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Sheep Skerry MBES Survey

Brims Tidal Array Project

Report to BTAL

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V1	25 Aug 2015	First draft for client review

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Contents

1 INTRODUCTION

Aquatera was commissioned to carry out a baseline multibeam echo-sounder (MBES) survey of the proposed Sheep Skerry cable route corridor Area of Search (Aos) on 29 June 2015 and 02 July 2015 to support the Brims Tidal Array Project. This baseline multibeam sonar survey determines the seabed bathymetry within the Sheep Skerry cable corridor AoS prior to commencement of development activities. The information obtained from the survey will inform the descriptions and assessments of numerous receptors presented in the Project Environmental Statement.

This survey data informs the supplementary geophysical report for the Sheep Skerry corridor AoS; which characterises the seabed and it’s suitability as a cable route corridor and should be read in conjunction with this report: Brown, J. F. (2015). Supplementary Study. Geological, Hydrogeological Baseline Desk Study, Brims Tidal Array Proposed Tidal Development in Orkney. Aquatera Ltd.

2 SURVEY METHODOLOGY

2.1 OPERATIONS

The required bathymetry data was collected using a multibeam sonar system deployed from a coastal survey vessel. The vessel was mobilised from Stromness Harbour with a transit time of approximately 2.5 hours. A series of pre-planned survey lines, spaced in proportion to water depth to achieve maximal survey efficiency, were run to provide full coverage of the designated survey area. Sufficient data was obtained within a two day operational period.

2.1.1 Personnel and equipment summary

Resource	Specification
Survey vessel	*MV Advance*
Multibeam specifications	A GeoSwath Plus system, operating at 250kHz which is appropriate for the water depths in question (0-45 m).
Survey logging	Logging of activities, position, bearing, depths etc. in relation to the vessel.
Survey Personnel	1. Skipper 2. Marine surveyor 3. Marine scientist/client representative
Communications	Vessel VHF radio, mobile telephones.

2.1.2 Roles and responsibilities

Company	Areas of responsibility
Aquatera	Overall scoping and management of data gathering activities. Preparation of the survey plan and risk assessment document. Oversight of operations to ensure safe working practices and scientific quality.
Roving Eye (REE)	Supply and operation of the survey vessel. Safe navigation and operation of the vessel and overall responsibility for all vessel based activities.
Triscom (TE)	Supply of sonar and navigation survey equipment and marine surveyor. Maintaining the integrity of the data retrieved during survey operations.

2.2 VESSEL AND EQUIPMENT

2.2.1 Equipment overview

Given the generally shallow depth, an interferometric sonar technology, "swath bathymetry" was utilised to provide efficient coverage of the area from a small workboat. This consists primarily of side-scanning sonars rigidly mounted to a vessel, scanning a fan-shaped swath either side of the vessel. A downward-looking acoustic altimeter acts as a nadir gapfiller and is integrated within the overall acquisition system.

The acoustic transducers, pitch/roll sensor, GPS and True Heading reference mounted onto a single rigid instrument frame which is itself mounted to the hull of the vessel in such a way that it can safely be stowed for transit was deployed into a vertical position for data acquisition.

Soundings were georeferenced to known horizontal and vertical datums using RTK-corrected dual-GPS which also provided a True heading reference.

Errors in soundings due to vessel roll and pitch were mitigated using a specialised motion reference unit (MRU). Errors in soundings due to tide were mitigated with use of RTK corrected GPS. Errors in soundings due to sound velocity were mitigated by profiling the sound velocity in water. A shore based GPS corrector station was used in conjunction with a POS MV system to increase positioning accuracy.

After collection, soundings were filtered for water-column noise and gridded for display, resulting in a matrix of depth measurements.

2.3 GENERAL SURVEY PROTOCOL

2.3.1 Calibration

The GeoSwath Plus system provides a built-in calibration routine based on the "patch-test" method, where the same sloping patch of seabed is orthogonally ensonified (the survey vessel travels upslope/downslope then at right-angles along the slope): this essentially "self-calibrates" the sonar for installation misalignment.

2.3.2 Data acquisition

Once calibrated, the seabed area was ensonified, accomplished from the systematic manner of pre-planned survey lines which were spaced in proportion to depth to achieve maximal survey efficiency.

A helmsman display estimated ensonification and allowed gaps to be filled. A paper log of survey lines was maintained to assist in postprocessing. A water-column profile was recorded at the beginning and end of each survey day. These profiles were used in the postprocessing phase.

2.3.3 Postprocessing

After acquisition, the data was filtered line-by-line to remove water-column noise and other spurious soundings. This resulted in a collection of georeferenced points which were taken to be the seabed. The data was then "gridded" – amalgamated into a Cartesian plane to provide a three dimensional graphical representation of the seabed surface.

2.4 SURVEY AREA

The following map in Figure 2.1 shows the location of the Sheep Skerry cable corridor MBES survey area.

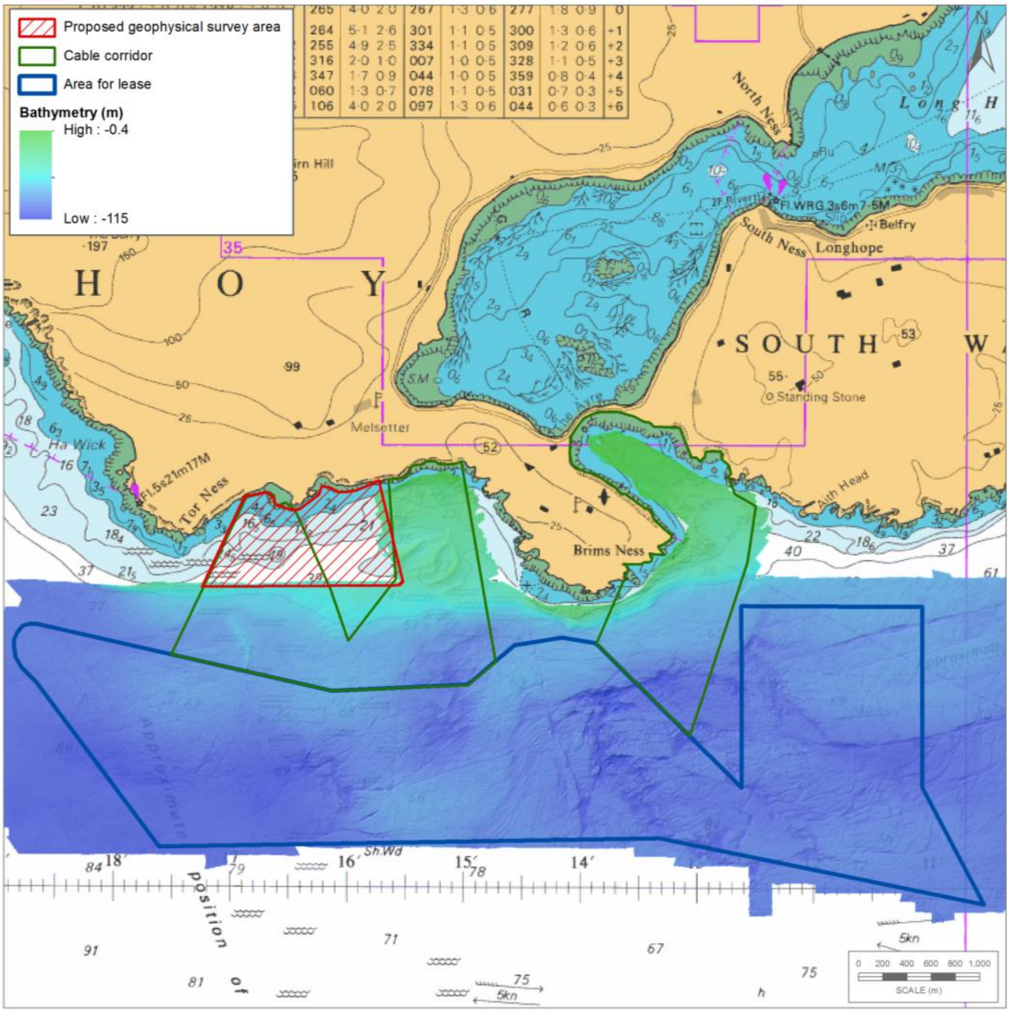


Figure 2.1 Sheep Skerry MBES survey area

3 RISK ASSESSMENTS

A series of risk assessments and safe working method statements were produced to identify and mitigate the potential risks associated with the planned survey operations. These are provided in the Sheep Skerry Multibeam Survey Method Statement and Risk Assessment (Aquatera, 2015[1]).

4 SURVEY RESULTS

The bathymetry of the Sheep Skerry corridor AoS is presented in Appendix A and with 1 m contours in Appendix B. Depths range from 3 m in the shallower nearshore area to 47 m in the deepest parts towards the AfL area. Fault line features and igneous laval outcrops throughout the corridor are apparent. The seabed survey shows clearly the fault pattern dying out southwards crossing the Sheep Skerry study area. Also clear is a pronounced rugosity with pillars of rock oval shape and about 5 m in height over the area. The pillars are interpreted as remnants of weathered lava flows with deep notches and weathering created by faults and cracks (Brown, 2015).

Mobile sand features ranging from 10 m high mega sand waves in the south-east to 1 m high sand waves are evident and in the shallow water ripple marked sand form much of the area; confirmed by the benthic ROV survey (Aquatera, 2015[2]).

Further interpretation and characterisation of the seabed geology is presented in the Sheep Skerry Geological and Hydrological Baseline Study (Brown, 2015). This report includes recommendations for a suitable cable route corridor from the AfL area to landfall.

5 REFERENCES

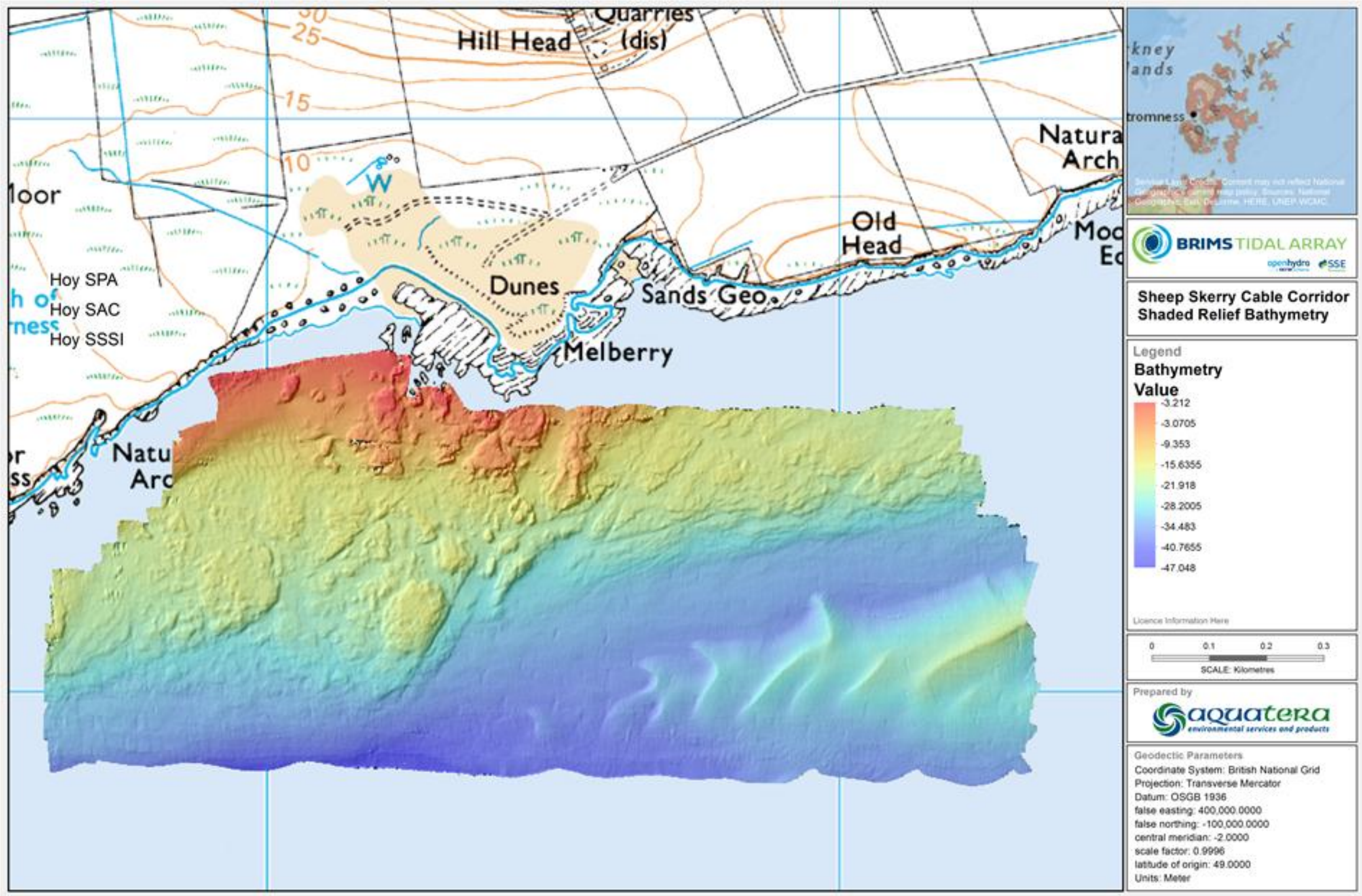
Aquatera (2015)[1]. Brims Tidal Array Project, Sheep Skerry Multibeam Survey, July 2015. Method Statement and Risk Assessment. Report to BTAL, Aquatera Ltd.

Aquatera (2015)[2]. Brims Tidal Array Project, Sheep Skerry Benthic ROV Survey. July 2015. Report to BTAL, Aquatera Ltd.

Brown, J. F. (2015). Supplementary Study. Geological, Hydrogeological Baseline Desk Study, Brims Tidal Array Proposed Tidal Development in Orkney. Aquatera Ltd.

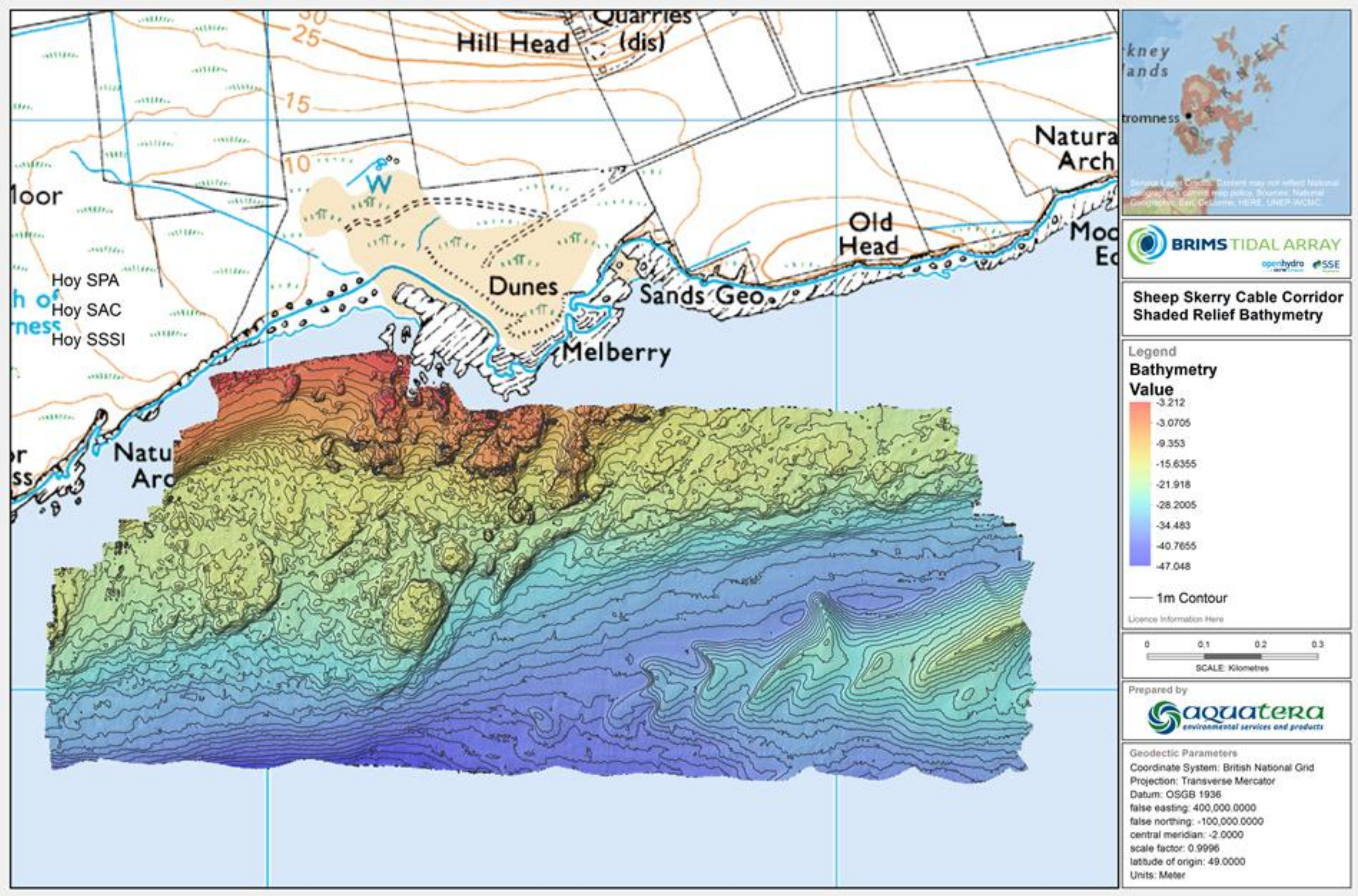
6 APPENDICES

APPENDIX A



Sheep Skerry Study Area bathymetry

APPENDIX B



Sheep Skerry Study Area bathymetry with 1 m contours