The Great Grid Upgrade

Sea Link

Sea Link

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1 INTRODUCTION

1.1 PROJECT DESCRIPTION

This report is focussed on the preliminary geophysical and habitat interpretation for the survey areas one to five along the Sea Link cable route, located in UKCS Blocks 56 and 52. The England and Wales Transmission Owner, National Grid Electricity Transmission Plc (NGET), are developing a High Voltage Direct Current (HVDC) electricity transmission link in the east coast of England from Richborough in Kent to Friston in Suffolk (Figure 1-1). The overall route of the marine cable is 120km with the additional areas to be surveyed adding up to approximately 35km in length. NGET has awarded these additional marine surveys to Next Geosolutions. The surveys will include geophysical, geotechnical, and benthic components of the nearshore/offshore cable corridors.

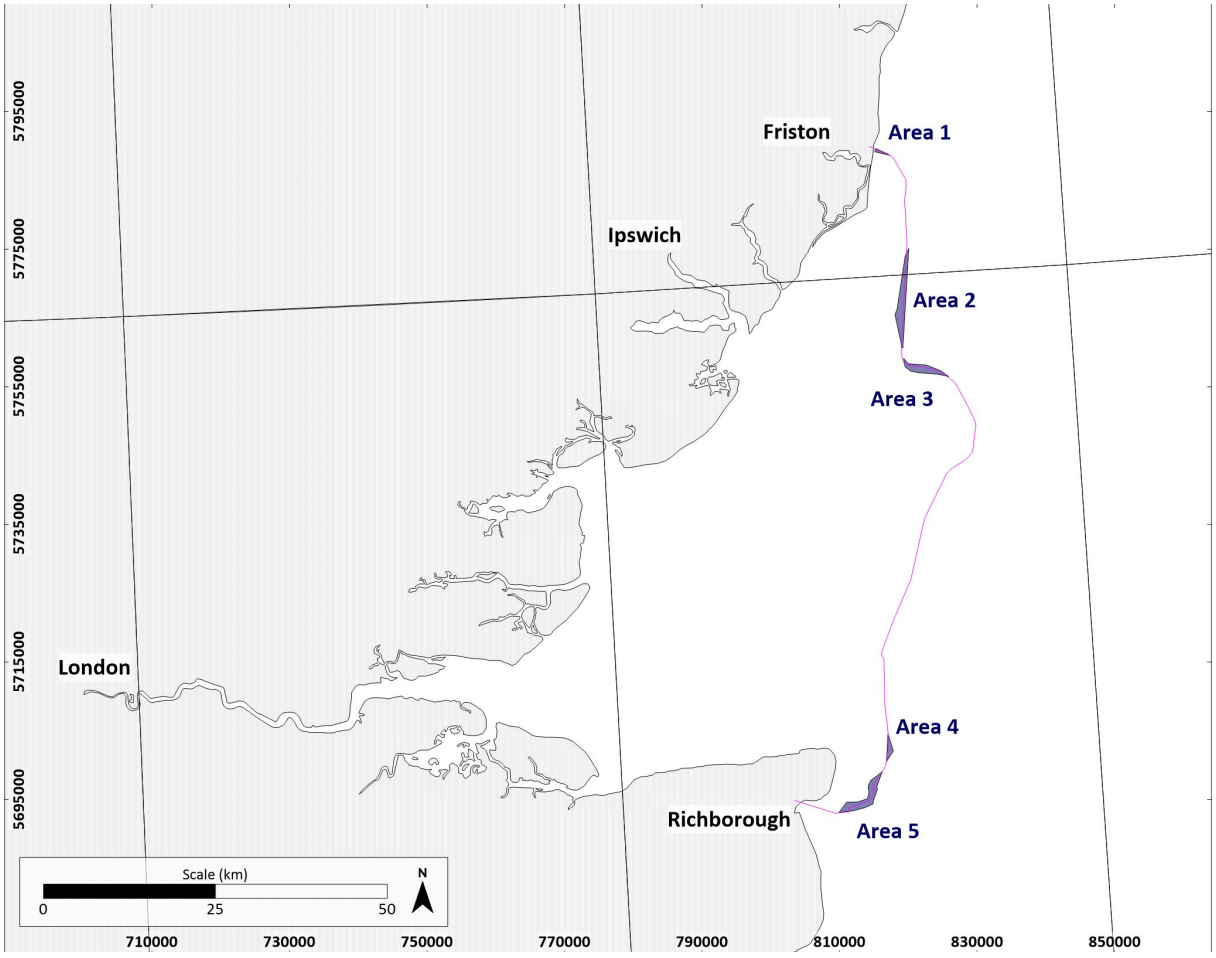


Figure 1-1 Project Location Overview

1.2 SCOPE OF WORK

A comprehensive survey of the main route has already been completed by MMT (2022). However, upon analysing the data, an additional five areas have been identified where the route could potentially avoid hazards or challenging seabed conditions whilst optimising the overall route length. This additional work was awarded to NextGeo. The primary objective of the survey was to conduct accurate surveys of the five additional Sea Link areas, to give clarity about the seabed morphology, shallow sediment structure, and to provide benthic characterisation and habitat maps. Seabed feature and sediment interpretations are based on Side Scan Sonar (SSS) and Multi Beam Echosounder (MBES) data along with previously identified sensitive areas.

1.3 REFERENCE DOCUMENTS

The reference documents for the project are as follows:

- **MMT Environnemental Survey Report (2022)** -NGET Doc ref: 103748-NAT-MMT-SUR-REP-ENVSURRE-B
- **NextGeosolutions Project Execution Plan (2023)** – Next Doc ref: P2097-000-PEP
- **NextGeosolutions Geophysical Survey Procedure, Mobilisation and Calibration Plan (2023)** – Next Doc ref: P2097-008-GEOP

2 FIELD METHODS

2.1 SURVEY METHODS

The shallow water survey at Area 1 was carried out by the *SHORE Possibility*, whilst nearshore geophysical survey operations, starting as shallow as safely possible, was carried out by the *SHORE Presence*. Geophysical equipment utilised to complete the scope is detailed in Table 2-1. The orientation of the survey lines were chosen in-field based on local conditions (current, tidal windows, prevalent sea conditions, safety for navigation, operational efficiency, etc.).

Table 2-1 Geophysical Survey Equipment and Objective

Survey Data Type	Type/Model	Objective	Requirements
Multibeam Echosounder (MBES)	Sidepole-mounted Singlehead R2Sonic 2024	Seabed mapping	100% coverage, overlaps to be achieved.
Side Scan Sonar (SSS)	Edgetech 4200 dual frequency (300/600 kHz)	Mapping of seabed features, hazards and habitats	200% coverage.
Sub Bottom Profiler (SBP)	Innomar Standard; side-pole mounted	Map the upper 5m of the seabed sediments.	Line spacing as per SSS.
Sparker	Geo-spark 1000 with a Geo-Source 200 LW sparker	Map the upper 25m of the seabed sediments.	Line spacing: 75m for Areas 1 to 4. Line spacing: 50m for Area 5.
Magnetometer (MAG)	Geometrics G882 Marine Magnetometer (piggy-backed to SSS)	Alignment of crossed cables/pipelines. Not intended to fulfil the requirements of a full unexploded ordnance (UXO) survey.	Line spacing as per SSS.

2.2 SURVEY PARAMETERS

2.2.1 Horizontal Datum

The datum and projection parameters used are provided below:

Table 2-2 Projection Parameters

GNSS Geodetic Parameters		
Ellipsoid:	GRS 1980	EPSG Code 7019
Datum:	European Terrestrial Reference System 1989	EPSG Code 4258
Semi-major axis (a):	6378137.000m	
Inverse Flattening (1/f):	298.572221010	
Projection Parameters		
Grid Projection:	Universal Transverse Mercator (UTM)	EPSG Code 25831
UTM Zone:	31N	
Central Meridian:	03°00'00" East	
Latitude of Origin:	00° (Equator)	
False Easting:	500,000m	
False Northing:	0m	
Units:	Metre	

2.2.2 Vertical Datum

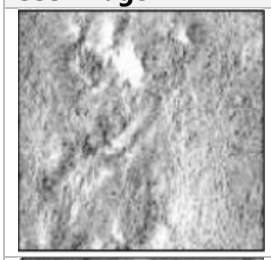
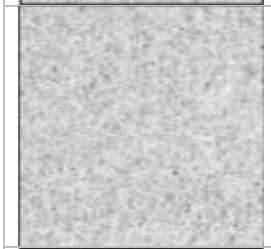
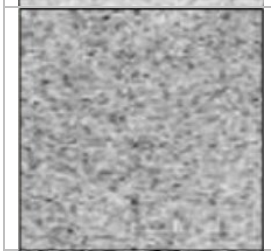
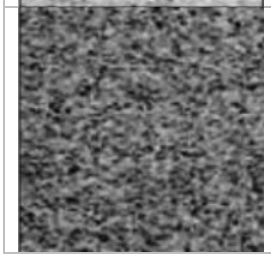
The vertical datum for the marine survey operations is the LAT (Lowest Astronomical Tide). Height data was acquired in relation to the ellipsoid and translated to the project vertical datum (LAT) as defined by the United Kingdom Office Vertical Offshore Reference Frame (VORF) geoid model at the project location.

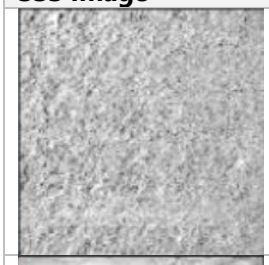
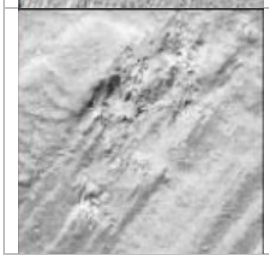
3 ANALYSIS METHODS

3.1 SEABED GEOLOGY CLASSIFICATION

The seabed classification followed the previous 2021 MMT seabed classification (103748-NAT-MMT-SUR-REP-SURVEYRE-A) (Table 3-1).

Table 3-1 SSS and Seabed Classification

SSS Image	Acoustic Character	Surficial Interpretation
	Medium reflectivity acoustic reflectivity, correlates with eroded seabed depressions	**CLAY** Predominantly Clay, may have minor fractions of silt and sand
	Medium acoustic reflectivity. Exhibits relief and texture.	**Stiff CLAY** Predominantly stuff clay, creating relief
	Low to Medium acoustic reflectivity, slightly grainy texture	**SILT** Predominantly Silt, may have minor fractions of Clay and Sand.
	Medium acoustic reflectivity, slightly grainy texture.	**SAND** Predominantly Sand, may have minor fractions of silt, clay and/or gravel.
	Medium to high acoustic reflectivity. Slightly grainy to grainy texture, coarse texture in places.	**Gravely SAND to Sandy GRAVEL** Predominantly Sand. Slightly gravelly sand to very gravelly sand.
	Medium to high acoustic reflectivity. Grainy texture, coarse texture in places.	**GRAVEL** Predominantly gravel. May contain minor fractions of sand, silt or clay. May also contain gravel sized shell fragments.

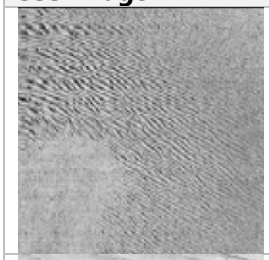
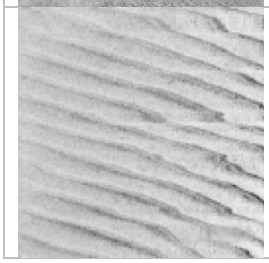
SSS Image	Acoustic Character	Surficial Interpretation
	Medium to high acoustic reflectivity. Grainy to coarse texture in places.	**Very Coarse** Predominantly
	Medium to high acoustic reflectivity. Exhibits relief and texture.	**CHALK** Structureless CHALK composed of sandy SILT.

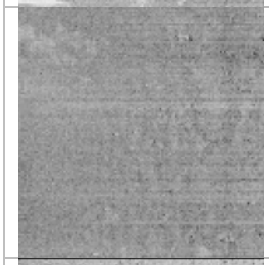
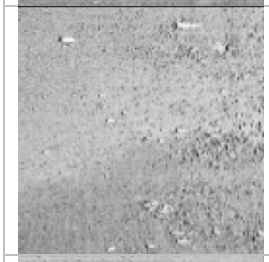
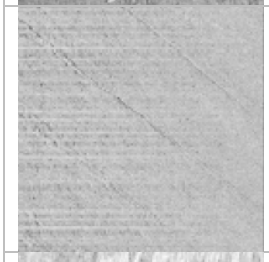
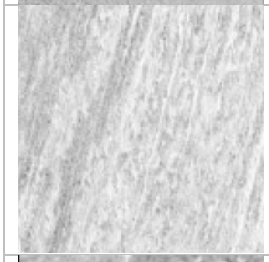
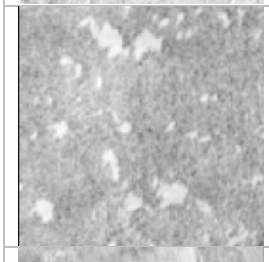
3.2 SEABED FEATURE CLASSIFICATION

Seabed features were picked as per the criteria outlined in Table 3-2. The minimum size of a target picked was 0.5m. In areas where there was a large quantity of boulders, these were grouped in boulder field occasional (between 5 and 20 boulders of over 0.5m per 100m^2) and boulder field numerous (>20 boulders of over 0.5m per 100m^2) boulder fields. The target picking criteria was classified according to the categories listed below:

- Debris (anthropogenic objects): any debris with any single dimension greater than 0.5m was picked, whether it is inside or outside the boulder fields.
- Wreck
- Linear Debris (length largely exceeds height and width): same picking criteria of Debris (above).
- Boulders (one of length, height or width exceeds 0.5m):
    - Outside a boulder field: any boulder with any single dimension greater than 0.5m was picked.

Table 3-2 SSS Seabed Feature Classification

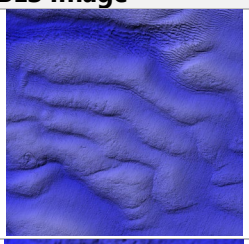
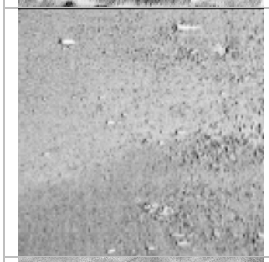
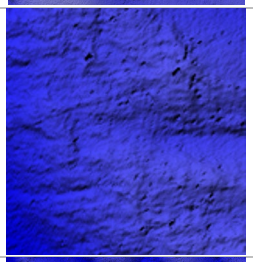
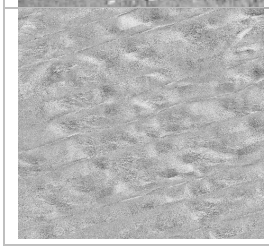
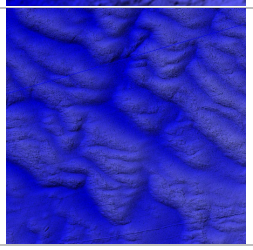
SSS Image	Seabed Feature	Criteria
	Ripples	Wave length <5m Height <1m
	Megaripples	Wave length 5-25m Height 1-3m

SSS Image	Seabed Feature	Criteria
	Sandwaves	Wave length >25m Height 3-5m Potential areas of Annex Sandbanks
	Boulder Field Occasional	Concentrations of 5-20 boulders within a maximum area of 100m^2
	Boulder Field Numerous	Concentration of ≥20 boulders within a maximum area of 100m^2 Potential areas of Annex I geogenic reef
	Trawl Mark Area	Numerous trawl marks
	Eroded Depressions	
	Mottled Seabed	Potential areas of Annex I biogenic reef
	Debris Field	

3.3 POTENTIAL SENSITIVE HABITAT CLASSIFICATION

The following table (Table 3-3) exhibits examples of SSS imagery in relation to potential sensitive habitats based on the reflectivity and seabed feature present. This includes the potential presence of Annex I sandbanks and *Sabellaria spinulosa* reefs in areas of sandwaves, and geogenic reefs across boulder fields and mottled seabed, all of which if present within underwater video footage will undergo further evaluation against their respective assessment criteria.

Table 3-3 Geophysical Data and Potential Sensitive Habitat Classification

SSS Image	MBES Image	Seabed Feature	Criteria
		Sandwaves	Potential areas of Annex I Sandbanks Potential areas of Annex I *Sabellaria spinulosa* reefs
		Boulder Field Numerous	Potential areas of Annex I geogenic reef
		Mottled Seabed	Potential areas of Annex I *Sabellaria spinulosa* reefs

4 INTERPRETATION

4.1 SEABED FEATURES AND POTENTIAL SENSITIVE HABITATS REVIEW

The five areas of the Sea Link route have been assessed based on preliminary SSS and MBES data to provide initial interpretations of the seabed sediments and potential sensitive habitats. These are detailed below by Area with seabed features and sensitive habitats illustrated in Figure 4-1and Figure 4-2.

4.1.1 Area 1

The central section of Area 1 is predominantly comprised of 'featureless' SAND, previously classified by MMT (2022) as '*Lagis koreni* and *Phaxas pellucidus* in Circalittoral Sandy Mud' (A5.335). In the north, sub/outcropping rock and Bedrock are present, aligning with the previous classification 'Communities on Soft Circalittoral Rock' (A4.23), which shows potential for Annex I geogenic reefs and therefore will require assessment against the Irving (2009) and Golding et al (2020) stony reef assessment. The southern extent of the Area 1 observed a mottled reflectivity seabed that varied between gravelly SAND, SILT and CHALK defined largely as 'encrusted' biogenic habitats. These 'encrusted' areas have the potential to be Annex I *Sabellaria spinulosa* reefs and will require assessment against the Gubbay (2007) system. Occurrences of 'debris' and 'boulders' are noted throughout Area 1.

4.1.2 Area 2

The northern section of Area 2 predominantly comprises of 'featureless' silty SAND with areas defined as 'rippled' or 'eroded depression' associated with SAND and clayey SAND. This interpretation aligns with previous classifications of 'Circalittoral Muddy Sand' (A5.26) and 'Circalittoral Mixed Sediments' (A5.44) that comprised a large proportion of the area (MMT, 2022). Although largely absent, localised patches of CHALK were also noted. Smaller areas of 'mottled reflectivity' seabed were noted across the western extent of Area 2 which suggests potential for *Sabellaria spinulosa* presence. Additionally, the presence of Annex I 'Sandbanks which are slightly covered by seawater all the time' were previously noted in areas of 'Circalittoral Fine Sand' (A5.25) within Area 2 (MMT, 2022). The southern section comprised largely of silty and clayey SAND associated with areas of 'eroded depression' and 'ripples' / 'mega-ripples', alongside large areas of gravelly SAND which were also noted on rippled or mega-rippled seabed. Smaller localised patches of sandy GRAVEL and sandy SILT were also present in the southern extent of Area 2. Three wrecks associated with areas of high-reflectivity were noted within Area 2, two in the north and one in the south. Occurrences of 'linear debris', 'debris' and 'boulders' are also noted throughout Area 2.

4.1.3 Area 3

Area 3 consisted predominantly of 'featureless' sandy GRAVEL and muddy sandy GRAVEL with intermittent areas of CHALK, silty SAND and SAND. The dominating gravel sediment type aligns with the 'Circalittoral Coarse Sediment' (A5.14) and '*Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in Circalittoral Coarse Sand or Gravel' (A5.142) habitat classification previously assigned by MMT (2022). Smaller areas of 'rippled' seabed

were noted across Area 3 whilst 'scour' was associated with the occurrences of two wrecks. Occurrences of 'linear debris', 'debris' and 'boulders' again are noted throughout Area 3.

4.1.4 Area 4

Area 4 was comprised of gravelly SAND defined as 'sandwaves' at the northern and southern extents, whilst 'featureless' sandy GRAVEL interspersed with patches of 'disturbed sediment' defined the central section. These 'disturbed sediment' patches show potential for *Sabellaria spinulosa* presence. An area defined as 'mound cluster' was noted in the south of the area, consisting of a localised cobble field which will require a stony reef assessment as per Irving (2009). Occurrences of 'linear debris', 'debris' and 'boulders' are noted throughout Area 4. The area is also likely to be classed as Annex I 'Sandbanks which are slightly covered in water all the time' (MMT, 2022).

4.1.5 Area 5

The northern and southern extents of Area 5 are predominantly defined by mobile 'mega-rippled' SAND to silty SAND with patches of 'occasional' and 'numerous' 'boulder fields. The central section of Area 5 comprises of gravelly SAND to sandy GRAVEL with areas of 'hummocky' seabed noted towards the south and areas of mobile 'sandwaves' and 'numerous boulder fields' to the north. The areas of mobile and 'hummocky' sand noted across the site are potential areas for *Sabellaria spinulosa* reefs whilst some areas defined as 'sandwaves' were previously associated the Annex I sensitive habitat 'Sandbanks which are slightly covered in water all the time' (MMT,2022). The presence of 'scour marks' and 'mattressing' is apparent within the southern 'hummocky' areas, associated with subsea infrastructure and wreck debris. Occurrences of 'linear debris', 'debris', 'anchors', 'chains', and 'boulders' are noted throughout Area 5 with the 'occasional' and 'numerous boulders' fields suggesting potential geogenic reef presence.

4.2 DESIGNATED SENSITIVE HABITASTS

Sensitive habitats noted within close proximity to the five Sea Link areas are tabulated below, including the sensitive areas interpreted from preliminary SSS data and the historical MMT report:

Table 4-1: Summarised Nearby Sensitive Habitats

Area	Sensitive Habitat	Distance
1	Geogenic Reef	3km S, 6.5km SW and 6km NE
	Sandbanks	3km E
2	Geogenic Reef	0.9km E and 1.5km N
	Sandbanks	0.7km W
3	Geogenic Reef	3.5km E
	Biogenic Reef (likely *Sabellaria spinulosa*)	6km W
4	Geogenic Reef	2 km NW, 2kn E and 1.2km SE
	Geogenic Reef	0.2km W, 2.5km E
5	Sandbanks	0.8km S

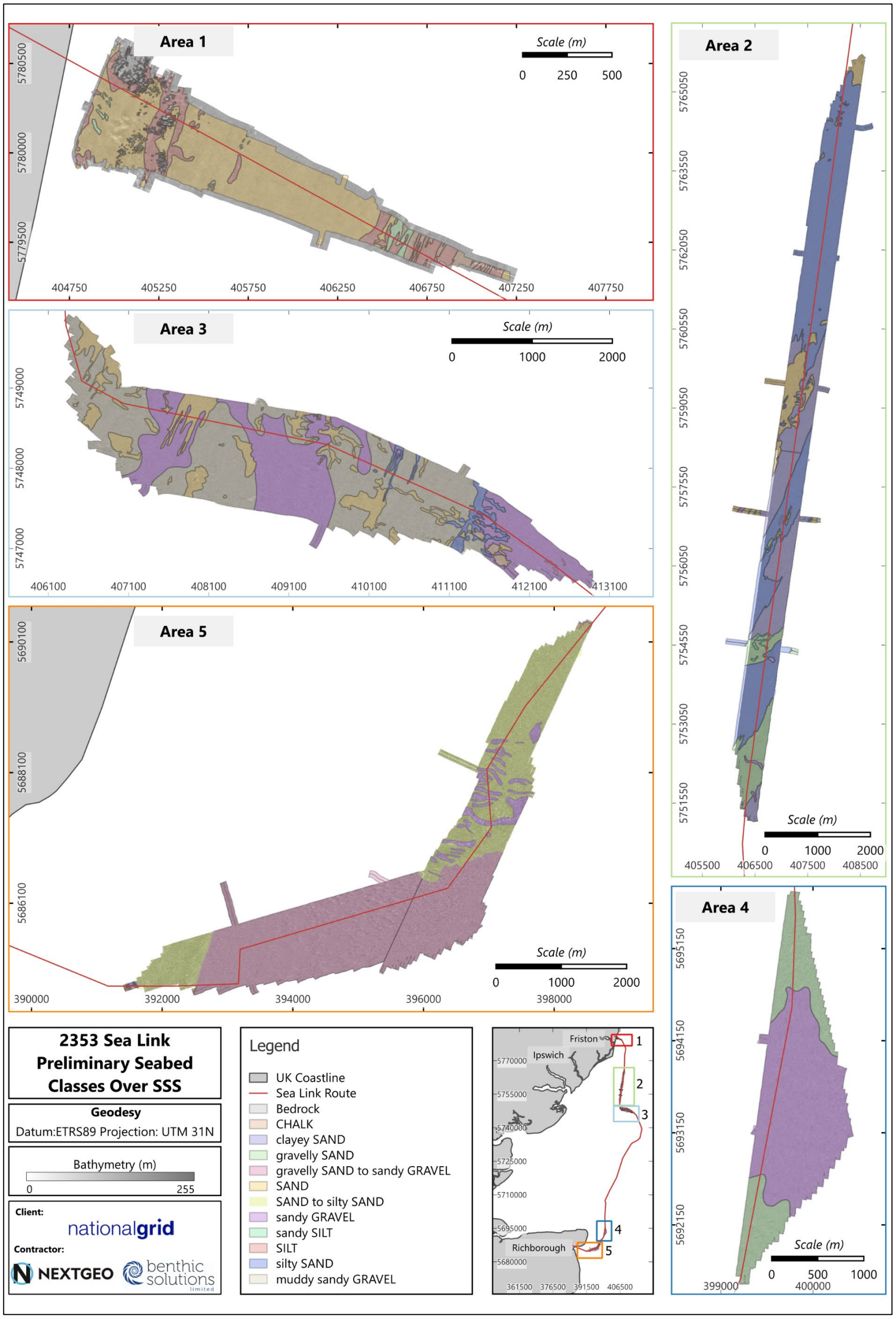


Figure 4-1 Seabed Classification Over SSS Data

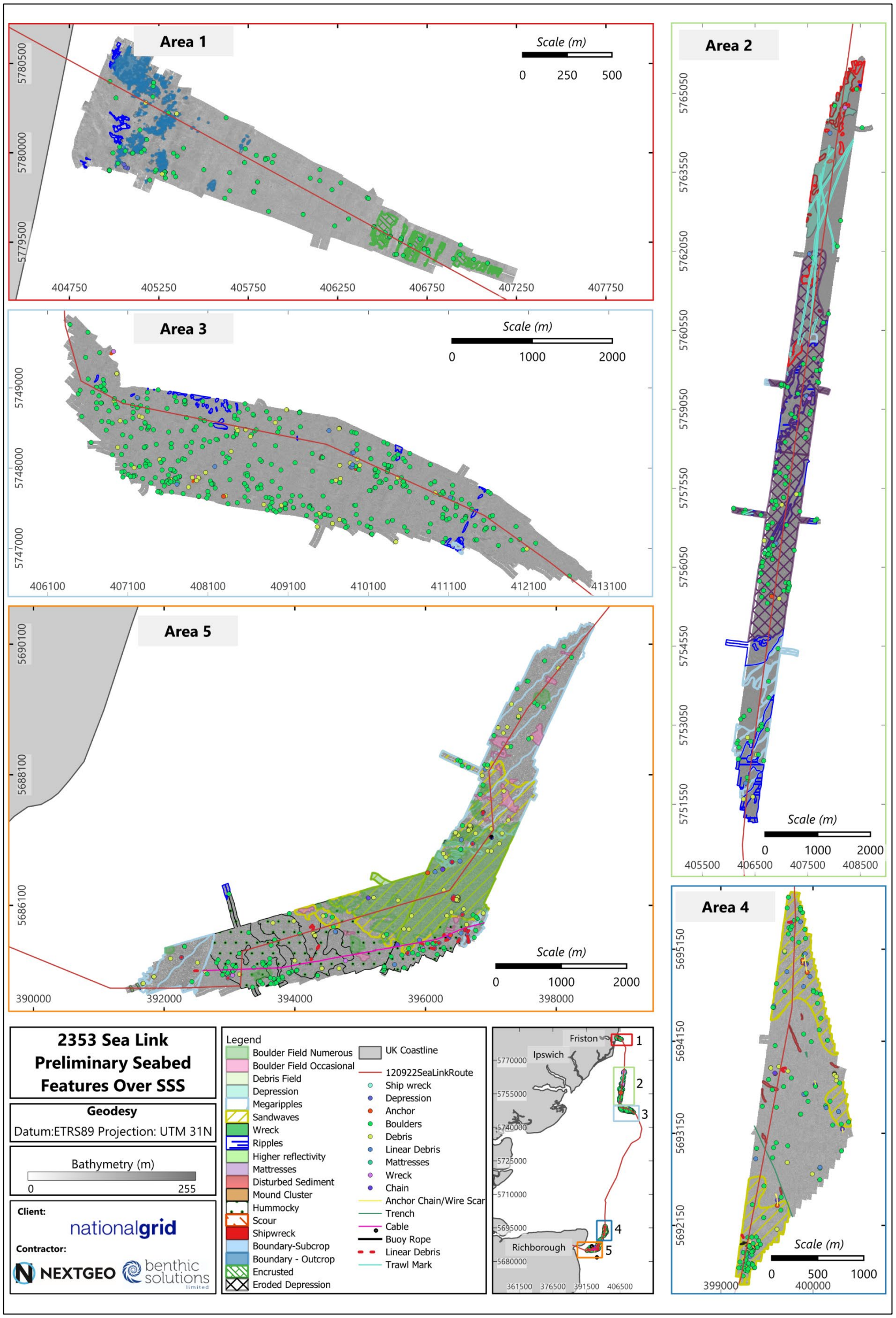


Figure 4-2 Seabed Features Over SSS Data

5 CONCLUSION

The preliminary interpretation of geophysical data obtained from the five areas along the Sea Link cable route incorporates historical information from the 2022 MMT survey report and broader regional context, revealing a variety of seabed features and potential sensitive habitats.

The potential for geogenic reefs was identified primarily in the northern section of Area 1, where sub/outcropping rock and bedrock are present. Boulder contacts were also observed throughout the route in varying densities with Area 5 noting both occasional and numerous boulder fields in the central and northern regions, these geological features suggest the possibility of geogenic reefs.

Potential *Sabellaria spinulosa* reefs were identified in several areas including the southern extent of Area 1, sections of Area 2, Area 4 and Area 5. These were typically characterized by mottled reflectivity seabed or areas defined as "encrusted" or 'hummocky', with the latter predominantly observed within Area 5. Within Area 4 potential areas of *S. spinulosa* were linked to areas of 'disturbed sediment'.

Annex I sandbanks, which are slightly covered by seawater all the time, were noted from the previous survey in Areas 2, 3, 4 and 5. These sandbanks were often associated with sandy sediments currently defined by 'sandwaves'.

Overall, the five additional areas for the Sea Link cable route encounter diverse seabed features, from ripples to expansive hummocks, indicating variability in potential sensitive habitats. These include potential geogenic reefs in Areas 1, 2, 3, and 4, along with sandbank habitats in Areas 1, 2, and 5. The likelihood of encountering *Sabellaria spinulosa* is increased in Areas 3 and 5 due to rippled seabed and sandwaves. This study highlights the necessity for further assessment of these sensitive habitats, particularly regarding potential reef formations and Annex I sandbanks.

6 REFERENCE LIST

Golding et al , 2020. Refining the Criteria for Defining Areas with a 'Low Resemblance' to Annex I Stony Reef. Available at: https://data.jncc.gov.uk/data/4b60f435-727b-4a91-aa85-9c0f99b2c596/JNCC-Report-656-FINAL-WEB.pdf [Accessed: 16/10/2023].

Gubbay, S. 2007. Defining and managing Sabellaria spinulosa reefs: Report of an inter-agency workshop 1-2 May, 2007, JNCC Report No. 405, JNCC, Peterborough, ISSN 0963-8091.

Irving, R. 2009. The identification of the main characteristics of stony reef habitats under the Habitats Directive: Summary report of an inter-agency workshop 26–27 March 2008, JNCC Report No. 432, JNCC, Peterborough, ISSN 0963-8091.

MMT, 2022. Environnemental Survey Report. NGET Doc ref: 103748-NAT-MMT-SUR-REP-ENVSURRE-B

NextGeosolutions Project Execution Plan, 2023. Next Doc ref: P2097-000-PEP

NextGeosolutions Geophysical Survey Procedure, Mobilisation and Calibration Plan, 2023. Next Doc ref: P2097-008-GEOP

7 APPENDIX A – SERVICE WARRANTY

This report, with its associated works and services, has been designed solely to meet the requirements of the contract agreed with you, our client. If used in other circumstances, some or all the results may not be valid, and we can accept no liability for such use. Such circumstances include different or changed objectives, use by third parties, or changes to, for example, site conditions or legislation occurring after completion of the work. In case of doubt, please consult Benthic Solutions Limited. Please note that all charts, where applicable should not be used for navigational purposes.

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