ABWP Phase I Decommissioning

Benthic Live Habitat Cable Survey and Observations Log

Volume 3, Appendix 5.1



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Project name ABWP Phase I Decommissioning

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1 INTRODUCTION

1.1.1.1 Arklow Energy Limited (Arklow Energy) is seeking planning permission to decommission Arklow Bank Wind Park (ABWP) Phase I (referred to hereafter as 'the Proposed Works'). The Proposed Works include decommissioning of ABWP Phase I offshore infrastructure (Proposed Works Offshore) and decommissioning of ABWP Phase I onshore infrastructure (Proposed Works Onshore).

1.1.1.2 The Proposed Works Offshore will be undertaken within the Offshore Site (see **Volume 2, Chapter 3: Proposed Works Description**), which includes:

- The Sub Lease Area, located on the long narrow Arklow Bank sand bank, situated approximately 10 km off the coast of Arklow, south-east Ireland, where seven wind turbine generators (WTGs) and foundations, associated scour protection, 7.4 km of inter-array cables and one met mast are located; and
- A 10 m wide cable corridor along the 15.6 km offshore export cable route connecting WTG T4 to the landfall point at High Water Mark (HWM).

1.1.1.3 This Appendix aims to present the results of the Benthic-live Habitat Cable Survey, including the report itself produced by Alpha Marine, and inform **Volume 2, Chapter 5: Marine Biodiversity** of the Environmental Impact Assessment Report (EIAR).

1.1.1.4 The specific objectives of this Appendix are to:

- Introduce the Benthic-live Habitat Cable Survey;
- Present the key findings from sonar analysis and Remotely Operated Vehicle (ROV) investigations; and
- Provide a consolidated log of observations obtained from the review of the video data to support the EIAR assessment of potential impacts on marine biodiversity.

1.1.1.5 The report generated by Alpha Marine as is presented in **Alpha Marine Operations and Results Report Benthic/Live Habitat Cable Survey**. Alpha Marine was contracted by Arklow Energy to undertake a bathymetric / backscatter survey along the offshore export cable route, the inter-array cables and the foundations of each WTG. The report documents the technical methodologies, survey equipment, data acquisition, quality control procedures, post-processing approach, and survey results associated with the benthic/live habitat cable survey at ABWP Phase I.

2 BENTHIC/LIVE HABITAT CABLE SURVEY

2.1 Overview

2.1.1.1 The purpose of the survey was to identify any areas of potential cable exposure and any areas of significant seabed variation along the offshore export and inter-array cable routes where benthic habitats of potential ecological interest could occur.

2.1.1.2 The survey works comprised two main components:

- A Side-Scan Sonar (SSS) and multibeam bathymetric survey using a Norbit iWBMSe high-resolution sonar deployed from the *AMS Panther vessel*; and
- A ROV investigation deployed from the *AMS Adventure vessel* to ground-truth features of interest identified from the sonar data.

2.1.1.3 Survey acquisition took place the 15th and 16th of December 2025 in calm sea conditions, with light southerly winds and swells of less than 1 m.

2.2 Key Findings of the report

2.2.1 Cable Burial Status

2.2.1.1 The SSS survey showed that the offshore export cable is largely covered, only with minor sections exposed, and that the inter-array cables between the WTGs and the met mast are also covered, in line with previous surveys began since 2004.

2.2.1.2 ROV inspection at WTG03 and WTG07 confirmed the sonar findings, although short sections of the inter-array cable protection structures were observed above the seabed near the turbine bases, including J-Tubes, flexi-hose and split pipes (see **Figure 2.1** for a diagram of exposed cable protection structures). ROV inspection of the other WTGs could not be completed because extensive kelp fronds impeded the survey.

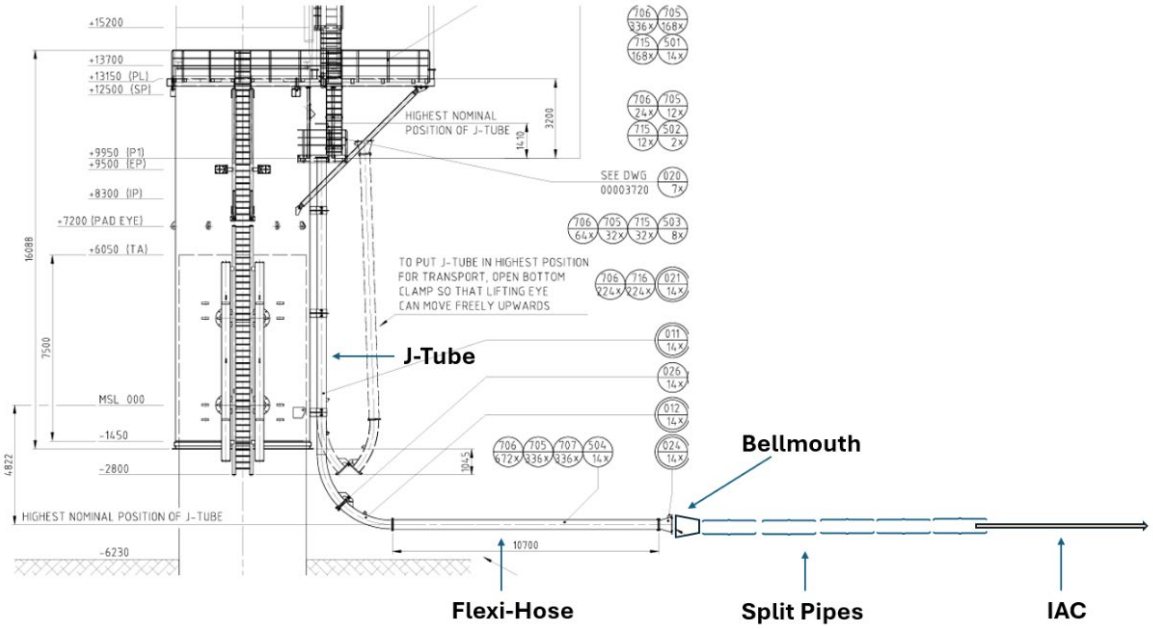


Figure 1: Diagram of WTGs foundation and transition of the inter array cable into the cable protection structures

2.2.2 Sonar Anomalies and ROV Ground-Truthing

2.2.2.1 Ten sonar objects (Sonar Objects 01–10) were identified as narrow linear features within the bathymetric and backscatter datasets along the offshore export cable (data presented in **Table 7.1: Sidescan Sonar Object locations** within **Appendix A**). ROV transects were run across nine of these (Sonar Object 07 was not surveyed).

2.2.2.2 The ROV investigation results were as follows:

- Sonar Objects 02, 03, 04, 05, 06, 08, and 09: offshore export cable not observed; confirmed as buried. Some debris, a linear object, and a cable joint area were noted at Objects 08 and 09.
- Sonar Object 01: Short lengths of a linear object observed, interpreted as possible offshore export cable exposure.
- Sonar Object 10: offshore export cable observed at a "wreck". The wreck is identified as the remains of a wooden-hulled vessel in near-total burial, with only a ~1.5 m section of hull visible.

2.2.3 Marine Growth and Benthic Habitat Observations

2.2.3.1 Where short sections of offshore export cable were visible on ROV video, no marine life was observed growing on the cable. ROV footage of the wreck (Sonar Object 10) did not reveal any marine growth.

2.2.3.2 Along the inter array cables, some marine growth was observed on sections of the cable protection systems close to the WTG foundations (see **Section 2.2.1)**, with extensive kelp fronds noted extending from the WTG towers between the high-water mark and approximately 2 m below.

3 RAMBOLL OBSERVATIONS LOG

3.1 Introduction

3.1.1 Scope of the Review

3.1.1.1 To independently review, supervise and verify the findings presented in the Alpha Marine Benthic/Live Habitat Cable Survey report, Ramboll undertook a structured visual analysis of the ROV video footage acquired along the Offshore Export Cable and at the Inter Array cable locations (WTG03 and WTG07) within the Offshore Site; seabed conditions, cable burial status and biological observations of the received footage were recorded in order to support **Volume 2, Chapter 5**.

3.1.1.2 The review covered the ROV video transects recorded by Alpha Marine across Sonar Objects 01 to 10 (excluding Sonar Object 07, which was not surveyed) along the offshore export cable, together with the ROV footage acquired at the inter-array cable locations associated with WTG03 and WTG07 covering part of the J-tube, Flexi-Hose, Spilt Pipes and cable exit areas (See **Figure 2.1** for a detailed diagram of the cable protection structures) at the turbine bases.

3.1.2 Methodology

3.1.2.1 The ROV video footage was visually reviewed by a qualified marine ecologist at Ramboll. The results are presented in **Table 3.1**. Each video clip was examined in full, and observations were logged on a time-stamped basis (start and end times in minutes:seconds (mm:ss) against the following parameters:

- Dominant substrate type (e.g. sand, mud, coarse sediment, mixed sediment, rock), recorded using a standardised substrate classification list;
- European Nature Information System (EUNIS) Level 3 habitat classification (e.g. A5.2 Subtidal sand, A5.4 Subtidal mixed sediments), applied where the substrate and visibility permitted habitat assignment;
- Depth and temperature as recorded by the ROV telemetry, where available;
- Biological observations, with the aim of identifying species to group level as a minimum, and to species or genus level where image quality, viewing angle and the ecologist's expert judgement allowed; and
- Visibility and data quality remarks, including periods of "no view of seabed" or high turbidity, to provide transparency on the limitations of the underlying footage.

3.1.2.2 Where notable features were identified (e.g. possible cable exposure, exposed rock, megafauna observations), still images were extracted and cross-referenced to the relevant video timestamp to support the written log.

3.1.3 Verification Approach

3.1.3.1 The Ramboll observations log was then compared against the cable observations, sonar interpretations and conclusions presented by Alpha Marine in order to:

- Independently verify the reported burial status of the offshore export cable and inter-array cables;
- Confirm or refine the substrate and habitat characterisations along the offshore export cable and inter-array cable; and
- Provide a consolidated, ecologically informed record of benthic biota observed in the footage to inform **Volume 2, Chapter 5**.

3.1.4 Ramboll's Observations log

Table 1: Ramboll's Video Analysis Register

Sonar Object ID	Video ID	Start Time (mm:ss)	End Time (mm:ss)	Dominant Substrate	EUNIS Level 3 Code	Depth (m)	Temp. (°C)	Notes
Sonar Object 1	0941-0944	0:00	0:38	NA	NA	NA	10	No view of seabed
Sonar Object 1	0941-0944	0:39	1:33	Mixed sediment	A5.4 Subtidal mixed sediments	23.8	10	1:07 - Fish - species uncertain
Sonar Object 1	0941-0944	1:34	1:52	NA	NA	21.1	10	No view of seabed
Sonar Object 1	0941-0944	1:53	2:39	Mixed sediment	A5.4 Subtidal mixed sediments	24	10	Occasional fleshy seaweed- likely *Desmarestia* covered in thin layer of mud/silty sediment* *Image 9.44.17 in folder Hermit crabs, scallops regular 2:15 - Fish - Species unclear
Sonar Object 1	0941-0944	2:40	2:47	NA	NA	24	10	No view of seabed
Sonar Object 1	0941-0944	2:47	3:00	Mixed sediment	A5.4 Subtidal mixed sediments	23.9	10	Mixed sediment with pebbles and shells, no obvious epifauna
Sonar Object 1	0944-0945	0:00	0:05	NA	NA	23.9	10	No view of seabed
Sonar Object 1	0944-0945	0:06	0:40	Mixed sediment	A5.4 Subtidal mixed sediments	24.1	10	Mixed sediment with pebbles and shells, no obvious epifauna
Sonar Object 1	0944-0945	0:41	3:00	NA	NA	NA	10	No view of seabed
Sonar Object 1	0944-0945	0:00	2:28	Mixed sediment	A5.4 Subtidal mixed sediments	23.4	10	Scattered brown seaweed Hermit crabs occasional
Sonar Object 1	0944-0945	2:29	3:00	NA	NA	NA	10	No view of seabed
Sonar Object 2	1025-1028	0:00	0:25	NA	NA	22.5	10	No view of seabed
Sonar Object 2	1025-1028	0:26	1:33	Mixed sediment	A5.4 Subtidal mixed sediments	22.5	10	Mixed sediment with rocks and small boulders scattered Scattered brown seaweed, attached to larger boulders and rocks
Sonar Object 2	1025-1028	1:33	2:07	Mixed sediment	A5.4 Subtidal mixed sediments	22.5	10	Mixed sediment, scattered rocks and boulders in aggregates
Sonar Object 2	1025-1028	2:07	3:00	Mixed sediment	A5.4 Subtidal mixed sediments	22.2	10	View of sediment patchy, high turbidity Scattered brown seaweed, attached to larger boulders and rocks
Sonar Object 2	1028-1030	0:00	0:44	Mixed sediment	A5.4 Subtidal mixed sediments	22.2	10	Mixed sediment with pebbles, rocks and small boulders. Scattered brown seaweed, attached to larger boulders and rocks 0:16 - Fish - Whiting or cod juvenile
Sonar Object 2	1028-1030	0:44	0:50	NA	NA	22.2	10	No view of seabed
Sonar Object 2	1028-1030	0:51	1:50	Mixed sediment	A5.4 Subtidal mixed sediments	22.2	10	View of seabed patchy, no view of seabed periodically, high turbidity Mixed sediment with sand and pebbles when visible
Sonar Object 3	1044-1047	0:00	0:18	NA	NA	25.2	10	No view of seabed
Sonar Object 3	1044-1047	0:19	1:10	Mixed sediment	A5.4 Subtidal mixed sediments	25.7	10	Visibility poor, high turbidity. 0:32 - Fish - species uncertain Mixed sediment with scattered pebbles, few large boulders or rocks
Sonar Object 3	1044-1047	1:11	1:37	Mixed sediment	A5.4 Subtidal mixed sediments	24.5	10	Mixed sediment with regular large rocks and small boulders Scattered *Laminaria spp*, hermit crabs 1:21 - Sea star (*Asterias rubens*) on large boulder
Sonar Object 3	1044-1047	1:37	2:09	NA	NA	24.5	10	Very poor/no view of seabed

Sonar Object ID	Video ID	Start Time (mm:ss)	End Time (mm:ss)	Dominant Substrate	EUNIS Level 3 Code	Depth (m)	Temp. (°C)	Notes
Sonar Object 3	1044-1047	2:10	3:00	Mixed sediment	A5.4 Subtidal mixed sediments	25.3	10	Mixed sediment with pebbles and small rocks *Laminaria spp* scattered on rocks 2:11 - Anemone - Small, red, short tentacles. 5+ other individuals in following 20 seconds
Sonar Object 3	1047-1050	0:00	3:00	Mixed sediment	A5.4 Subtidal mixed sediments	25.2	10	Mixed sediment with pebble and small rocks Scattered brown seaweed, anemone (as above) Sea stars occasional 2:25 *Virgularia spp*
Sonar Object 4	1059-1101	0:00	3:00	Mixed sediment	A5.4 Subtidal mixed sediments	29.1	10	Visibility poor, high turbidity. Mixed sediment, sandy bottom with small pebbles scattered
Sonar Object 4	1102-1104	0:00	1:42	Mixed sediment	A5.4 Subtidal mixed sediments	28.8	10	Visibility poor, high turbidity. Mixed sediment, sandy bottom with small pebbles scattered
Sonar Object 4	1102-1104	1:43	2:05	NA	NA	28.1	10	Very poor/no view of seabed
Sonar Object 5	1113-1116	0:00	3:00	Mixed sediment	A5.4 Subtidal mixed sediments	26.5	10	Mixed sediment with pebble and small rocks Scattered brown seaweed *Virgularia spp* periodically Sea stars frequent on larger rocks, anemone (same spp as above)
Sonar Object 5	116-1118		2:10	Sand	A5.4 Subtidal mixed sediments	26.8	10	Mixed sediment with scattered small rocks and pebbles *Virgularia spp* occasional Hermit crabs, sea stars, anemone frequent
Sonar Object 5	116-1118	2:11	2:39	NA	NA	26.8	10	Very poor/no view of seabed
Sonar Object 6	1127-1130	0:00	0:47	NA	NA	29.3	10	Very poor/no view of seabed
Sonar Object 6	1127-1130	0:48	1:55	Mixed sediment	A5.4 Subtidal mixed sediments	29.3	11	Mixed sediment with small rocks and pebbles, few hermit crabs 1:47
Sonar Object 6	1127-1130	1:56	2:45	Sand	A5.2 Subtidal sand	28.9	11	Substrate changes gradually to be dominated by sand - Subtidal sand, very few small pebbles. No visible epifauna
Sonar Object 6	1127-1130	2:45	3:00	Mixed sediment	A5.4 Subtidal mixed sediments	28.7	11	Around 2:45 dominant habitat goes back to mixed sediment, more frequent pebbles and rocks
Sonar Object 6	1131-1134	0:00	0:37	Mixed sediment	A5.4 Subtidal mixed sediments	28.9	11	Very poor view, but from flashes of seabed it is mixed sediment
Sonar Object 6	1131-1134	0:38	2:29	Mixed sediment	A5.4 Subtidal mixed sediments	28.8	11	Visibility poor, high turbidity. Mixed sediment, sandy bottom with small pebbles scattered
Sonar Object 6	1131-1134	2:30	3:00	NA	NA	28.4	11	Very poor/no view of seabed
Sonar Object 8	1145-1148	0:00	2:12	Mixed sediment	A5.4 Subtidal mixed sediments	Unknown	Unknown	Mixed sediment with small rocks scattered throughout, no visible epifauna 1:26 Sonar Object 8 image - likely exposed rock.
Sonar Object 8	1145-1148	2:13	2:30	Coarse sediment (gravel/cobble)	A5.4 Subtidal mixed sediments	Unknown	Unknown	Object (as pictured in 10.48.20.png) - Best view 2:18-2:32 - likely exposed rock.
Sonar Object 8	1148-1149	0:00	1:19	Coarse sediment (gravel/cobble)	A5.4 Subtidal mixed sediments	Unknown	Unknown	Visibility poor, rocky bottom (pebbles, small rocks) and sand. No visible epifauna.
Sonar Object 8	1148-1149	1:20	1:28	NA	NA	Unknown	Unknown	Very poor/no view of seabed
Sonar Object 9	1118-1121	0:00	2:49	NA	NA	Unknown	Unknown	Very poor/no view of seabed
Sonar Object 9	1118-1121	2:50	11:01	Mixed sediment	A5.4 Subtidal mixed sediments	Unknown	Unknown	View of seabed poor and patchy, but mixed sediment throughout. Sandy substrate with rocks and pebbles, shells frequent throughout No visible epifauna

Sonar Object ID	Video ID	Start Time (mm:ss)	End Time (mm:ss)	Dominant Substrate	EUNIS Level 3 Code	Depth (m)	Temp. (°C)	Notes
Sonar Object 9	1121-1124	0:00	12:00	Sand	A5.4 Subtidal mixed sediments	Unknown	Unknown	Visibility very poor throughout video. Mixed sediment with fine sand/mud. Abundant small pebbles and shells (scallops ex.) No visible epifauna
Sonar Object 9	1124-1127	0:00	4:09	Sand	A5.4 Subtidal mixed sediments	Unknown	Unknown	Visibility very poor throughout video. Mixed sediment with fine sand/mud. Abundant small pebbles and shells (scallops ex.) No visible epifauna
Sonar Object 9	1124-1127	4:10	6:22	NA	NA	Unknown	Unknown	Very poor/no view of seabed
Sonar Object 9	1124-1127	6:22	12:00	Sand	A5.4 Subtidal mixed sediments	Unknown	Unknown	Visibility very poor throughout video. Mixed sediment with fine sand/mud. Abundant small pebbles and shells No visible epifauna
Sonar Object 9	1127-1139	0:00	9:42	Sand	A5.4 Subtidal mixed sediments	Unknown	Unknown	Visibility very poor throughout video. Mixed sediment with fine sand/mud. Abundant small pebbles and shells No visible epifauna
Sonar Object 10	Video 1 of 3	0:00	1:34	Sand	A5.2 Subtidal sand	Unknown	Unknown	Subtidal sand with occasional hermit crabs, shells scattered.
Sonar Object 10	Video 1 of 3	1:22	1:34	Sand	A5.2 Subtidal sand	Unknown	Unknown	Image: Sonar Object 10 – Cable protection - Black and uniform in shape.
Sonar Object 10	Video 1 of 3	1:35	2:19	Sand	A5.2 Subtidal sand	Unknown	Unknown	Subtidal sand with occasional hermit crabs, shells scattered.
Sonar Object 10	Video 1 of 3	2:20	2:35	Sand	A5.2 Subtidal sand	Unknown	Unknown	Image: Sonar Object 10 - Cable protection - Black and uniform in shape.
Sonar Object 10	Video 1 of 3	2:35	3:00	Sand	A5.2 Subtidal sand	Unknown	Unknown	Subtidal sand with occasional hermit crabs, shells scattered.
Sonar Object 10	Video 2 of 3	0:00	1:55	Sand	A5.2 Subtidal sand	Unknown	Unknown	Image: Sonar Object 10 - Cable protection - Black and uniform in shape.
Sonar Object 10	Video 2 of 3	1:56	3:00	Sand	A5.2 Subtidal sand	Unknown	Unknown	Subtidal sand with shells scattered. No visible epifauna
Sonar Object 10	Video 3 of 3	0:00	3:00	Sand	A5.2 Subtidal sand	Unknown	Unknown	0:27 Sonar Object 8 image - likely exposed rock. 1:24 Sea star (*A. reubens*) on object above 2:57 Black cable/pipe as seen in Video 1 of 3, 2 of 3.
T3 Full J tube & Flexi		0:00	0:46	NA	NA	Unknown	Unknown	Very poor/no view of seabed
T3 Full J tube & Flexi		0:47	2:05	Other	Other	4.5	11	Extensive mussel coverage on small section of cable protection exposed 20+ sea stars covering mussels and small section of cable protection exposed
T3 Full J tube & Flexi		2:06	6:00	Sand	A5.2 Subtidal sand	8.5	11	Cable covered in later of fine sediment, scattered crabs, sea stars. Cable appears to be half buried in sediment
T7		0:00	6:00	Sand	A5.2 Subtidal sand	8	11	Cable protection half buried in sandy sediment with moderate coverage of mussels, sea stars scattered, brown algae
T7 cable exit		0:00	6:00	Sand	A5.2 Subtidal sand	7.5	11	Sandy sediment with scattered boulders. Patches of mussels on cable, scattered sea stars and extensive brown algae and barnacles Visibility poor
T7 End of Flexi		0:00	5:07	NA	NA	Unknown	Unknown	Very poor/no view of seabed
T7 End of Flexi		5:08	6:00	Sand	A5.2 Subtidal sand	7.5	11	Cable protection half buried in sandy sediment Extensive mussel coverage, scattered sea stars
T72		0:00	1:48	NA	NA	Unknown	Unknown	Very poor/no view of seabed
T72		1:49		Sand	A5.2 Subtidal sand	7.8	11	Very poor visibility Cable protection half buried in sandy sediment, moderate mussel coverage on cable. Scattered crabs and sea stars

APPENDIX A ALPHA MARINE OPERATIONS AND RESULTS REPORT BENTHIC/LIVE HABITAT CABLE SURVEY

Date	Revision	Reason for Change	Prepared by	Reviewed by	Approved by
10/03/2026	01	Initial Release	S. Greenwood	T. Greenwood	T. Greenwood
01/04/2026	02	Updates following inter array cable works + client comment	S. Greenwood	T. Greenwood	T. Greenwood
08/05/2026	03	Further updates following client review	S. Greenwood	T. Greenwood	T. Greenwood

Operations and Results Report

for

GE VERNOVA

Arklow Bank Offshore Windfarm

Benthic/Live Habitat Cable Survey

ALPHAMARINE VESSEL SUPPORT & MARINE SERVICES ISO 9001 ISO 14001 ISO 45001 BUREAU VERITAS Certification UKAS MANAGEMENT SYSTEMS 0008

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1. Introduction

Alpha Marine Ltd was contracted by GE Vernova to undertake a bathymetric / backscatter survey along the Export cable route corridor and along the Infield Array cables on the Arklow Bank Wind Farm. This report documents the technical methodologies utilised for the survey and the data acquired from the survey

The survey work was undertaken using a Norbit iWBMSe high resolution sonar with factory set normalised backscatter.

2. Scope of Work

High-level scope of benthic surveys along the export cable route

- Side-scan sonar (SSS) survey to be undertaken within a 10m corridor along the existing export cable and inter array cable routes, including as close to landfall as possible
- SSS survey data to be collected in one go and data to be processed / analysed on vessel to inform remotely operated vehicle (ROV) deployment

Deployment of ROV (drop camera) with video equipment on points of interest, e.g. where cable sections are exposed or where seabed shows variation and potential habitats of interest (based on interpretation by an experienced ecologist or geologist).

3. Background

A 'Depth of Burial' survey was carried out on the Export cable in 2010 and on the Inter Array cables in 2007. The same method was used for both surveys and this method required a 'tone' to be introduced to the cables to enable detection by the towed sensor array. This method was 'non-visual' so the results of these surveys could not determine if the cables were exposed at the time of the survey or indeed at any time after the survey.

The results from the 2010 Depth of Burial survey on the Export Cable show areas where depth of burial was positive, zero or not recorded – this does not mean that the cable is exposed. Where a trench has been dug in the seabed - the variable movement of seabed sediments with strong currents has been shown to restore the mean seabed level to that prior to trenching and therefore the cable in the trench may become covered or exposed given the variable movement of seabed sediments over time.

Annual sonar surveys of the Export cable and the Inter Array cables from 2010 to 2025 have not detected any exposure of the power cables. Evidence of trenching and spoil heaps have been detected along the Export cable route. A review of the sonar data from 2012 to 2019 shows that the length of the trenches and spoil heaps on the seabed as detected by sonar have gradually reduced year on year. This

indicates that these areas of trench have been naturally backfilling as the seabed returns to its original level pre-trenching. Therefore, based on this review and this latest survey, it is apparent that the export power cable is now largely covered.

Hence the objective of this survey has been to acquire side-scan sonar data along the Export and Inter Array Cables to determine if there are any areas of cable exposure or areas of significant variation in the seabed along the cable routes where benthic habitats might exist.

This report details how this has been achieved.

4. Survey Methodology

There are two parts to this survey.

- The first part was to conduct a side-scan sonar survey of the Export and Inter Array power cables to identify any areas of exposed cable and seabed variations along the cable routes that may have benthic habitats of interest.

- The second part was to deploy a ROV with video equipment on points of interest, e.g. where cable sections are exposed or where seabed shows variation and potential habitats of interest (based on interpretation by an experienced ecologist or geologist).

4.1 Survey Extents

The survey was undertaken across the known Export cable route corridor, see Figure 1 below. This included the inter array cable routes between the existing turbine bases. The water depths along the cable routes range from 5-30 metres.

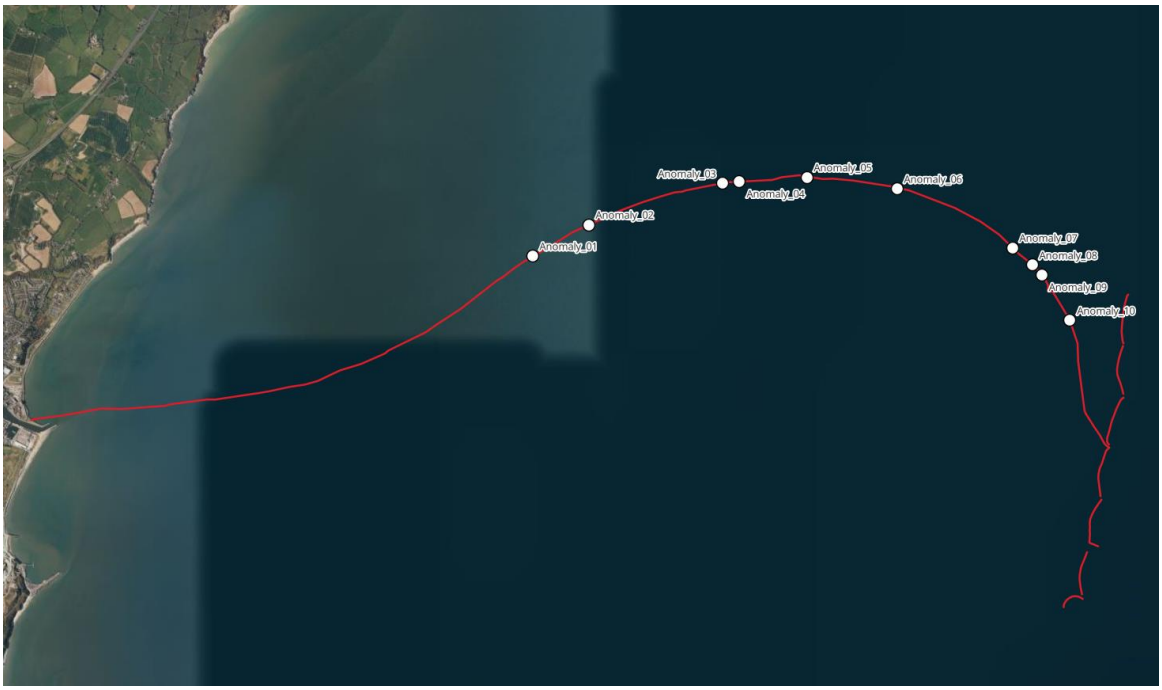


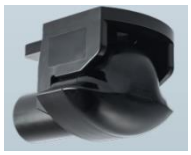
Figure 1. Export and Inter Array Cable Route

4.2 Survey Vessel

The AMS Panther was used as the primary survey vessel for this project. The vessel is a 17m catamaran powered by twin water jets. The multibeam sonar was pole mounted on the starboard side of the vessel at a draft of 1.5m, i.e. 0.5 m below the vessel draft of 1.0 m to give maximum un-interrupted swath width.

Vessel Details					
	Type	**Name**	**Description**	**Dims (m)**	**Deck Area**
	Survey/CTV	AMS PANTHER	17metre Catamaran	17 x 6.3 x 1.0	25m2

4.3 Survey Equipment

Equipment Specifications			
Surface Positioning & Heading	Applanix POS SurfMaster		Precise inertial navigation system (INS) outputting heave, pitch, roll, speed & heading
Multibeam/SSS	Norbit – iWBMSe multibeam Sonar System		Fully featured wide swath, high resolution multibeam system, mounted on overside pole
Sound Velocity Profiler	Valeport Mini SVS-P		The Valeport miniSVS uses digital 'Time of Flight' technology to provide the lowest noise, highest accuracy, best resolution sound velocity data available.

Processing Software	Beamworx NavAQ	Beam worX	Data processing and charting software used to record and process backscatter
Drop Down Video	FIFISH V6 Expert		Compact & manoeuvrable, tethered ROV with high resolution video and image capture.

4.4 Equipment and Platform

The bathymetric survey was undertaken using a Norbit iWBMSe multibeam echosounder and sonar system - pole mounted on the AMS Panther. Both bathymetric data and normalised sonar backscatter was recorded throughout the survey period. A swath width of 130 degrees was used with 512 equidistant beams. The sonar was operated at a frequency of 400kHz with gains set manually and fixed throughout the survey period. The multibeam system is factory calibrated to record normalised backscatter.

The sonar is integrated with a Applanix POSMV SurfMaster attitude sensor.

4.5 Positioning and Navigation

Real-time horizontal positioning was achieved using Trimble VRS Now RTK GNSS corrections, providing centimetre-level accuracy throughout the survey. This ensured reliable positional control over the survey area.

4.6 Sound Velocity Control

A Valeport SWiFT Sound Velocity Profiler (SVP), operating under a valid calibration certificate, was used to collect sound velocity profiles at regular intervals and after notable environmental changes. These profiles ensured accurate beam refraction correction during both acquisition and processing. Sound velocity was also measured at the sonar head continually throughout the acquisition.

4.7 Multibeam System Calibration (Patch Test)

A full multibeam patch test was completed prior to commencement of data acquisition to calibrate the system and resolve any residual alignment offsets between the GNSS antenna, IMU, and multibeam transducer. Calibration lines were run using Trimble VRS Now RTK corrections to ensure the highest possible positioning accuracy during the determination of latency, pitch, roll, and yaw offsets. The derived calibration parameters were incorporated into both acquisition and processing workflows to ensure geometrically accurate soundings and compliance with Special Order standards, see APPENDIX A for a copy of the patch test report.

4.8 Geodetic Setup

All survey data was recorded to WGS 84 / UTM zone 29N (EPSG code 32629). The WGS84 ellipsoid was used as the vertical datum.

4.9 Survey Lines

Survey lines were run parallel to the known Export cable route and the Inter Array cable routes

Two survey lines were run either side of the cable routes.

4.10 Survey Time and Date

The table below details the start and end times for the survey works.

Table 4.10-1: Survey date and times (UTC)

Port of Mobilisation	Date	Survey acquisition start	Survey acquisition end
Arklow	15/12/2025	13:30	16:15
Arklow	16/12/2025	09:15	12:45

4.11 Weather and Tide Conditions

The sea conditions were calm throughout the survey, with light southerly winds and swells <1m.

The survey was conducted around the turbines over a period of HW on the 16/12/2025 to ensure maximum water depth for the multibeam transducer.

5. Data Acquisition and Quality Control

Data acquisition was performed within Beamworx NAVAQ, which provided continuous real-time monitoring of beam performance, vessel motion, coverage density, and system health. Real-time quality control procedures ensured that overlap, coverage, and accuracy criteria were maintained across the entire survey.

6. Post-Processing and Surface Generation

Post-processing was conducted within the Beamworx Auto Clean and modelling environment. This included application of refined navigation, motion and sound velocity corrections, automated and manual cleaning, and the creation of the final gridded bathymetric / backscatter surfaces. Structural imagery, point clouds, and all required deliverables were produced in accordance with project specifications.

NOTE: Bathymetric Charts listed in **APPENDIX B** are sent as a separate file.

7. Survey Results

The data was analysed by an experienced hydrographic surveyor to locate any possible areas of exposed transmission cable and areas where the seabed showed variation in elevation.

Both the bathymetric dataset and the backscatter dataset were analysed, and 10 locations were selected

See Table 3.1 below.

Table 7-1: Sidescan Sonar Object locations

Objects Detected	Easting	Northing	Water Depth Chart Datum	Latitude	Longitude
Sonar Object 01	698746.0	5855422.7	22.54	52° 48.7141'N	006°03.0582'W
Sonar Object 02	699417.4	5855831.1	21.33	52° 48.9192'N	006°02.4464'W
Sonar Object 03	701023.7	5856401.6	25.00	52° 49.1907'N	006°00.9972'W
Sonar Object 04	701225.3	5856428.6	28.51	52° 49.2007'N	006°00.8169'W
Sonar Object 05	702044.2	5856513.7	25.58	52° 49.2282'N	006°00.0857'W
Sonar Object 06	703146.0	5856425.1	27.71	52° 49.1557'N	005°59.1094'W
Sonar Object 07	704574.5	5855766.5	30.06	52° 48.7685'N	005°57.864'W
Sonar Object 08	704828.7	5855571.2	31.51	52° 48.6575'N	005°57.6454'W
Sonar Object 09	704945.7	5855453.0	32.14	52° 48.5912'N	005°57.5458'W
Sonar Object 10	705311.1	5854919.7	27.88	52° 48.2956'N	005°57.2411'W

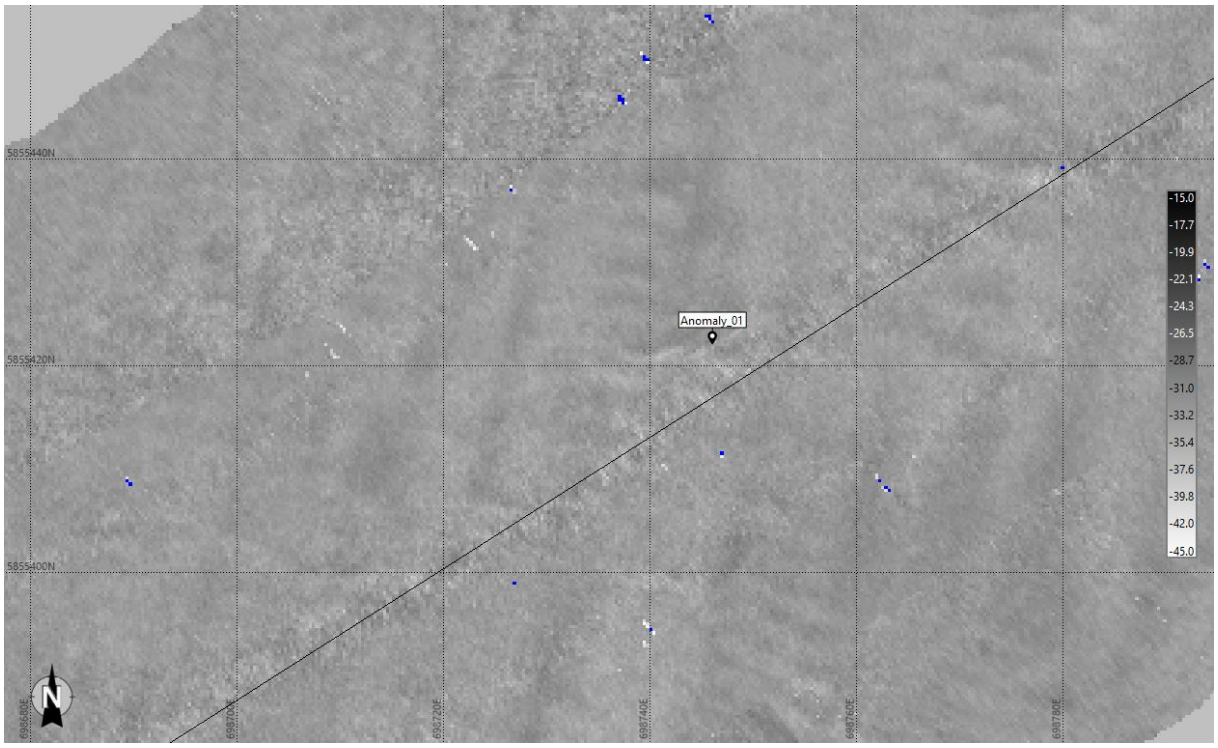


Figure 7-1: Sonar Object 01 was picked from the backscatter dataset as a narrow linear feature

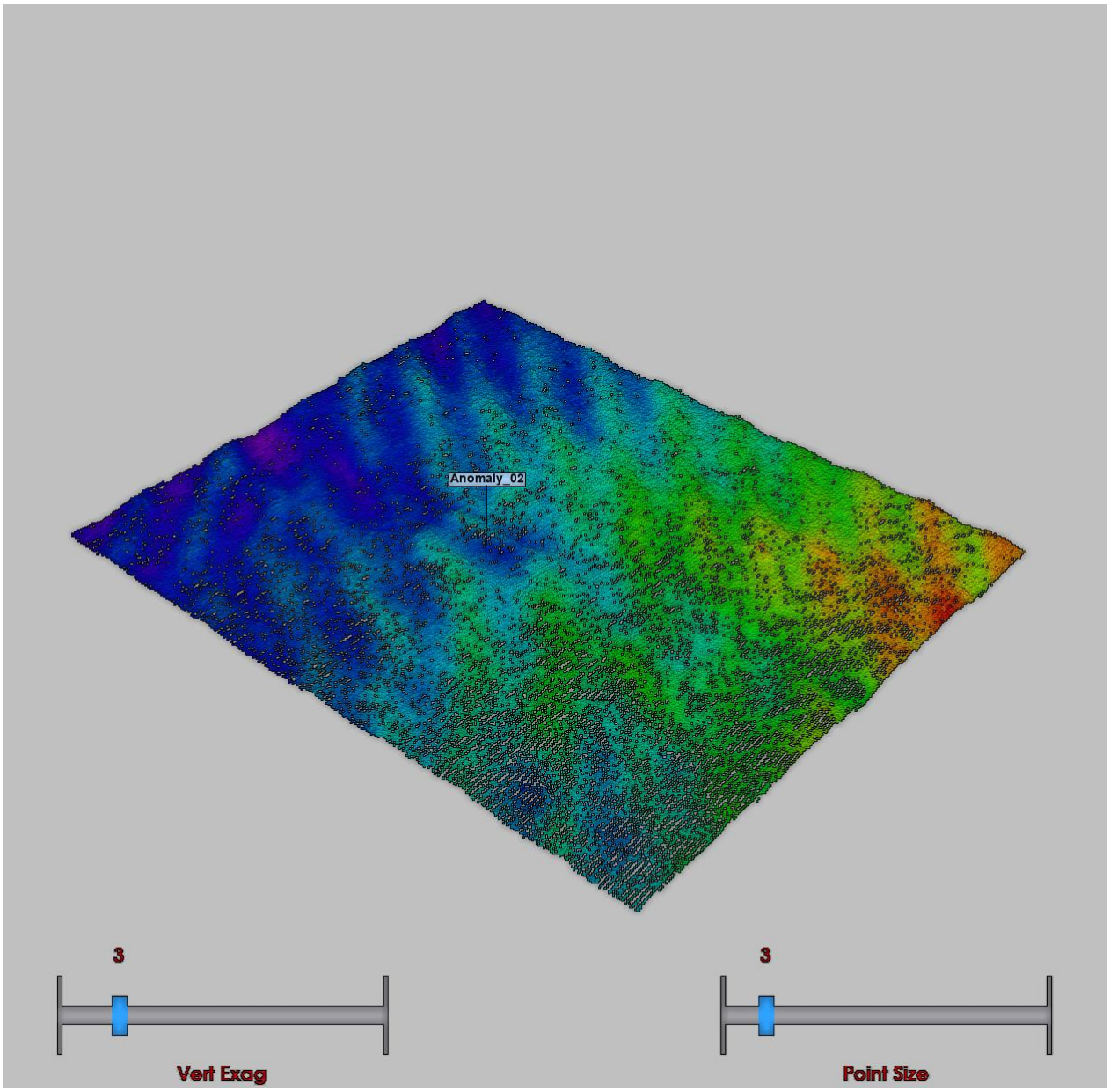


Figure 7-2: Sonar Object 02 was picked from the bathymetry dataset as a narrow linear feature

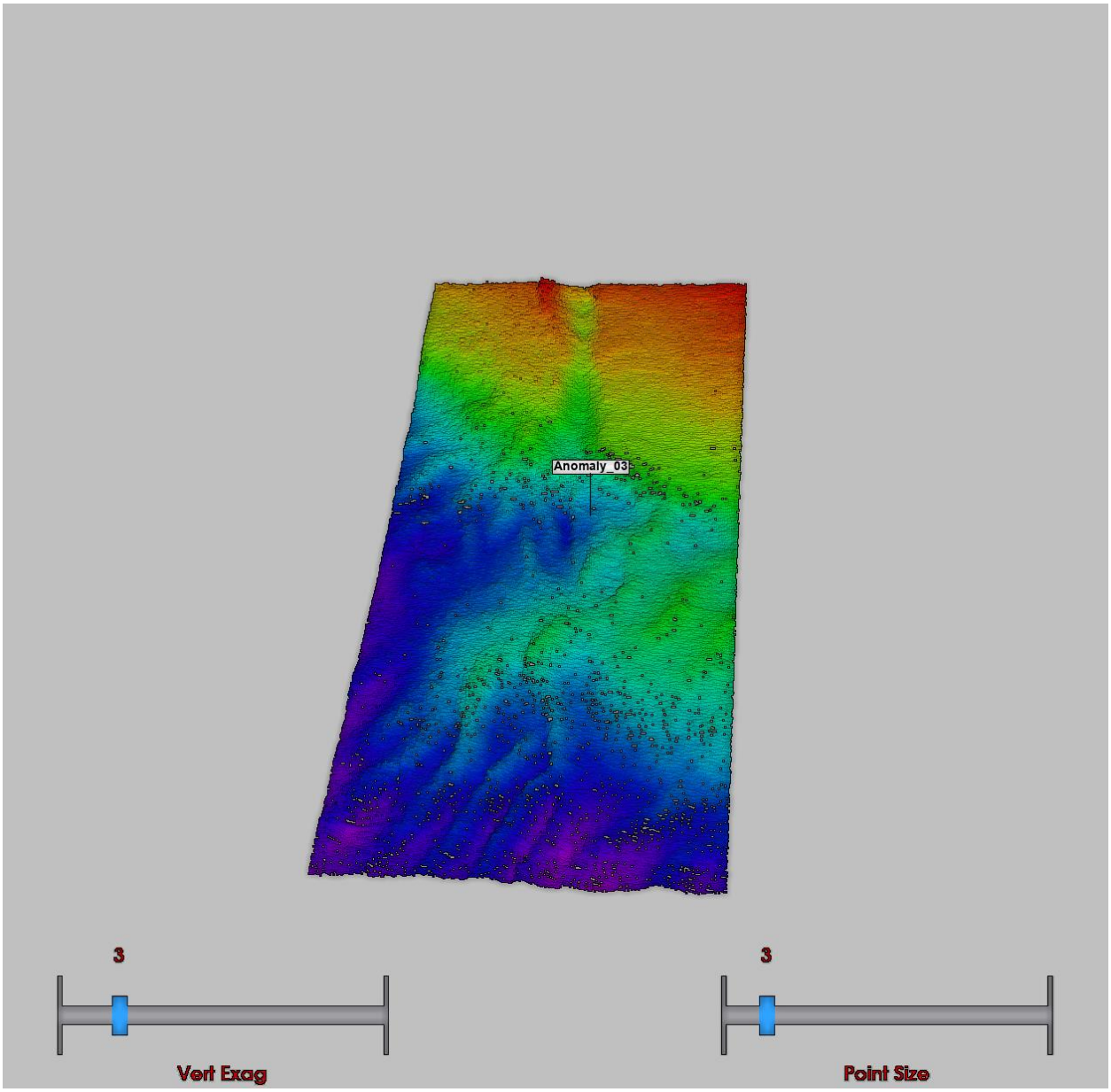


Figure 7-3: Sonar Object 03 was picked from the bathymetry dataset as a narrow linear feature

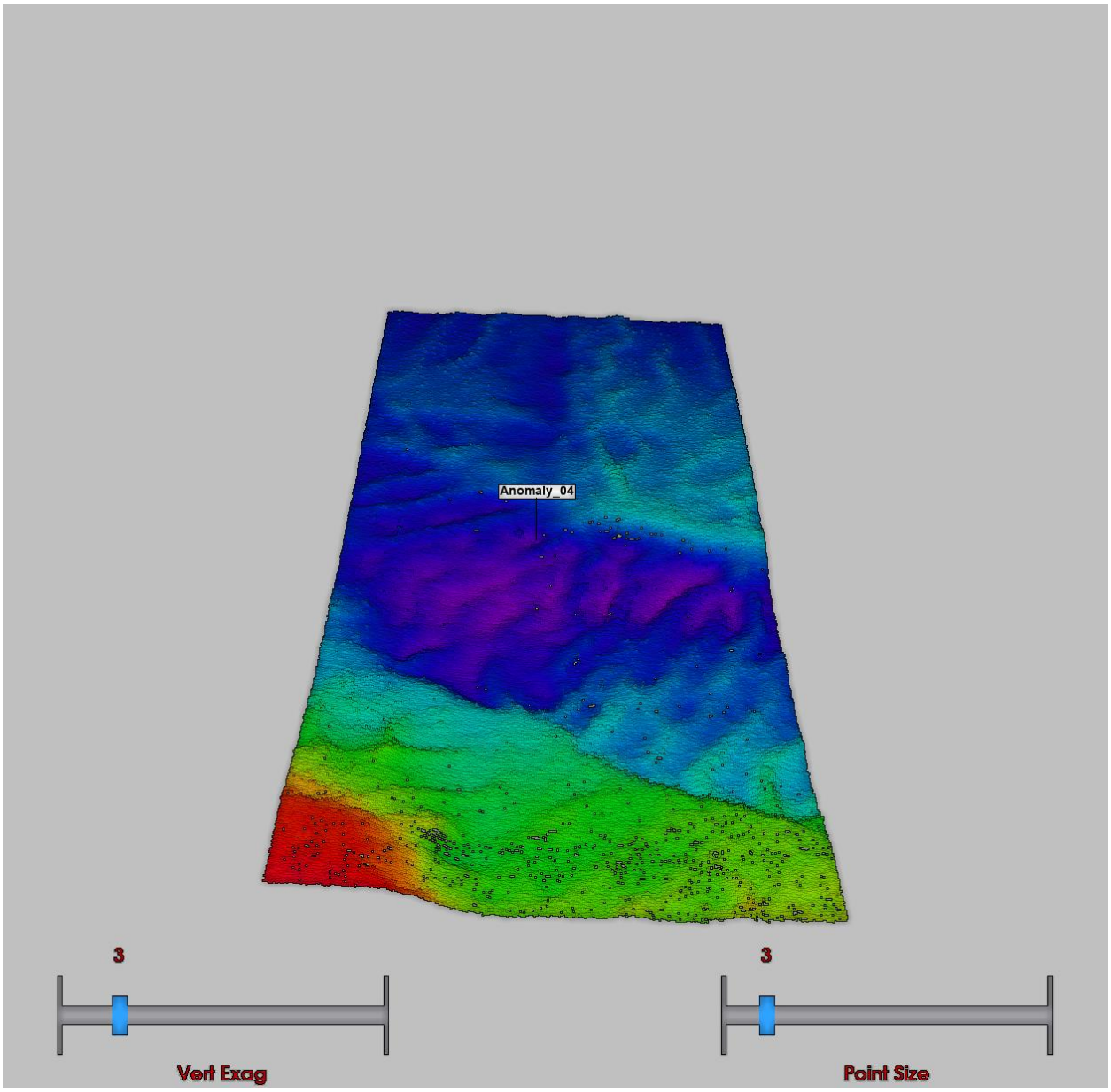


Figure 7-4: Sonar Object 04 was picked from the bathymetry dataset as a narrow linear feature

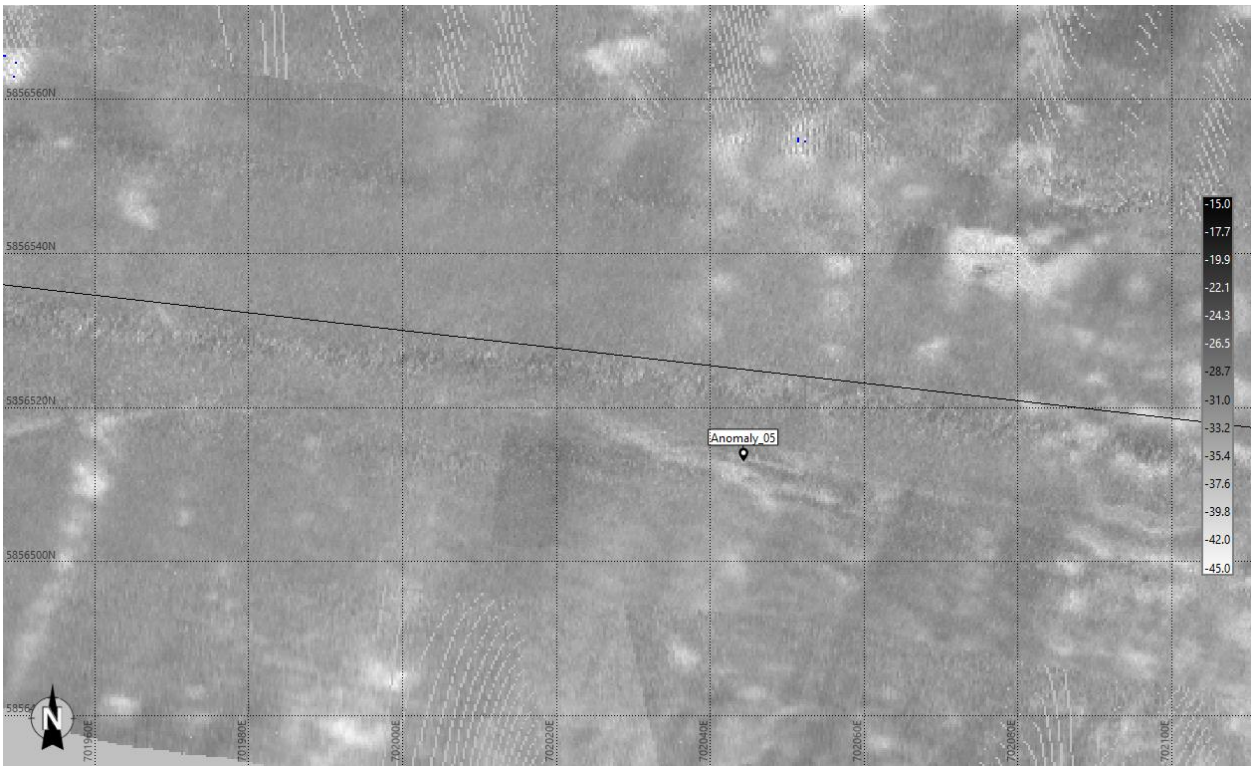


Figure 7-5: Sonar Object 05 was picked from the backscatter dataset as a narrow linear feature



Figure 7-6: Sonar Object 06 was picked from the backscatter dataset as a narrow linear feature

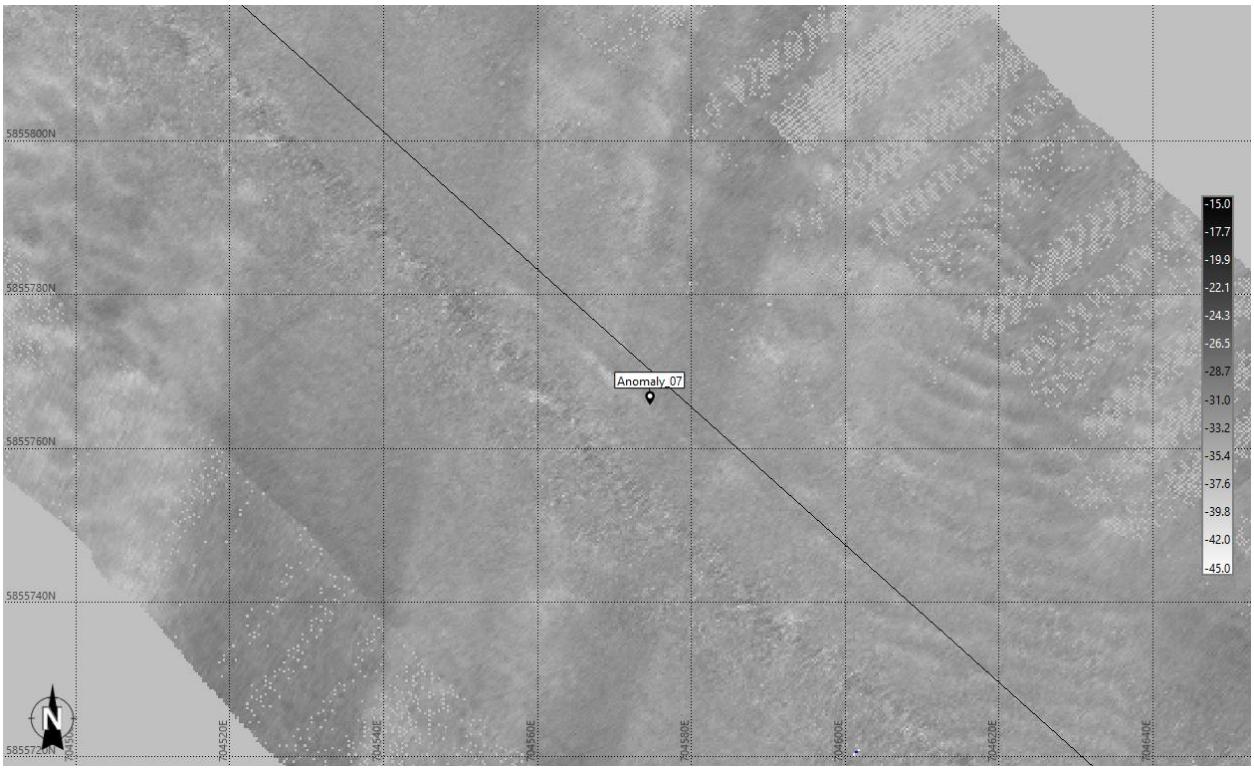


Figure 7-7: Sonar Object 07 was picked from the backscatter dataset as a narrow linear feature

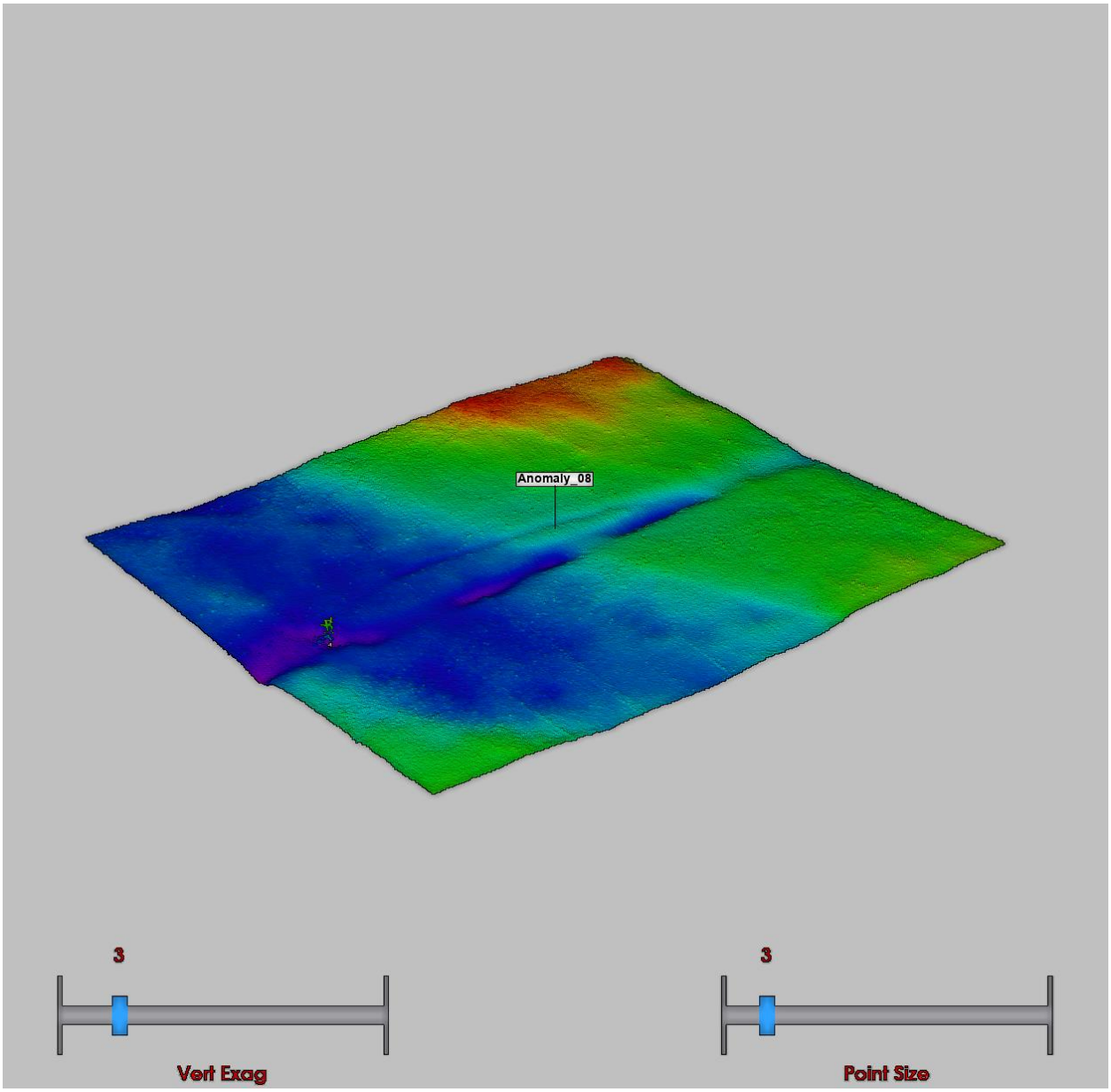


Figure 7-8: Sonar Object 08 was picked from the bathymetry dataset as a narrow linear feature

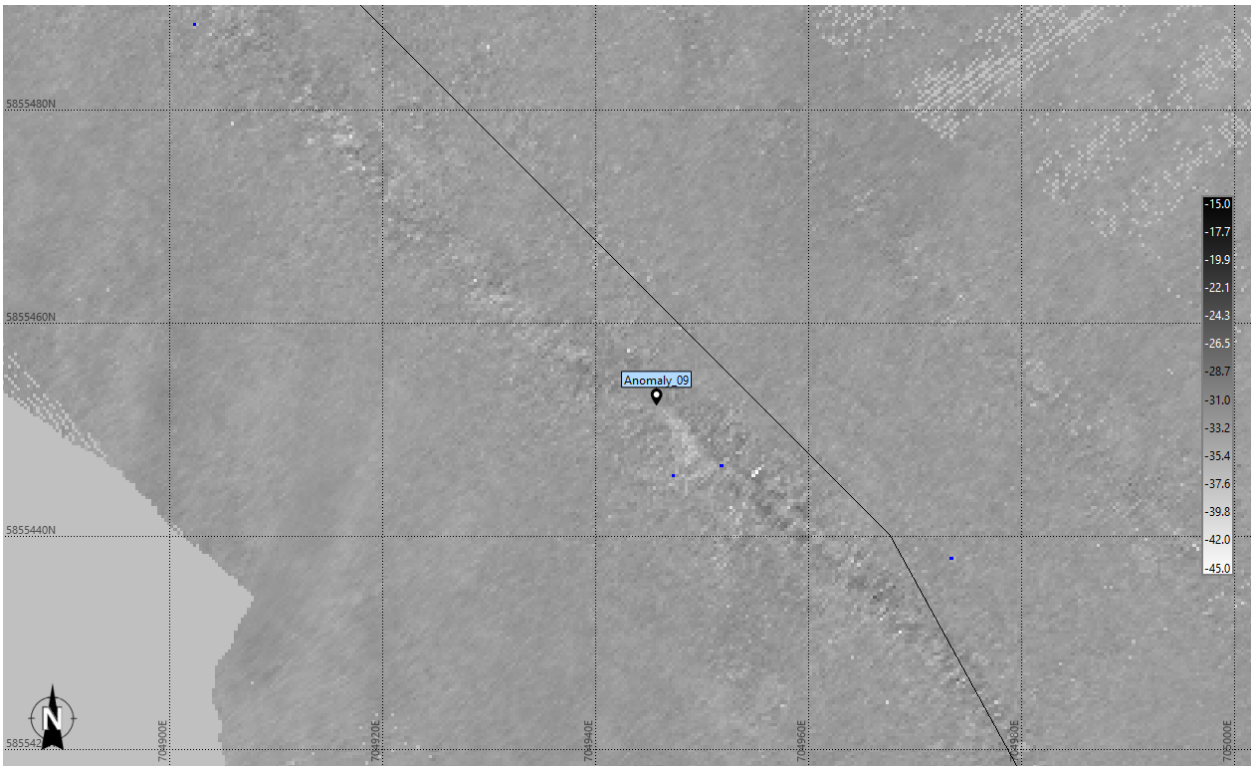


Figure 7-9: Sonar Object 09 was picked from the backscatter dataset as a narrow linear feature

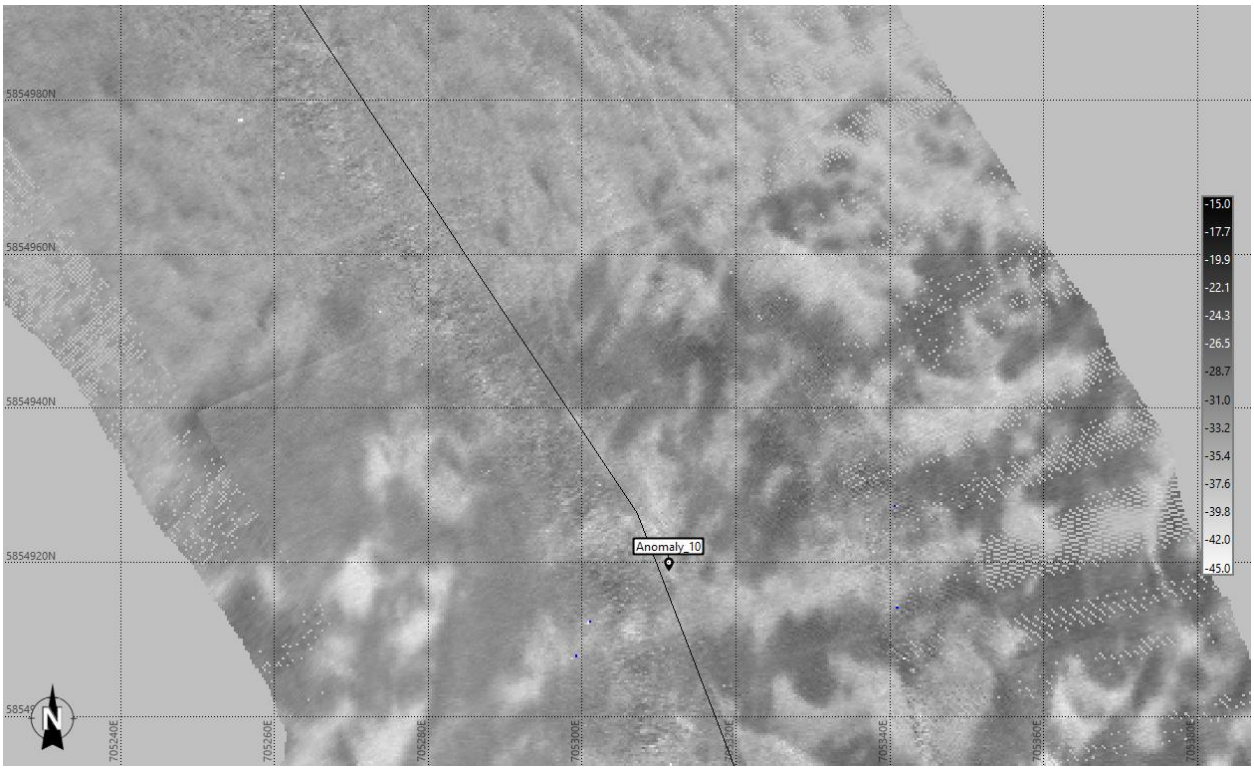


Figure 7-10: Sonar Object 10 was picked from the backscatter dataset as a narrow linear feature.

8. ROV Underwater Video Results - Investigation of Areas of Interest

8.1 ROV Methodology for Video & Stills Capture

On the Export Cable area of interest AMS Adventure was positioned up-tide of the area to be investigated. The ROV was deployed to the seabed and surveyed a transect to cross the export power cable at each of the sonar object areas identified from the side-scan sonar survey.

The sea surface and weather conditions were good at the time. The visibility on the seabed was moderate to good

For the Inter Array cables, the survey had to be conducted in calm conditions with a neap tide at slack water. The time available was limited, visibility was poor and the ROV was hampered by extensive Kelp fronds extending from the towers from the high water mark down to 2 metres below. Nevertheless, WTG03 and WTG07 were surveyed.

8.2 Equipment used

Vessel Details					
	Type	**Name**	**Description**	**Dims (m)**	**Deck Area**
	Survey/CTV	AMS ADVENTURE	18metre Catamaran	18 x 5.8 x 1.0	25m2
POSITIONING SYSTEM (WGS 84) - AMS Adventure used a Differential GPS system for positioning					

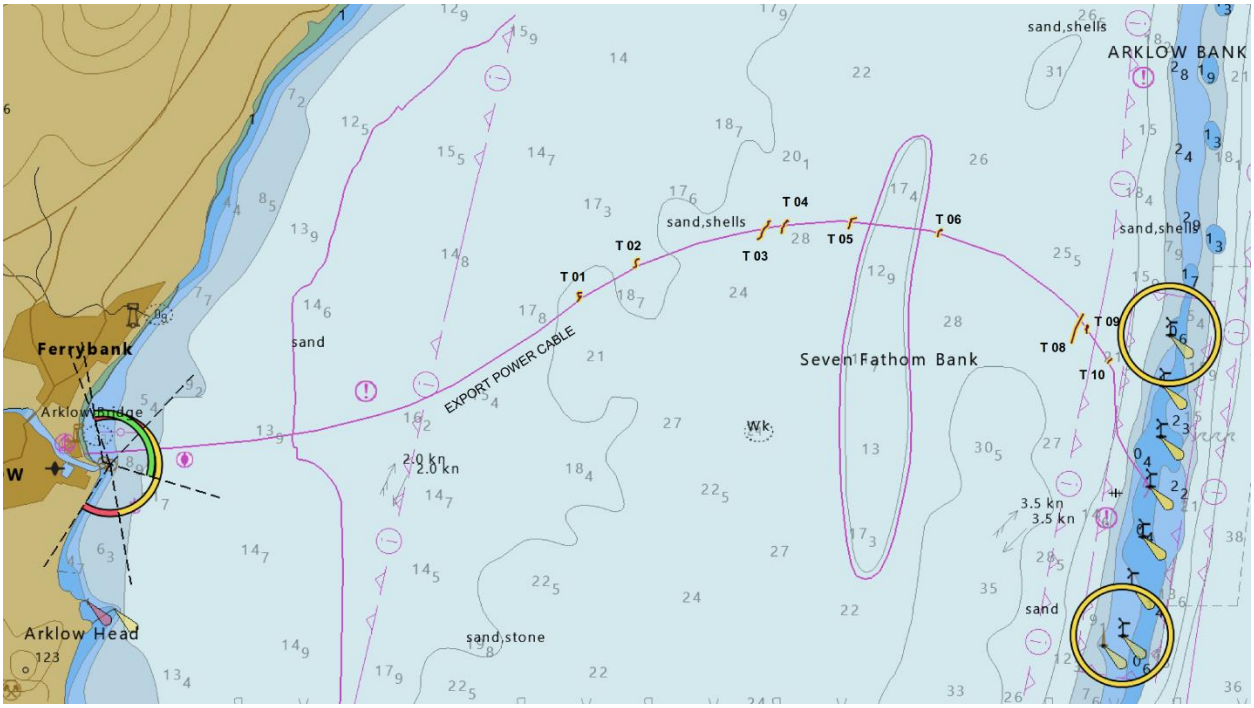
Drop Down Video	FIFISH V6 Expert		Compact & manoeuvrable, tethered ROV with high resolution video and image capture.

8.3 Areas Investigated with ROV

The Sonar Objects 01 to 10 excluding 07 in Table 3-1, were investigated by ROV by running Transects across the Export Power cable.

The Transects crossing these sonar objects on the Export Power Cable are shown on the attached chart

Sonar Object 10 is a wreck. It is the remains of a wooden hulled vessel which from the latest survey has been observed to be in near total burial. The overall dimensions of the wreck are unknown however, there is a short section (1.5m) of the wooden hull visible which has enabled identification.



8.4 Inter Array Cables between the Turbines.

The Inter Array cables connecting the Turbines were surveyed with Side-scan Sonar. The analysis of the sonar data did not reveal any areas of exposed inter array cables between the towers, however some marine growth was observed along sections of the cable protection systems close to the towers.

Due to the soft seabed sediments on the Arklow Bank between the Turbines, the Inter Array cables have been covered since surveys first began in 2004.

8.5 ROV Video and Stills Results

SONAR OBJECT NO.	TRANSECT NO.	ROV STILL - TIMESTAMP	VIDEO START – END TIME	RESULT	REMARKS
01	**01**	094405 094417	0941-0945 1003-1006	SHORT LENGTHS OF OBJECT OBSERVED	POSSIBLE EXPORT CABLE
02	**02**		1025-1028 1028-1030	EXPORT CABLE NOT OBSERVED	
03	**03**		1044-1047 1047-1050	EXPORT CABLE NOT OBSERVED	
04	**04**		1059-1101 1102-1104	EXPORT CABLE NOT OBSERVED	
05	**05**		1113-1116 1116-1118	EXPORT CABLE NOT OBSERVED	
06	**06**		1127-1130 1131-1134	EXPORT CABLE NOT OBSERVED	
07					NOT SURVEYED
08	**08**	104628 104730	1045-1049 2 VIDEOS	EXPORT CABLE NOT OBSERVED	DEBRIS OBSERVED LINEAR OBJECT
09	**09**		1118-1139 4 VIDEOS	EXPORT CABLE NOT OBSERVED	CABLE JOINT AREA
10	**10**	105812 110339	1056-1105 3 VIDEOS	EXPORT CABLE AND WRECK OBSERVED	NO MARINE LIFE OBSERVED ON EXPORT CABLE
WTG03		113853	1136-1139	FLANGE OBSERVED CABLE BURIED	CONFIRMED SONAR FINDINGS
WTG07		120330	1152-1207 4 VIDEOS	FLANGE OBSERVED CABLE BURIED	CONFIRMED SONAR FINDINGS

9. Conclusion

The results of the side-scan sonar survey and the ROV video show that the export power cable is largely covered over the entire length. Where short sections of cable have been recorded on video, no marine life was observed to be growing on the cable at these locations.

In addition, video footage of the wreck does not show any marine growth.

The side scan sonar survey of the inter array cables between the turbines are covered. Subsequent ROV footage at WTG03 and WTG07 confirmed this and indicate that only short sections of inter-array cable protection structures were found to be exposed above seabed.

Strong currents on a relatively flat seabed between the shore and Arklow bank ensure a harsh environment with no shelter for habitat formation.

APPENDIX A MULTIBEAM SYSTEM CALIBRATION - PATCH TEST REPORT



Patch Test Report.pdf

APPENDIX B CHARTS

Drawing #	Description	Scale	Paper size
HS25039_D00	Drawing layout overview	1:20000	A1
HS25039_D01	Bathymetry layout 1 of 13	1:2000	A1
HS25039_D02	Bathymetry layout 2 of 13	1:2000	A1
HS25039_D03	Bathymetry layout 3 of 13	1:2000	A1
HS25039_D04	Bathymetry layout 4 of 13	1:2000	A1
HS25039_D05	Bathymetry layout 5 of 13	1:2000	A1
HS25039_D06	Bathymetry layout 6 of 13	1:2000	A1
HS25039_D07	Bathymetry layout 7 of 13	1:2000	A1
HS25039_D08	Bathymetry layout 8 of 13	1:2000	A1
HS25039_D09	Bathymetry layout 9 of 13	1:2000	A1
HS25039_D10	Bathymetry layout 10 of 13	1:2000	A1
HS25039_D11	Bathymetry layout 11 of 13	1:2000	A1
HS25039_D12	Bathymetry layout 12 of 13	1:2000	A1
HS25039_D13	Bathymetry layout 13 of 13	1:2000	A1
HS25039A_D01	Backscatter layout 1 of 13	1:2000	A1
HS25039A_D02	Backscatter layout 2 of 13	1:2000	A1
HS25039A_D03	Backscatter layout 3 of 13	1:2000	A1
HS25039A_D04	Backscatter layout 4 of 13	1:2000	A1
HS25039A_D05	Backscatter layout 5 of 13	1:2000	A1
HS25039A_D06	Backscatter layout 6 of 13	1:2000	A1
HS25039A_D07	Backscatter layout 7 of 13	1:2000	A1
HS25039A_D08	Backscatter layout 8 of 13	1:2000	A1
HS25039A_D09	Backscatter layout 9 of 13	1:2000	A1
HS25039A_D10	Backscatter layout 10 of 13	1:2000	A1
HS25039A_D11	Backscatter layout 11 of 13	1:2000	A1
HS25039A_D12	Backscatter layout 12 of 13	1:2000	A1
HS25039A_D13	Backscatter layout 13 of 13	1:2000	A1

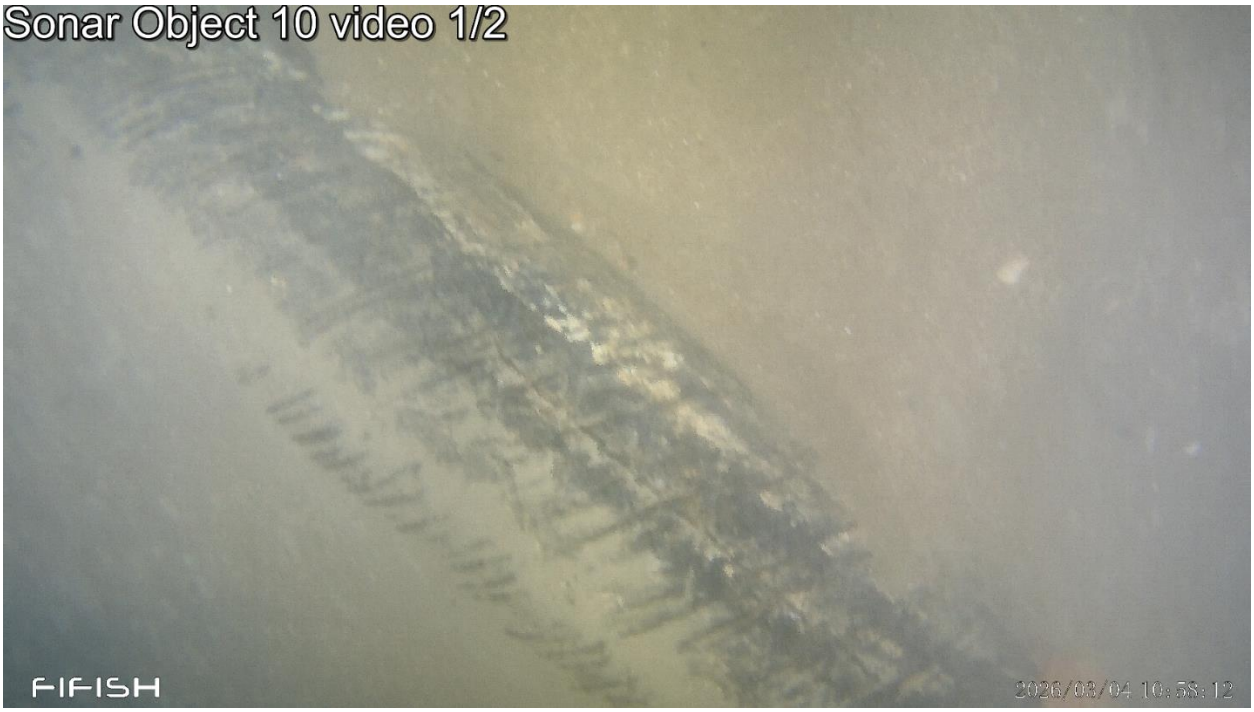
APPENDIX C STILL PHOTOS OF AREAS OF INTEREST AND HABITATS



POSSIBLE EXPORT CABLE EXPOSURE AT TRANSECT 01



UNIDENTIFIED LINEAR OBJECT – NEAR EXPORT CABLE LOCATION



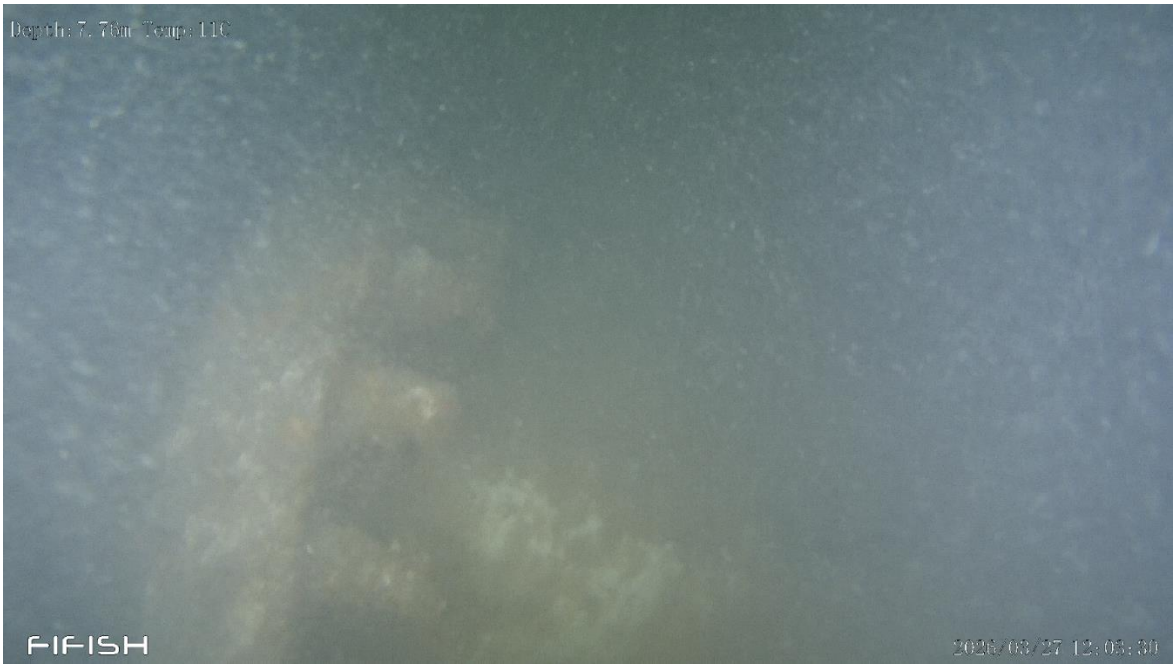
EXPORT CABLE OBSERVED AT WRECK SITE (SONAR OBJECT 10)



LINEAR OBJECT



FLANGE AT WTG03



FLANGE AT WTG07

APPENDIX D ROV VIDEOS OF AREAS OF INTEREST AND HABITATS

ROV Videos due to file size, are sent separately to this report