);
- OSPAR Convention;
- Hazardous waste regulations 2005;
- London Convention 1972 and the 1996 protocol relating to the prevention of marine pollution by dumping of wastes; and
- Construction design and management regulations (CDM) 2007.

1.3 Relevant Qualifications / Experience of Authors

This Decommissioning Plan has been prepared by Intertek Energy & Water Consultancy Services (Intertek). Intertek is part of the Intertek Group plc, a FTSE 100 listed company quoted on the London Stock Exchange. Previously Metoc, Intertek E&W has been operating since 1983, providing specialist technical services in the marine, coastal and river environments. The company has considerable experience in undertaking interconnector route development, managing and supporting cable route surveys and has led the environmental assessment process on twelve of the interconnectors that connect or are proposed to connect into the UK.

Intertek have overseen numerous subsea cables related technical studies, such as the provision of independent burial assessment study reviews, cable burial risk assessments, landfall and cable routing studies. Intertek provide project management with attention to quality assurance, document management, performance monitoring and project controls for subsea HVDC & HVAC power interconnectors and renewable energy cable arrays. All work is undertaken to the highest quality and professionalism in accordance with Intertek's Quality Assurance Protocols.

2. BASELINE INFORMATION

2.1 PFE (2) Description

The PFE (2) cable was laid and buried for stability, and in locations where there was an identified potential interaction with demersal fishing activity (primarily scallop dredging). In locations where stabilisation was required and where burial was insufficient or not possible, the cable was pinned in place with rock bags.

Split Pipe was installed on the cable at the two shore ends to provide additional protection.

The cable was buried along the cable route, where the soils allowed. The maximum and minimum depth of burial (depth of cover) ranges from a minimum of 0.01m to a maximum of 0.93m below Mean Seabed Level.

2.2 Description of Items to be Decommissioned

2.2.1 Subsea Cables

The now-faulted PFE (2) 33 kV subsea cable is a 400mm three core XLPE (cross-linked polyethylene) conductor with two x 48 fibre optic cables, encased within a double layer of 6mm steel wire armour. The double wired armour (DWA) construction provides the cable with additional mechanical protection and weight. Fibre optics are integral to the power cable for the purpose of cable condition monitoring, control and power systems protection. The cable structure is shown below in Figure 2-1.

Figure 2-1 Installed cable structure (Global Marine 2019)



2.2.2 External Cable Protection

2.2.2.1 Rock Bags

Rock bags were used to pin cable in place and are approximately 2.4m in diameter, 0.6m in height and have a weight of typically 4 tonnes in air.

2.2.2.2 Concrete mattresses

Eight concrete mattresses (6m long by 3m wide) were installed to facilitate the crossing by the PFE (2) cable of two existing fibre optic cables. Each mattress thickness is 300mm, giving a volume per mattress of 5.4m³.

2.2.2.3 Split Pipe or Uraduct

Split Pipe or Uraduct has been installed to protect the cable in the nearshore and intertidal section of the cable route.

Table 2-1 Summary of PFE (2)

Item	Quantity	Comment
HVAC cable	35.789 km	
Rock Bags	378	1512 Te (378 x 4 Te)
Concrete Mattresses	8	80 Te (8 x 10 Te)
Split Pipe / Cast Iron Shells	1850 m	

2.3 Physical Environment

The Orkney Isles are characterised by their strong wind climate. Prevailing winds from between the west and south-east occur for 60% of the year, with an hourly mean wind speed of approximately 4m/s being exceeded 75% of the period between 1965 – 1973 (Barne et al., 1997). The months of October-March feature the strongest winds, with the summer months of June – August being the calmest, with dead-calm days occurring for less than 1% of the year.

The Pentland Firth is subject to some of the strongest tidal currents in the world, with some localised currents having been recorded as reaching 4.5m/s near the seabed at certain points in the tidal cycle (Barne et al., 1997). These high speeds are due to the waters of the Pentland Firth being acted upon by the Atlantic Ocean and North Sea tidal systems, with the net flow of water occurring from west to east (Barne et al., 1997). Typical current speeds along the replacement as-laid cable route do not reach this level, however, with peak speeds reaching approximately 1.5 to 2m/s in some instances (Atkins Geospatial, 2019). During mean spring tides the tidal range varies between 2.5 and 3m, although this can vary in bays and tidal estuaries. The west of Orkney is subject to higher mean wave heights than the east, with mean wave heights exceeding 1m for 75% of the year compared to 0.5m for 75% of the year in the east respectively (Xodus Group, 2019a).

The High Level Cable Protection Study carried out for the as-laid cable route (Cathie Associates, 2019) indicated that sandwaves are a prominent feature of the seabed in this region of the Pentland Firth, primarily in the seabed closest to the Scottish mainland. The angle of the seabed slopes indicated a generally gentle slope of less than approximately 5°. Some instances of localised moderate to high angles do occur, however, with an angle of 37° and 32° at KP18.5 and KP21.9 respectively, being associated with sandwaves. Water depth along the route reaches a maximum of 89m below chart datum and fluctuates between approximate depths of 75m and 90m to approximately KP25, where depths gradually reduce thereafter until landfall. Outcrops of glacial till and bedrock have also been found to occur along the route, with the underlying till being deposited during the Late Devensian Period when the area was covered by an advancing ice-sheet.

The cable landfall at Rackwick Bay is surrounded by several protected areas but is not located within any of these sites.

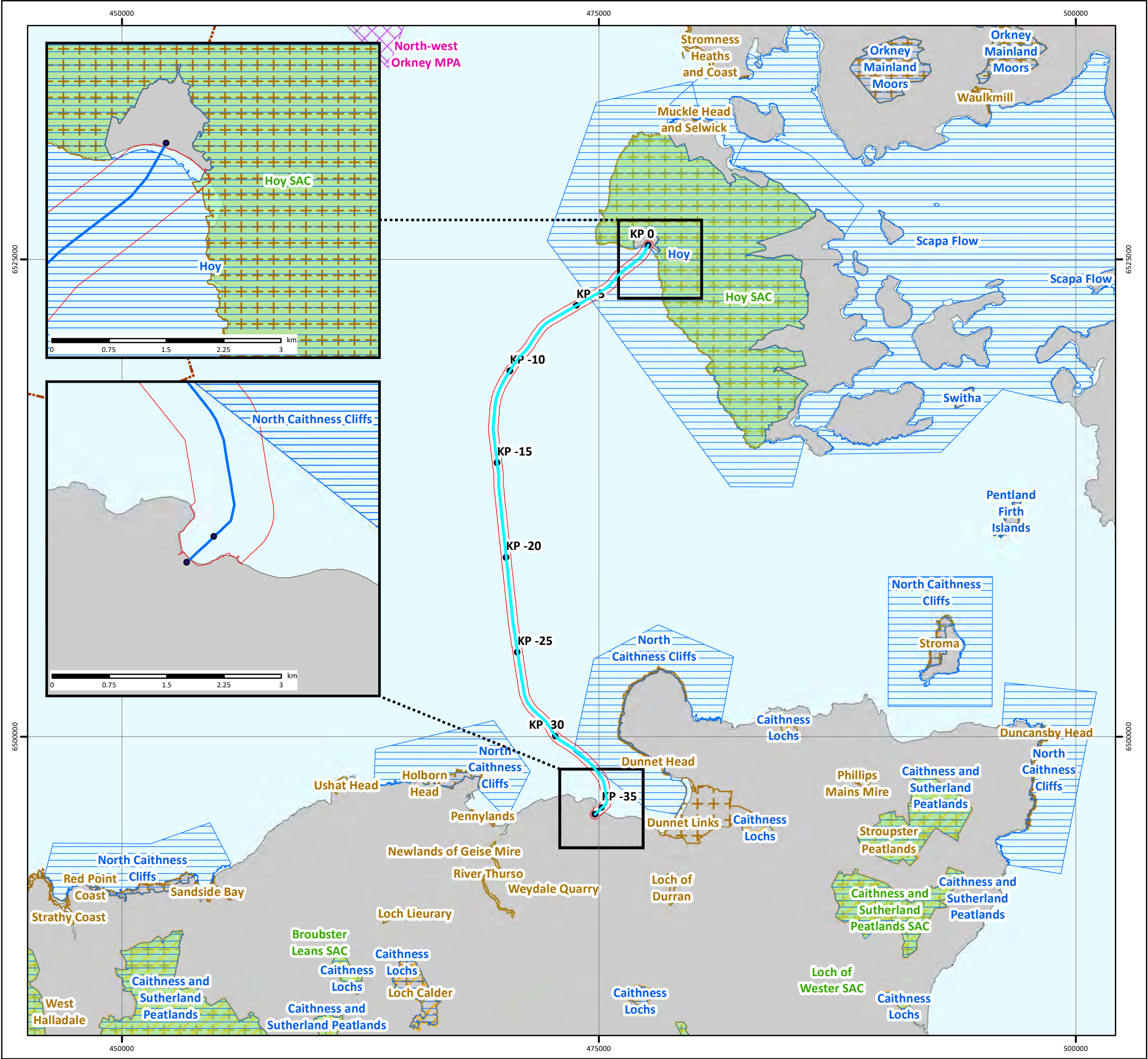
2.4 Protected Sites

The UK is no longer a member of the European Union (EU). The Withdrawal Agreement between the UK and the EU set out the arrangements for the UK's withdrawal from the EU on the 31st January 2020 ("exit day"), which included a transition or implementation period which expired on the 31st December 2020 and during which EU law continued to apply in the UK.

Some types of EU legislation such as Regulations and Decisions, were directly applicable as law in the EU Member States without any further action required by each State. Other types of EU legislation, such as Directives, were indirectly applicable and required domestic implementation in national law. In the UK this was often achieved by making Statutory Instruments rather than passing primary legislation.

EU legislation which applied directly or indirectly to the UK before 11.00 p.m. on 31 December 2020 has been retained in UK law as a form of domestic legislation known as 'retained EU legislation'. The sections that follow, therefore, make little reference to the detailed requirements of EU Directives, Regulations and Decisions specifically and instead focus on the domestic requirements, while acknowledging where the legislation originated from the EU.

There are several existing and proposed protected sites within or in close proximity to the as-laid cable route and landfall sites. These sites are displayed in Figure 2-1



PENTLAND FIRTH CABLE REPLACEMENT
MARINE LICENCE SUPPORT

PROTECTED SITES
Marine Licence Corridor

Drawing No: P2577-PROT-001

A

Legend

- KP
- Route Centreline
- ▭ Marine Licence Corridor (500m)
- - - 12nm Territorial Sea Limit
- ▭ SPA
- ▭ SAC
- ▭ Ramsar
- ▭ NCMPA
- ▭ SSSI



NOTE: Not to be used for Navigation

Date	18 November 2022
Coordinate System	WGS 1984 UTM Zone 30N
Projection	Transverse Mercator
Datum	WGS 1984
Data Source	UKHO; OSOD; JNCC; NS; ESRI; SHEPD;
File Reference	J:\P2577\MXD_QGZ\06_PROT\ P2577-PROT-001.mxd
Created By	Emma Kilbane
Reviewed By	Lewis Castle
Approved By	Matthew Peden



2.4.1 Special Protection Areas (SPA)

Special Protection Areas (SPAs) are sites classified under the Conservation (Natural Habitats, & c.) Regulations 2010 (as amended), the Conservation of Offshore Marine Habitats and Species Regulations 2017 and in accordance with the Birds Directive, for the protection of Annex I or migratory breeding and non-breeding birds (JNCC, 2019c). There are four SPAs relevant to this Project: Scapa Flow SPA, The Hoy SPA, North Caithness Cliffs SPA and the Caithness Lochs SPA.

2.4.2 Special Areas of Conservation (SACs)

Special Areas of Conservation (SACs) are sites classified under the Conservation (Natural Habitats, & c.) Regulations 2010 (as amended), the Conservation of Offshore Marine Habitats and Species Regulations 2017 and in accordance with the Habitats Directive, for the protection of Annex I and II habitats and species respectively (JNCC, 2019b). Habitats and species listed under these Annexes are considered to be in need of conservation at a European level. There is one SAC that is relevant to this Project: Hoy SAC.

2.4.3 Sites of Special Scientific Interest (SSSI)

Sites of Special Scientific Interest (SSSI) are statutory designations made by Scottish Natural Heritage (SNH) under the Nature Conservation (Scotland) Act 2004 (SNH, 2019h). Under section 3 of the Act, SNH have the responsibility to designate areas of land as SSSI's that are of special interest for their flora, fauna, geology or morphology. There are two SSSI's relevant to this Project: Dunnet Head SSSI and Hoy SSSI.

2.4.4 Other Established and Protected Sites

Other established and potential protected sites in the vicinity of the project include an area of potential bedrock reef (an Annex I habitat), Hoy and West Mainland National Scenic Area and Caithness Lochs Ramsar site (joined with the current SPA). There are no Nature Conservation Marine Protected Area's (NCMPA's) within the vicinity of the Project.

2.4.5 Non-designated sites of interest

The Hoy Royal Society for the Protection of Birds (RSPB) Nature Reserve is also found within the vicinity of PFE (2). While not a designated site, it covers a wide area of the island of Hoy (3926 hectares) (RSPB, 2019a) and is home to numerous protected bird species.

2.5 Biological Environment

2.5.1 Benthic and intertidal ecology

The Pentland Firth is one of the most prominent examples of the UK Post-2010 Biodiversity Framework (formally; UK Biodiversity Action Plan (UKBAP)), Priority Habitat 'tide-swept channels' (formerly 'tidal rapids') in the United Kingdom (UK) (Moore, 2009). However, unlike other examples of 'tide-swept channels' in the UK that are characterised by abundant marine life (JNCC, 2016e), the benthic communities recorded in the Pentland Firth are typically of low diversity, being characterised by common, widely distributed and scour tolerant species such as acorn barnacles (*Balanus crenatus*) and the dahlia anemone (*Urticina felina*) (Moore, 2009).

During the study undertaken by Moore (2009) into the benthic environment of the Pentland Firth in relation to renewable energy developments, a single biotope was identified in the region of the as-laid cable route. This was the biotope *Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment (SS.SMx.CMx.FluHyd), a Scottish Biodiversity List Habitat. This is a common biotope around the UK coastline (JNCC, 2019a), with the site recorded here being dominated

by the bryozoan *F. foliacea*, along with occasional occurrences of the soft coral *Alcyonium digitatum* and crusts of the tube-worm *Spirobranchus*. Potential stony reef habitat has also been identified within the nearshore environment of Rackwick Bay.

2.5.2 Marine mammals and Otters

2.5.2.1 Cetaceans

Since 1980, seventeen cetacean species have been recorded in the Pentland Firth and adjacent Orcadian waters (Evans, Baines and Coppock, 2010). Of these species, the most commonly observed in near-shore waters (in descending order) are harbour porpoise (*Phocoena phocoena*), minke whale (*Balaenoptera acutorostrata*), white-beaked dolphin (*Lagenorhynchus albirostris*), Risso's dolphin (*Grampus griseus*), killer whale (*Orcinus orca*) and bottlenose dolphin (*Tursiops truncatus*). Four other species are considered casual visitors to the region: short-beaked common dolphin (*Delphinus delphis*), Atlantic white-sided dolphin (*Lagenorhynchus acutus*), long-finned pilot whale (*Globicephala melas*), Humpback whales (*Megaptera novaeangliae*) and sperm whale (*Physeter macrocephalus*). Aside from harbour porpoise and long-finned pilot whales which are sighted year-round, sightings of other species typically occur in the summer months.

2.5.2.2 Pinnipeds

The Orkney Isles are hugely important to both the grey seal (*Halichoerus grypus*) and harbour seal (*Phoca vitulina*), with the Faray and Holm of Faray SAC and Sanday SAC designated for the protection of grey and harbour seals respectively (Marine Scotland, 2016b). Both sites are important breeding grounds for their respective populations, with the Faray and Holm of Faray SAC supporting 9% of the annual UK grey seal pup production (JNCC, 2016a) and the Sanday SAC supporting 4% of the overall harbour seal breeding population (JNCC, 2016d). These sites are located approximately (in straight line distances) 48.2km and 57.7km from the as-laid cable route. As such the actual sea distances from these sites to the corridor will be even greater. Harbour seals typically forage between 11-21km from their haul-out site (DECC, 2016), so individuals from these sites are unlikely to be found foraging within the vicinity of the as-laid cable route. While grey seals are known to travel up to 100km from their haul-out site to forage (DECC, 2016), on average 43% of grey seals are found within 10km of their haul-out site (McConnell et al., 1999). As such the likelihood of grey seals from these sites being present within the vicinity of the as-laid cable route is unlikely.

There are no recorded seal haul-out sites nearby the cable landfalls at Murkle Bay or Rackwick Bay, with the closest haul sites to the cable corridor being the Selwick site for harbour seals (found approximately 10.6km around the coast to the north of Hoy), Gills Bay for grey seals (found approximately 19.1km to the east) and Stroma for grey seals (found approximately 20.5km to the east) (Atkins Geospatial, 2019).

2.5.2.3 Otters

Within the Orkney Isles there is one protected site where otters (*Lutra lutra*) are a qualifying feature, the Loch of Isbister SAC (JNCC, 2015b), found approximately 25km north of the as-laid cable route. The site was re-examined in 2011 as part of a Scottish-wide site-condition monitoring report by SNH (Findlay, Alexander and Macleod, 2015). The report concluded that otters were still present at the site, with 50% of the surveyed sites finding otters to be present. Additionally, informal accounts from local farmers reported that additional otters over those recorded in the survey had been sighted in the loch. Otters are also found around Orkney outside of this protected site and so could potentially be found at the Rackwick Bay landfall.

2.5.3 Fish and shellfish

2.5.3.1 Spawning and Nurse Grounds

Two of the most commercially important species that rely on the seabed for much of their lifetime are herring (*Clupea harengus*) and sandeels (*Ammodytidae* sp.). These species are also of huge conservation importance due to their position as important prey species for numerous other species for herring spawning (Coull, Johnstone and Rogers, 1998; Ellis et al., 2012). Additionally, data presented in the Updated Fisheries Sensitivity Maps Report by Marine Scotland (2014) indicates that the probability of the presence of group aggregations of herring (individuals in their first year of life) is low (Aires, González-Irusta and Watret, 2014). Similarly, while there is potential for sandeels to spawn in the Pentland Firth (Coull, Johnstone and Rogers, 1998), it has been determined to be of low intensity (Ellis et al., 2012).

The Pentland Firth is known to be used as a nursery ground for blue whiting (*Micromesistius poutassou*) and anglerfish (*Lophius piscatorius*), which are both listed as Priority Marine Features (PMFs) in Scottish waters (MarLIN, 2019). It has also been suggested that the Pentland Firth may be an important nursery ground due to the abundance of juvenile Brown crab (*Cancer pagurus*) found here during a recent benthic survey (Moore, 2009).

2.5.3.2 Elasmobranchs and other electro-sensitive species

Elasmobranchs (sharks and rays) use electroreceptors to aid in detecting prey, with ampullary pores in elasmobranchs skin connecting to a gel-filled canal that contains a sensory epithelium that detect external electrical fields (Wueringer, 2012). As a result of this adaptation, there exists the potential for elasmobranchs to be disturbed by the weak electromagnetic fields (EMF) generated by power cables in the marine environment (Orr, 2016). Other fish species that are sensitive to electromagnetic fields are migratory species such as the Atlantic salmon (*Salmo salar*), which are theorised to use magnetite particles found in their lateral line to orientate themselves using the Earth's magnetic field (Moore et al., 1990).

Within the Pentland Firth and the Project area, there exists the potential for several elasmobranch species to be present, including common skate complex (*Dipturus batis*-complex), spurdog (*Squalus acanthias*), tope shark (*Galeorhinus galeus*), spotted ray (*Raja montagui*), and thornback ray (*Raja clavata*), with the area being a low intensity nursing ground for these species (Ellis et al., 2012). Basking sharks (*Cetorhinus maximus*) may also be present in the area. Basking sharks are discussed in section 2.5.3.3.

There also exists the potential for migratory species such as Atlantic salmon, Sea Trout and European eel (*Anguilla anguilla*) to be present within the project area, with studies providing evidence indicating that these species migrate through the Pentland Firth from freshwater rivers on the Scottish mainland to reach the deeper waters of the Atlantic Ocean and around Iceland (Malcolm, Godfrey and Youngson, 2010; Guerin et al., 2014; NBN Atlas, 2022).

2.5.3.3 Basking sharks

A study of basking shark abundance and behaviour found that the 345 recorded sightings around Orkney showed no clear pattern or particular concentration, except that sightings were lower in the months between November and April (Evans, Baines and Coppock, 2010). Due to the low population numbers, the Northeast Atlantic population of basking sharks are listed as 'endangered' under the International Union for Conservation of Nature (IUCN) Red List OF Threatened Species (Fowler, 2009).

2.5.3.4 Noise Sensitive Species

Some species of fish are more sensitive to disturbance/injury from noise than others, depending on whether the species possesses a swim bladder and the distance of this bladder from their ear. Based

on these dependencies, three separate functional groups of fish can be developed (Hawkins and Popper, 2014). These groups include:

- Fish without a swim bladder. Low sensitivity to noise as they can only detect kinetic energy. Species include sharks, common skate complex, mackerel, flounder).
- Fish that possess a swim bladder but is located far from the ear. Medium sensitivity to noise, as despite the presence of the bladder it will likely not contribute to pressure reception with species being primarily kinetic detectors. Such species include salmon and sea trout. Also included in this group are fish eggs and larvae that due to limited mobility lack the ability to move away from a noise source.
- Fish that possess a swim bladder or other air bubble close to the ear. High sensitivity to noise, as the proximity of the bladder/air bubble to the ear allows for sound pressure to be detected. This broadens the fishes' hearing range but makes it susceptible to anthropogenic noise disturbance as the noise levels are more likely to breach their hearing threshold compared to less sensitive species (Popper et al., 2014). Such species include herring, sprat and cod.

As described in Section 2.5.3.1, there is low potential for species sensitive to noise such as herring, sprat, and salmon to be present within the vicinity of PFE (2).

2.5.3.5 Horse mussels (*Modiolus modiolus*)

Horse mussels (*Modiolus modiolus*) are a bivalve species that in dense aggregations can create biogenic reef habitat that provides shelter and support for numerous other species (Marine Scotland, 2018a). Scotland holds approximately 85% of the UK population, with the waters around Orkney being home to some of the few remaining extensive horse mussel beds in the country (JNCC, 2015a). The species is a filter feeder, making tide swept channels such as the Pentland Firth a potentially ideal location for the species (SNH, 2019i).

2.5.4 Ornithology

Both the Caithness coastline and the island of Hoy are home to numerous protected species of birds, as evidenced by the number and extent of the designated sites that cover these coastlines. Relevant protected sites include the Hoy SPA, North Caithness Cliffs SPA and the Caithness Loch's SPA and Ramsar sites. The Hoy RSPB Reserve (an undesignated site) is also located in the vicinity of PFE (2). PFE (2) passes within the Hoy SPA and North Caithness Cliffs SPA sites, which protect numerous bird species including peregrine falcon (*Falco peregrinus*), red-throated diver (*Gavia stellate*), great skua (*Catharacta skua*), fulmar (*Fulmarus glacialis*), guillemot (*Uria aalge*) and kittiwake (*Rissa tridactyla*), along with seabird assemblages of international importance at both sites (JNCC, 2005b, 2005c). The waters of the Pentland Firth are used by the various breeding bird populations at varying times of year. It should be noted, however, that in the north of Scotland, breeding seasons typically begin approximately one month later than breeding seasons to the south, with surveys studying the Orkney seabird population beginning in May (RSPB, 2019a, 2019b).

2.6 Anthropogenic Environment

2.6.1 Human health

Dounreay Nuclear Power Station (located approximately 18km west of the Murkle Bay landfall site) was an experimental nuclear site that entered full operation in 1958, and remained open until the end of the 1990's. The site was used for testing and recycling different fuel types, with used fuel being stored in water-filled ponds before chemical processing was conducted to recover any material that may be re-used (Dounreay, 2016a). These processes created small radioactive metal fragments which in some cases managed to reach the marine environment through the sites effluent system. While protections were implemented in the 1980's to prevent further discharge, these particles have been

identified along the Caithness coastline (including Murkle Bay), being transported along the coast by the coastal processes of the area. As such, nearby beaches are now routinely monitored with radiation detection instruments to find and remove any radioactive particles washed up.

2.6.2 Shipping and Navigation

A Navigational Risk Assessment conducted by Intertek in support of the PFE (3) installation (Document Reference P2577_R5880) provided an assessment of baseline conditions. The overall vessel density across the Application Corridor is generally consistent across the Pentland Firth and observed to be fairly low over the cable corridor itself (~1.2 vessel hours per km²). There are horizontal and vertical patterns of more intense vessel density related to unofficial shipping lanes, used by cargo, tanker and fishing vessels leaving and entering ports. The East-West route is mainly traversed by cargo vessels, whilst the North-South routes are regularly used by passenger vessels.

From available Royal Yachting Association (RYA) data, the intensity of recreational boating appears low across the study area, though the dataset is limited particularly between KP5 and KP20, with the most activity in close vicinity to Scrabster Harbour. The operation is not impacted by the Orkney Islands Area to Avoid.

Fishing activity is fairly consistent within the study area, with some greater activity present in a vertical pattern perpendicular to the coast at Melvich (to the West of the study area). Moreover, creeling, otter trawling and demersal gear are particularly common in the inshore areas.

2.6.3 Commercial Fisheries

The PFE (2) corridor is contained within International Council for Exploration of the Seas (ICES) rectangle 46E6, which is targeted primarily for shellfish and pelagic species, although some demersal species are also targeted within Orkney waters (Marine Scotland, 2018c). As the majority of vessels fishing in Orkney waters are below 15m in length, fishing activity data is sourced from ScotMap, a Marine Scotland Project which sourced spatial data on vessels less than 15m in length between 2007 – 2011 by conducting face-to-face interviews with 1090 fishermen (Marine Scotland, 2014).

Within the Pentland Firth and Orkney Waters, creeling is the most popular method of fishing, with 146 vessels classified as creeling vessels (of which 141 are 15m in length or less) (Marine Scotland, 2012a). Creels are used to target mobile scavenger crustacean species such as brown crab, velvet crab (*Necora puber*), Langoustines (*Nephrops norvegicus*) and lobster (*Homarus Gammarus*). Within ICES rectangle 46E6, creeling accounts for three-quarters of fishing effort, with the top species targeted being crab, lobster and haddock (see Section 7 of the Fishing Liaison Mitigation Action Plan (FLMAP)). Dredging effort is low within the vicinity of PFE (2), with a peak of 20 to 50 hours to the western edge of the corridor. Fishing effort in the region follows a seasonal pattern with activity varying to shelter from adverse weather conditions, reacting to seasonal changes and exploiting target species (Coleman and Rodrigues, 2016).

2.6.4 Tourism and recreation

The Pentland Firth is used for several recreational activities such as sailing, yachting and canoeing. The Pentland Canoe Club and Pentland Firth Yacht Club are based in Scrabster and Thurso respectively, which are approximately 7km and 6km respectively around the coast from the Murkle Bay landfall site. The coastline near the Murkle Bay landfall is a known small hotspot for coasteering, according to data collated by the Scottish Marine Recreation and Tourism Survey 2015 (Land Use Consultants Ltd, 2015). In Orkney waters SCUBA diving is a popular pursuit, with areas around Orkney as well as north coast of Caithness and Sutherland are also popular with divers (Aquatera, 2015). Additionally, the island of Hoy features the Hoy RSPB Nature Reserve, which covers a large area of the north and west of the island, including around the Rackwick Bay landfall site (RSPB, 2019a). As a result of the varied habitat of the site, from tall sandstone cliffs near Rackwick Bay to the inner moorland, a wide variety

of species may be found here. The reserve is particularly popular with tourists during the summer months as this is when the peak breeding season for the majority of birds in the site occurs (RSPB, 2019a, 2019b).

2.6.5 Marine archaeology

The Pentland Firth has throughout history been an important maritime route between the Atlantic Ocean and the North Sea. As such there exists the potential for undiscovered wrecks to be present within the Pentland Firth. Due to the Royal Navy's use of Scapa Flow as a base in both World War 1 (WW1) and World War 2 (WW2) and subsequent incursions from German vessels and U-boats, sunken vessels from this era have the greatest potential to be preserved in the Pentland Firth. Two undiscovered wrecks of high importance are the HMT Orsino and SS Navarra, which were sunk during WW1 and WW2 respectively and if discovered would be considered as war graves. There are a further possible 63 wrecks that may be located close to PFE (2). Additionally, there are 16 lost WW2 era aircraft. Side-scan sonar (SSS) and multibeam echosounder (MBES), conducted prior to installation of PFE (2), did not identify magnetic anomalies that represent underwater cultural heritage remains.

2.6.6 Other sea users

The Pentland Firth and Orkney Waters are used by several different sea users, with activities including:

- Renewable energy (Operational/Consented);
- Telecommunications/Power Cables;
- Disposal sites; and
- Recreational activities.

As a result of the fast-flowing tidal conditions of the Pentland Firth, the area has seen significant interest from developers of tidal energy technologies. Two projects currently have received Agreements for Lease (AFL) from the Crown Estate for areas of seabed in the Pentland Firth: Meygen (located in the channel between the Swona and the mainland, approximately 19.3km east) and Duncansby Tidal Power (located off the north-east coast of Caithness, approximately 25.4km east) (Atkins Geospatial, 2019). Of these projects, only Meygen is currently operational, with phase 1A of the project (consisting of four 1.5MW tidal turbines) formally entering its operational phase in April 2018 (Simec Atlantis Energy, 2019). Additionally, the Dounreay Tri demonstration project, a planned floating windfarm that has received an Agreement for Lease (AFL) from the Crown Estate, is located approximately 20.1km to the west of PFE (2). Development was halted in 2017 after Dounreay Tri Ltd, the project owner, filed for administration due to a lack of funding (reNEWS.biz, 2017). The project is currently being developed by Hexicon AB, a Swedish based developer of floating wind farm technologies (4C Offshore, 2019). The European Marine Energy Centre (EMEC) testing facility at Bilia Croo is located approximately 12.8km north of PFE (2), around the northwest coast of Hoy.

Marine Scotland, through their work identifying potential leasing sites for new offshore wind developments in Scottish waters, has identified an Area of Search (AoS) for the north-west and North of Scotland that is located approximately 2.45km to the east at its closest point (Marine Scotland, 2018b; Atkins Geospatial, 2019).

There are two telecommunications cables that intersect the as-laid cable route. These are:

- FARICE 1 – Operated by Farice ehf (an Icelandic state-owned telecommunications group), this telecoms cable connects between Iceland, the Faroe Islands and Scotland, making landfall at Dunnet Bay in Caithness (Farice, 2019).

- Northern Lights – Operated by BT, this telecoms cable connect the Scottish mainland (via Dunnet Bay, Caithness) to Orkney, making landfall at the Bay of Skaill on the west coast of the Orkney mainland (Fiber Atlantic, 2008).

The nearest oil and gas well to PFE (2) is Well 12/16-1, located approximately 53km around the Scottish mainland coast to the south-east.

There are three closed disposal sites in the vicinity of PFE (2). These are Thurso, Scrabster Extension and Scrabster which are located approximately 0.1km, 1.05km and 1.31km from the route respectively.

3. STAKEHOLDER ENGAGEMENT

Stakeholder engagement on the status of the PFE (2) cable has been ongoing since January 2020 following the occurrence of the fault.

As outlined in Section 1, as a result of the decision to replace the faulted cable from end to end, SHEPD are required to prepare a Decommissioning Plan for submission to Marine Scotland as a licence requirement of the existing consent for the PFE (2) cable. Any subsequent decommissioning works in the marine environment will require a Marine Licence under the Marine (Scotland) Act 2010.

A replacement cable for PFE (2) will also be required which will require consent under the above act. Consultation on both the decommissioning plan and the associated Marine Licence application(s) covering decommissioning and installation of a new Pentland Firth East cable is anticipated to occur in tandem.

During future operational activities SHEPD will engage with stakeholders in accordance with the procedures and methods set out in the following documents which will form part of the consultation pack for the PFE (3) Marine Licence application and PFE (2) Decommissioning Strategy:

- North Coast and Orkney Fisheries Liaison and Mitigation Action Plan (FLMAP); and
- How Scottish Hydro Electric Power Distribution co-exists with other marine users.

4. DECOMMISSIONING

4.1 Guiding Principals

The guiding principles which have been applied in this Decommissioning Plan are outlined in Figure 4-1.

Figure 4-1 Guiding Principles for Pentland Firth East (2) Decommissioning

Guiding Principles	Description
1. Safety	The Licensee is committed to the highest Health, Safety, Security and Environment (HSSE) standards throughout the project. Decommissioning measures will be designed and undertaken to the highest HSE standards.
2. Other sea users	Decommissioning measures will be designed to minimise impacts to other sea users.
3. Minimise environmental impact	Decommissioning measures will be selected to provide most benefit for the least damage to the environment.
4. Polluter pays principle	Decommissioning and waste management measures recognise the party responsible for producing pollution is responsible for any subsequent impacts on the environment and any remedial measures.
5. Sustainable development	The Licensee aims to develop, operate, and decommission PFE (2) to meet the needs of the present while not compromising the ability for future generations to meet their needs.
6. Maximise re-use of materials	The Licensee aims to minimise the volume of material generated from decommissioning and ensure that any material will be disposed of correctly and in accordance with the waste hierarchy.
7. Cost to consumer	The Licensee will evaluate best available techniques to ensure the decommissioning measures selected do not generate excessive costs to the consumer.
8. Best Practice Environmental Option (BPEO)	The licensee will apply the approach of BPEO to the assessment and implementation of decommissioning measures.

Intertek has reviewed the latest industry guidance and best practice relating to the decommissioning of subsea cables and infrastructure which currently includes, but may not be limited to:

- Decommissioning of offshore renewable energy installation under the Energy Act 2004: Guidance notes for industry (DTI, 2006);

- Decommissioning of Offshore Renewable Energy Installations in Scottish Waters or in the Scottish Part of the Renewable Energy Zone under the Energy Act 2004 Guidance notes for industry (in Scotland);
- Decommissioning of Subsea Telecommunication Cables in UK Waters: Guidance on Environmental Impacts (BT Technology, December 2020);
- Guidance notes for industry: Decommissioning of Offshore Oil and Gas Installations and Pipelines (Department for Business, Energy and Industrial Strategy, 2018);
- ESCA Guideline No. 8 – Guidelines for Submarine Cable Decommissioning, Issue 5, March 2016;
- ICPC Recommendation No. 1 – Management of Redundant and Out-of-Service Cables Issue 12B, 6 May 2011; and
- Guidelines for environmental risk assessment and management (DEFRA, 2002).

Other guidance and legislation includes:

- United Nation Convention on the Law of the Sea (UNCLOS);
- International Maritime Organisation (IMO);
- OSPAR Convention;
- Hazardous waste regulations 2005;
- London Convention 1972 and the 1996 protocol relating to the prevention of marine pollution by dumping of wastes; and
- Construction design and management regulations (CDM) 2007.

Under UNCLOS and customary international law, there is no requirement for the removal of Out Of Service (OOS) cables (ICPC, 2011). The general assumption is that returning the seabed to pre-installation condition, i.e. full recovery of cable and all associated deposits, would be preferential from an environmental perspective. It is recognised, however, that other factors, including socio-economic, health and safety, waste hierarchy, technical feasibility and legislation/policy, are also important considerations in determining the fate of decommissioned subsea cables.

ICPC Recommendation No.1 (ICPC, 2011) lists the following factors which cable owners should consider when deciding whether to remove an OOS Cable:

- Any potential effect on the safety of surface navigation or other uses of the sea including a comparison of whether removal is reasonable or realistic given the presence of other manmade objects on the seabed such as shipwrecks, debris and oil and gas structures and installations.
- Present and possible future effects on the marine environment. If the cable is composed of material that is inert or environmentally benign, consideration should be given to leaving the cable in place.
- The risk that the cable will significantly shift position at some future time.
- The costs and technical feasibility associated with removal of cables.
- The determination of a new use or other reasonable justification for allowing the cable or parts thereof to remain on the seabed.
- The comparative environmental impact of leaving the cable in place compared to the disruption caused by attempting to remove the cable.
- The management of out-of-service cables as part of the cable protection program.
- The potential socio-economic & economic benefits of recovering the cable.

Guidelines prepared by the European Subsea Cables Association (ESCA, 2016) provide a general recommendation to remove subsea cables between the high and low water mark and seaward to the territorial sea limit (i.e. 12 nm). Beyond 12 nm to the EEZ limit, it suggests the decommissioned subsea cable should, in general, be left in place.

In the oil and gas sector, government seeks to achieve effective and balanced decommissioning solutions, which are consistent with international obligations and have a proper regard for safety, the environment, other legitimate users of the sea, economic and social considerations as well as technical feasibility. This policy is underpinned by two key principles (Department for Business, Energy and Industrial Strategy, 2018):

- A precautionary principle, that decommissioning should aim to achieve a clear seabed (acknowledging that this will not always be achievable given the complexities involved).
- A polluter pays principle that those who have benefitted from the exploitation or production of hydrocarbons in the UKCS to bear the responsibility for decommissioning.

4.2 Decommissioning Approaches

4.2.1 Approach 1: Recover Cable and Associated Deposits

The total removal option would consider the de-burial of the cable, retrieval to the surface, and transportation to shore for recycling. Prior to any operation, the cable depth and removal method to be used would have to be assessed, in addition to tools and equipment. To de-bury cable, either similar techniques to installation are used to uncover the cable from the seabed, or via simply pulling the cable with sufficient force if the seabed consists of soft soil (Smith, Garrett and Gibberd, 2015). Various methods may be required to loosen the cable from the seabed. One of the methods uses “under runs”, which consists of a device to be installed under the cable while being towed with a line from a vessel (BERR, 2009). This method is only applicable to shallow burial depths (less than 1 m) and soft soils using a vessel equipped with suitable cable recovery equipment. The sediment above the cable can be removed using a mass flow excavator (MFE) to ensure the cable can be exposed for easy retrieval. Where appropriate, recovery works are monitored with the aid of a remote operated vehicle (ROV), and the cable either reeled or cut up in sections and stored on the vessels deck. The cable can be cut at the 3rd party asset crossing locations and at the extents of external cable protection, where this has been used, if the intention is to leave the external cable protection in-situ. However, for a full retrieval even these would be removed in agreement with the third-party asset owners.

Regardless of the de-burial method, the cable end is attached to the retrieval vessel where they are spooled onto a drum or cut into lengths using a hydraulic cutting tool on board the vessel if the cable is not planned to be used afterwards (Smith et al., 2016; Topham and McMillan, 2017). Therefore, the cable decommissioning vessel needs to be equipped with the necessary tools to lift, cut and stow the cable and operate the de-burial vehicle with the possibility to use the same cable installation vessel (Smith et al., 2016).

4.2.2 Approach 2: Partial cable recovery

The cable and associated deposits would be recovered in discrete locations or over specific extents. For example, in the inter-tidal zone and where required to facilitate the installation of the new cable.

Methods for decommissioning would be as per Approach 1, detailed above.

4.2.3 Approach 3: ‘Do Nothing’ – Leave the cable and associated deposits in-situ

This approach is considered to cause the least number of adverse impacts to the environment. The cable is buried in the seabed to between 0.75m and 1.5m deep (target depth to top of cable). The

cable is not oil filled but is solid-state and if left undisturbed poses minimal risk to the marine environment; therefore, leaving the cable in-situ would avoid any potential disturbance to the seabed caused by de-burial and the action of the cable ship lifting the cable from the seabed. This would also avoid the need to mobilise a vessel and any materials recovery and disposal once the cable is brought ashore.

5. CONSIDERATION OF FACTORS INFLUENCING APPROACH SELECTION

5.1 Environmental Review and Impacts of Removal Methods

The potential environmental effects that may arise from cable decommissioning can include decommissioning vessel emissions, sediments resuspension, physical disturbance to benthic habitats, chemical pollutions, and underwater noise emissions. The sediments resuspension effect is highly dependent on the nature of the seabed and hydrodynamic conditions along the route. These will be similar to those identified and experienced during the cable installation.

Table 5-1 details the environmental impacts associated with each of the operations required to decommission PFE (2).

Table 5-1 Environmental Impact of Operations

Operation	Substrate type	Potential Environmental Impact
Use of mass flow excavator (MFE) / controlled flow excavator (CFE) for cable de-burial	Non-cohesive sediment	<p>MFE's operate by directing a high-volume, low-pressure flow of water towards the seabed to displace the sediments. This results in suspension of sediments, which can be transported by ocean currents before being deposited. The most significant deposition will occur in the area immediately surrounding the cable, and the extent of the sediment transport will largely depend on the sediment particle size and hydrodynamic regime.</p> <p>Displacement of sediments is likely to result in sorting of sediments, with larger particles being deposited closer to the operations, and finer particles travelling further. This can cause change to another sediment type and impact the suitability of the benthos for specialised flora, infauna and epifauna species. Displacement of sediments in high-clay substrates can also lead to scars in the seabed which, due to the cohesive nature of these substrates, and lower energy environments typical of high-clay substrates, would be slow to recover from trenches produced by MFE (MarLIN, 2022). However, sediment sampling undertaken along the cable route did not identify any substrate with a high clay content.</p> <p>Suspended sediments have the potential to damage fish eggs and obstruct or damage the filter feeding mechanisms of some marine organisms e.g. mussels. Deposited materials can smother sessile organisms within the deposition area, and for mobile species lead to increased energy expenditure of mobile species to escape deposited sediment, injury or mortality depending on the extent of the deposited sediment (MarLIN, 2022). Organisms which are directly below the MFE would also be displaced, damaged or killed.</p>
	Cohesive sediment	<p>A study undertaken in the Caithness-Moray HVDC Cable Replacement determined that the majority of the seabed disturbance would be within a 30m wide corridor surrounding the cable. Fine sediments, such as clays, were calculated to travel up to 15km either side of the cable, however this was based on highly conservative metrics and would be specific to local conditions (Marine Space, 2019).</p> <p>MFE operations were required in September 2021 to remove sections of faulted cable.</p>
Use of ROV jet for cable de-burial	Non-cohesive sediment	<p>ROV jetting directs a low-volume flow of fluid under high pressure towards the seabed, which fluidises the seabed and causes resuspension of sediments. This can directly displace, damage or kill organisms which are located at the cable, such as polychaete species and sea pens. Suspended sediments also have the potential to damage fish eggs and obstruct or damage the filter feeding mechanisms of some benthic and pelagic species e.g. mussels. Deposited materials can smother organisms within the deposition, leading to increased energy expenditure to escape deposited sediment, injury or mortality depending on the extent of the deposited sediment (MarLIN, 2022).</p> <p>Displacement of sediments is likely to result in sorting of sediments, with larger particles being deposited closer to the operations, and finer particles travelling further. This can cause change to another sediment type and impact the suitability of the benthos for specialised flora, infauna and epifauna species (MarLIN, 2022). However, due to the strong</p>

Operation	Substrate type	Potential Environmental Impact
		<p>currents and wave action along the Pentland Firth cable, the impact from this is likely to be short term, with sediments quickly being reworked to natural composition.</p> <p>Modelling undertaken in the Environmental Supporting Information (ESI) which supported the Marine Licence Application (MLA) for the Pentland Firth East cable estimated that ROV jetting in sand is estimated to have a zone of influence of up to 20m from the operation, settling within 71 seconds at low current speeds with a mean deposit depth 16mm, (0.5m/s) (ESI, Document Reference P2291_R437_Rev2).</p>
	Cohesive sediment	<p>Clay is composed of a high proportion of silt particles, which can remain suspended in the water column for long periods. This also results in lower mean deposition depths than larger sediment particles (approximately 0.012mm in 0.5m/s currents), as sediment is transported further (ESI, Document Reference P2291_R437). Suspended sediments have the potential to damage fish eggs and obstruct or damage the filter feeding mechanisms of some benthic and pelagic species e.g. mussels (MarLIN, 2022).</p> <p>Displacement of sediments is likely to result in sorting of sediments, with larger particles being deposited closer to the operations, and finer particles travelling further. This can cause change to another sediment type and impact the suitability of the benthos for specialised flora, infauna and epifauna species. Displacement of sediments in high-clay substrates can also lead to scars in the seabed which, due to the cohesive nature of these substrates, and lower energy environments typical of high-clay substrates, would be slow to recover from trenches produced by ROV jets (MarLIN, 2022). However, sediment sampling undertaken along the cable route did not identify any substrate with a high clay content.</p> <p>Sediment models undertaken in the Pentland Firth East cable ESI estimated that silt can remain in the water column for more than 6 hours after ROV jetting and spread up to 50km in high current speeds before settling (5m/s) (Intertek Document Reference P2291_R4837). However, significant concentrations of suspended material would likely be limited to approximately 300m from the jetting site as a result of dispersion and dilution in the water column (BERR, 2008).</p>
ROV to attach lift gear to cut cable ends, rock bags and concrete mattresses for recovery to the surface	Non-cohesive and cohesive sediments	<p>ROV's used for attaching the lift gear for recovery of the cable, rock bags and concrete mattresses to the surface use positioning jets, which expel a water current to manoeuvre the ROV. These jets will have the potential to displace sediments on the seabed and may damage or displace any organisms directly below the jets, such as polychaetes and sea pens. However, this impact will also be localised, with sediment likely to return to their natural state soon after displacement due to the strong currents and wave action along the Pentland Firth cable.</p> <p>Suspended sediments have the potential to damage fish eggs and obstruct or damage the filter feeding mechanisms of some marine organisms e.g. mussels. Deposited materials can smother sessile organisms within the deposition area, and for mobile species lead to increased energy expenditure of mobile species to escape deposited sediment, injury or</p>

Operation	Substrate type	Potential Environmental Impact
		<p>mortality depending on the extent of the deposited sediment (MarLIN, 2022). The volume of displaced and suspended sediment will depend on the composition of the sediment equipment used. However, this will be significantly less than MFE and ROV jetting operations.</p> <p>The lifting gear may cause direct sediment displacement and disturbance of the seabed during attachment. However, this will be a small, highly localised area which is unlikely to have any significant impacts and would quickly return to natural conditions.</p>
	Bedrock	<p>Positioning jets from the ROV have the potential to disturb and displace flora, epifauna and benthic species from the bedrock. However, this will be significantly less than MFE and ROV jetting operations and the impacted area will be highly localised to the area surrounding the cable, rock bags or concrete mattresses.</p> <p>The lifting gear is likely to cause abrasion to the bedrock during cable attachment, particularly if this is undertaken in areas of softer bedrocks (e.g. sandstone). This can remove, damage or kill established algae, vegetation (including kelp) and epifaunal species and leave permanent scars/scratching on the seabed. Succession to a mature community following disturbance to hard substrates such as those along the PFE (2) cable is expected between 5-10 years following disturbance and full recovery of some species may take up to 20 years (MarLIN, 2022). However, the area affected would be localised and damage to the habitat will be limited, and recovery may be expected to occur more quickly.</p>
Cable recovered to vessel	Non-cohesive and cohesive sediments	<p>Cable recovery to the vessel involves the pulling up of the cable, which will occur following de-burial of the cable and removal of any rock bags or concrete mattresses, where applicable.</p> <p>Cable recovery can cause disturbance of the surface of the seabed along the cable route, which is likely to damage fauna and flora and may damage a proportion of the characterizing species of the habitat. However, the substrate would be expected to be quickly recolonised from the surrounding habitat (MarLIN, 2022).</p> <p>The impact of cable recovery would be within the footprint of the de-burial. For areas of surface laid cable, the area impacted would be within several meters of the cable, as a worst-case scenario.</p>
	Bedrock	<p>Cable recovery to the vessel involves the pulling up of the cable, which will occur following removal of any rock bags or concrete mattresses, where applicable.</p> <p>Cable recovery may lead to abrasion of the bedrock under the cable and leave permanent scars/scratching on the bedrock. This can remove, damage or kill established algae, vegetation and epifauna species. Succession to a mature community following disturbance to hard substrates such as those along the Pentland Firth East cable is expected between 5-10 years following disturbance and full recovery of some species may take up to 20 years (MarLIN, 2022).</p> <p>Cable recovery may also lead to disturbance, damage or mortality of any flora or fauna which are present on the cable.</p>

Operation	Substrate type	Potential Environmental Impact
Cable with cable protection system (CPS) e.g. cast iron shells	Bedrock	<p>Cable recovery to the vessel involves the pulling up of the cable, which will occur following removal of any rock bags or concrete mattresses, where applicable. This will be similar to removal of cable without the CPS, however, due to the increased weight and diameter of the CPS a larger area will be impacted.</p> <p>Cable recovery may lead to abrasion of the bedrock under the cable. This can remove, damage or kill established algae, vegetation and epifauna species and leave permanent scars/scratching on the seabed. Succession to a mature community following disturbance to hard substrates such as those along the PFE (2) cable is expected between 5-10 years following disturbance and full recovery of some species may take up to 20 years (MarLIN, 2022).</p> <p>Cable recovery may also lead to disturbance, damage or mortality of any flora or fauna which are present on the cable.</p>
	Intertidal	<p>The ESI (Document Reference P2577_R5892) identified that the effects of disturbance on the intertidal habitats ranges from non-sensitive to medium (MarLIN, 2022). Organisms, such as seaweed communities, barnacles and polychaetes, which are directly below the excavator or in the area to be trenched could be displaced, crushed, damaged or killed. However, this impact will be localised.</p> <p>The trench size and footprint of the equipment would likely be similar to installation, with a 1m wide open cut trench and an excavator footprint of 10m. The overall footprint at Radwick landfall was estimated to be 260m², and at Murkle Bay was 360m².</p>
Recovery of rock bags	Non-cohesive and cohesive sediments	<p>Rock bags placed in sandy habitats will inevitably support the settlement of non-local hard bottom fauna that may not be representative of the surrounding benthos, although this process is likely to take longer than if placed on bedrock given the limited presence of reef. Evidence suggests that effects on the local fauna in soft sediment areas will in most cases be very localised but long-term, for the duration that the non-local substrate is present. Removal of the rock bags will result in the loss of any fauna which has established on the rock bags. The substrate beneath the sand or clay will likely be recolonised from the surrounding infauna community (MarLIN, 2022).</p> <p>Rock bags are also likely to support organisms between the rocks, such as refuge-seeking fish and crustaceans. These organisms may be unable to escape when the rock bags are displaced, or behaviourally they may move further into the rocks to seek protection, leading to them being crushed or killed when the rock bag is recovered to the surface.</p> <p>The immediate area in the vicinity of each rock bag (5m² per 4 tonne rock bag) will be impacted by removal of rock bags. Placement of rock in mobile substrates can also result in scour around the placed rock. As the Pentland Firth is a high energy environment mobile sediments are likely to quickly fill any scoured areas following removal of rock bags.</p>
	Bedrock and stony reef	<p>Rock bags provide a hard substrate for epifauna, algae and vegetation to colonise. In areas where the substrate is stable stony or bedrock reef, communities from the surrounding substrate are likely able to rapidly colonise the rock bags</p>

Operation	Substrate type	Potential Environmental Impact
		<p>(MarLIN, 2022). Therefore, it is expected that local epifauna will be present on the rock bags. Encrusting bryozoans, hydroids and ascidians are likely to have succeeded the initial rapid colonisers and have developed a faunal turf within the two years since placement of the rock bags. Succession to a mature, stable community is expected between 5-10 years following disturbance (MarLIN, 2022). Removal of rock bags will result in loss of the developed benthic communities which have established on the rock bags, and new communities will have to re-establish in the footprint beneath the rock bags.</p> <p>Rock bags are also likely to support organisms between the rocks, such as refuge-seeking fish and crustaceans. These organisms may be unable to escape when the rock bags are displaced, or behaviourally they may move further into the rocks to seek protection, leading to them being crushed or killed when the rock bag is recovered to the surface.</p> <p>Removal of rock bags will be highly localised, only impacting the immediate area in the vicinity of each rock bag (5m² per 4 tonne rock bag) will be impacted by removal of rock bags. There is also potential for abrasion on the bedrock from the equipment used to lift the rock bags, or if rock bags are not which may displace, damage or kill any organisms which are established on the surrounding rock.</p>
Recovery of mattresses	Non-cohesive and cohesive sediments	<p>Concrete mattresses placed in sandy or clay habitats can help support the settlement of non-local hard bottom fauna that may not be representative of the surrounding benthos, although this process is likely to take longer than if placed on bedrock given the limited presence of reef. Evidence suggests that effects on the local fauna in soft sediment areas will in most cases be very localised but long-term, for the duration that the non-local substrate is present (MarLIN, 2022).</p> <p>Removal of the mattresses will result in the loss of epifauna which has established on the mattresses, and loss of habitat for organisms which use these as shelter. The substrate beneath the sand or clay will likely be quickly recolonised from the surrounding infauna community (MarLIN, 2022).</p> <p>The immediate area in the vicinity of each concrete mattress (18m² footprint) will be impacted by their removal.</p> <p>Placement of concrete mattresses in mobile substrates can also result in scour around the placed rock. As the Pentland Firth is a high energy environment mobile sediments are likely to quickly fill any scoured areas following removal of mattresses.</p> <p>Significant scour would be less likely to occur in substrates with a high clay content due to the cohesive nature of these substrates which reduces the mobility, and as substrates of high clay content are typical of lower energy environments. However, sediment sampling undertaken along the cable route did not identify any substrate with a high clay content.</p>
	Bedrock and stony reef	<p>Concrete mattresses provide a hard substrate for epifauna, flora and algae to colonise. In areas where there is substrate of stable stony or bedrock reef, species from communities are likely able to rapidly colonise the mattresses (MarLIN, 2022). Therefore, it is expected that local benthic species will be present on the mattresses. Encrusting bryozoans, hydroids and ascidians are likely to have succeeded the initial rapid colonisers and have developed a faunal turf within the two years</p>

Operation	Substrate type	Potential Environmental Impact
		<p>since placement of the mattresses. Succession to a mature, stable community is expected between 5-10 years following disturbance (MarLIN, 2022). Removal of mattresses will result in loss of the developed communities which have established on the mattresses, and new communities will have to re-establish in the footprint beneath the mattresses. The immediate area in the vicinity of each concrete mattress (18m² footprint) will be impacted by their removal.</p>
Cable de-burial using excavation at shore ends	Intertidal	<p>Excavators used to de-bury the cable at the shore end and intertidal area and the substrate replaced following cable removal. Boulders can be removed, moved or replaced using a hydraulic grab.</p> <p>The ESI (Document Reference P2577_R5892) identified that the effects of disturbance on the intertidal habitats ranges from non-sensitive to medium (MarLIN, 2022). Organisms, such as seaweed communities, barnacles and polychaetes, which are directly below the excavator or in the area to be trenched could be displaced, crushed, damaged or killed. However, this impact will be localised.</p> <p>The trench size and footprint of the equipment would likely be similar to installation, with a 1m wide open cut trench and an excavator footprint of 10m. The overall footprint at Radwick landfall was estimated to be 260m², and at Murkle Bay was 360m².</p>
Invasive Non-Native Species (INNS)	All habitats	<p>INNS (Invasive Non-Native Species) are non-native species which can cause significant adverse impacts, for example by causing damage to the environment, economy, human health or the way we live. Vehicles, equipment and ballast water can act as pathways for spread or introduction of INNS. The ESI (Document Reference P2577_R5892) determined that there was a medium potential or introduced INNS to settle within the Pentland Firth and the potential for such settling to act as a 'stepping stone' to reach other protected sites within Orcadian waters. These risks can be reduced by following the International Convention for the Control and Management of Ship's Ballast Water and Sediments, and by implementing a non-native species management plan as per the latest guidance from the GB non-native species secretariat (2015).</p>

NOTE: During decommissioning of the cable, it is assumed that any impacts will be contained within the width of disturbance created by the installation of the cable. It is anticipated that there will not be any further effects than those predicted during preparation, installation, or operation.

Table 5-2 Potential impacts of cable removal – intertidal

Activity	Impact	Receptor
Cable Removal (Cable de-burial by excavator)	Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion (change to seabed features)	Intertidal habitats (Rackwick): A2.111, A2.21, A2.82, A1.213, A1.4111, A1.2142, A1.123
Cable Removal (Cable de-burial by excavator)		Intertidal habitats (Murkle Bay): A2.22, A2.21, A2.82/A1.45, A231
Cable Removal (Anchoring)	Abrasion/disturbance of the surface of the substratum or seabed	Intertidal habitats (Murkle Bay): A2.22, A2.21
Cable Removal	INNS (Invasive Non-Native Species)	All intertidal
Removal of Split Pipe CPS	Abrasion/disturbance of the surface of the substratum or seabed	Intertidal habitats (Rackwick): A2.111, A2.21, A2.82, A1.213, A1.4111, A1.2142, A1.123
		Intertidal habitats (Murkle Bay): A2.22, A2.21

Table 5-3 Potential impacts of cable removal – subtidal

Activity	Pressure	Receiving environment
Cable Removal (Cable laid on surface)	Abrasion/disturbance of the surface of the substratum or seabed	A5.231 A5.45 (Length: 55 m) ANNEX I (1170) - Stony Reefs, Medium Grade (Length (L): 45 m, Width (W): 0.155 m, Footprint (L*W) = 6.975 m ²)
Cable Removal (Cable laid on surface)	Abrasion/disturbance of the surface of the substratum or seabed	A5.45 (Length: 110 m) ANNEX I (1170) - Stony Reefs, Medium Grade (Length: 150 m; 52.5 m ²) A5.142 A5.133 A5.133 / A5.25
Cable Removal (Cable Laid on surface within cast iron pipe)	Abrasion/disturbance of the surface of the substratum or seabed	A5.231
Cable Removal (Cable laid on surface)		ANNEX I (1170) - Bedrock Reefs (KP 34.000 – 34.310; Length 310m; 81.53m ²)
Cable Removal (MFE followed by cable retrieval)	Disturbance of the substrate below the surface of the seabed, including abrasion (change to seabed features). Siltation rate changes, including smothering (depth of vertical sediment overburden)	A5.231 - Infralittoral mobile clean sand with sparse fauna, A5.25 - Circalittoral fine sand, A5.27 - Deep circalittoral sand, A5.15 - Deep circalittoral coarse sediment, A5.45 - Deep circalittoral mixed sediments, ANNEX I (1170) - Stony Reefs, Medium Grade (Length: ~ 20m; 140m ²)

Activity	Pressure	Receiving environment
		A5.45 - Deep circalittoral mixed sediments, ANNEX I (1170) - Stony Reefs, Medium Grade (Length: ~ 110m; 770m ²)
		A5.45 - Deep circalittoral mixed sediments, ANNEX I (1170) - Stony Reefs, Medium Grade (Length: ~ 235m; Footprint = 1645m ²) A5.15 - Deep circalittoral coarse sediment, A5.27 - Deep circalittoral sand, ANNEX I (1170) - Stony Reefs, Low Grade (Length: ~ 40 m; 280 m ²)
		A5.15 - Deep circalittoral coarse sediment, A5.142 - <i>Mediomastus fragilis</i> , <i>Lumbrineris</i> spp. and venerid bivalves in circalittoral coarse sand or gravel
		A5.142 - <i>Mediomastus fragilis</i> , <i>Lumbrineris</i> spp. and venerid bivalves in circalittoral coarse sand or gravel, A5.15 - Deep circalittoral coarse sediment ANNEX I (1170) - Stony Reefs, Low Grade (Length: ~ 470 m; Footprint = 3290 m ²), A5.444 - <i>Flustra foliacea</i> and <i>Hydrallmania falcata</i> on tide-swept circalittoral mixed sediment/ A5.451 - Polychaete-rich deep Venus community in offshore mixed sediments ANNEX I (1170) - Stony Reefs, Medium Grade (Length: ~ 250 m; Footprint = 1750 m ²)
		A5.142 - <i>Mediomastus fragilis</i> , <i>Lumbrineris</i> spp. and venerid bivalves in circalittoral coarse sand or gravel
		A5.133 - <i>Moerella</i> spp. with venerid bivalves in infralittoral gravelly sand/ A5.25 - Circalittoral fine sand

Activity	Pressure	Receiving environment
		<p>A5.15 - Deep circalittoral coarse sediment, ANNEX I (1170) - Stony Reefs, Low Grade (Length: ~ 20 m; Footprint = 140 m²), A5.45 - Deep circalittoral mixed sediments ANNEX I (1170) - potential Stony Reefs (Length: ~ 105 m; Footprint = 735 m²)</p>
		<p>A5.231 - Infralittoral mobile clean sand with sparse fauna/ A5.25 - Circalittoral fine sand, A5.14 - Circalittoral coarse sediment, ANNEX I (1170) - Bedrock Reefs (Length: ~ 45 m; Footprint (L*W) = 315 m²)</p>
Cable Removal (MFE followed by cable retrieval)	Disturbance of the substrate below the surface of the seabed, including abrasion (change to seabed features). Siltation rate changes, including smothering (depth of vertical sediment overburden)	<p>A5.231 - Infralittoral mobile clean sand with sparse fauna, A5.25 - Circalittoral fine sand, A5.27 - Deep circalittoral sand, A5.15 - Deep circalittoral coarse sediment, A5.45 - Deep circalittoral mixed sediments</p>
		<p>A5.45 - Deep circalittoral mixed sediments</p>
		<p>A5.45 - Deep circalittoral mixed sediments, A5.15 - Deep circalittoral coarse sediment, A5.27 - Deep circalittoral sand</p>
		<p>A5.15 - Deep circalittoral coarse sediment, A5.142 - <i>Mediomastus fragilis</i>, <i>Lumbrineris</i> spp. and venerid bivalves in circalittoral coarse sand or gravel</p>

Activity	Pressure	Receiving environment
		<p>A5.142 - <i>Mediomastus fragilis</i>, <i>Lumbrineris</i> spp. and venerid bivalves in circalittoral coarse sand or gravel,</p> <p>A5.15 - Deep circalittoral coarse sediment</p> <p>A5.444 - <i>Flustra foliacea</i> and <i>Hydrallmania falcata</i> on tide-swept circalittoral mixed sediment/ A5.451 - Polychaete-rich deep Venus community in offshore mixed sediments</p>
		<p>A5.142 - <i>Mediomastus fragilis</i>, <i>Lumbrineris</i> spp. and venerid bivalves in circalittoral coarse sand or gravel</p>
		<p>A5.133 - <i>Moerella</i> spp. with venerid bivalves in infralittoral gravelly sand/ A5.25 - Circalittoral fine sand</p>
		<p>A5.15 - Deep circalittoral coarse sediment,</p> <p>A5.45 - Deep circalittoral mixed sediments</p>
		<p>A5.231 - Infralittoral mobile clean sand with sparse fauna/ A5.25 - Circalittoral fine sand,</p> <p>A5.14 - Circalittoral coarse sediment</p>
<p>Cable Removal (Cable Laid on surface, concrete mattresses (4), Northern Lights FO Cable Crossing</p> <p>Unit footprint (width: 3 m; Length: 6 m) = 18 m²</p>	<p>Abrasion/disturbance of the surface of the substratum or seabed and Physical change (to another seabed type)</p>	<p>A5.142 –<i>Mediomastus fragilis</i>, <i>Lumbrineris</i> spp. and venerid bivalves in circalittoral coarse sand or gravel (Length: ~ 20 m)</p>
<p>Cable Removal (Cable Laid on surface, concrete mattresses (4), Farice FO Cable Crossing</p>		<p>A5.133 – <i>Moerella</i> spp. with venerid bivalves in infralittoral gravelly sand/A5.25 – Circalittoral fine sand (Length: ~ 80 m)</p>
		<p>A5.133 – <i>Moerella</i> spp. with venerid bivalves in infralittoral gravelly sand/A5.25 – Circalittoral fine sand</p>

Activity	Pressure	Receiving environment
Unit footprint (width: 3 m; Length: 6 m) = 18 m ²		A5.231 A5.231, A5.25, A5.27, A5.15, A5.45 ANNEX I (1170) - Stony Reefs, Medium Grade ANNEX I (1170) - Bedrock Reefs
Anchor deployment Footprint (incl. chains): 12.286m ²	Abrasion/disturbance of the surface of the substratum or seabed	A5.231
Anchor deployment Footprint (incl. chains): 12.286m ²		ANNEX I (1170) - Bedrock Reefs (KP 34.000 – 34.310; Length 310 m; 81.53 m ²)
Rock Bag Removal (Rock Bags; Unit footprint = 5 m ² Total number of bags = 378)	Abrasion/disturbance of the surface of the substratum or seabed and Physical change (to another seabed type)	A5.231, A5.25, A5.27, A5.15, A5.45, A5.145 / A5.133, A5.142, A5.451, A5.231 / A5.25, A5.14, A5.444 / A5.451
Cable Removal	INNS (Invasive Non-Native Species)	All intertidal and subtidal habitats

5.2 Interaction With Other Sea Users

The use of Pentland Firth by other sea users is fully described in Section 2 and within the 2019 licence application supporting information.

As a result of the limited spatial and temporal extent of decommissioning operations, it is expected that there will be no significant impact on shipping and navigation within the Pentland Firth during recovery operations.

There is little trawling and dredging activity along the as-laid cable route and the loss of fishing grounds is not expected to be significant due to the minimal spatial extent of the cable on the seabed. Therefore, should Approach 3 be pursued, and PFE (2) be left in-situ, there is little risk of snagging events occurring along the route.

5.3 Decommissioning Option Appraisal Conclusion

The environmental impacts of cable de-burial and retrieval and the removal of the stabilisation and protection deposits (rock bags, concrete mattresses and split pipe) are limited and similar to those during the cable installation phase. The cost of cable removal versus leaving in-situ may be the determining decision point. The advantages and disadvantages of each approach are detailed in Table 5-4.

Table 5-4 Option Appraisal

Approach	Advantage	Disadvantage
Approach 1: Full cable removal	<ul style="list-style-type: none"> No need for asset condition surveys. Recycle of cable metal – Value of the metal Potential reuse the rock bags and mattresses for other projects. New cable can be laid along the removed cable route within disturbed seabed. Full width of 3rd party crossings can be used for the new cable. Seabed reverts over time to pre-installation state. 	<ul style="list-style-type: none"> Cost of cable de-burial, retrieval and disposal. Cost of rock bags and mattresses retrieval (disposal / reuse). Uncertainty regarding feasibility of reuse of rock bags and mattresses. Negotiation with 3rd party asset holders for the removal of the crossing infrastructure (e.g. mattresses and cable). Seabed clearance and restoration. Emissions from decommissioning vessels.
Approach 2: Partial cable removal	<ul style="list-style-type: none"> Recycle of cable metal – Value of the metal. Potential reuse of rock bags and mattresses. 3rd party crossings left in-situ and can be re-utilised for new cable (with or without faulted cable removal). 	<ul style="list-style-type: none"> Condition surveys required along non-decommissioned locations. Seabed clearance and restoration. Potential interaction with other sea users (as assessed within 2019 licence application supporting information).

Approach	Advantage	Disadvantage
	<ul style="list-style-type: none"> Reduced costs compared to complete removal. Targeted removal provides option for new cable to cross PFE (2) route without a need for crossing construction. Reduced emissions associated with decommissioning activities. 	
Approach 3: Leave in-situ	<ul style="list-style-type: none"> No cost of cable removal. 3rd party crossings left in-situ and can be re-utilised for new cable. No emissions associated with decommissioning activities. No seabed disturbance due to decommissioning activities. 	<ul style="list-style-type: none"> Condition surveys required along the cable and at the 3rd party crossing locations. No recycle value of the cable. No opportunity to reutilise rock bags and concrete mattresses. Faulted cable may restrict options for installation of new cable with potential for additional works (e.g. sandwave clearance) and impacts on virgin seabed. Potential interaction with other sea users (as assessed within 2019 licence application supporting information)

Considering the advantages and disadvantages of the approaches explored, the following approach to decommissioning is proposed:

- Removal of buried and surface laid cable only where required to enable replacement cable to be installed (the level of removal would be determined by further engineering study);
- Expectation that all rock bags to be left in-situ;
- Concrete mattresses at crossing points to be left in-situ; and
- Inter-tidal cable sections to be removed.

6. DECOMMISSIONING SURVEY AND VERIFICATION

6.1 Survey Requirements

6.1.1 Pre-decommissioning Surveys

It may be necessary for the cable to be surveyed with appropriate resources to ascertain depth of burial of the cable along the route and the condition at rock bags and the cable crossing before a decision can be made as to the final decommissioning approach at a particular location along the cable route.

The following surveys are anticipated:

- Multi-beam echosounder to determine seabed profile and condition of rock bags, and potentially high resolution shallow seismic or other methods to determine burial depth of the cable; and
- ROV survey of crossings and external cable protection locations.

6.1.2 Post-decommissioning Surveys

Immediately following decommissioning, a survey regime will be carried out to confirm the location and burial depth of cable ends where sections of cable have been removed under Approaches 2 and 3. These surveys are likely to include sidescan, magnetometer and bathymetric surveys, with possible use of dropdown video or ROV to ground truth the data where necessary. It is proposed that these surveys would be commissioned directly by the Licensee. These surveys will enable identification and subsequent recovery of any debris located on the seabed or the requirement for reburial for example of exposed cable ends and will cover a corridor 50m wide centred on the as-found location of the PFE (2) cable. Reference will be made to any archaeological exclusion zones or environmentally sensitive areas including fisheries.

6.2 Disposal Costs

The method of disposal is currently not known; however, the cable will be disposed in line with relevant legislation at the time and following best practice. It is assumed that the inherent value of the recovered materials will balance out any disposal costs and thus no additional costs are included.

6.3 Decommissioning Verification

The Licensee will be responsible for the management of the decommissioning activities. Standard procedures for operations and hazard identification and management will be employed. The Licensee will monitor and track the process of consents and the consultation required as part of these processes. Stakeholder engagement during the activities will be in accordance with the procedures outlined in Section 3, Stakeholder Engagement.

On completion of any cable recovery operation, the Licensee will review the result of the operation to ensure that the objectives have been met. A post decommissioning report will be prepared and issued to the regulator for their approval.

7. HEALTH, SAFETY, SECURITY & ENVIRONMENT (HSSE)

All decommissioning activities will be undertaken in accordance with the prevailing health and safety legislation at the time of decommissioning. A full risk assessment will be undertaken to ensure HSSE risks are appropriately identified and mitigated to a level that is as low as reasonably practicable.

As part of the Final Decommissioning Plan a risk assessment will be undertaken with respect to the stability of cable burial and the external cable protection and the chances of cable exposure over time. The risk assessment will also assess the risk that cut cable ends secured in accordance with European Subsea Cables Association (ESCA) and ICPC guidance might create a hazard where none existed before, such as fouling fishing gear, or again close to shore pose a hazard to the public.

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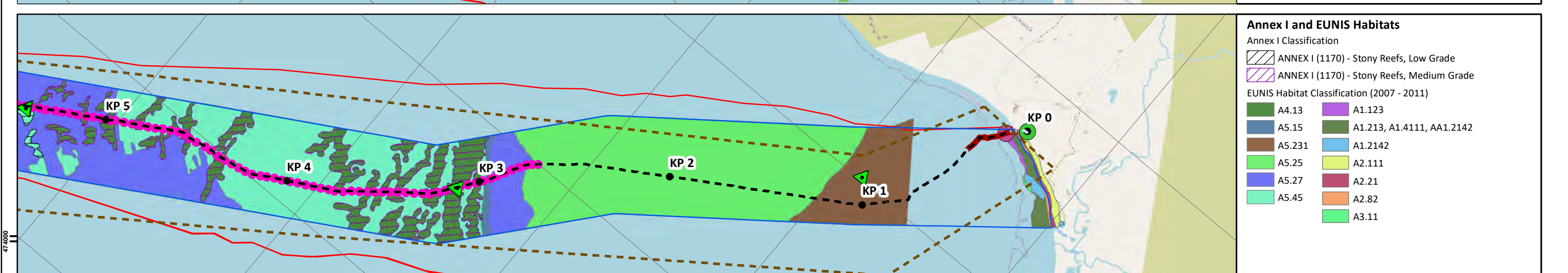
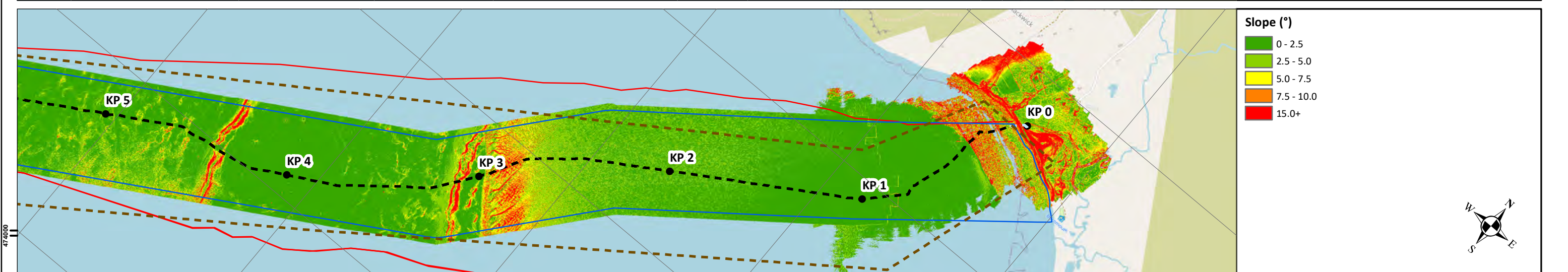
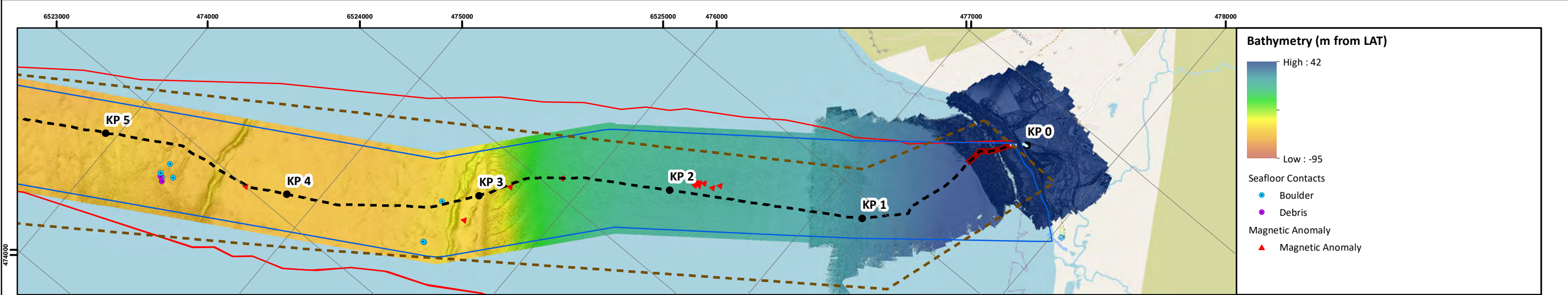
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APPENDIX A

As-built Pentland Firth RPL



SSE PENTLAND FIRTH AS LAID PLANS

Legend

- Marine Licence Corridor
- Installation Corridor
- Installed Cable
 - Trenched
 - Surface Laid
- Existing Cables
 - Power
- Installation Event
 - Grab Sample
 - Rock Bag
 - Trench End
 - Trench Start
 - Split Pipe Protection

Note: Features not present in map where legend is not populated.

Survey Data and As Laid Cable Route - Sheet 1 of 9

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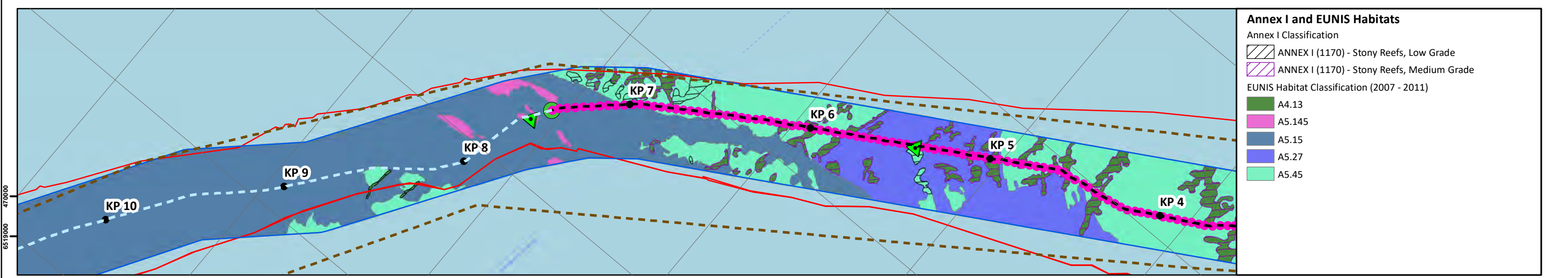
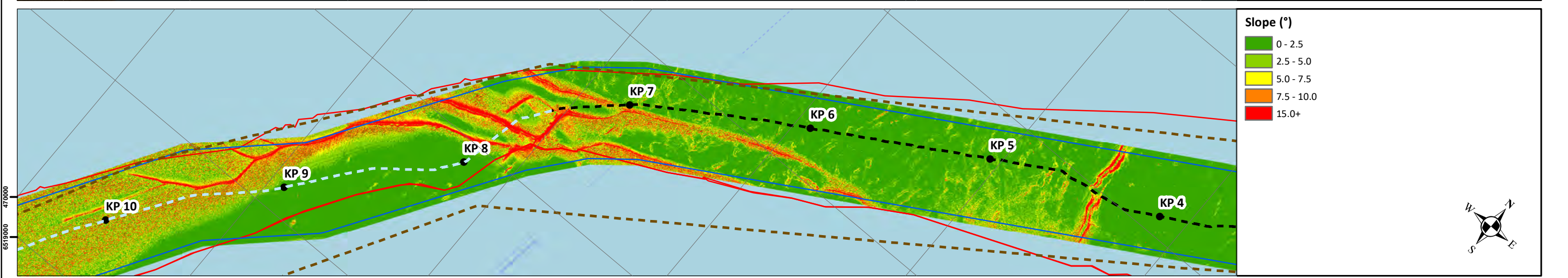
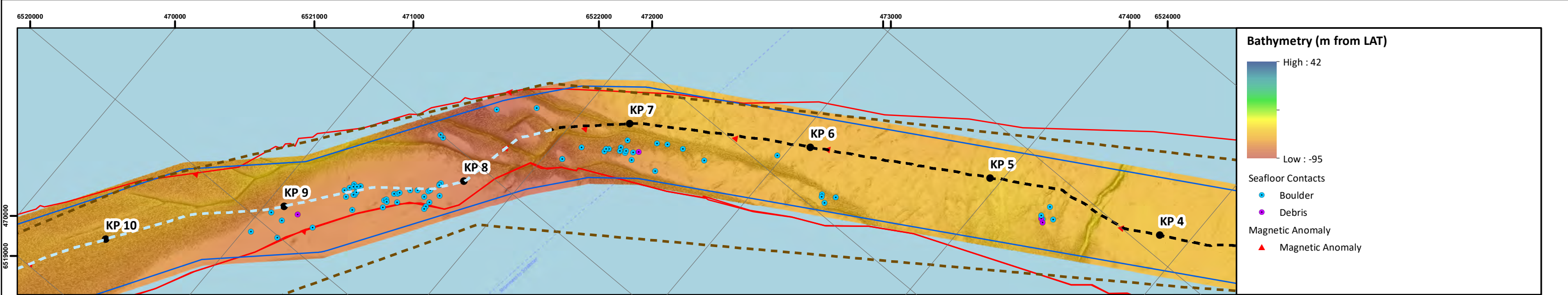
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Created By	Irinios Yiannoukos
Reviewed By	Lewis Castle
Approved By	Andrew Page

NOTE: Not to be used for Navigation

0 200 400 600 800 m

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SSE PENTLAND FIRTH AS LAID PLANS

Legend

- Marine Licence Corridor
- Installation Corridor
- Installed Cable
 - Trenched
 - Surface Laid
- Existing Cables
 - Power
- Installation Event
 - Grab Sample
 - Rock Bag
 - Trench Start

Note: Features not present in map where legend is not populated.

Survey Data and As Laid Cable Route - Sheet 2 of 9

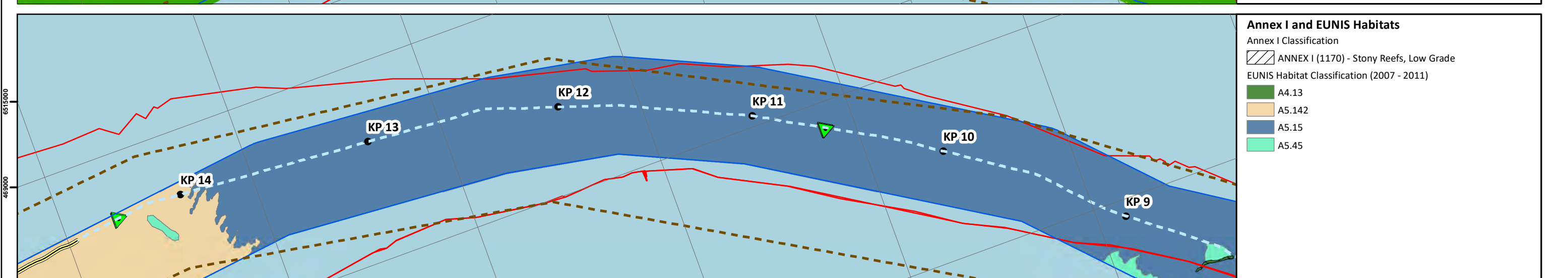
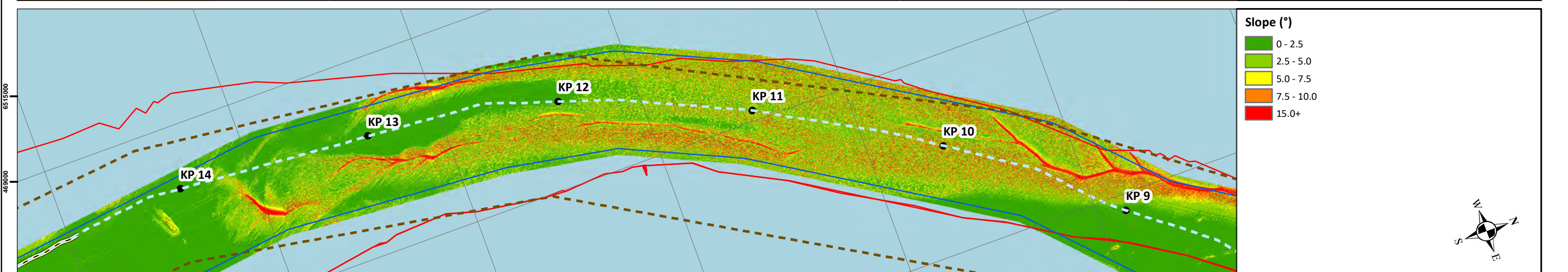
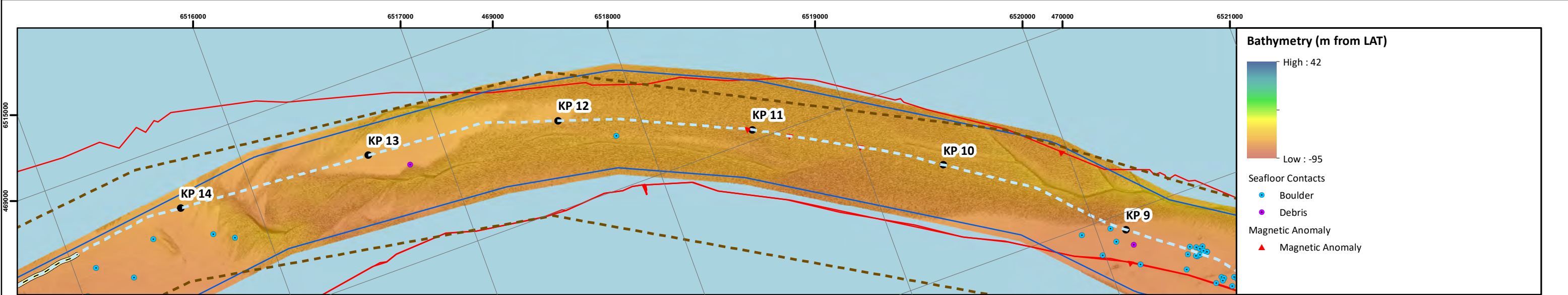
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Created By	Irinios Yiannoukos
Reviewed By	Lewis Castle
Approved By	Andrew Page

NOTE: Not to be used for Navigation

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SSE PENTLAND FIRTH AS LAID PLANS

Legend

- Marine Licence Corridor
- Installation Corridor
- Removed Cable
- Installed Cable
 - Trenched
- Existing Cables
 - Power
- Installation Event
 - Grab Sample

Note: Features not present in map where legend is not populated.

Survey Data and As Laid Cable Route - Sheet 3 of 9

NOTE: Not to be used for Navigation

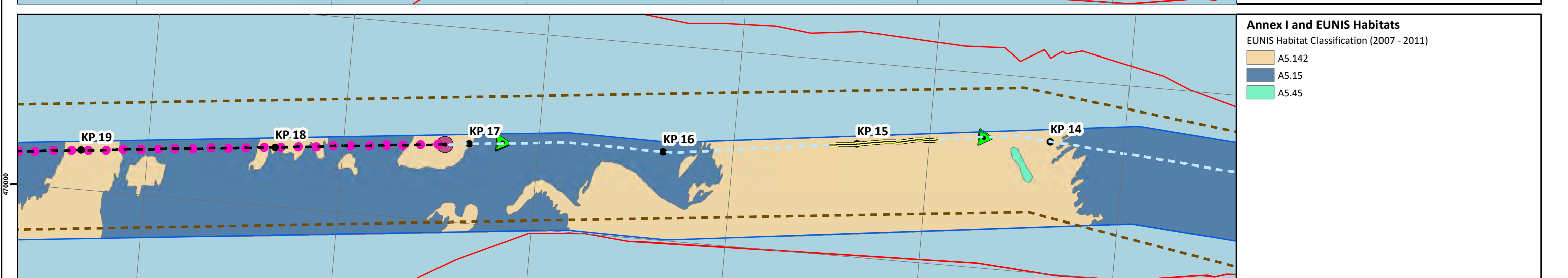
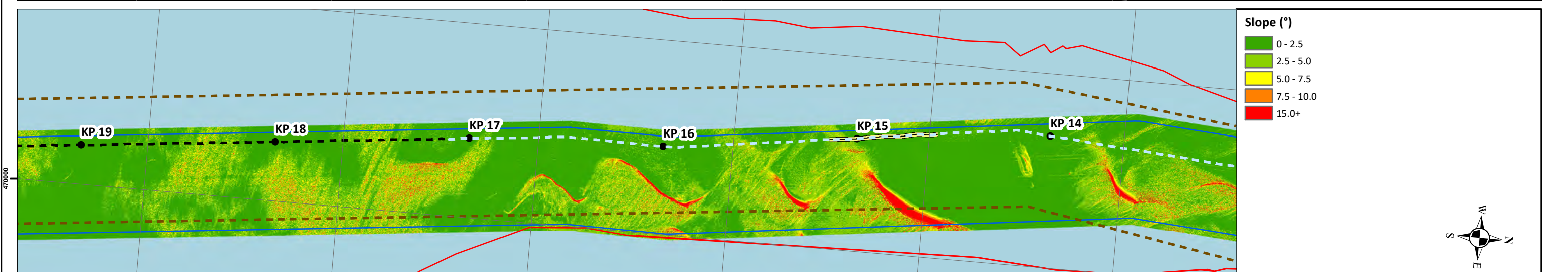
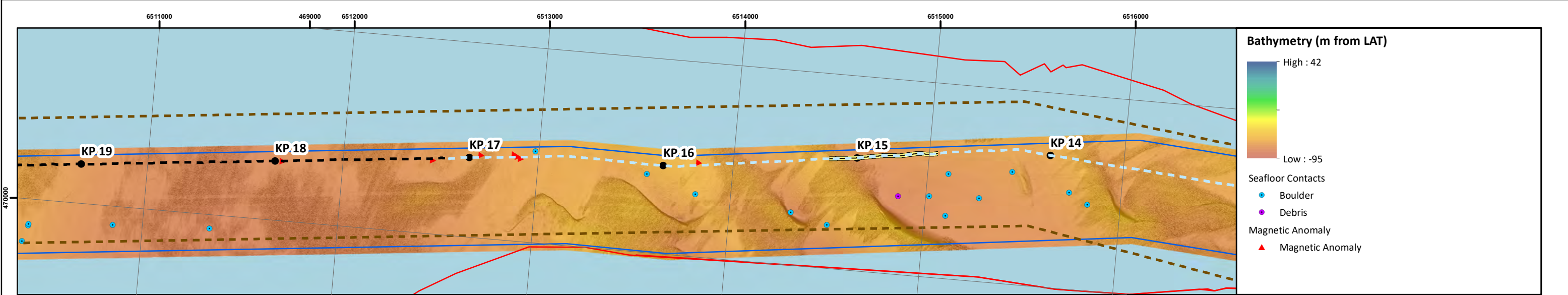
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File Reference	J:\P2539\Mxd_QGZ\01_ROUTE\ P2539-ROUTE-001.mxd
Created By	Irinios Yannoukos
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Approved By	Andrew Page

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SSE PENTLAND FIRTH AS LAID PLANS

Survey Data and As Laid Cable Route - Sheet 4 of 9

Drawing No: P2539-ROUTE-001 | B

Legend

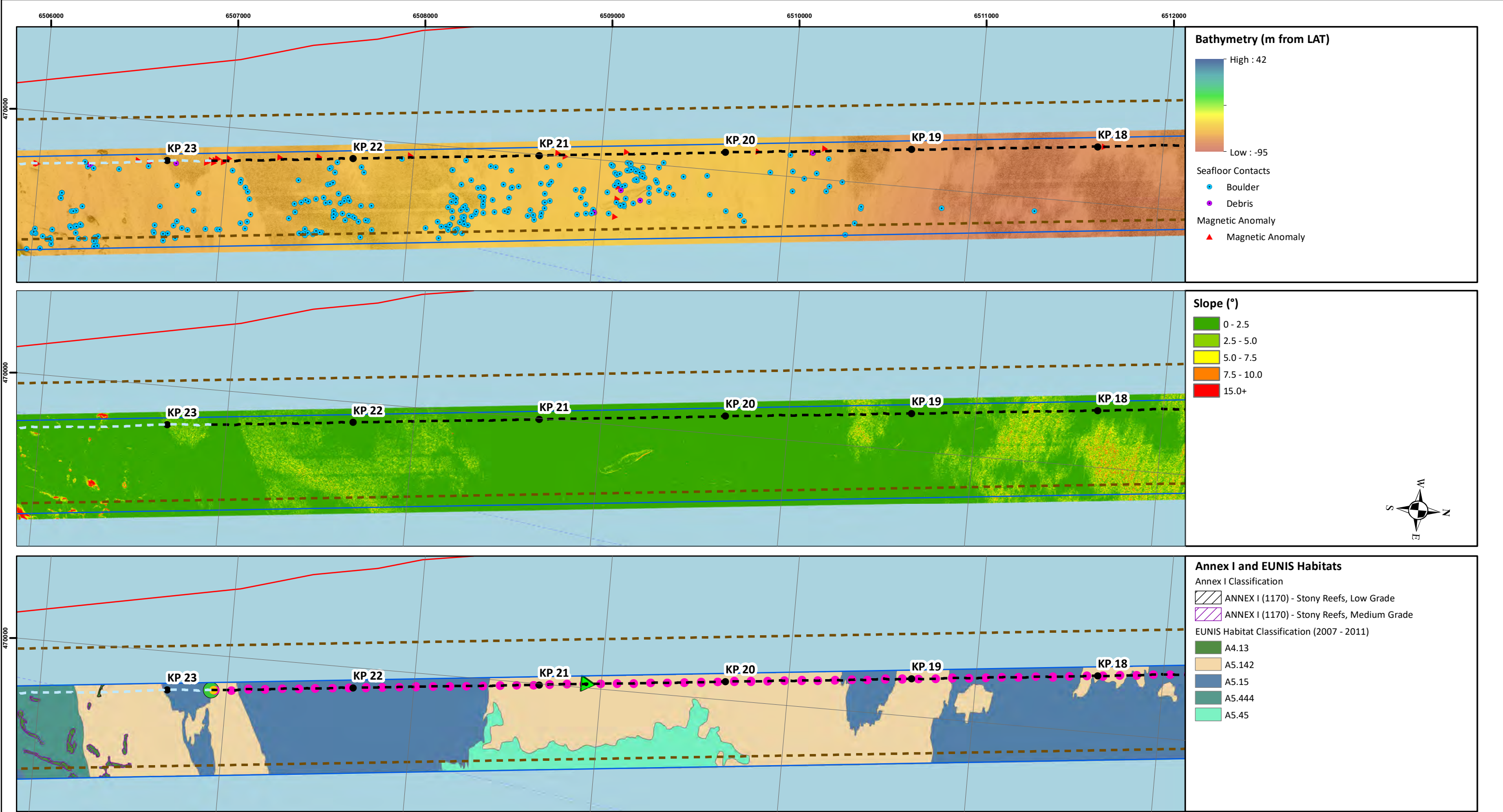
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- Installation Corridor
- Removed Cable
- Installed Cable
 - Trenched
 - Surface Laid
- Existing Cables
 - Power
- Installation Event
 - Grab Sample
 - Rock Bag
 - Trench End

Note: Features not present in map where legend is not populated.



Date	28 June 2022
Coordinate System	WGS 1984 UTM Zone 30N
Datum	WGS 1984
Vertical Datum	Lowest Astronomical Tide (LAT)
Data Source	ESRI; SSEN; GLOBAL MARINE; KISORCA
File Reference	J:\P2539\Mxd_QGZ\01_ROUTE\ P2539-ROUTE-001.mxd
Created By	Irinios Yiannoukos
Reviewed By	Lewis Castle
Approved By	Andrew Page

NOTE: Not to be used for Navigation



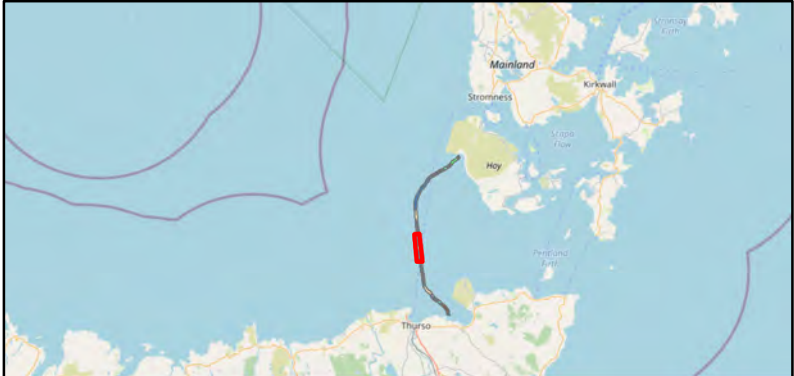
SSE PENTLAND FIRTH AS LAID PLANS

Survey Data and As Laid Cable Route - Sheet 5 of 9

Drawing No: P2539-ROUTE-001 | B

- Legend**
- Marine Licence Corridor
 - Installation Corridor
 - Installed Cable
 - Trenched
 - Surface Laid
 - Existing Cables
 - Power
 - Installation Event
 - Grab Sample
 - Crossing Location
 - Rock Bag
 - Trench Start

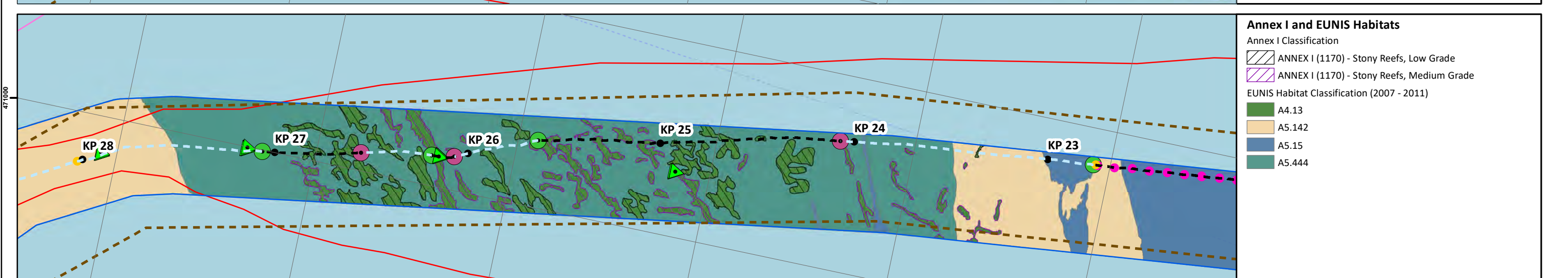
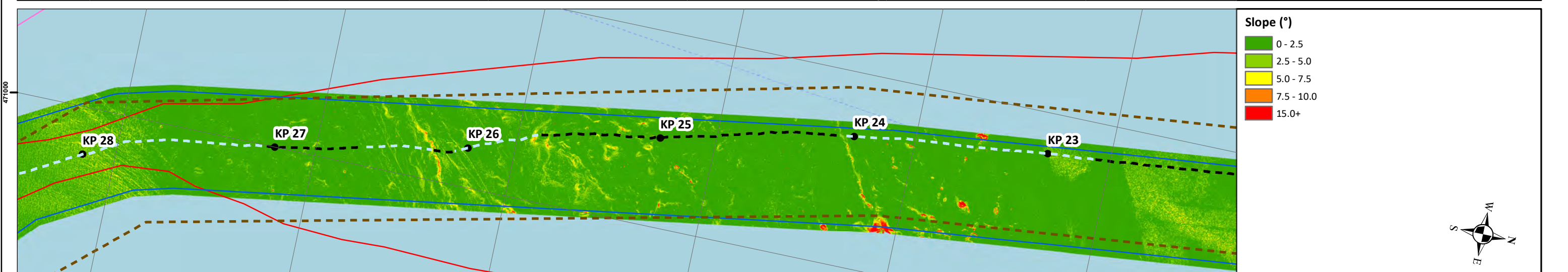
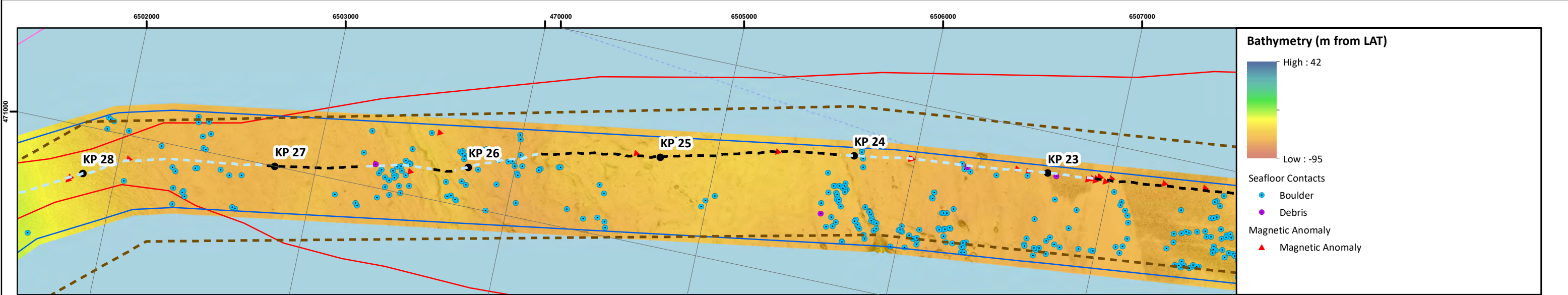
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NOTE: Not to be used for Navigation

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File Reference	J:\P2539\Mxd_QGZ\01_ROUTE\ P2539-ROUTE-001.mxd
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Reviewed By	Lewis Castle
Approved By	Andrew Page





SSE PENTLAND FIRTH AS LAID PLANS

Legend

- Marine Licence Corridor
- Installation Corridor
- Installed Cable
 - Trenched
 - Surface Laid
- Existing Cables
 - Power
 - Telecom
- Installation Event**
 - Grab Sample
 - Crossing Location
 - Rock Bag
 - Trench End
 - Trench Start

Note: Features not present in map where legend is not populated.

Survey Data and As Laid Cable Route - Sheet 6 of 9

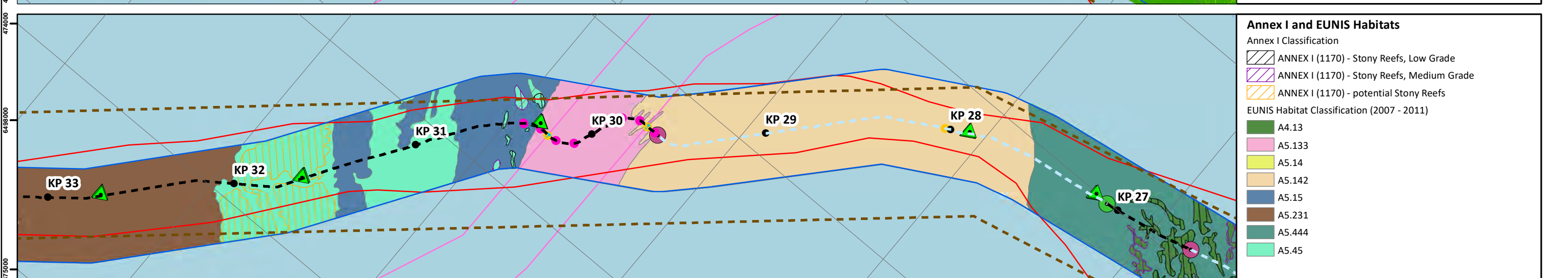
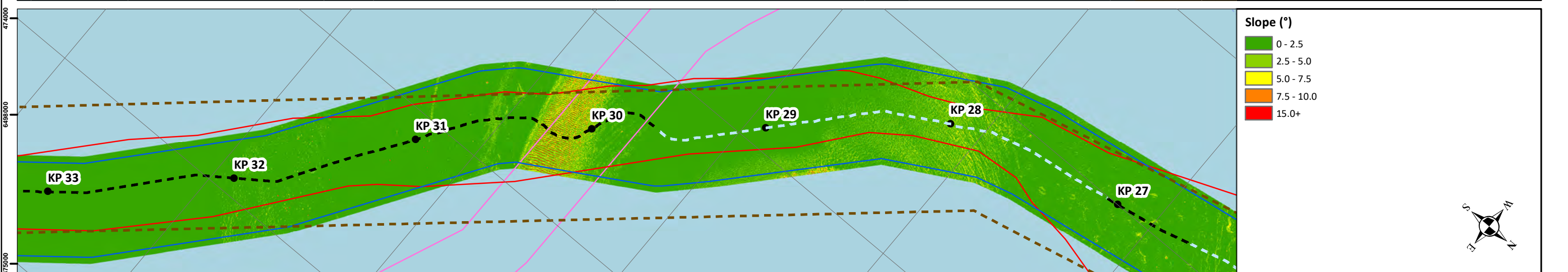
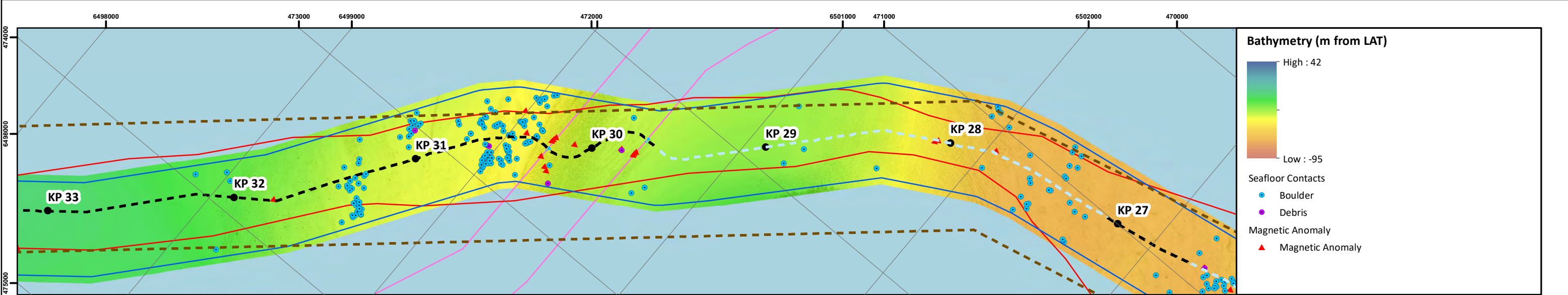
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Created By	Irinios Yiannoukos
Reviewed By	Lewis Castle
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NOTE: Not to be used for Navigation

0 200 400 600 800 m

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SSE PENTLAND FIRTH AS LAID PLANS

Survey Data and As Laid Cable Route - Sheet 7 of 9

Drawing No: P2539-ROUTE-001 | B

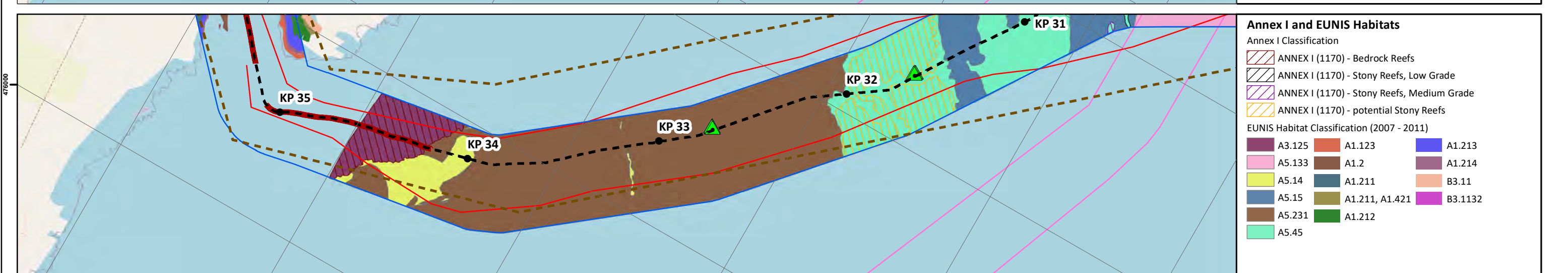
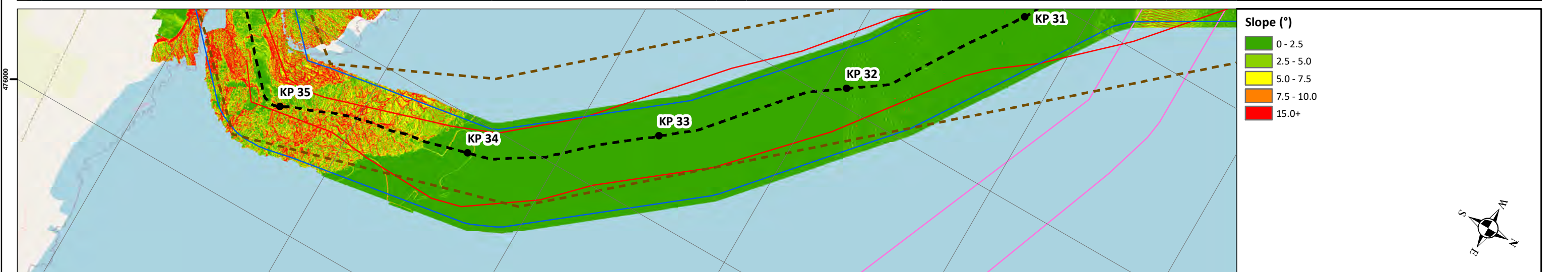
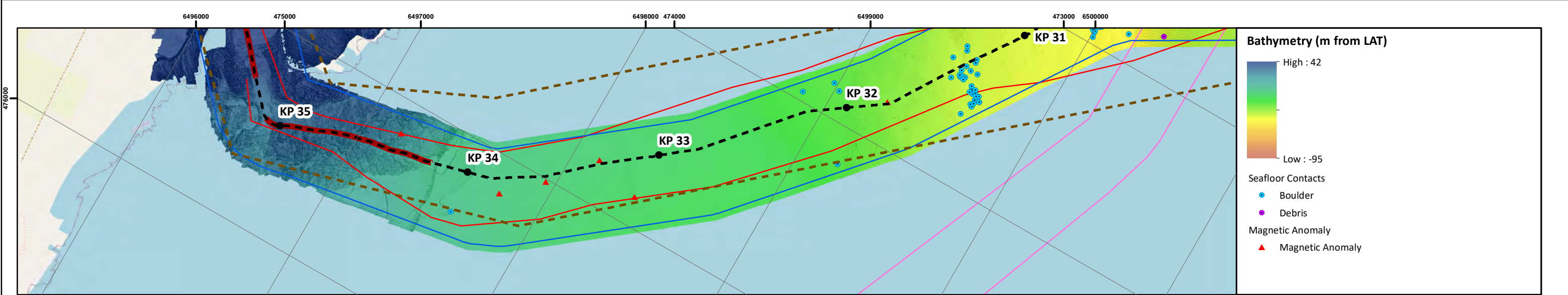
Legend

- Marine Licence Corridor
- Installation Corridor
- Installed Cable
 - Trenched
 - Surface Laid
- Existing Cables
 - Power
 - Telecom
- Installation Event
 - Grab Sample
 - Crossing Location
 - Rock Bag
 - Trench End
 - Trench Start
 - Pre-Lay Mattress

Note: Features not present in map where legend is not populated.



Date	28 June 2022
Coordinate System	WGS 1984 UTM Zone 30N
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File Reference	J:\P2539\Mxd_QGZ\01_ROUTE\ P2539-ROUTE-001.mxd
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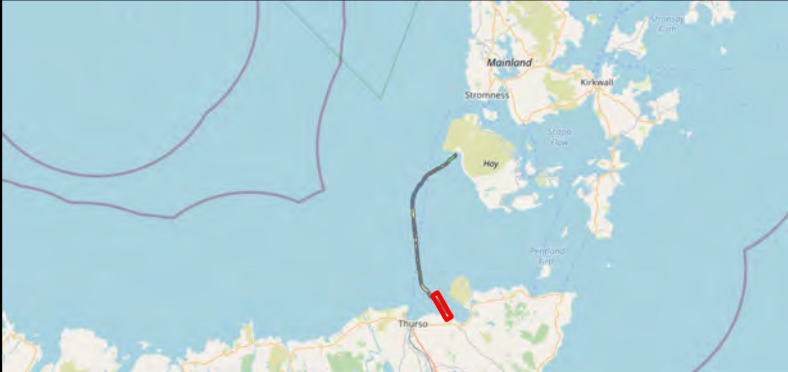
SSE PENTLAND FIRTH AS LAID PLANS

Survey Data and As Laid Cable Route - Sheet 8 of 9

Drawing No: P2539-ROUTE-001 | B

- Legend**
- Marine Licence Corridor
 - Installation Corridor
 - Surface Laid
 - Power
 - Telecom
 - Installation Event
 - Grab Sample
 - Split Pipe Protection

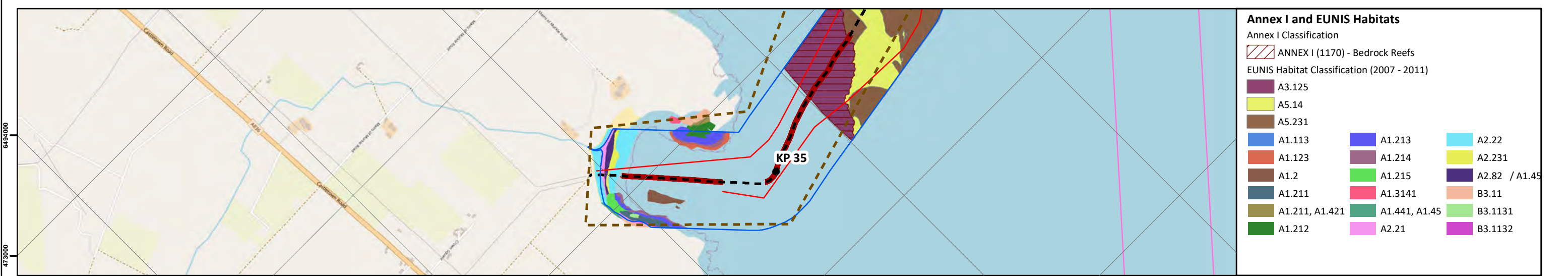
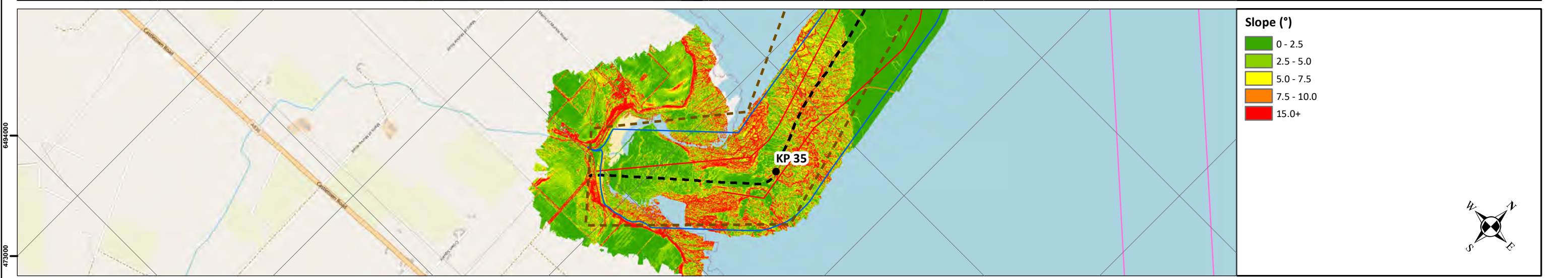
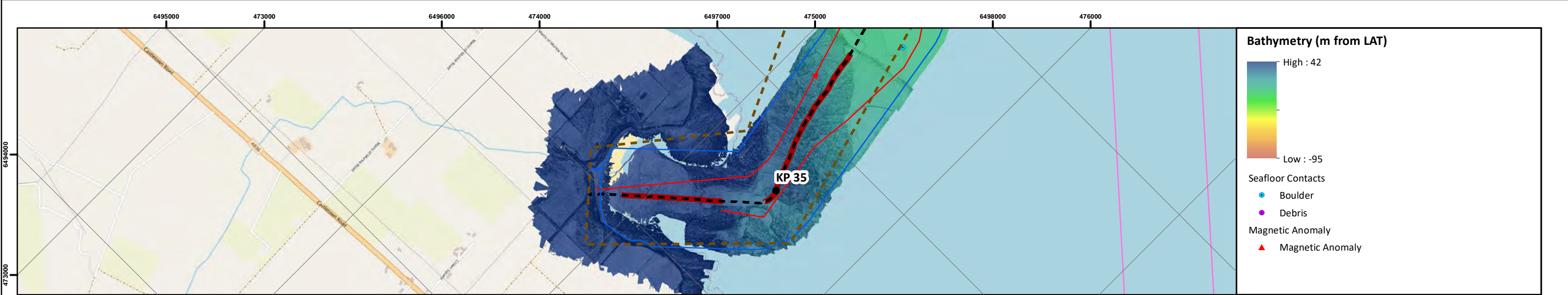
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NOTE: Not to be used for Navigation

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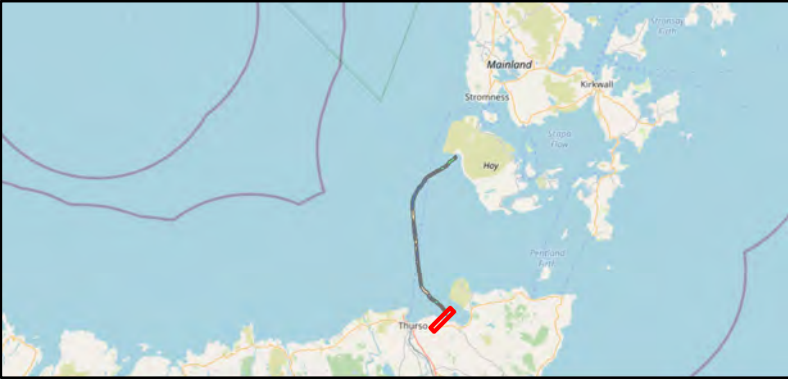
SSE PENTLAND FIRTH AS LAID PLANS

Survey Data and As Laid Cable Route - Sheet 9 of 9

Drawing No: P2539-ROUTE-001 | B

- Legend**
- Marine Licence Corridor
 - Installation Corridor
 - Surface Laid
 - Power
 - Telecom
 - Installation Event
 - Split Pipe Protection

Note: Features not present in map where legend is not populated.



NOTE: Not to be used for Navigation

Date	28 June 2022
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Datum	WGS 1984
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