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Brims Tidal Array Project

Sheep Skerry Benthic Survey Report

July 2015

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1 Introduction

The objective of the survey work was to collect representative seabed video data within the Sheep Skerry potential cable corridor identified by BTAL. This information would then be used along with previously collected multibeam bathymetric data to update the map of predicted seabed habitats for the proposed development area.

2 Survey Methodology

2.1 Survey equipment and personnel

2.1.1 Contractor details

The survey operations were conducted by a team of Orkney-based specialist contractors:

Contractor	Areas of responsibility
Aquatera	Overall scoping and management of data gathering activities. Preparation of the survey plan for gathering necessary information.
RovingEye Enterprises (REE)	Supply and operation of the survey vessel and ROV system. Safe navigation and operation of the vessel and overall responsibility for all vessel based activities.
Triscom Enterprises (TE)	Supply of USBL/navigation survey equipment and operators. Maintaining the integrity of the data retrieved during survey operations.

2.1.2 Personnel and equipment summary

Resource	Details	
Survey vessel	*MV Lodesman*	
ROV specifications	*Seaeye Falcon* ROV fitted with digital video cameras capable of providing high quality footage necessary for the identification of seabed flora and fauna.	
Position fixing	Vessel GPS system and *EIVA Navipac* online navigation system. *Easytrak* USBL system for subsea ROV positioning.	
Survey Personnel	**Role**	**Name/company**
	Skipper	Keith Bichan
	Marine surveyor	Fred Vincent (TE)
	Umbilical man/deckhand	Joseph Greaves (REE)
	ROV pilot	Eric Malcolm (REE)
	Marine scientist/client rep	Sarah Murray (Aquatera)
Communications	Vessel VHF radio, mobile telephones.	

2.1.3 Vessel and equipment description

2.1.3.1 Overview

A *Seaeye Falcon* observation-class ROV fitted with a high resolution video and GoPro camera systems was deployed from the survey vessel *MV Lodesman*. Accurate ROV position-fixing was achieved using a calibrated *EasyTrak* Ultra Short BaseLine (USBL) sonar system and the positional data overlaid on the video footage collected as UTM (Universal Transverse Mercator) coordinates.

The vessel crew included the skipper, an umbilical man for the ROV, the ROV pilot and a marine surveyor. Aquatera supplied a scientist to coordinate all survey activities and to observe the live footage from the ROV and, where necessary, to guide the pilot to any notable physical/ecological features.

2.1.3.2 Vessel specifications

Name

MV Lodesman:

Design

Originally built for the Trinity House pilotage service in 1967, by R.S. Stokvis & Zonen N.V. Rotterdam. Overall hull dimensions are 21.67 x 5.48 x 2.6 draft aft. The hull design is based on the Clyde class of RNLI lifeboats and features a double skin and built in buoyancy. Overall design was by Burness Corlett & Partners to Lloyds specifications. The hull is steel and superstructure G.R.P.

Propulsion

2 x Gardener 8LB's, 2:1 reduction with single lever controls. Tenjford hydraulic, spade rudders behind each propeller, dual hydraulic system working from each engine as required with jockey lever control through autopilot (Robertson AP40) also upper steering position with main controls duplicated.

Layout and Equipment

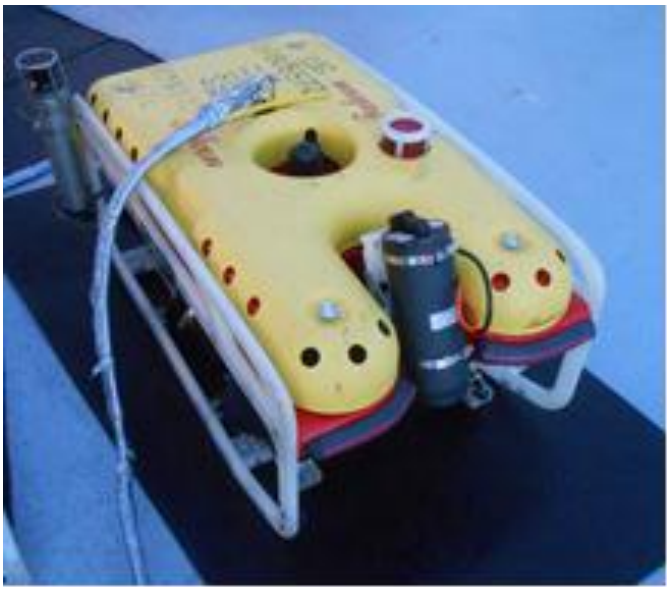
From forward, fore peak with chain locker, single phase 230 v a.c. motor driving anchor windlass, W/T bulkhead, forward cabin access from deck behind spray shelter, used as a storage area for ROV equipment. Seat lockers and access through bolt down hatches to sonar and tank space below. W/T bulkhead with W/T door to engine room. Tankage for fuel, centre line 3,300 litres, twin wing tanks aft about 3,000 litres each, 2000 litre reserve tank, plus 3,500 litres approximately, below fore cabin floor. Access ladder leads into forward end of wheelhouse. This is fitted with main steering position, separate chart table and ROV Station. Comprehensive electronics as well as full display of engine temperatures etc., and bilge and fire alarms. Control switches for all equipment arranged for either/or duplicate operation from either port or starboard batteries.

The wheelhouse joins the survey area via a short passage with sliding doors opening port and starboard with 3 steps down to deck. Aft of saloon is a galley to port and a W/C and shower to starboard, also a starboard storage cupboard. On port side a companionway leads below to accommodation of 1 double berth and two single berth cabins. Centre line tank for fresh water 3.5 tons between accommodation and aft peak, with useful void spaces outboard port and starboard. Spare propellers and stainless steel shafts are included together with much further spares and equipment.

2.1.3.3 ROV system specifications

STANDARD FALCON FEATURES INCLUDE:

- 300 m (1,000 ft) depth rating, 8.5 kg (19 lbs) payload
- Max 450 m umbilical length upgradeable to 1100 m length with F2 Fibre Optic Pack upgrade
- Magnetically coupled brushless DC thrusters with velocity feedback - 4 vectored and 1 vertical
- 50 kgf (110 lbs) of thrust with 1:1 power to weight ratio, without additional payload
- Distributed intelligence control system
- High resolution colour camera on 180° tilt platform
- Variable intensity 150 Watts of lighting
- Auto heading and depth
- Single phase 100-270 VAC universal auto sensing power input at 2.8 kW.



SPECIFICATIONS	FALCON
System power requirements	Single phase 100-270 VAC at 2.8kW
Maximum umbilical length	450 m
Depth rating	300 msw
Length	1000 mm
Height	500 mm
Width	600 mm
Launch weight	55 kg
Forward speed	> 3 knots
Thrust forward	50 kgf
Thrust lateral	28 kgf
Thrust vertical	13 kgf
Payload	8.5 kg

3 Survey Design

The survey strategy was devised following an assessment of previously collected seabed video and the available geophysical and bathymetric survey data. The primary focus of the study was to collect video footage in areas where different seabed types and biological communities would be expected – primarily driven by water depth and physical seabed characteristics.

The survey team has extensive experience of collecting seabed data in Orkney coastal waters following the guidelines developed by European Marine Energy Centre (EMEC) in tandem with SNH scientists (ROV Seabed Survey Guideline REP167-02-02 20100210[1]). These guidelines are consistent with those published by SNH for the monitoring of marine renewables deployments in Scotland (Saunders et al 2011[2]).

A map showing the seabed locations surveyed on 24 July 2015 is provided in Figure 3.1. The collection of continuous transects in the nearshore area (transects SSW and SSE) was prevented due to the presence of a line of creels in the area at the time of the survey. Video was therefore collected via two ROV deployments for each transect. A separate ROV dive was conducted at SSD to assess the seabed characterisation in the deeper water parts of the potential cable corridor.

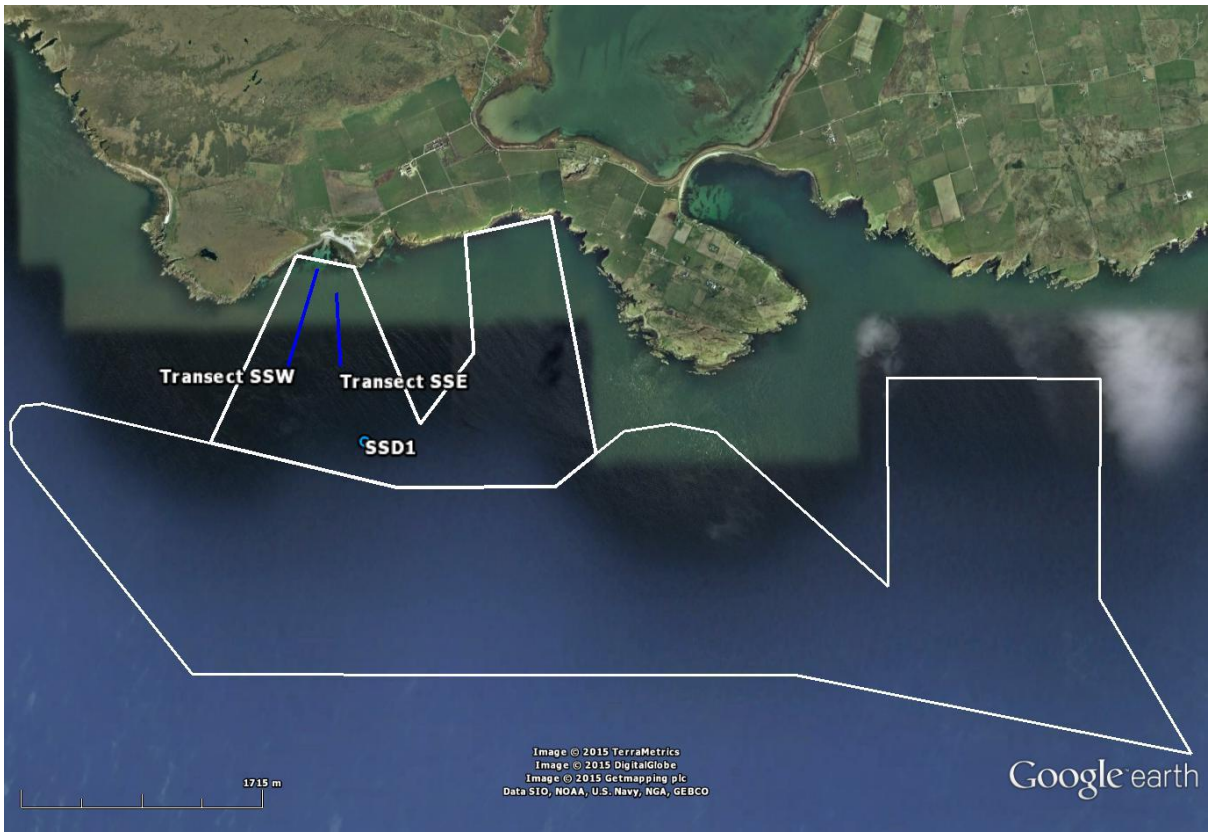


Figure 3.1 Sheep Skerry Corridor planned ROV deployments, July 2015 Survey

[1] Issued by EMEC to developers.

[2] Saunders, G., Bedford, G.S., Trendall, J.R., and Sotheran, I. (2011). Guidance on survey and monitoring in relation to marine renewables deployments in Scotland. Volume 5. Benthic Habitats. Draft report to Scottish Natural Heritage and Marine Scotland.

4 Survey Observations

The video collected within the proposed Sheep Skerry cable corridor was reviewed and a series of representative seabed images captured from the high definition GoPro camera footage. These images provide examples of the characteristic seabed types observed in the area. Details (coordinates, water depths, brief descriptions, and video file names) of the representative images are provided in Section 7 (Video/Image Log) and the locations are displayed in Figure 4.1 along with the multibeam bathymetry data collected at the site. Copies of all images are provided in an Annex to this document (Annex A).

The seabed characteristics observed in the cable corridor areas during the July 2015 survey were consistent with the data from the multibeam bathymetric survey of the area in June 2015. The relatively sheltered nearshore part of cable corridor was mainly composed of areas of gently-shelving fine rippled sand with occasional rocky outcrops. Larger rocky outcrops and raised platforms became more frequent as distance from the shore and water depth increased. In water depths of greater than 30 m the seabed was composed of mixed sediments, boulders and rock outcrops with the quantity of sand present generally decreasing with increasing water depth. The proportion of sandy sediment in the deeper water areas appeared to be greater along the eastern transect (SSE) probably due to the close proximity of major sand wave bedforms present to the east of the proposed corridor. Descriptions of the biotopes present in the area are provided in Section 5.

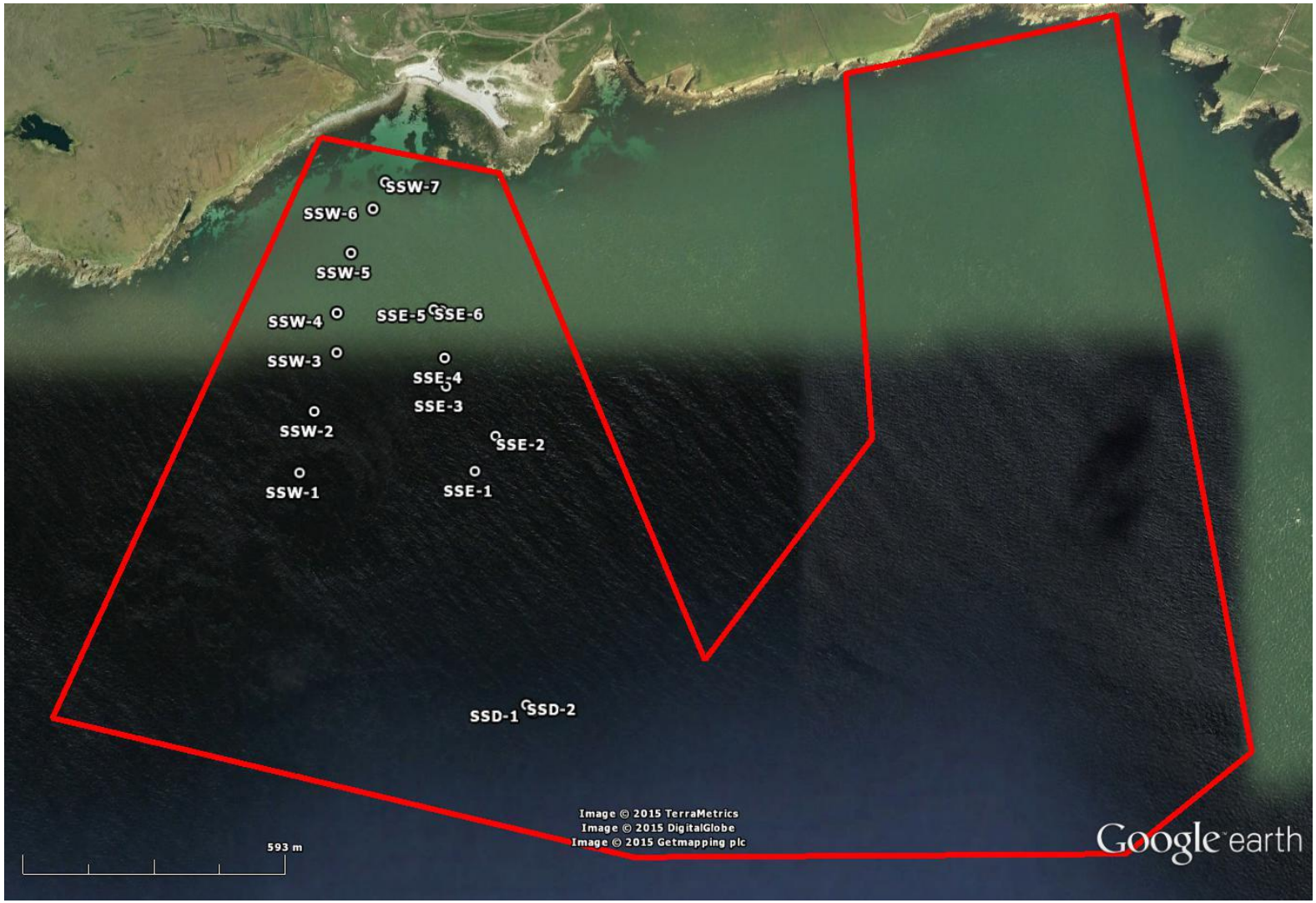


Figure 4.1 Sheep Skerry Cable Corridor, Representative Seabed Locations, July 2015 Survey

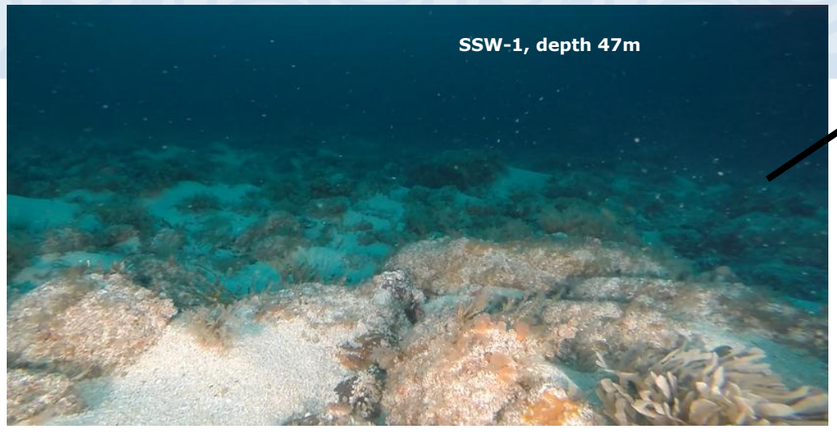
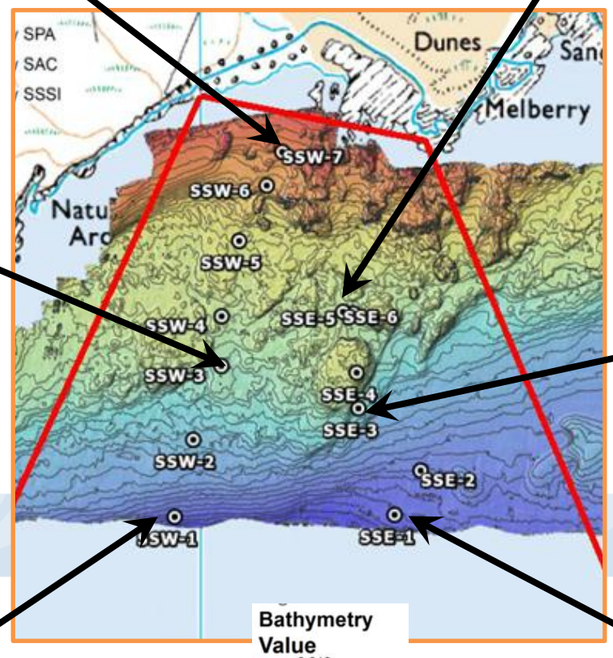


Figure 4.2 Sheep Skerry Cable Corridor - nearshore



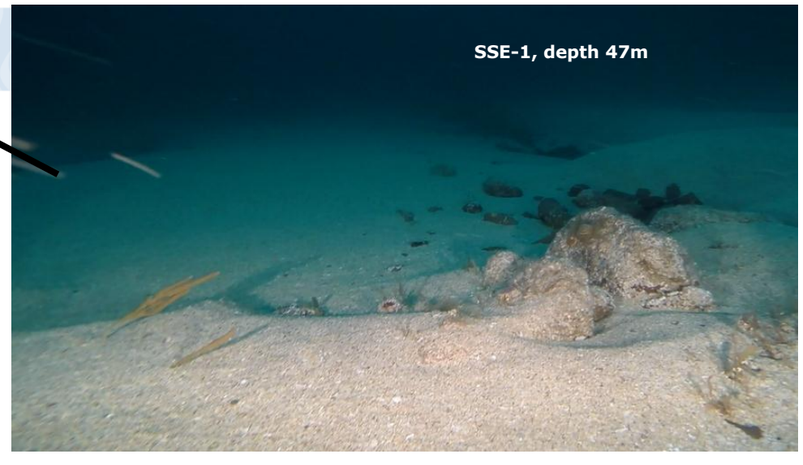


Figure 4.3 Sheep Skerry Cable Corridor - offshore

5 Description of Biotopes and Species

The JNCC biotope classification system[3] was used to identify the biotopes present in the survey area. The biotopes recorded are identified in Figure 5.1. An annotated biotope map, based on the characteristics of the representative images captured from the video footage and the bathymetry and seabed features identified from the multibeam survey, is provided in Figure 5.2.

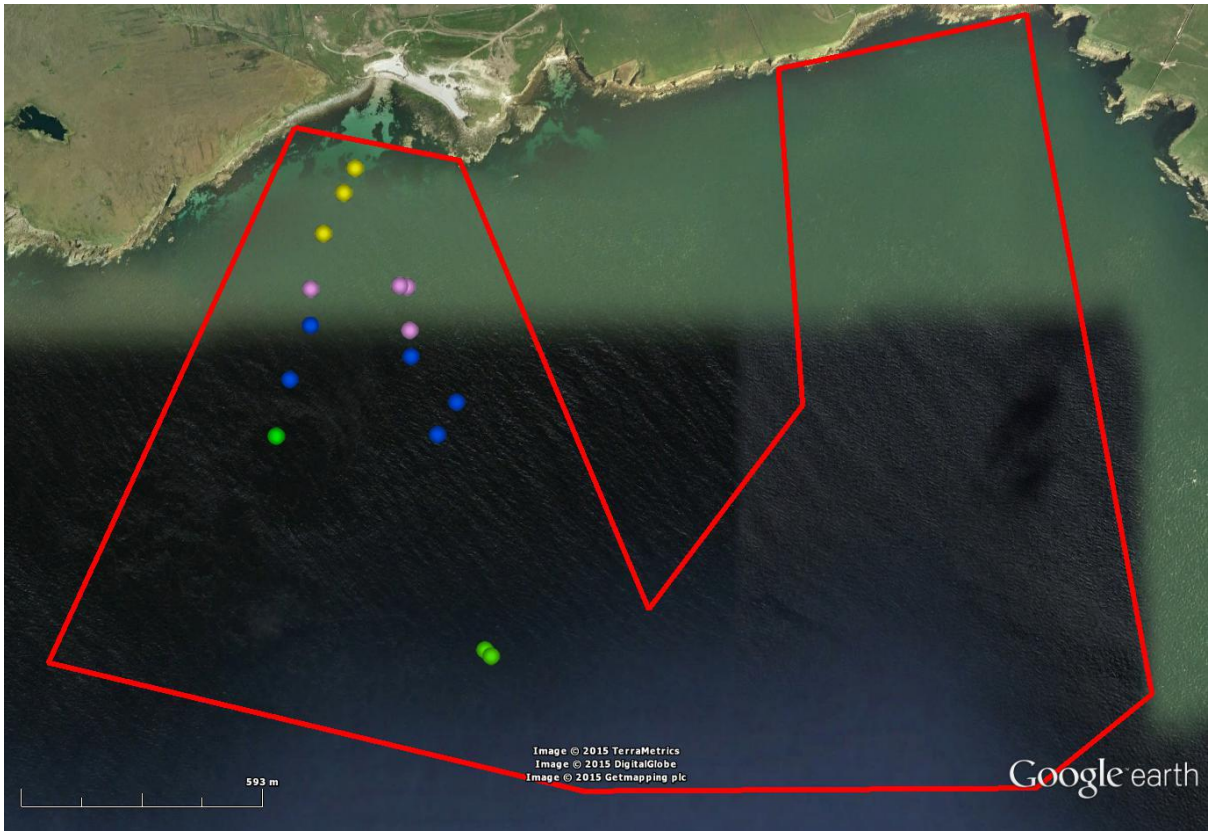
In shallow areas of the cable corridor (close to the potential cable landing point in water depths of less than 20m) the dominant biotope is characterised by fine sand and indication of burrowing polychaetes (SS.SSa.IFiSa) with occasional bedrock outcrops with varying densities of kelp and other seaweed. Areas of exposed bedrock covered by kelp (*Laminaria hyperborea*) and other seaweeds are present further from the coast in water depths of between 20 - 30m (IR.MIR.KR). The seabed found further offshore in water depths of between 30-50 m is primarily composed of mixed sediment and rocky outcrops supporting a range of biota including *Flustra foliacea*, *Nemertesia antennina*, *Pomatoceros triqueter, Urticina feline, Alcyonium digitatum* and echinoderms including *Asterias Rubens* and *Echinus esculentus* (SS.SMx.CMx.FluHyd).

In the deeper water parts of the potential cable corridor closer to the AfL area (depths of approximately 50 - 70m) the seabed becomes more rocky and dense faunal turf communities are present on tidally exposed surfaces (CR.HCR.FaT.CTub).

5.1 Conclusion

The survey work conducted in the Sheep Skerry cable corridor found a range of benthic habitats and species primarily influenced by water depth and degree of current and wave exposure. The communities present can be considered as being typical of the coastal Pentland Firth area and broadly similar to those recorded in other potential cable corridors under consideration for the Project (Melsetter and Aith Hope).

[3] DAVID W. CONNOR, JAMES H. ALLEN, NEIL GOLDING, KERRY L. HOWELL, LOUISE M. LIEBERKNECHT, KATE O. NORTHEN AND JOHNNY B. REKER (2004). The Marine Habitat Classification for Britain and Ireland Version 04.05 JNCC, Peterborough (internet version) jncc.defra.gov.uk/MarineHabitatClassification



Code	Description
SS.SSa.IFiSa	Infralittoral fine sand.
IR.MIR.KR	Kelp and red seaweeds (moderate energy infralittoral rock).
SS.SMx.CMx.FluHyd	*Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment.
SS.SMx.CMx.FluHyd/ CR.HCR.FaT.CTub	*Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment interspersed with *Tubularia indivisa* on tide-swept circalittoral rock.

Figure 5.1 Sheep Skerry Cable Corridor – recorded biotopes

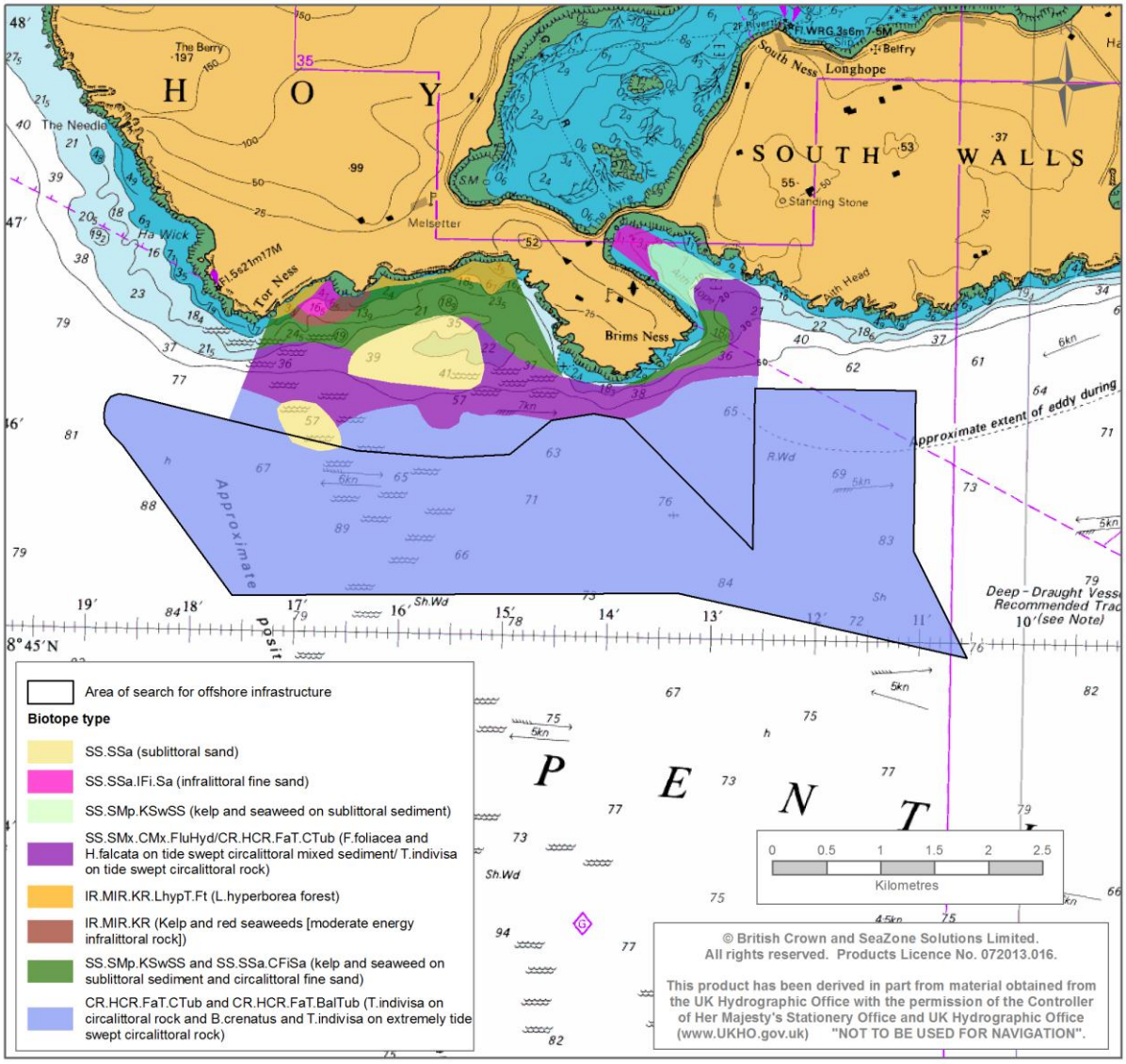


Figure 5.2 Sheep Skerry Cable Corridor – biotope map

Date/time	Description
25 July 2015	Low water 1147 High water 17224 (Dover). Weather forecast, westerly winds reducing from moderate to light
0850	Depart Stromness.
1100	Arrive on site – assess conditions and prepare equipment for deployment
	Southern extent of SSW transect
1120	ROV launched
1145	ROV recovered due to creels
	Offshore Drop Station SSD
1200	ROV launched
1220	ROV recovered
	Southern extent of SSE transect
1235	ROV launched
1245	ROV recovered (ROV manoeuvrability impaired by tide >2 knots)
	Northern extent of SSW transect
1355	ROV launched
1415	ROV recovered
	Northern extent of SSE transect
1430	ROV launched
1445	ROV recovered
1500	Depart site for Stromness
1700	Arrive Stromness – demobilise personnel/equipment

Image	Easting	Northing	depth m	Descriptive notes	GoPro file	Video Chapter
Sheep Skerry West (SSW) Transect						
1	483682	6514711	47	Boulders and rock outcrops interspersed with sand, encrusting biota and faunal turf on rock surfaces	381	1
2	483716	6514849	37	Mixed sediment and occasional rock outcrops, encrusting biota and faunal turf on rock surfaces		
3	483767	6514981	30	Mixed sediment and occasional rock outcrops, encrusting biota and faunal turf on rock surfaces		
4	483768	6515070	25	Rocky seabed with areas of sand veneer, kelp and other seaweeds, encrusting biota and faunal turf on rock surfaces		
5	483800	6515205	22	Rippled sandy sediment with occasional rock outcrops and boulders	385	4&5
6	483850	6515304	12	Rippled sandy sediment with large kelp covered boulder		
7	483878	6515364	9	Rippled sandy sediment		
Sheep Skerry East (SSE) Transect						
1	484077	6514713	47	Sandy sediment and occasional rock outcrops, encrusting biota and faunal turf on rock surfaces	384	3
2	484124	6514792	42	Mixed sediment and occasional rock outcrops, encrusting biota and faunal turf on rock surfaces		
3	484013	6514904	34	Mixed sediment and occasional rock outcrops, encrusting biota and faunal turf on rock surfaces	386	6&7
4	484010	6514968	23	Rocky seabed with areas of sand veneer, kelp and other seaweeds, encrusting biota and faunal turf on rock surfaces		
5	484004	6515074	27	Rocky seabed with areas of sand veneer, kelp and other seaweeds, encrusting biota and faunal turf on rock surfaces		
6	483986	6515077	26	Rocky seabed with areas of sand veneer, kelp and other seaweeds, encrusting biota and faunal turf on rock surfaces		
Sheep Skerry Drop Station (SSD)						
1	484206	6514172	67	Boulders and rock outcrops interspersed with sand, encrusting biota and faunal turf on rock surfaces	383	2
2	484191	6514187	67	Boulders and rock outcrops interspersed with sand, encrusting biota and faunal turf on rock surfaces		

Captured images listed here are supplied as an Annex to the report (Annex A).