The Great Grid Upgrade

Sea Link

Sea Link

Volume 9: Examination Submissions

Document 9.80: Integrated Geophysical and Geotechnical Survey Report - Extract

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nationalgrid

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An extract of the 'Integrated Geophysical and Geotechnical Survey Report' has been produced to deliver the baseline bathymetric and geological description of the Sea Link Marine Route Corridor. This Extract comprises of sections 1, 2, 3, 4, and 10 of the original report.

DOCUMENT

VOLUME 4 - INTEGRATED GEOPHYSICAL & GEOTECHNICAL SURVEY REPORT

PROJECT

SEA LINK

MARINE CABLE ROUTE SURVEY

EMPLOYER

National Grid Electricity Transmission PLC (NGET)

EMPLOYER DOCUMENT CODE

TBC

NEXT GEOSOLUTIONS DOCUMENT CODE

P2097-010-REP-004

Revision No.:	C5	Issued by:	MZ
Date:	21/10/2025	Reviewed by:	UO
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C1	All	Issued for Client Review	18.03.2025
C2	All	Re-Issued for Client Review	19.05.2025
C1	All	Re-Issued as C1 as per Client Request	09.06.2025
C2	All	Issued for Client Review	01.08.2025
C3	All	Issued for Client Review	19.09.2025
C4	All	Issued for Client Review	02.10.2025
C5	Final	Issued for Construction	21.10.2025

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1 INTRODUCTION & SCOPE OF WORK

1.1 PROJECT DESCRIPTION

In 2021, National Grid Electricity Transmission Plc (NGET) awarded MMT the geophysical, environmental, and geotechnical survey for the proposed Southeast Anglia Link (SEAL), covering about 127 km of the cable route corridor.

In 2023, Ocean Infinity commissioned SEP Hydrographic to carry out land-based geophysical surveys at the proposed Sea Link landfalls between Pegwell Bay in Kent and Aldeburgh in Suffolk. The aim was to obtain accurate interpretations of surface and subsurface conditions.

Later in 2023, following route re-engineering, additional survey areas were identified. Next Geosolutions was contracted to complete about 35 km of geophysical, geotechnical, and benthic surveys across five sections of the survey corridors.

Also in 2023, Structural Soils Ltd (SSL), instructed by Mott MacDonald on behalf of NGET, carried out a preliminary ground investigation at the Kent landfall (SEA Link FEED). The work provided geotechnical and geoenvironmental information for the proposed 2 GW HVDC link between Richborough in Kent and Friston in Suffolk. This investigation took place between 18 September and 1 December 2023, with locations selected by Mott MacDonald, set out by SSL, and adjusted where necessary to avoid buried or overhead services and other restrictions.

Project details for both scopes (MMT & NextGeo) of the proposed route are presented in Table 1-1 and

Table 1-2 .

Table 1-1: Project Details – MMT Scope (2021)

Client:	National Grid Electricity Transmission Plc
Project:	South East Anglia Link (SEAL) marine survey
MMT Sweden AB (MMT) Project Number:	103748
Survey Type:	Geophysical, Environmental and Geotechnical
Area:	Southern North Sea
Survey Period	Aug / Sep 2021
Survey Vessel	Northern Franklin, Nora B, and Mersey Discovery
MMT Project Manager:	Martin Godfrey
Client Project Manager	George Hawkings

Table 1-2: Project Details – NEXTGEO Scope (2023)

Client:	National Grid Electricity Transmission Plc
Project:	South East Anglia Link Additional Survey
Next Geosolutions UKCS:	P2027
Survey Type:	Geophysical, Environmental and Geotechnical
Area:	Southern North Sea
Survey Period	Nov / Dec 2023
Survey Vessel	Ievoli Grey, NG Driller, and Shore Presence
MMT Project Manager:	Lucy Cotton
Client Project Manager	Jonathon Cunningham

1.2 SCOPE OF WORK / SURVEY OBJECTIVES

National Grid Electricity Transmission Plc (NGET) are developing a High Voltage Direct Current (HVDC) electricity transmission link in the East coast of England from Kent to Suffolk and have awarded MMT and NextGeo to perform the marine surveys (seabed surveys) for the proposed South East Anglia Link (SEAL) HVDC Link. The marine seabed survey data was acquired by MMT in 2021 and by Next Geosolutions in 2023. The detailed scope of work carried out during each campaign is outlined below.

1.2.1 MMT Scope

The following survey activities were carried out for the nearshore / offshore surveys areas:

- Bathymetric (MBES) data.
- High-resolution Side Scan Sonar (SSS) data.
- High-resolution Sub-Bottom Profiler (SBP) data.
- High quality Magnetometer data.
- High quality Benthic Grab Samples.
- High-quality Drop-Down Video/Stills data.
- High quality soil samples.
- High quality soil Thermal Resistivity data
- High quality CPT/VC results
- High quality lab testing results of soil samples.
- Full and detailed Survey Reports in accordance with the Technical Specification of the survey
- A conformant GIS deliverable package in accordance with the Technical Specification of the survey.

For the Landfall the objectives of the geophysical surveys were to:

- Provide accurate topographic data using UAV-based photogrammetry and LiDAR.
- Identify overburden thickness, soil layering, and rockhead depth relevant to project requirements.
- Assess magnetic anomalies along the proposed cable route.
- Evaluate potential magnetic risks within the Pegwell intertidal zone before carrying out seismic refraction.

To meet these objectives, the following survey activities were conducted at the proposed cable landing site for Aldeburgh and Pegwell:

- UAV photogrammetry and LiDAR acquisition.
- Seismic refraction survey using a 48-channel system with 2.5 m geophone spacing, targeting a depth of 25 m below ground level.
- Magnetometer survey with 50 m line spacing.
- UAV magnetometer survey over the Pegwell intertidal area with 2 m line spacing.

Figure 1-1 to Figure 1-3 presents overview maps of the Nearshore, Offshore and Landfall undertaken by MMT in 2021 survey.

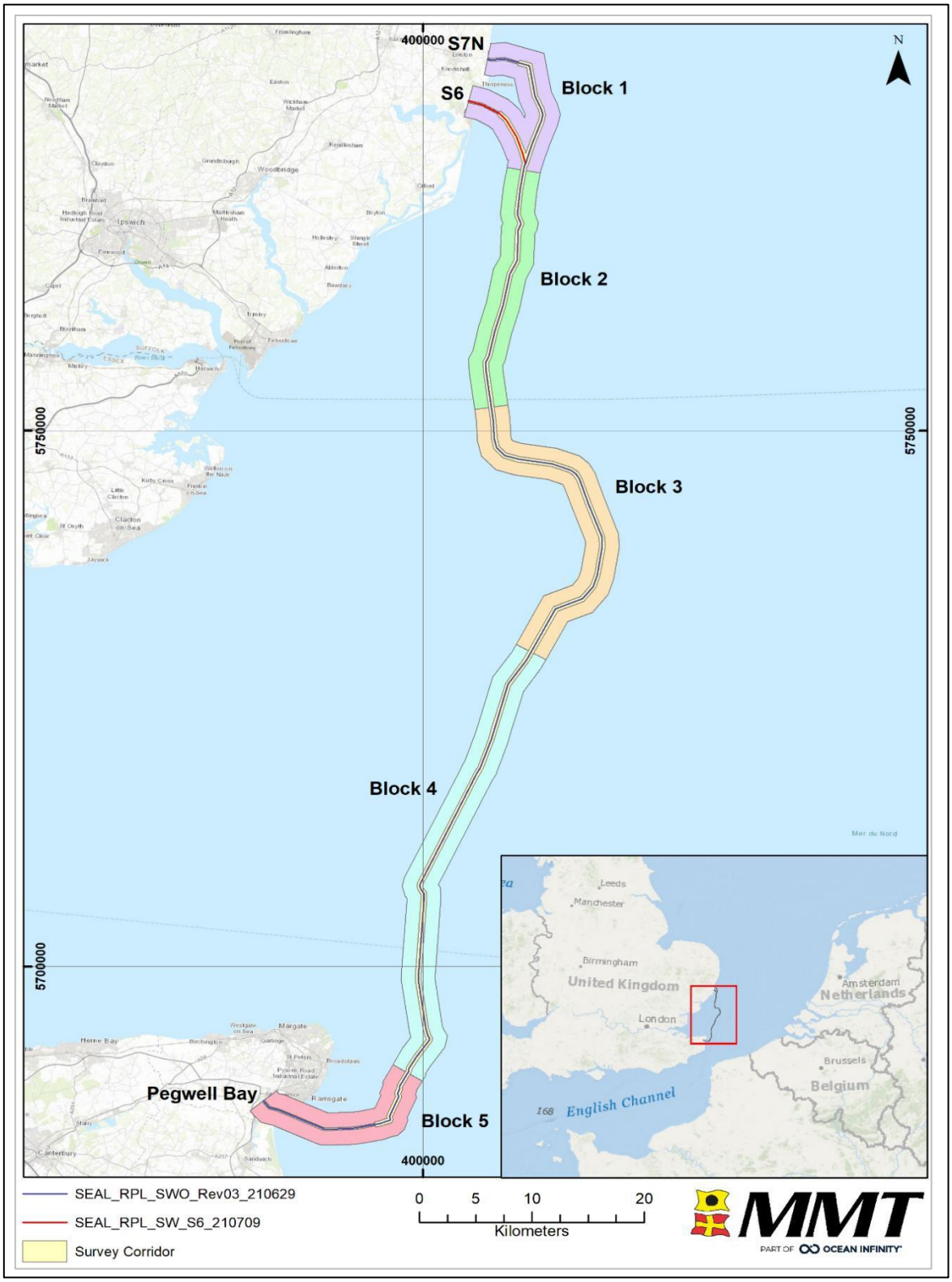

Figure 1-1: Overview Nearshore and Offshore Blocks (MMT Survey 2021)

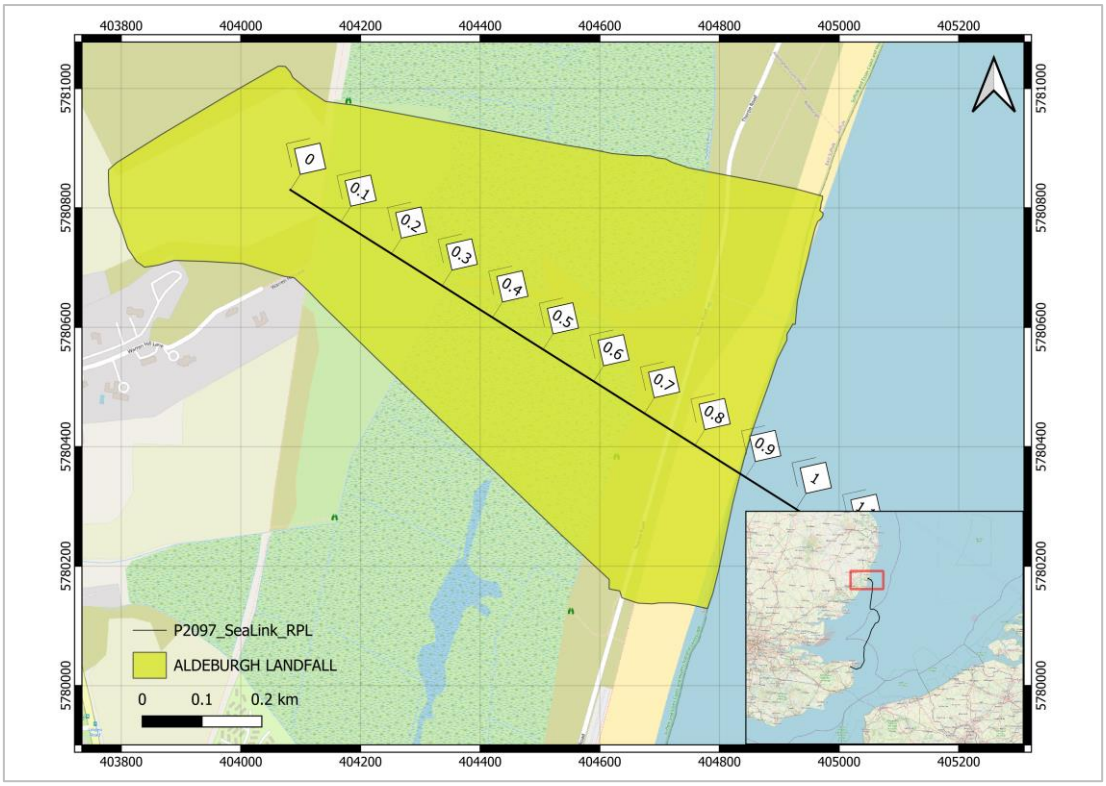

Figure 1-2: Overview of Aldeburgh Landfall (MMT Survey 2021)

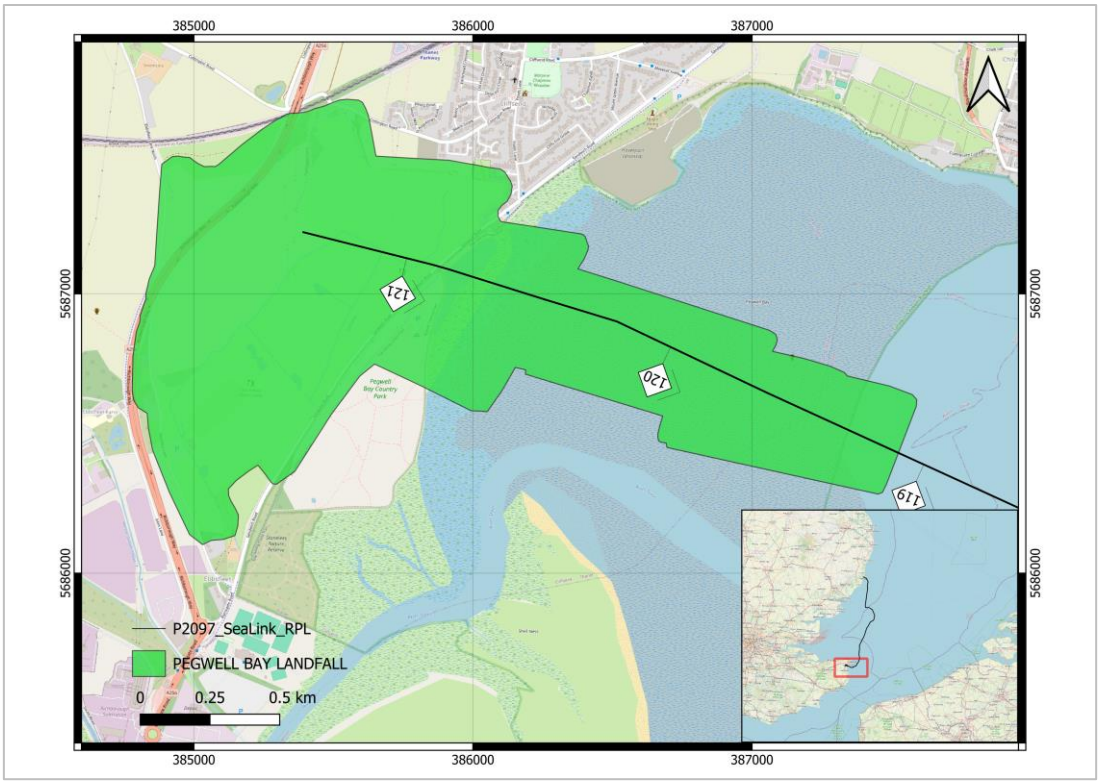

Figure 1-3: Overview of Pegwell Bay Landfall (MMT Survey 2021)

1.2.2 NextGeo Scope

The following survey activities were carried out for the nearshore / offshore surveys areas for the NextGeo Survey in 2023:

- Bathymetric (MBES) data.
- High-resolution Side Scan Sonar (SSS) data.
- High-resolution Sub-Bottom Profiler (SBP) data.
- Ultra Hih resolution seismic (Sparker in Area 3, 4 and 5)
- High quality Magnetometer data.
- High quality Benthic Grab Samples.
- High quality CPT/VC results (Including archaeological VC locations)
- High quality lab testing results of soil samples.
- Full and detailed Survey Reports in accordance with the Technical Specification of the survey
- A conformant GIS deliverable package in accordance with the Technical Specification of the survey.

Table 1-3: NEXTGEO Additional Survey - Scope of Work.

Area	Description	Area Size (km^2)	Surveyed (km^2)	VC Sites	CPT Sites	Benthic Sites	Water Depth	Figure
Area 1	Aldeburgh Nearshore	0.6	0.6	0	0	0	0-10m	Figure 1-4
Area 2	East Shipwash	11.3	6.4	4	4	4	18-23m	Figure 1-5
Area 3	North of the Sunk	5.7	5.7	1	1	1	20-32m	Figure 1-5
Area 4	Grid Link Crossing	1.83	1.83	1	1	1	12-14m	Figure 1-6
Area 5	Outer Pegwell Bay	9.1	6.3	3	3	3	5-11m	Figure 1-6
Archaeological VC's (*)				8				
Pre-Sweeping Samples (**)						16		
	Total:	**28.53**		**17**	**9**	**25**		
Note:	(*) At 8 locations (Archaeological BH sample duplicates_190423), a second VC sample shall be undertaken for archaeological evaluation only.							
	(**) At 16 locations, pre-sweeping samples shall be taken at locations provided by the Employer based on SSS/SBP data. Samples acquired in areas that may need pre-sweeping for sandwaves clearance prior to cable installation require the chemical analysis to be completed in an MMO validated lab, as the process is treated as disposal.							

After surveying the priority areas that were defined by NGET, the whole area was surveyed for the additional Area 3. Figure 1-4 to Figure 1-6 presents overview maps of the Nearshore / Offshore areas undertaken by NEXTGEO in 2023 survey.

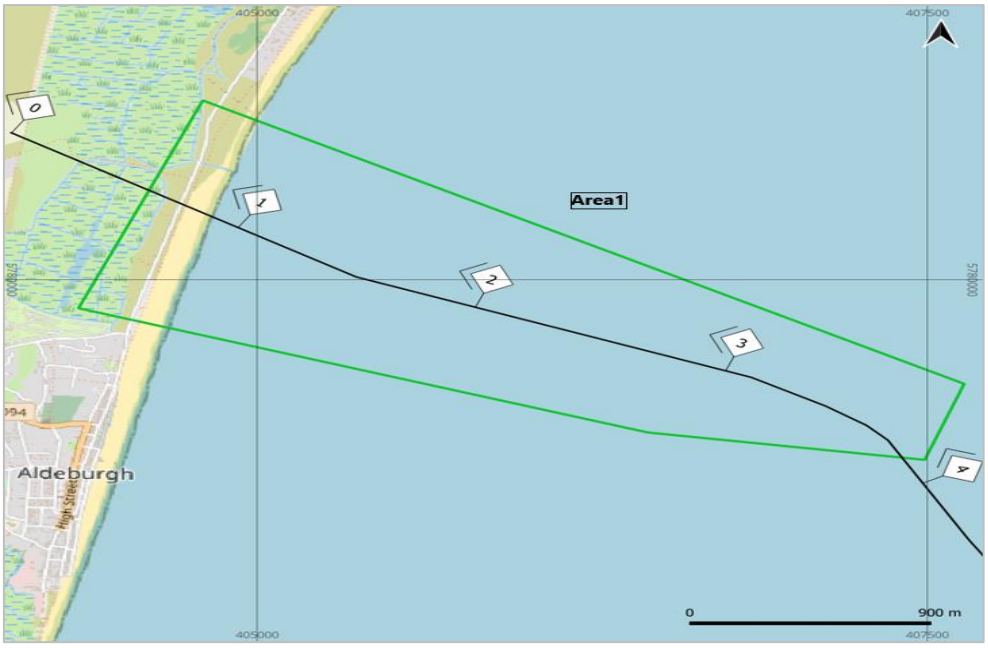

Figure 1-4: Overview of Additional Area 1

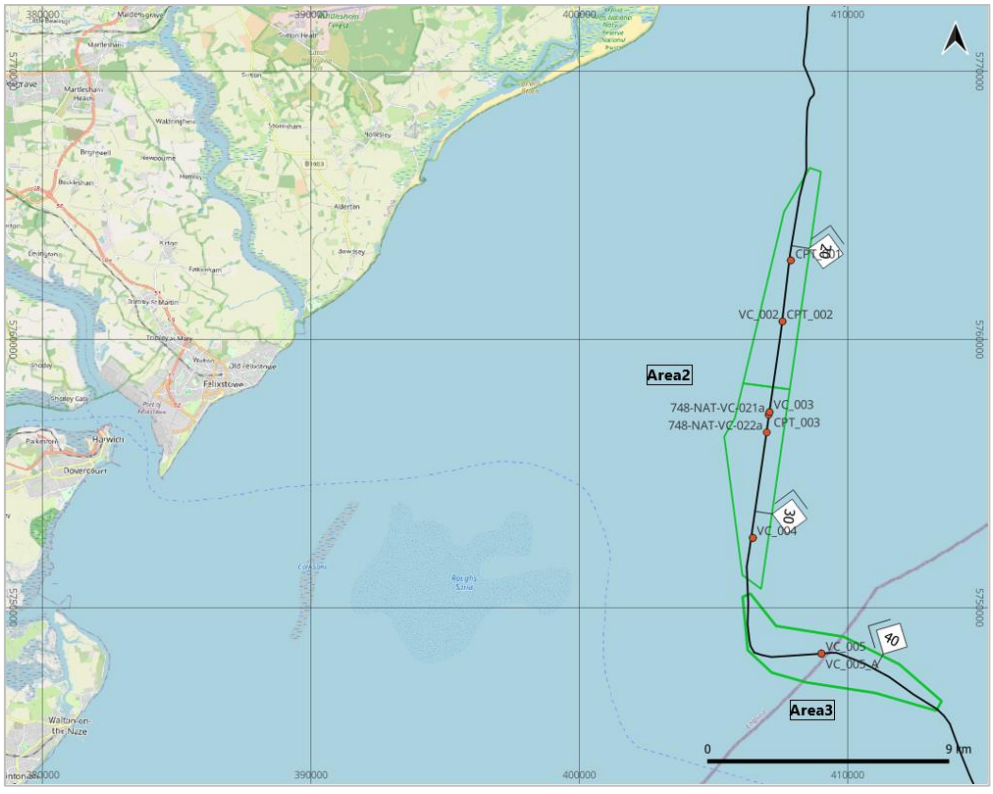

Figure 1-5: Overview of Additional Areas 2 and 3

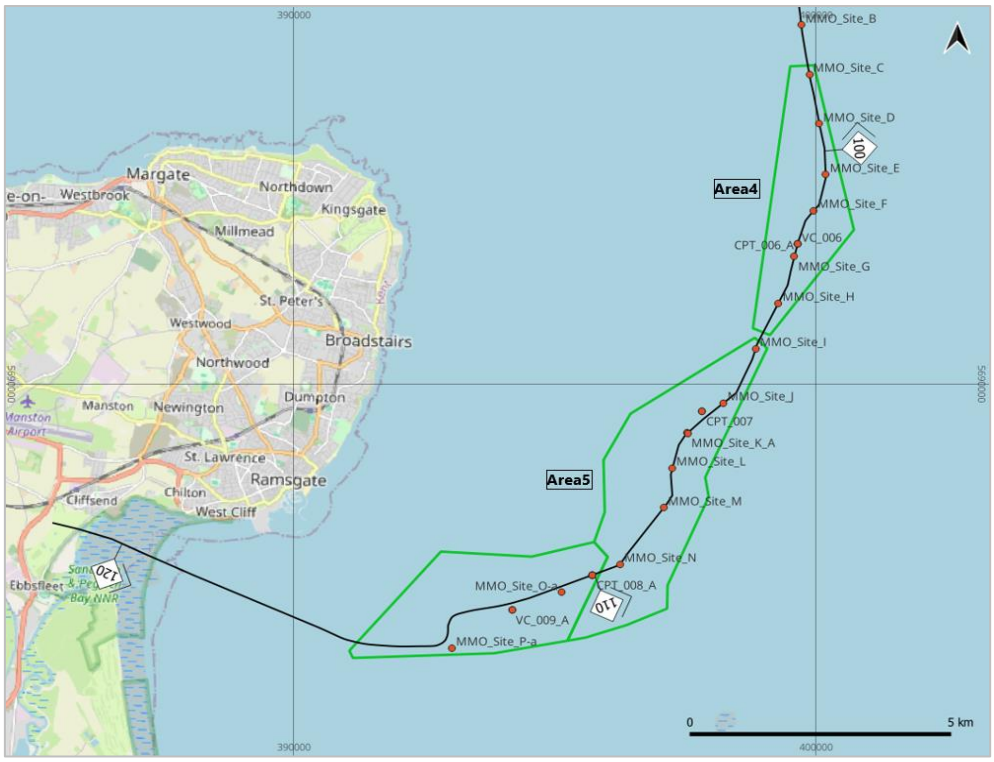

Figure 1-6: Overview of Additional Areas 4 and 5

1.2.3 Integrated Report Scope

For better integration between the MMT 2021 survey and the NextGeo 2023 survey datasets, NGET mandated NextGeo to produce an integrated geophysical and Geotechnical report covering the Corridor along the P2097_DF3_RPL_UTM31 cable route. The route along the new RPL was divided into divided into seven blocks and two landfalls at each end (see Figure 1-7 - Figure 1-15).

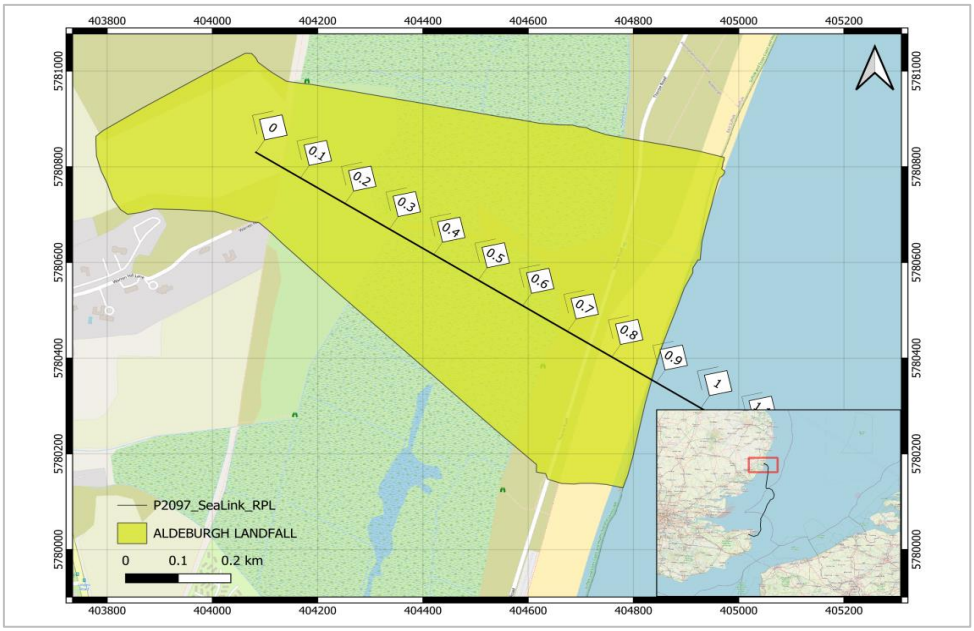

Figure 1-7: Overview of Aldeburgh Landfall

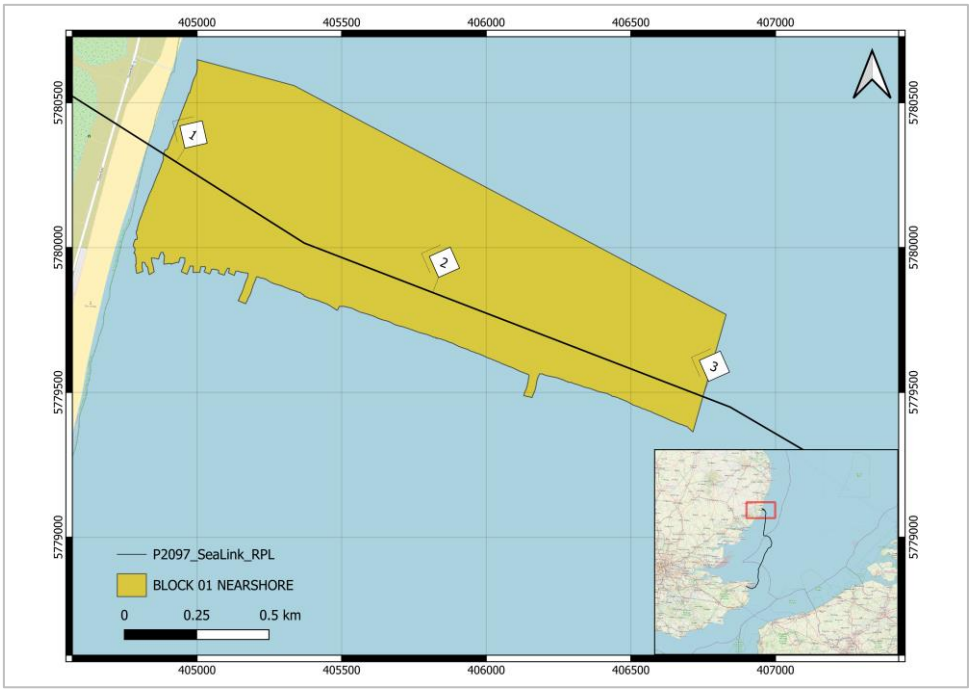

Figure 1-8: Overview of Block 01 Nearshore

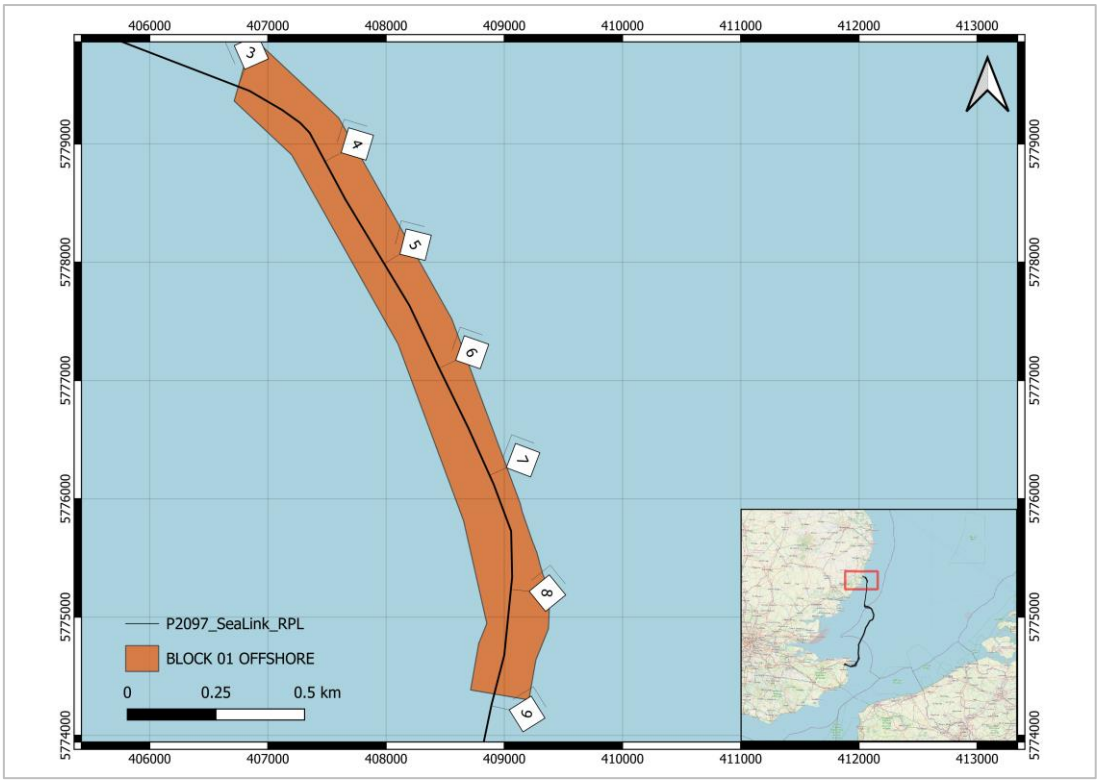

Figure 1-9: Overview of Block 01 Offshore

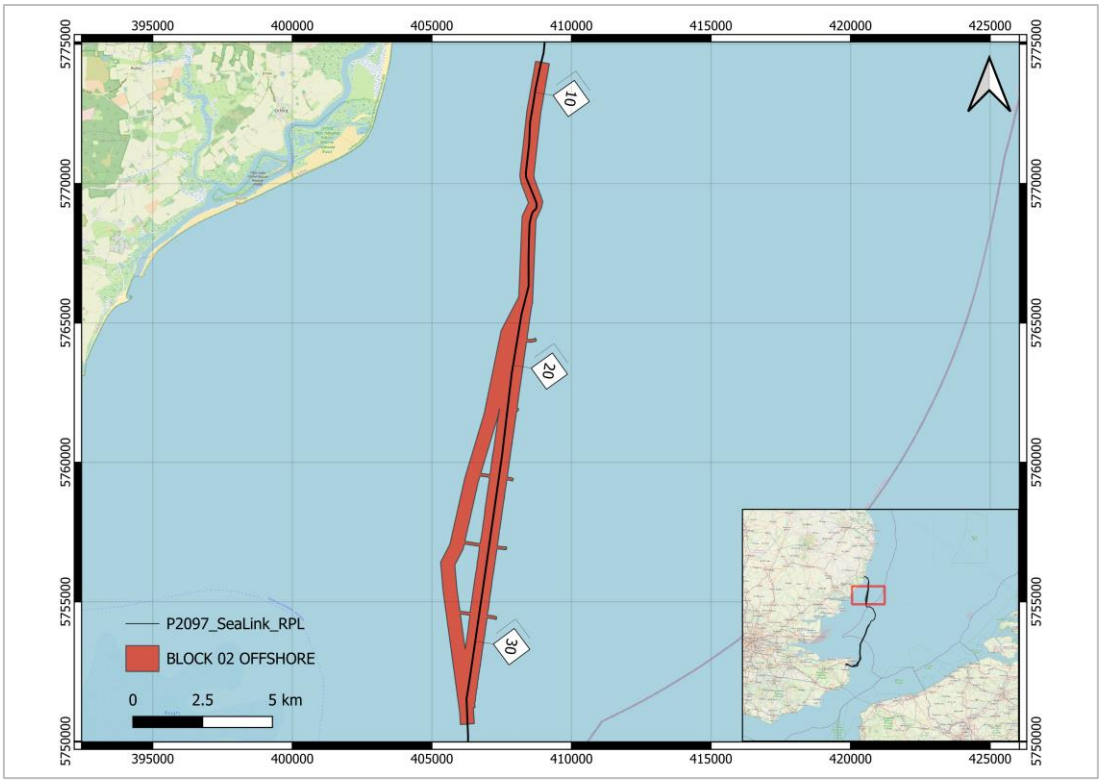

Figure 1-10: Overview of Block 02

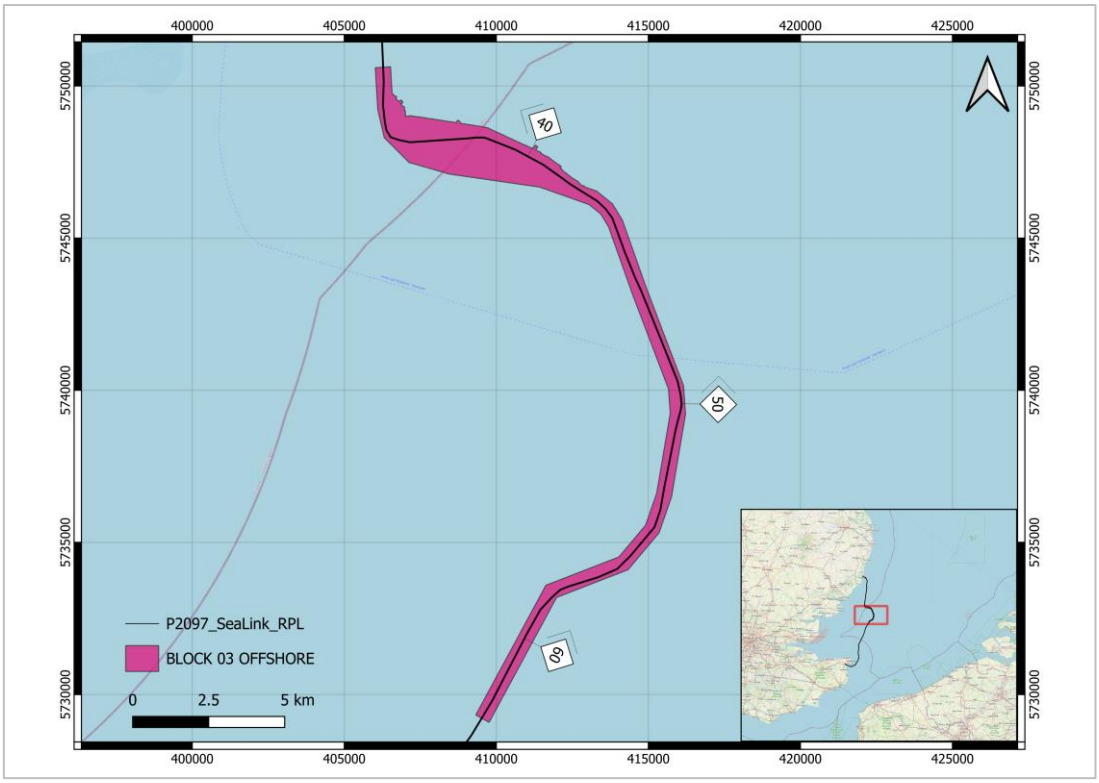

Figure 1-11: Overview of Block 03

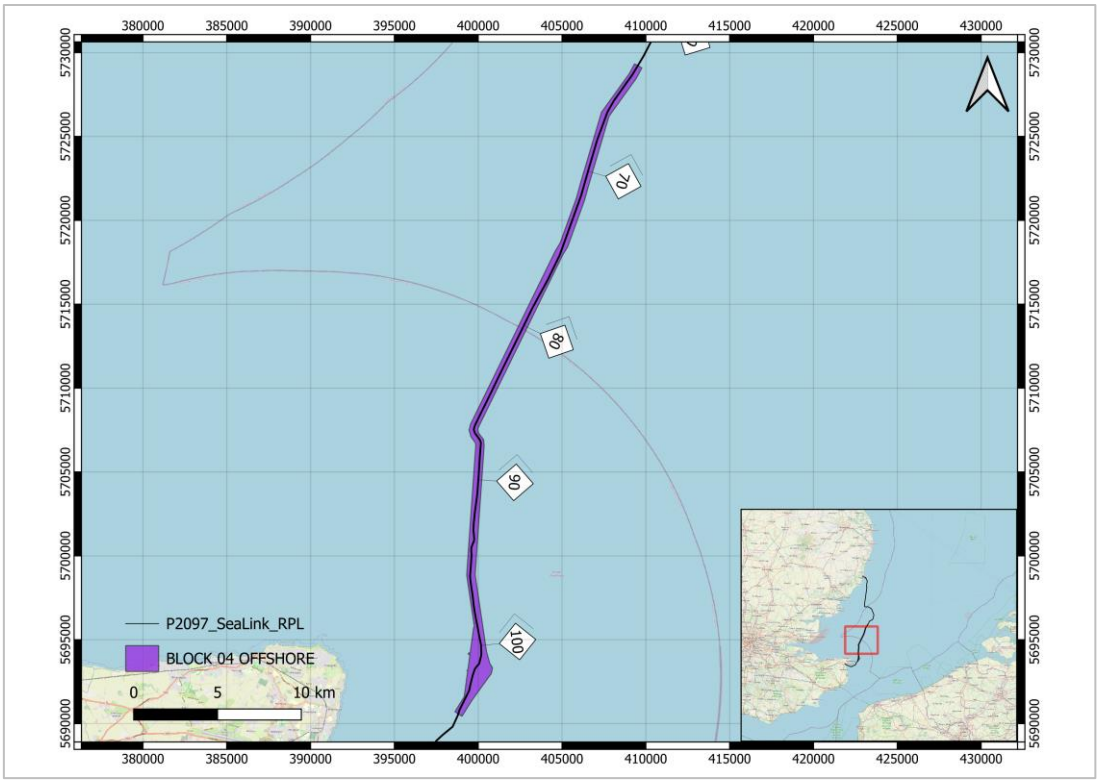

Figure 1-12: Overview of Block 04

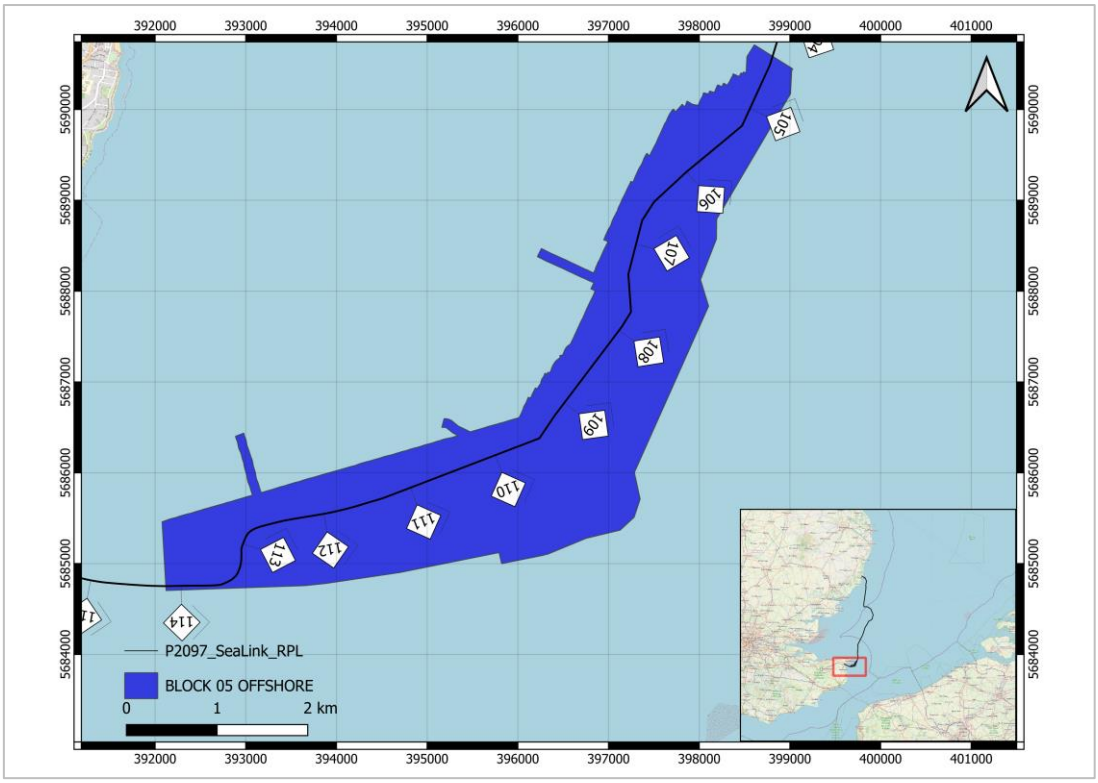

Figure 1-13: Overview of Block 05 Offshore

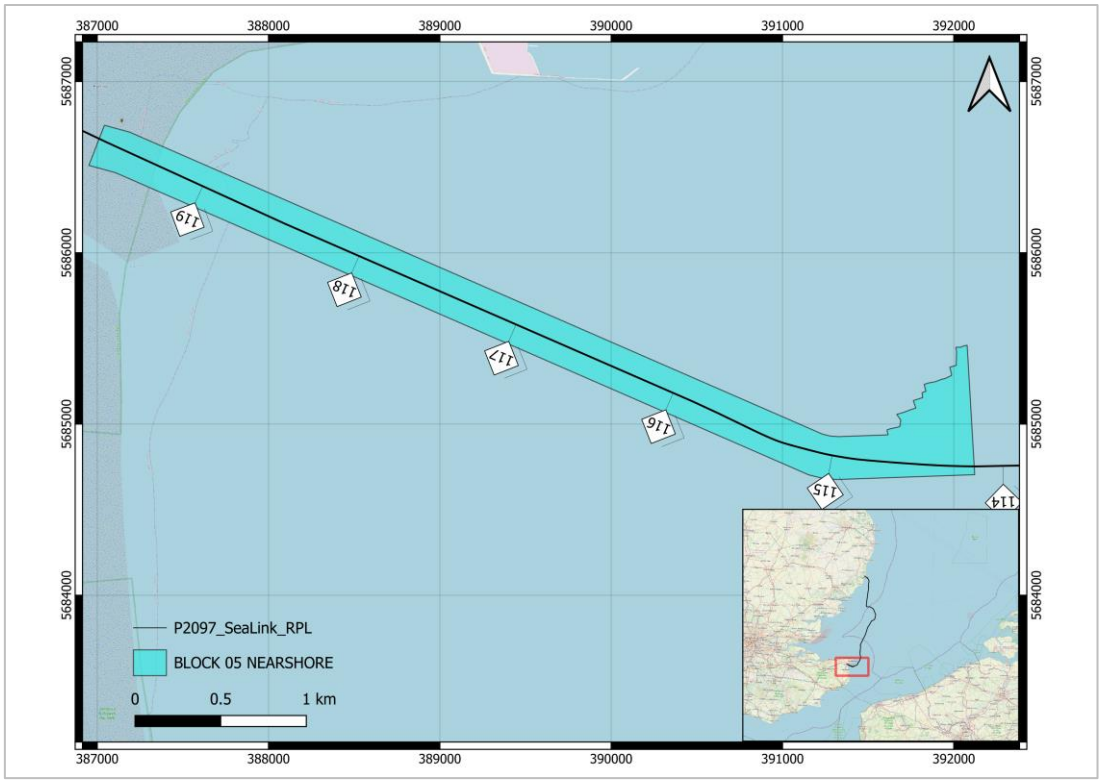

Figure 1-14: Overview of Block 05 Nearshore

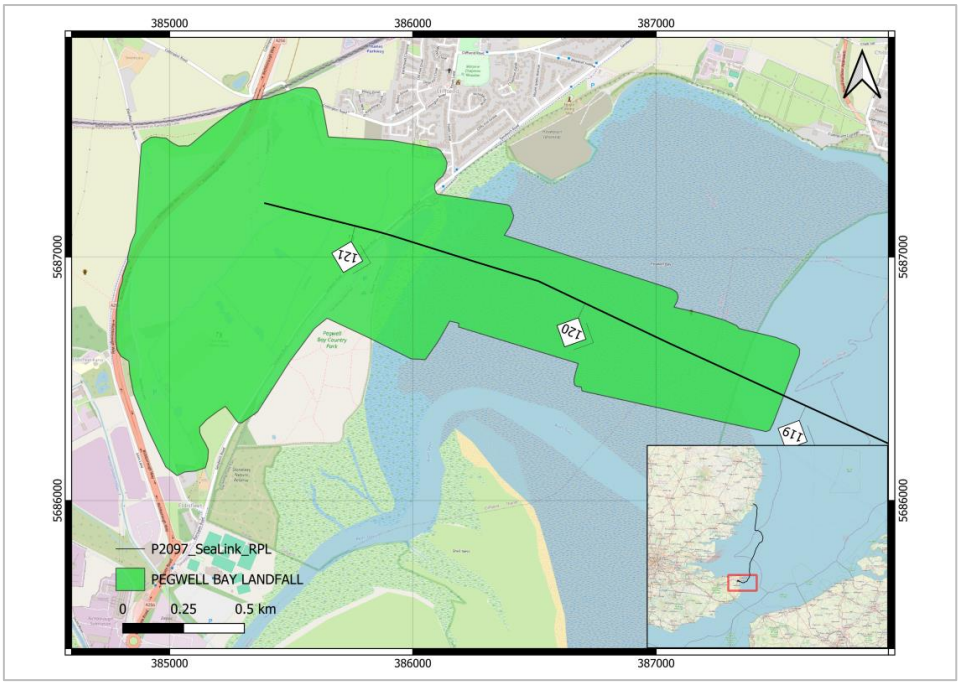

Figure 1-15: Overview of Pegwell Bay Landfall

1.3 PURPOSE OF DOCUMENT

This report consolidates the integrated results of geophysical data acquired during the recent NEXTGEO survey conducted in 2023 and the earlier MMT survey conducted in 2021. These findings were previously presented and reviewed by NGET on February 4th, 2025. The analysis confirmed a strong correlation between the NEXTGEO and MMT datasets, reinforcing the reliability of the interpretations.

The report presents the results of offshore, nearshore, and landfall geophysical surveys conducted by MMT, alongside five additional areas surveyed by NEXTGEO to evaluate various route options. These geophysical findings are integrated with geotechnical and benthic survey data from both contractors, providing a comprehensive overview to address specific project requirements.

The primary objectives of this report are to:

1. Finalize route planning.
2. Support permit applications and environmental statement preparation.
3. Contribute to the cable installation Invitation to Tender (ITT) package.
4. Provide key data to inform the design and installation process.

The report offers an overview of bathymetric, geophysical, surficial geological, and subsurface conditions along the route corridors, based on the interpretation of the acquired geophysical data. It also summarizes observed seabed features such as infrastructure, wrecks, and man-made objects that may present constraints during future installation or operational activities.

All geophysical and geotechnical datasets obtained from the surveys have been cross-referenced and validated against existing background information to ensure a robust and accurate assessment.

The combined interpretation integrates bathymetry, side-scan sonar (SSS), and sub-bottom profiler (SBP) data with geotechnical results to deliver key insights into seabed conditions, sediment distribution, and potential development constraints. Figure 1-16 illustrate an overview map of the entire route integrated in this phase of the project.

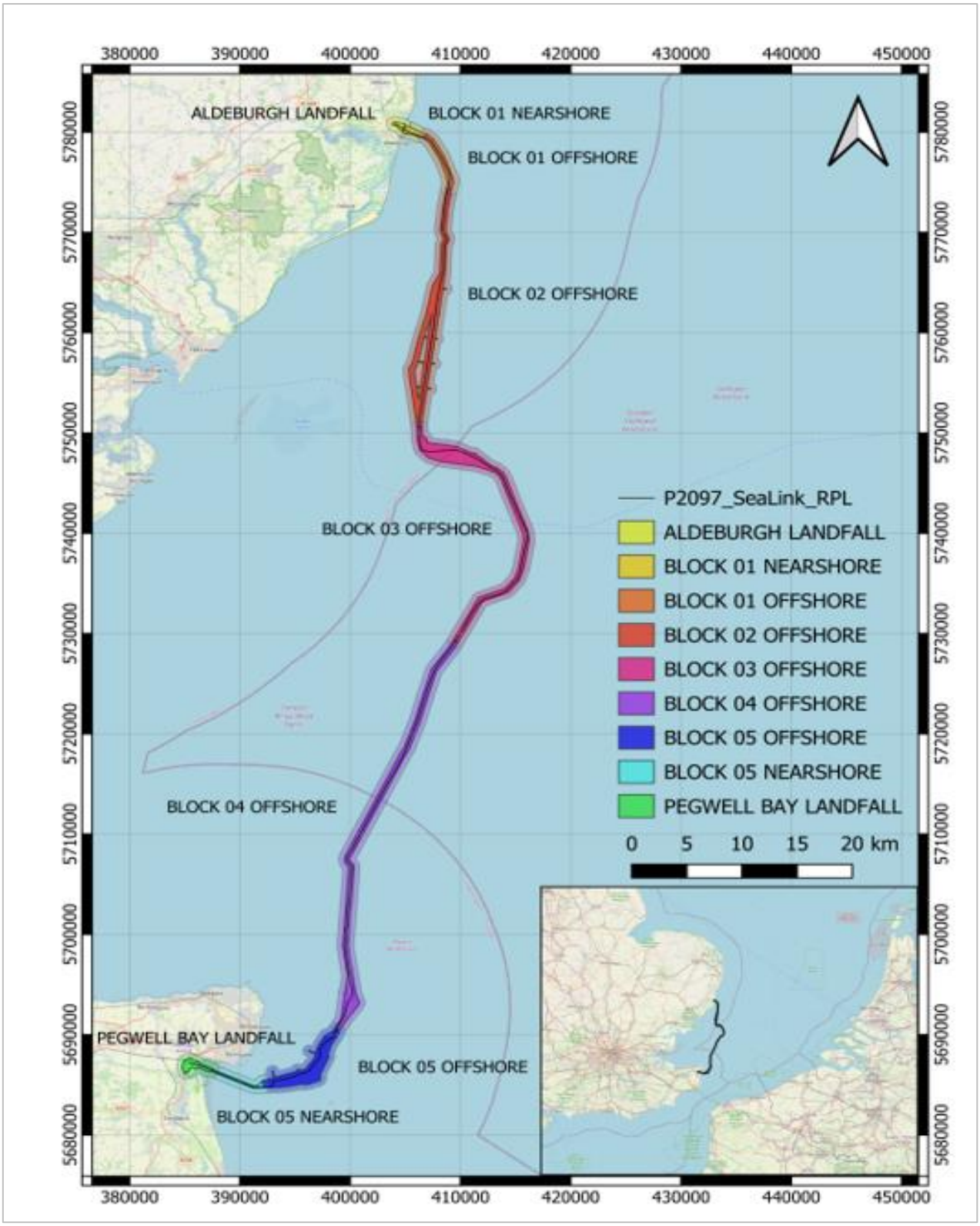

Figure 1-16: Overview of Integrated Survey Area

1.4 ROUTE INFORMATION

KP ranges in this report refer to *P2097_DF3_RPL_UTM31*. The route spans ~121 km in length, with detailed block descriptions provided in Table 1-4.

Table 1-4: Block Breakdown along the P2097_DF3_RPL_UTM31 Route.

Area	KP start (km)	KP end (km)	Figure
Aldeburgh Landfall	0.000	0.900	Figure 1-7
Block 01 Nearshore	0.900	3.000	Figure 1-8
Block 01 Offshore	3.000	8.900	Figure 1-9
Block 02	8.900	33.000	Figure 1-10
Block 03	33.000	63.000	Figure 1-11
Block 04	63.000	104.400	Figure 1-12
Block 05 Offshore	104.400	114.200	Figure 1-13
Block 05 Nearshore	114.200	119.700	Figure 1-14
Pegwell Bay Landfall	119.323	121.382	Figure 1-15

2 DEFINITION AND ABBREVIATIONS

2.1 DEFINITIONS

Project	SEALINK – MARINE CABLE ROUTE SURVEY
Employer/Client	National Grid (hereinafter also indicated as "NGET" or "EMPLOYER")
Contractor	Next Geosolutions (hereinafter also indicated as "NEXT" or "Contractor")
Sub-Contractor	Shore Monitoring & Research (hereinafter SHORE)
Previous Contractor	MMT / Ocean Infinity
Previous Sub-Contractor	SEP Hydrographic Limited (Landfall), Structural Soils Ltd (SSL).

2.2 ABBREVIATIONS

Abbreviation	Description
AGS	Association of Geotechnical and Geoenvironmental Specialists
ASCII	American Standard Code for Information Interchange
BEN	Benthic
BH	Borehole
B_q	Pore pressure ratio
BS EN ISO 14688	British Standard European Norm International Organization for Standardization 14688
cm	Centimetre
Coax	Coaxial
CPT	Cone Penetration Test
CS	core sub-samples
DC	Direct Current
D_r	Relative Density
DTM	Digital Terrain Model
DUG	Down Under Geophysics
E	East
ENF	Emergency Notification Flowchart
EPSG	European Petroleum Survey Group
ERP	Emergency Response Plan

Abbreviation	Description
ETRF	European Terrestrial Reference Frame
FME	Feature Manipulation Engine
FOC	Fibre Optic Cable
FX	Frequency-Domain
GEOP	Geophysical Survey Procedure
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GRS	Geodetic Reference System
GeoTIFF	Georeferenced Tagged Image File Format
HIPS	Hydrographic Information Processing System
HIRA	Hazard Identification & Risk Assessment
HSE	Health, Safety and Environment
HSSE	Health, Safety, Security and Environment
HVDC	High Voltage Direct Current
IMCA	International Marine Contractors Association
INS	In Service
ISO	International Organization for Standardization
ITRF	International Terrestrial Reference Frame
JSF	JASON Sonar Format
KP	Kilometre Point
LAT	Lowest Astronomical Tide
LiDAR	Light Detection and Ranging
L x W X H	Length x Width x Height
m	Metre
MAG	Magnetometer
MBE / MBES	Multibeam Echo Sounder
M BSF	Depth in metres below seafloor
MCR	Mobilisation & Calibration Report

Abbreviation	Description
MDR	Master Document Register
MMO	Marine Management Organisation / Marine Mammal Observer
ms	Millisecond
N	North
N_{kt}	Cone Factor
MPa	Megapascal
MPSV	Multi-Purpose Support Vessel
N/A	Not Applicable
NGET	National Grid Electricity Transmission Plc
NEXT	Next Geosolutions
NMO	Normal Moveout
NSH	Nearshore
nT	Nanotesla
OCR	Offshore Construction Representative
OFS	Offshore
OOS	Out of Service
OPS	Operations
P_a	Atmospheric Pressure
PAHs	Polycyclic Aromatic Hydrocarbons
PCPT	Piezocone Penetration Test
PEP	Project Execution Plan
Pen	Penetration
POW	Plan of Work
ppm	Parts per million
PRR	Project Risk Register
PSA	Particle Size Analysis
QAP	Quality Assurance Plan
QC	Quality Control
QCP	Quality Control Plan

Abbreviation	Description
QINSy	Quality Integrated Navigation System
q_n	Net cone resistance
QPS	Quality Positioning Services
q_t	Total cone resistance
Rec	Recovery
REP	Report
R_f	Friction ratio
ROTV	Remotely Operated Towed Vehicle
ROV	Remotely Operated Vehicle
RPL	Route Position List
S-UHRS	Sparker Ultra-High Resolution Seismic
SBP	Sub-Bottom Profiler
SBET	Smoothed Best Estimate of Trajectory
SBT	Soil Behaviour Type
SEGY	Society of Exploration Geophysicists data format
SEP	Survey & Engineering Projects (Sub-contractor)
SHEQ	Safety, Health, Environment and Quality
SI	System International or Seabed Index
SIPS	Sonar Information Processing System
SoW	Scope of Work
SSL	Structural Soils Ltd
SSS	Side Scan Sonar
S_u	Undrained Shear Strength
SV	Sound Velocity
SVP	Sound Velocity Profile(r)
SWP	Standard Working Practice
TFDN	Time-Frequency Domain Normalization
THU	Total Horizontal Uncertainty
TM	Transverse Mercator

Abbreviation	Description
TPU	Total Propagated Uncertainty
TRT	Torvane or Pocket Penetrometer Test
TVU	Total Vertical Uncertainty
TWT	Two-Way Travel time
u_2	Excess Pore Pressure
UAV	Unmanned Aerial Vehicle
UKHO	United Kingdom Hydrographic Office
USBL	Ultra-Short Baseline
UTM	Universal Transverse Mercator
UU	Unconsolidated-Undrained
UXO	Unexploded Ordnance
VC	Vibrocore
VORF	Vertical Offshore Reference Frame
WGS84	World Geodetic System 1984
XYZ	X, Y, Z coordinates
y_w	Unit Weight of Water (in same units as y;)

3 REFERENCE DOCUMENTS

3.1 CODE OF STANDARDS

Table 3-1: Codes and Standards

Document No.	Document Title
ISO 9001:2015	Quality management systems - Requirements
ISO 9000:2015	Quality management systems – Fundamentals and vocabulary
IMCA Guidelines	ROV, Survey, HSSE, LR, Competence, Marine, Contracting Publications, as applicable

3.2 CLIENT DOCUMENTS

Table 3-2: Client Supplied Documents

Employer Document No.	Document Title
AHFEB04_P2601_Rev0	Sea Link Additional Survey Scope of Work_Final
AHFEB03_P2601_Rev0	Sea Link Additional Survey Technical Specification Final
N/A	Sea Link Marine Survey SHEQ Requirements Final
	Pre-Sweeping Sampling Requirement

3.3 MMT DOCUMENTS

The documents used as references to this Survey Report are presented in Table 3-3.

Table 3-3: MMT Technical Documents

DOCUMENT NUMBER	TITLE
103748-NAT-MMT-QAC-PRO-PROJMANU	Project Manual
103748-NAT-MMT-MAC-REP-FRANKLIN	Mobilisation and Calibration Report Franklin
103748-NAT-MMT-MAC-REP-MERSEYDI	Mobilisation and Calibration Report Mersey Discovery
SEPH-2021-019 Field and Operations Report	Nearshore Operations Report
103748-NAT-MMT-SUR-REP-OPEREPFR	Offshore Operations Report
103748-NAT-MMT-SUR-REP-GEOTECH-A	Geotechnical Report
SEA Link Scope_A4	Scope of Work
SEA Link Techspec_A3	Technical Specification

3.4 NEXT DOCUMENTS

3.4.1 Project Documents

Table 3-4: NEXT Documents

Contractor Document No.	Employer Document No.	Document Title
P2097-000-MDR	N/A	Project Master Document Register (MDR)
P2097-000-PEP	N/A	Project Execution Plan
P2097-000-POW	N/A	Project Schedule (Plan of Work)
P2097-000-PRR	N/A	Project Risk Register (Contractual / Operational Risks)
P2097-003-QAP	N/A	Quality Assurance Plan (QAP)
P2097-003-QCP	N/A	Quality Control Plan (QCP)
P2097-005-HSE-001	N/A	HSE Plan
P2097-008-GEOP	N/A	Geophysical Survey Procedure, Mobilisation and Calibration
P2097-004-HIRA-NSH	N/A	Hazard Identification & Risk Assessment - NSH
P2097-007-ENF-NSH	N/A	Emergency Notification Flowchart- NSH
P2097-006-ERP	N/A	Emergency Response Plan (ERP)
P2097-005-HSE-002	N/A	Bridging Plan
P2097-009-MCR-001	N/A	Mobilisation & Calibration Report - SHORE Presence
P2097-010-REP-001	N/A	Volume 1 – Field Results Report – Geophysical Survey
P2097-010-REP-003	N/A	Volume 3 – Results Report - Geotechnical Laboratory Testing

3.4.2 Technical Documents

The following documents listed in Table 3-5 were referenced as guides during the Survey and Processing operations.

Table 3-5: Technical Documents

Contractor Document No.	Employer Document No.	Document Title
SWP-OPS-01	N/A	MBES Processing
SWP-OPS-02	N/A	MBES Calibration
SWP-OPS-07	N/A	MBES System
SWP-OPS-08	N/A	SSS System
SWP-OPS-10	N/A	Seismic Survey with Sparker
SWP-OPS-012	N/A	Coordinate Transformation
SWP-OPS-013	N/A	Sound Velocity Determination
SWP-OPS-014	N/A	Offset Measurement
SWP-OPS-016	N/A	Side Scan Sonar Launching and Recovery
SWP-OPS-017	N/A	Sub-Bottom Profiler System
SWP-OPS-020	N/A	Sound Probe Velocity System
SWP-OPS-021	N/A	Heading & Attitude Reference System
SWP-OPS-022	N/A	Magnetometer
SWP-OPS-061	N/A	Charting
SWP-OPS-067	N/A	Processing Flow
SWP-OPS-073	N/A	SSS-SBP Processing Flow
SWP-OPS-074	N/A	Magnetometer Processing Flow

4 SURVEY CONTROL

4.1 DATUM DEFINITION

4.1.1 Horizontal Datum

All survey activities were carried out using the geodetic parameters presented in Table 4-1.

Table 4-1: Geodetic Parameters

GNSS Geodetic Parameters		
Datum:	European Terrestrial Reference System 1989	EPSG Code 4258
Ellipsoid:	GRS1980	EPSG Code 7019
Semi-major axis (a):	6378137.000m	
Inverse Flattening (1/f):	298.257222101	
Project Projection Parameters		
Grid Projection:	Universal Transverse Mercator (UTM)	EPSG Code 25831
TM Zone:	31N	
Central Meridian:	03° 00′ 00″ East	
Latitude of Origin:	00° (Equator)	
False Easting:	500,000m	
False Northing:	0m	
Scale Factor on Central Meridian:	0.9996	
Units:	Metre	
Notes: EPSG website: http:// www.epsg-registry.org/		

4.1.2 Datum Transformation

All data is transformed from WGS84 (ITRF2014) to ETRS89 (ETRF2000), Epoch 2021.5, using the 7-parameter Helmert transformation in the online survey software, illustrated in Table 4-2.

Table 4-2: Transformation parameters WGS84 to ETRS89

7-Parameter transformation WGS84(ITRF2014) to ETRS89 EPOCH 2021.5	
Tx (m)	0.106650
Ty (m)	0.066130
Tz (m)	-0.128730
Rx (")	-0.00340900
Ry (")	-0.01406500
Rz (")	0.02520700
Sf (ppm)	0.003200

4.1.3 Vertical Datum

The vertical datum for the marine survey operations is the LAT (Lowest Astronomical Tide). Reduction of ellipsoidal heights to LAT shall be done using the VORF model.

VORF has been developed by the UKHO to cover UK and Irish Waters, to establish a transformation model that allowed the terrestrial vertical reference frames to be extended offshore and to provide one vertical reference frame for offshore surveys. The increasing need to merge onshore and offshore data sets prompted the development of VORF and any vessel now equipped with a precise GPS system can accurately record the elevation of the antenna, and consequently the water level, above the ETRF89 datum.

By recording the height of the GPS antenna in real time, in some cases using C-Tides or another software to maximise vertical accuracy, the vessel effectively becomes its own tide gauge. Height data is recorded and post-processed, and a tide curve generated. Having vessel attitude interfaced into the software, the fixed distance between the antenna and the transducer allows to translate precise GPS ellipsoidal height to the transducer taking vessel motion into account. By subtracting the geoidal separation provided by the VORF model, height of the transducer and, consequently, acquired soundings are reduced to LAT.

4.1.4 Survey Time Standard

UTC was used for all operational activities, logbooks, displays and reporting. All survey systems and equipment were synchronised to this reference system.

4.1.5 Units

The units of measurements adopted in this document are System International (SI) units.

Linear units are international metres (m), and angular units are in Degrees (° (positive clockwise)).

4.1.6 Rotation Conventions

Figure 4-1 below illustrates the rotation convention used during the mobilisation and subsequent surveys.

ROTATION CONVENTION	
Heading	Heading is measured clockwise from Vessel North (+ Y Axis).
Pitch	Positive Pitch is Bow Up (Vessel North).
Roll	Positive Roll is Port Up (Vessel North).

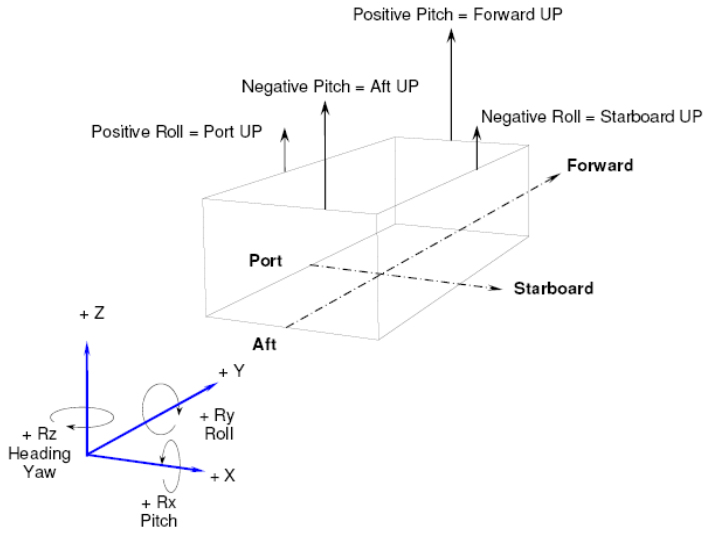

Figure 4-1: Survey Rotation Convention

10 SURVEY RESULTS

10.1 ALDEBURGH LANDFALL KP 0.000 TO KP 0.900

Table 10-1: Alignment Sheets for Block Aldeburgh Landfall KP 0.000 to KP 0.900

AS-5K-001

10.1.1 Bathymetry (UAV Photogrammetry / Lidar)

UAV LiDAR data acquired at Aldeburgh landfall demonstrates strong correlation with existing nearshore bathymetry datasets. The LiDAR data at KP0.000 recorded a height of 8.10 m above LAT, continuing to KP 0.889 with a height of 0.33 m above LAT (Figure 10-1).

The average slope along the route is less than 5° (4.54° - gentle according to gradient classification scheme). A maximum slope of 31.70° was observed at KP 0.743 on the shingle bank, representing a localized topographic feature (Figure 10-2).

Note: A data gap exists along the RPL between Aldeburgh landfall and Block 01 nearshore (KP 0.889 – KP 0.913), as this area was not accessible during the survey due to shallow water depths.

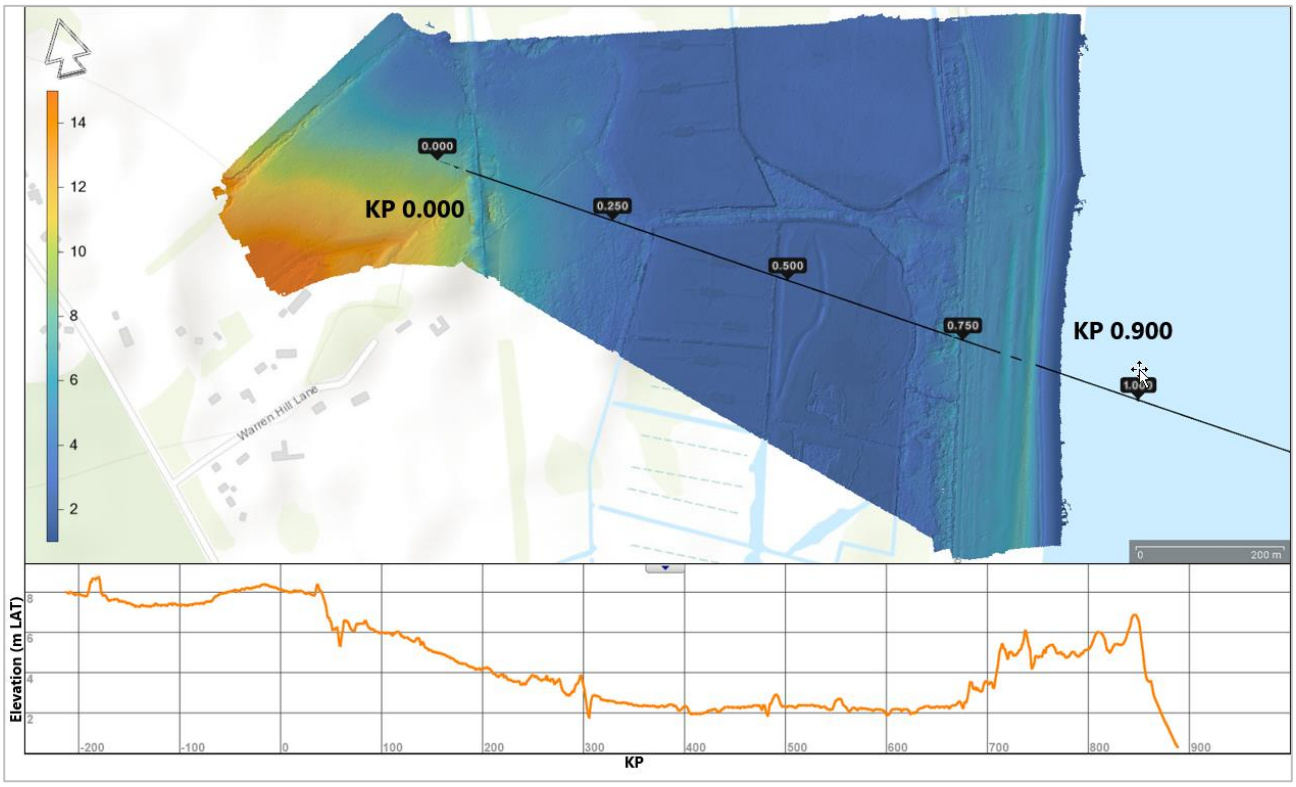

Figure 10-1: Overview of the Bathymetry (Lidar) in Aldeburgh Landfall

Figure 10-2: Aldeburgh Landfall Elevation and Slope Profile

10.1.2 Surficial Geology and Seabed Features

The Aldeburgh Landfall is comprised mostly of SANDs of the Norwich Crag Formation of Pleistocene age. These sediments were deposited in a near-shore environment, and comprise a range of SANDs, SILT CLAYs and flint-rich GRAVELs.

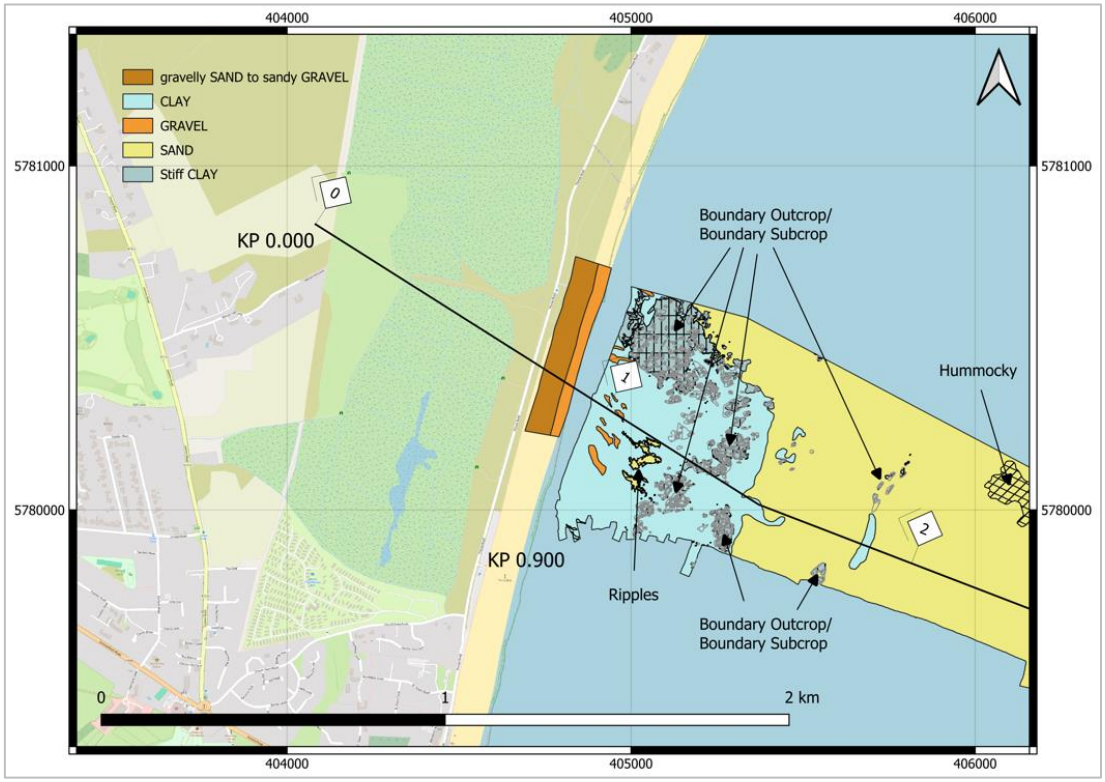

Figure 10-3: Overview of Seabed Geology and Features Block Aldeburgh Landfall between KP 0.000 and KP 0.900

10.1.3 Contacts and Anomalies (Walked Magnetometer)

A total of 64 magnetic anomalies were identified within the walked magnetometer survey at the Aldeburgh landing site. Magnetic anomalies are summarized in Table 10-2

Table 10-2: Summary Aldeburgh Landfall Magnetic Anomalies

CLASSIFICATION	NUMBER
Infrastructure	17
Utility/ Pipeline	1
Unknown	46
Total	64

10.1.4 Shallow Geology (P-Wave Seismic Refraction)

Geophysical data from the beach section at Aldeburgh indicate a straightforward two-layer structure. The upper layer (Layer 1), with a velocity of 0.35 km/s, corresponds to dry SAND and GRAVEL deposits. Beneath this, a second layer (Layer 2a) with a velocity of 1.2 km/s is likely associated with unsaturated beach sediments or drier Red Crag deposits. The top of Layer 2a is situated between 1.5 m above LAT and 0.5 m below LAT in this area.

Similarly, in the RSPB and adjacent farmland areas, a comparable two-layer configuration is observed. The upper layer (Layer 1), also with a velocity of 0.35 km/s, represents uncompacted, unsaturated sandy soils (Figure 10-5). The underlying layer (Layer 2b), with a higher velocity of 1.9 km/s, is interpreted as the Red Crag Formation. Across these areas, the top of Layer 2b lies between 3.4 m above LAT and 4.2 m below LAT.

A plan view, showing the position of the seismic refraction lines across the Aldeburgh site, is shown in Figure 10-4.

Table 10-3: Aldeburgh Layer Boundary Interpretation.

Interpretation	P-wave velocity (km/s)	Possible Lithology
Layer 1	0.35	Shallow, unsaturated, uncompacted sandy soils/sandy beach deposits
Layer 2a	1.2	(Beach) Unsaturated SANDs and GRAVELs or Red Crag deposits
Layer 2b	1.9	(RSPB & Farmland) Red Crag Formation (possible saturated/weathered interface on beach)

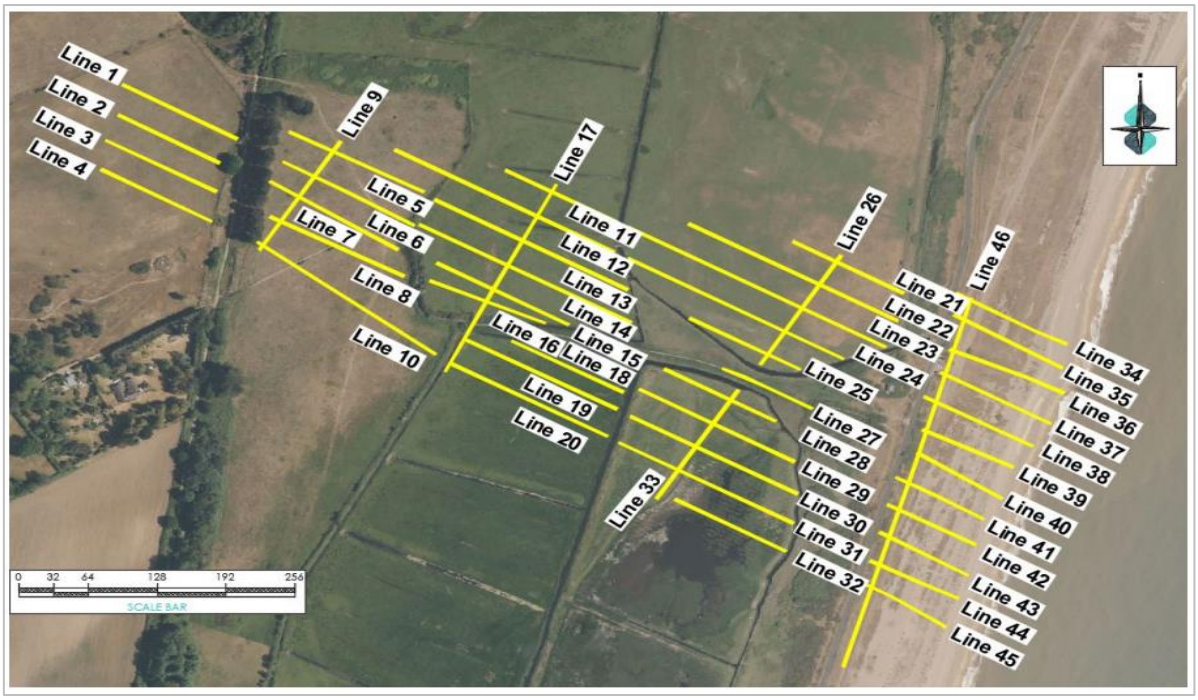

Figure 10-4: Seismic Refraction Survey Lines at Aldeburgh – Plan View

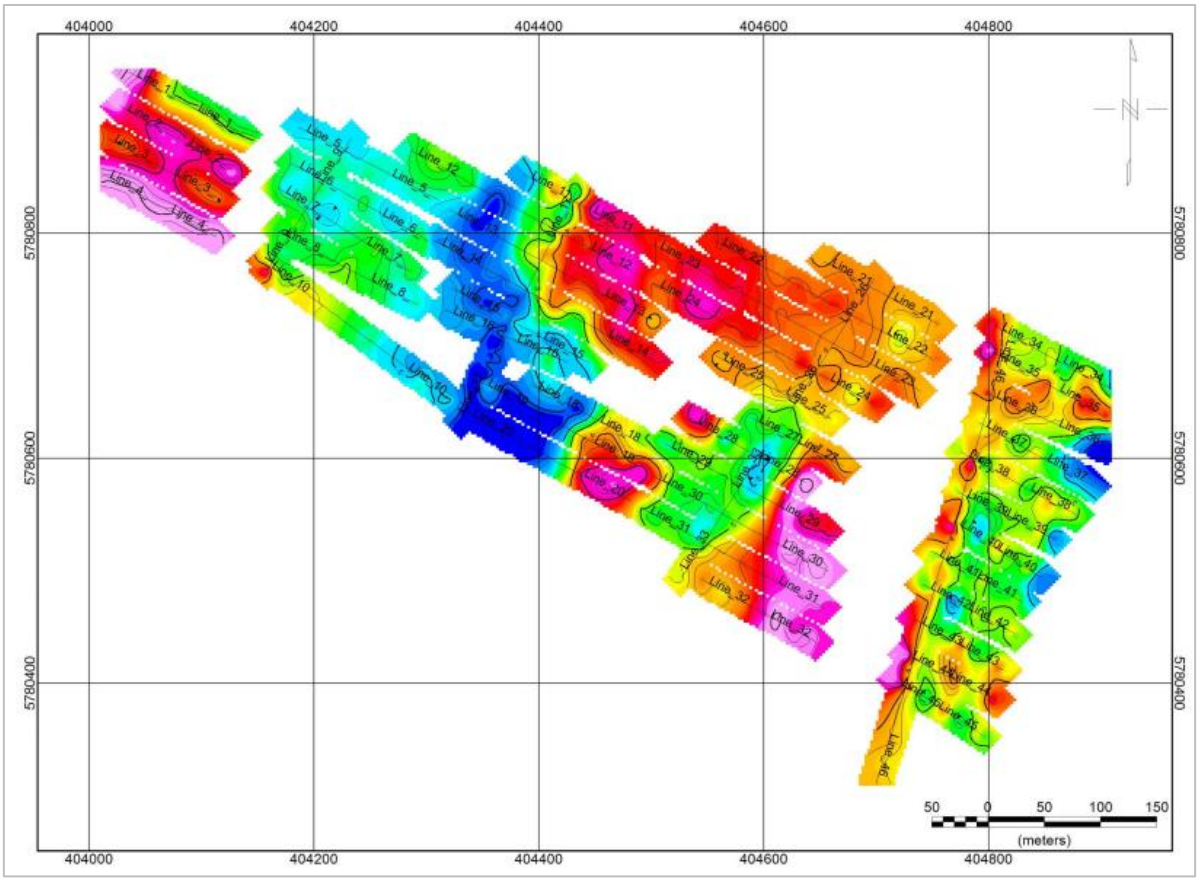

Figure 10-5: Isopach Diagram for Layer 1 (whole site)

10.1.5 Geotechnical

Two cable percussive boreholes were undertaken by SSL along the new RPL alignment within the Aldeburgh landfall, these were RedP-BH-1A and RedP-BH-4. The locations are shown schematically below in Figure 10-6. Both boreholes reached the target depth of 30.00 m, with RedP-BH-4 reaching 30.45 m due to the final SPT test being undertaken at the base of the hole.

Some of SSL locations were excluded from the interpretation as they fall far away from the new RPL. These locations are listed in Table 10-4 for reference. The geological information from these locations was no longer suitable to the RPL, which had been re-routed for engineering purposes.

Table 10-4: Geotechnical Locations excluded from Aldeburgh Landfall Interpretation

Location ID	Distance from RPL (m)	Reason for Exclusion
F22-BH203	491	Not suitable for re-route RPL
F22-BH306	457	Not suitable for re-route RPL
F22-BH307	507	Not suitable for re-route RPL
F22-BH308	249	Not suitable for re-route RPL
F22-BH309	187	Not suitable for re-route RPL
F22-BH310	356	Not suitable for re-route RPL
F22-BH501	176	Not suitable for re-route RPL
F22-BH502	256	Not suitable for re-route RPL
F22-BH502A	256	Not suitable for re-route RPL
F22-TP203	382	Not suitable for re-route RPL
F22-TP203A	382	Not suitable for re-route RPL
F22-TP204	477	Not suitable for re-route RPL
F22-TP204A	477	Not suitable for re-route RPL
F22-TP204B	477	Not suitable for re-route RPL
F22-TP205	459	Not suitable for re-route RPL
F22-TP205A	459	Not suitable for re-route RPL
F22-TP218	445	Not suitable for re-route RPL
F22-TP218A	445	Not suitable for re-route RPL
F22-TP220	440	Not suitable for re-route RPL
F22-TP221	409	Not suitable for re-route RPL
F22-TP222	120	Not suitable for re-route RPL

Location ID	Distance from RPL (m)	Reason for Exclusion
F22-TP222A	109	Not suitable for re-route RPL
F22-TP229	452	Not suitable for re-route RPL
F22-TP229A	452	Not suitable for re-route RPL
F22-TP310	498	Not suitable for re-route RPL
F22-TP311	386	Not suitable for re-route RPL
F22-TP312	433	Not suitable for re-route RPL
F22-TP312A	433	Not suitable for re-route RPL
F22-TP313	272	Not suitable for re-route RPL
F22-TP313A	272	Not suitable for re-route RPL
F22-TP314	313	Not suitable for re-route RPL
F22-TP315	190	Not suitable for re-route RPL
F22-TP316	169	Not suitable for re-route RPL
F22-TP316A	169	Not suitable for re-route RPL
F22-TP317	397	Not suitable for re-route RPL
F22-TP317A	397	Not suitable for re-route RPL
F22-TP317B	397	Not suitable for re-route RPL
F22-TP404	598	Not suitable for re-route RPL
F22-TP404A	598	Not suitable for re-route RPL
F22-TP406	668	Not suitable for re-route RPL
F22-TP406A	668	Not suitable for re-route RPL
F22-TP511	407	Not suitable for re-route RPL
F22-TP513	334	Not suitable for re-route RPL
F22-TP513A	334	Not suitable for re-route RPL
F22-TP514	299	Not suitable for re-route RPL
F22-TP515	7	Not suitable for re-route RPL
F22-TP515A	7	Not suitable for re-route RPL
F22-TP516	269	Not suitable for re-route RPL
F22-TP518	975	Not suitable for re-route RPL
F22-TP525	1010	Not suitable for re-route RPL

Location ID	Distance from RPL (m)	Reason for Exclusion
RedP-BH-1	223	Not suitable for re-route RPL

Figure 10-6 Location Plan for Aldeburgh Landfall Nearshore KP 0.000 to KP 0.900

RedP-BH-1A (KP 0.696) is recorded as containing 1.50 m of Made Ground, overlying a 2.00 m thick bed of medium dense slightly silty sandy GRAVEL. A layer of very soft to soft CLAY is encountered from 3.50 m to 5.20 m, with a slight hydrocarbon odour recorded within these strata. A bed of spongy fibrous PEAT with strong hydrocarbon odour underlies the CLAY to a depth of 6.50 m. Medium to very dense SAND is encountered from 6.75 m to 24.70 m, underlain by firm to very stiff CLAY to the base of the hole at 30.00 m. A groundwater strike at 5.50 m is recorded during drilling, with the level rising to 2.50 m after a 20-minute period.

RedP-BH-4 (KP 0.098) encountered SAND from the surface to a depth of 20.50 m, with variable percentages of secondary constituents. Stiff to very stiff thickly laminated CLAY is then recorded underlying the SAND to the base of the hole at 30.45 m.

Table 10-5 below summarises the depths at which each geological unit is encountered within the borehole locations.

Table 10-5 Summary of Depths of Geological Formations

Geological Formation	Location ID's and depth (m)	
	KP 0.098	KP 0.696
	RedP-BH-4	RedP-BH-1A
Made Ground/Topsoil	0.00-0.35	0.00-1.50
Surficial Deposits	-	1.50-3.50
Tidal flat deposits	-	3.50-6.75
Marine Beach Deposits	-	6.75-9.50
Red Crag Formation	0.35-20.50	9.50-24.70
London CLAY Formation	20.50-30.45	25.50-30.00

10.1.5.1 Geotechnical Model

Figure 10-7 below presents the upper 6.00 m of the locations in the form of a geotechnical model; with the shear strength (Su), relative density (Dr) and soil classification plotted against depth in 0.50 m sections. Su and Dr values have been averaged for each half-meter section. The Su values have been taken from triaxial tests undertaken within the cohesive strata, and the Dr values from a correlation between SPT N-value and relative density as given by Gibbs & Holtz (1951). It is observed from the geotechnical model that only a single strength test was undertaken within the boreholes in this depth range. A test was taken at 4.50 m in RedP-BH-1A, which returned a value of 22 kPa, classifying the CLAY as low strength. The conversion from SPT N-value to relative density shows that the granular strata within the top 6.00 m of the locations can be classified as loos.

KP (km)	0.098			0.696		
DCC (m)	8.100			-219.400		
ID BH	RedP-BH-4	RedP-BH-4	RedP-BH-4	RedP-BH-1A	RedP-BH-1A	RedP-BH-1A
Depth (m)	**DR**	**Su**	**BH**	**DR**	**Su**	**BH**
0.0 - 0.5			9	Made Ground		
0.5 - 1.0			9			
1.0 - 1.5	18		9			
1.5 - 2.0			9	35		7
2.0 - 2.5	22		8			7
2.5 - 3.0			8	22		7
3.0 - 3.5	22		8			7
3.5 - 4.0			8			4
4.0 - 4.5	25		8			4
4.5 - 5.0			8		22	4
5.0 - 5.5	25		8			4
5.5 - 6.0			8			3

Figure 10-7 Geotechnical Model of Aldeburgh landfall at KP 0.098 to KP 0.696

10.2 BLOCK 01 NEARSHORE KP 0.900 TO KP 3.000

Table 10-6: Alignment Sheets for Block 01 Nearshore KP 0.950 to KP3.000

AS-5K-001
AS-5K-002

10.2.1 Bathymetry and Morphology

Bathymetric data within the surveyed area reveals gentle seabed morphology. A channelized feature extends from KP 0.910 to KP 0.921, characterized by a rapid increase to a maximum depth of 2.65 m below seabed (LAT). Seabed depth increases from 2.11 m at KP 0.95 to 11.17 m at KP 3.00. Depths range between a minimum of 2.09 m and a maximum of 11.26 m. Figure 10-8 illustrates MBES data within the surveyed area.

The average seabed gradients along the route are less than 1° (0.96° - very gentle according to gradient classification scheme), with a maximum slope of 11.98° recorded at KP 2.78, aligning with the edge of the consolidated sediments. Figure 10-9 illustrates the depth - slope plot within Block01 nearshore.

Note: A data gap exists along the RPL between Aldeburgh landfall and Block 01 nearshore (KP 0.889 – KP 0.913), as this area was not accessible during the survey due to shallow water depths.

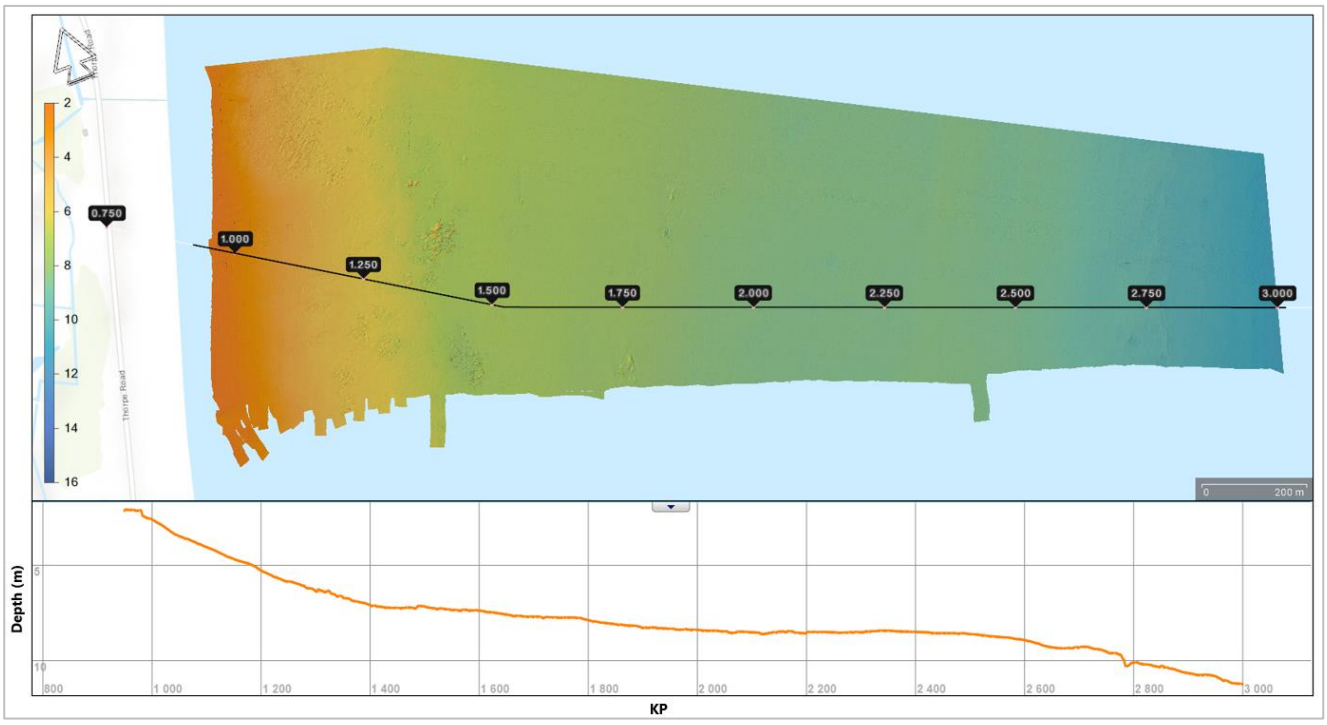

Figure 10-8: Overview of the Bathymetry in Block 01 Nearshore between KP 0.900 and KP 3.000

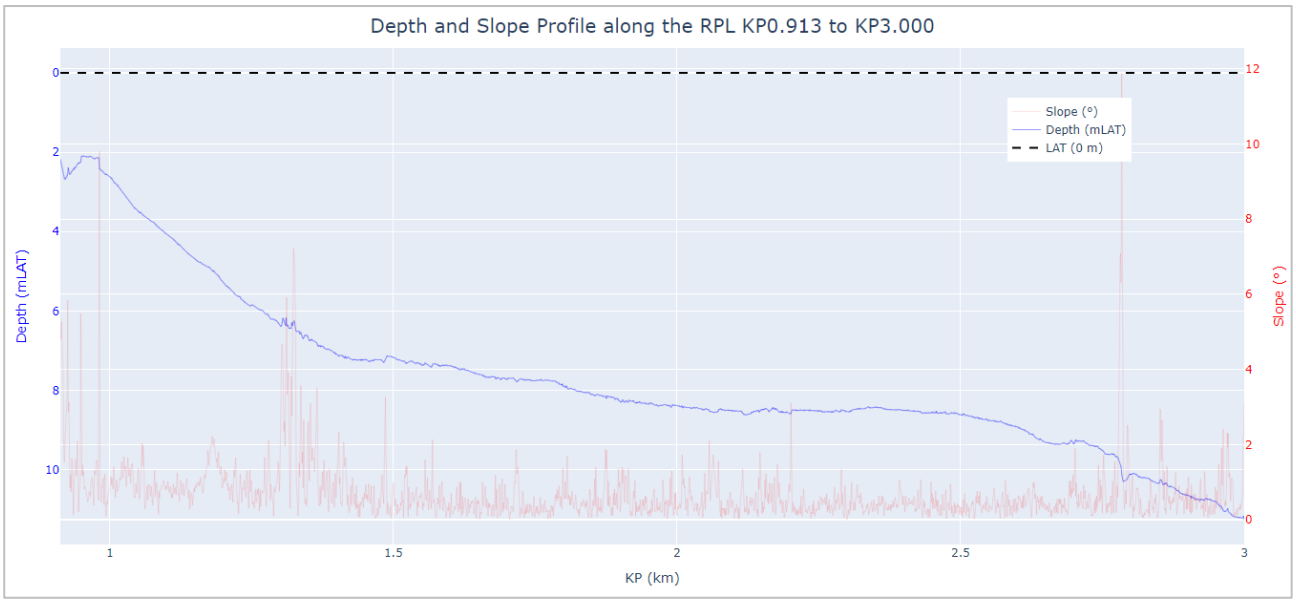

Figure 10-9: Block 01 Nearshore between KP 0.900 and KP 3.000 Seabed Depth and Slope Profile

10.2.2 Surficial Geology and Seabed Features

The surficial geology within Block 01 Nearshore consists of a mixture of CLAY and SAND, with areas of GRAVEL identified. A CLAY seabed is present along the survey route between KP 0.949 – KP 1.469 and KP 1.483 – KP 1.533, transitioning to SAND until KP 2.697. Within this area, the RPL crosses a small area of CLAY between KP 1.843 and KP 1.869, a small area of GRAVEL between KP 1.053 and KP 1.058, and a patch of stiff CLAY between KP 1.290 and KP 1.368.

Between KP 2.697 and KP 3.000, the surficial geology along the survey route comprises a mixture of CLAY and sediment, described as gravelly SAND to sandy GRAVEL. CLAY was encountered within CPT-S6-002, characterized as having extremely low to very low strength and a slight sandy, silty CLAY.

Notable seabed features along the RPL in Block 01 nearshore, include a stiff CLAY outcrop/sub located between KP 1.054 – KP 1.062, KP 1.298 – KP 1.356, KP 1.362 –KP 1.370 and KP 1.396 – KP 1.411.

The route traverse N-S trending patches of consolidated sediments (encrusted seabed) between KP 1.356 – KP 1.362, KP 1.370 – KP 1.396, KP 1.411 – KP 1.488, and from KP 2.696 to KP 3.000. These sediments are described as consolidated due to their compact-lithified-almost cemented and hardened structure, resulting from natural processes such hydrodynamic behaviour or biological-chemical processes. They are characterized by clear, defined edges and a consistent orientation extending from the northeast to the southwest. No Ground truthing has been performed in Block 01 nearshore, to verify the nature of these sediments.

Additional features such as ripples, eroded depressions, and hummocky terrain were observed across the surveyed area, though none were seen crossing the RPL. Figure 10-10 illustrates the seabed sediments and features present in Block 01 nearshore.

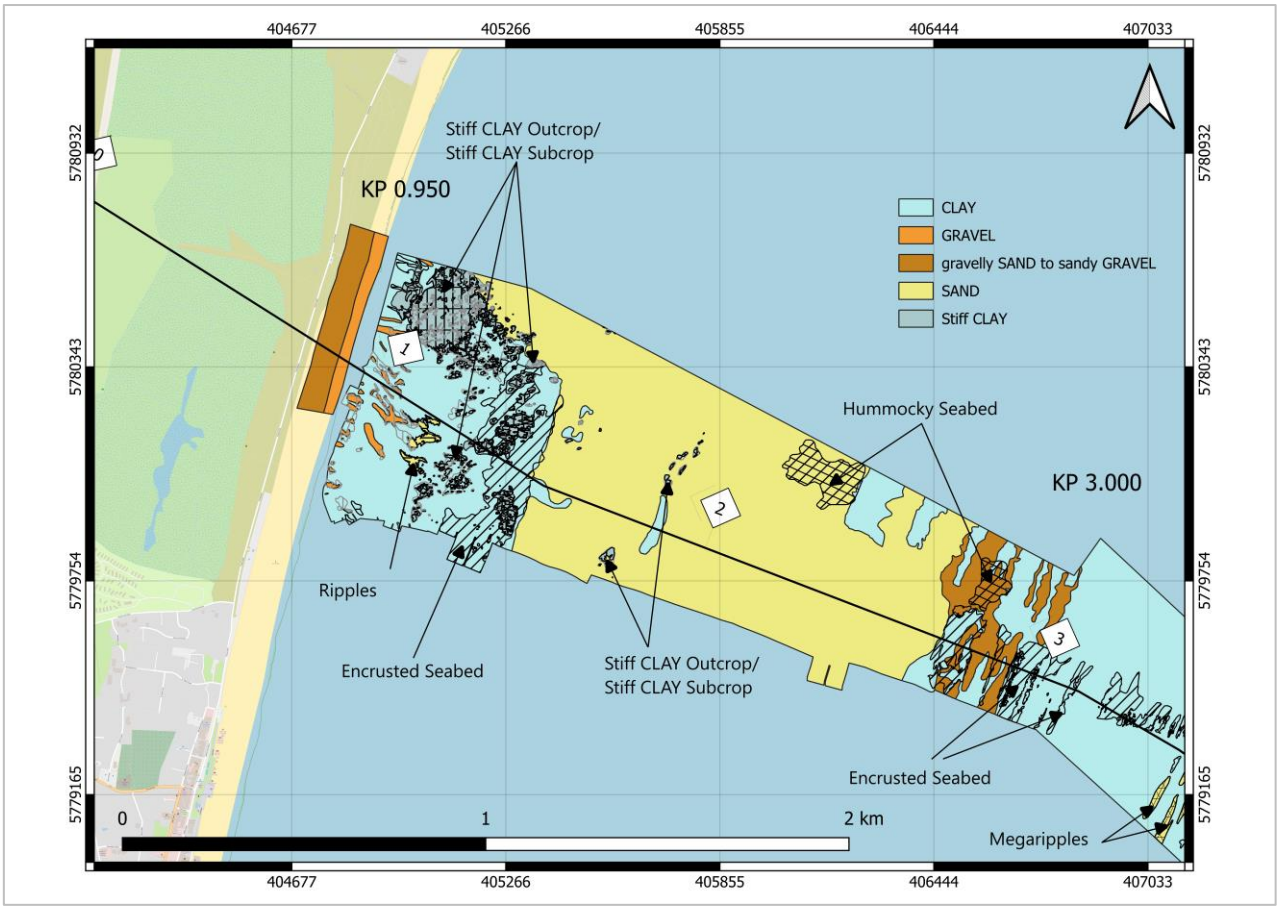

Figure 10-10: Overview of Seabed Geology and Features Block 01 Nearshore KP 0.950 to KP3.000

10.2.3 Contacts and Anomalies

A total of 99 SSS contacts and 379 magnetic anomalies were identified within the Block 01 nearshore survey corridor. Summaries of SSS contacts and magnetic anomalies are provided in Table 10-7 and Table 10-8.

A total of 11 SSS contacts correlate with magnetic anomalies; nine are related to boulders, and two are related to debris. A correlation distance of 10 m was used between MAG and SSS.

Table 10-7: Summary Block 01 Nearshore SSS Contacts

CLASSIFICATION	NUMBER
Boulder	87
Debris	10
Linear Debris	0
Wreck	0
Other	2
Total	99

Table 10-8: Summary Block 01 Nearshore Magnetic Anomalies

CLASSIFICATION	NUMBER
Known wreck	0
Known cable	0
Unknown cable	0
Linear debris of geological feature	25
Unclassified Discrete anomalies	354
Total	379

10.2.4 Shallow Geology

The sub-bottom profiler data interpretation reveals one horizon along the RPL as well as subsurface gas occurrence.

Unit I is interpreted to be mixture of SAND, GRAVEL and CLAYs, along the RPL Unit I base (H1), exclusively occurring between KP 0.949 and KP 3.000. This sediment package extends from 0.6 m BSF to 3.7 m BSF. Unit I thickness thins to 1 m BSF between KP 0.949 and KP 1.424.

Beneath Unit I, stiff CLAY (likely corresponding to the London CLAY Formation – Unit II) is present. The base of this unit could not be identified using Innomar sub-bottom profiler (SBP) data and remains uncertain due to a lack of geotechnical information. Between KP 0.949 and KP 1.424, the stiff CLAY is close to the surface, at depths of less than 1 m BSF. Caution is advised during laying and trenching operations in areas where this hard substrate is sub-cropping or outcropping.

Sections up to 120 m in length show acoustic blanking caused by diffuse shallow gas within 1 m below the seabed, which obscures the shallow geology. The proposed RPL is crossing these acoustic blanking between approximately KP 1.680 – KP 1.725 and KP 2.338 – KP 2.455.

There is uncertainty regarding the presence of Red Crag Formation Sandstone due to the lack of geotechnical sampling in this section.

10.2.5 Geotechnical

A single geotechnical location was undertaken within the nearshore section of Block 01, this was MMT location CPT-S6-002 at KP 2.815. The location is shown schematically below in Figure 10-11.

Figure 10-11: Location plan for Block 01 Nearshore KP 0.000 to KP 3.000

The CPT achieved a penetration depth of 5.47 m, encountering a surficial deposit of extremely low to very low strength, slightly sandy, silty CLAY to a depth of 1.29 m. Beneath this layer of CLAY, the geology was recorded as being predominantly gravelly silty SAND, with three beds of sandy silty CLAY, each up to 0.34 m thick.

10.2.5.1 Geotechnical Model

Figure 10-12 below presents the location in the form of a geotechnical model; with the relative density (Dr), shear strength (Su), and soil classification plotted against depth in 0.50 m sections. Dr and Su values have been averaged for each half-meter section. It is observed from the geotechnical model of CPT-S6-002 that the CLAY encountered is extremely low to very low strength, especially within the top 0.50 m, where an average Su value of 3 kPa is recorded. Dr values within the SAND layers increased with depth between 1.50 m and 4.00 m, with the average value climbing from 52% to 93%. The average Dr remained above 73% for the remainder of the CPT to a depth of 5.50 m. The granular stratum within this location is therefore classified as medium dense to very dense.

KP (km)	2.814		
DCC (m)	-164.305		
ID CPT / VC	748-CPT-S6-002	748-CPT-S6-002	
Depth (m)	**DR**	**Su**	**VC**
0.00 - 0.50		3	
0.50 - 1.00		11	
1.00 - 1.50		10	
1.50 - 2.00	52		
2.00 - 2.50	61		
2.50 - 3.00	66		
3.00 - 3.50	70		
3.50 - 4.00	93		
4.00 - 4.50	79		
4.50 - 5.00	73		
5.00 - 5.50	96		
5.50 - 6.00			

Figure 10-12: Geotechnical Model of Block 01 Nearshore at KP 2.814

10.2.6 Geohazards, Seabed Index, and Trenching Suitability

The average seabed gradient along the route is less than 1°. However, steeper slopes of up to 16° are present at the sharp edges of localized hard sediment outcrops, particularly at KP 2.787. Mobile sediments in the form of ripples were observed throughout the surveyed area.

No wrecks were identified along the route, and no cables or pipelines were detected crossing the proposed corridor.

Table 10-9: Seabed Index for Block 01 Nearshore

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (Depth in m)					
				Pen. (m)	Rec. (m)	Refusal Depth (m)	Depth to 10 MPa (Dense)	Depth to 20 MPa (V Dense)	0.5	1	1.5	2	2.5	3
1.000		NG	SBP						9	9	1	1	1	1
1.500		NG	SBP						9	9	1	1	1	1
2.000		NG	SBP						9	9	7	5	5	1
2.500		NG	SBP						9	9	7	5	5	5
2.815	CPT-S6-002	MMT	CPT			5.47	1.91	3.33	9	9	7	5	5	5
3.000		NG	SBP						9	9	7	9	9	9

10.3 BLOCK 01 OFFSHORE KP 3.000 TO KP 8.900

Table 10-10: Alignment Sheets for Block 01 Offshore KP 3.000 to KP8.900

AS-5K-001, AS-5K-002, AS-5K-003

10.3.1 Bathymetry and Morphology

Block 01 offshore route begins at a depth of 11.26 m at KP 3.000, descending to a maximum depth of 22.90 meters at KP 6.722. The route then gradually ascends, reaching a depth of 18.54 meters at KP 8.900, which marks the end of Block 01 offshore (see Figure 10-13).

The average seabed gradients along the route are less than 2° (1.64° - gentle according to gradient classification scheme), as shown in Figure 10-14. Maximum gradients of 29.34° recorded at KP 4.054, captured along eroded depressions.

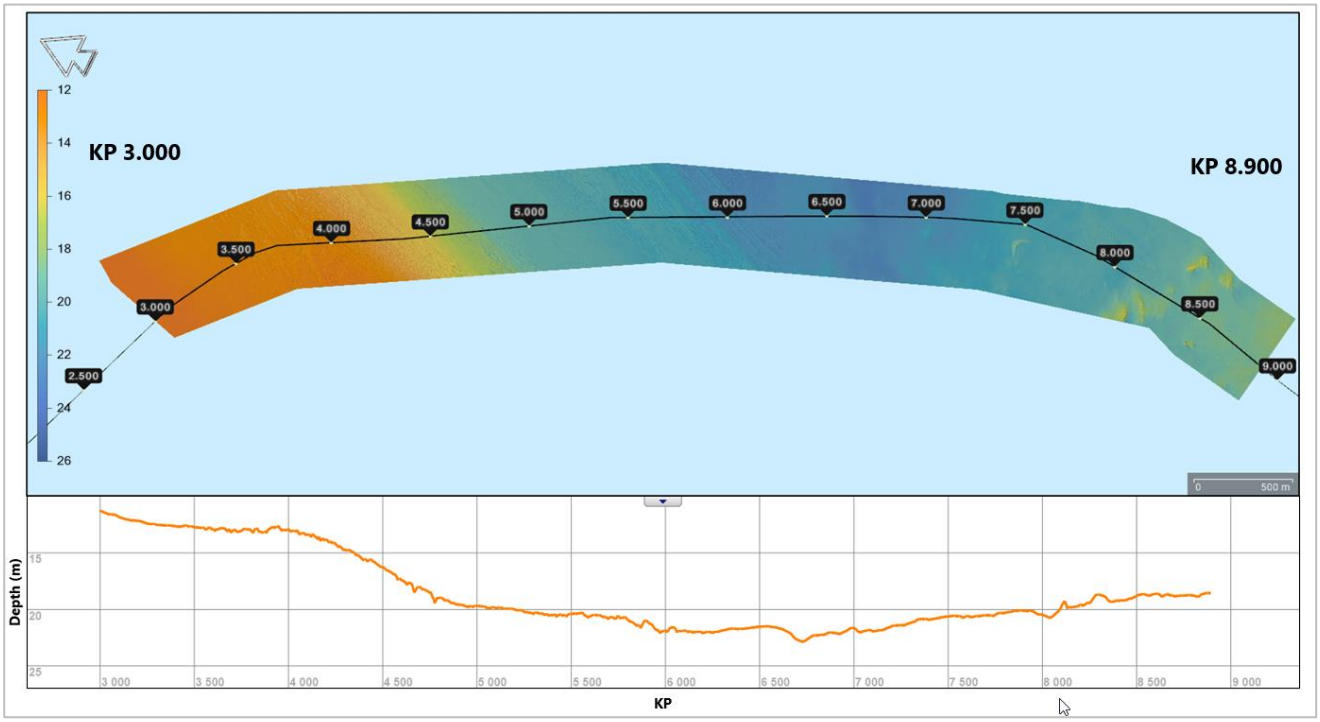

Figure 10-13: Overview of the Bathymetry in Block 01 Offshore between KP 3.000 and KP 8.900

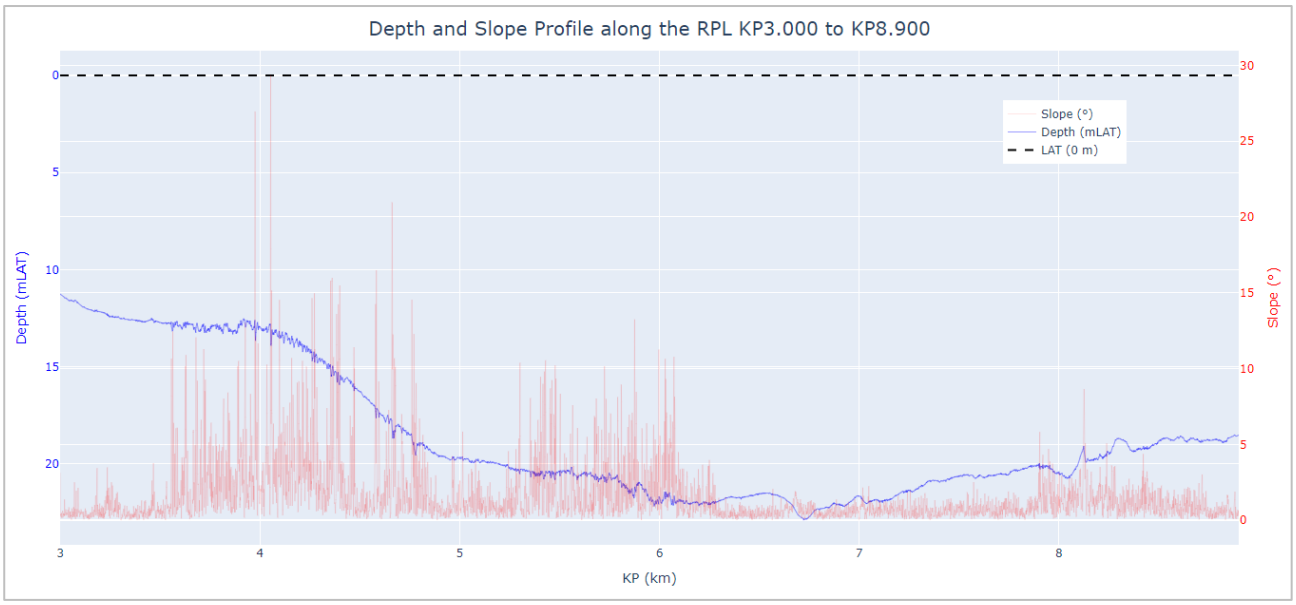

Figure 10-14: Block 01 Offshore between KP 3.000 and KP 8.900 Seabed Depth and Slope Profile

10.3.2 Surficial Geology and Seabed Features

The northern half of Block 01 offshore, between KP 3.000 and KP 6.127, is predominantly characterized by CLAY seabed. However, a section of SAND is present along the RPL between KP 3.452 and KP 4.380. CPT-S6-004 and VC-S6-005 encountered this CLAY at the surface, describing it as extremely low to very low strength, slightly sandy, and silty clay.

Further south, the seabed sediments comprise gravelly sand to sandy gravel along the RPL from KP 6.127 to the end of the block at KP 8.900. Patches of exposed CLAY and stiff CLAY were also observed within this section, although the RPL does not cross through these features. The surficial seabed sediment identified by VC-011 was interpreted as slightly silty, gravelly, and medium to coarse SAND.

Seabed features within this section of the route includes encrusted seabed from KP 3.070 – KP 3.091, and between KP 3.179 and KP 3.923. Megaripples are also present on this section of the route, a summary of their crossings with the RPL is provided in Table 10-11.

Other notable seabed features include areas of eroded depressions, crossing the RPL generally between KP 3.580 – KP 4.476, KP 4.579 – KP 4.863, KP 5.288 – KP 6.285, and further along the route between KP 8.320 and KP 8.518.

Figure 10-15 and Figure 10-16 illustrate the seabed sediments and features present in Block 01 offshore.

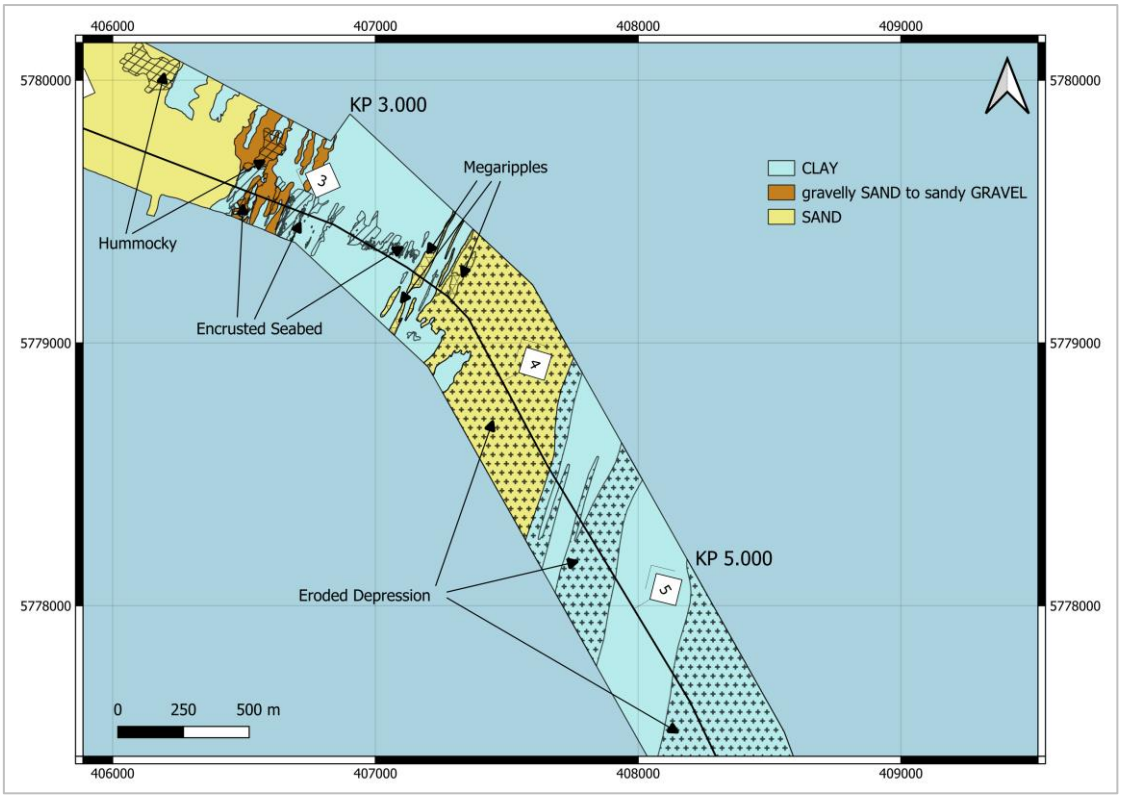

Figure 10-15: Overview of Seabed Geology and Features Block 01 Offshore KP 3.000 to KP5.500

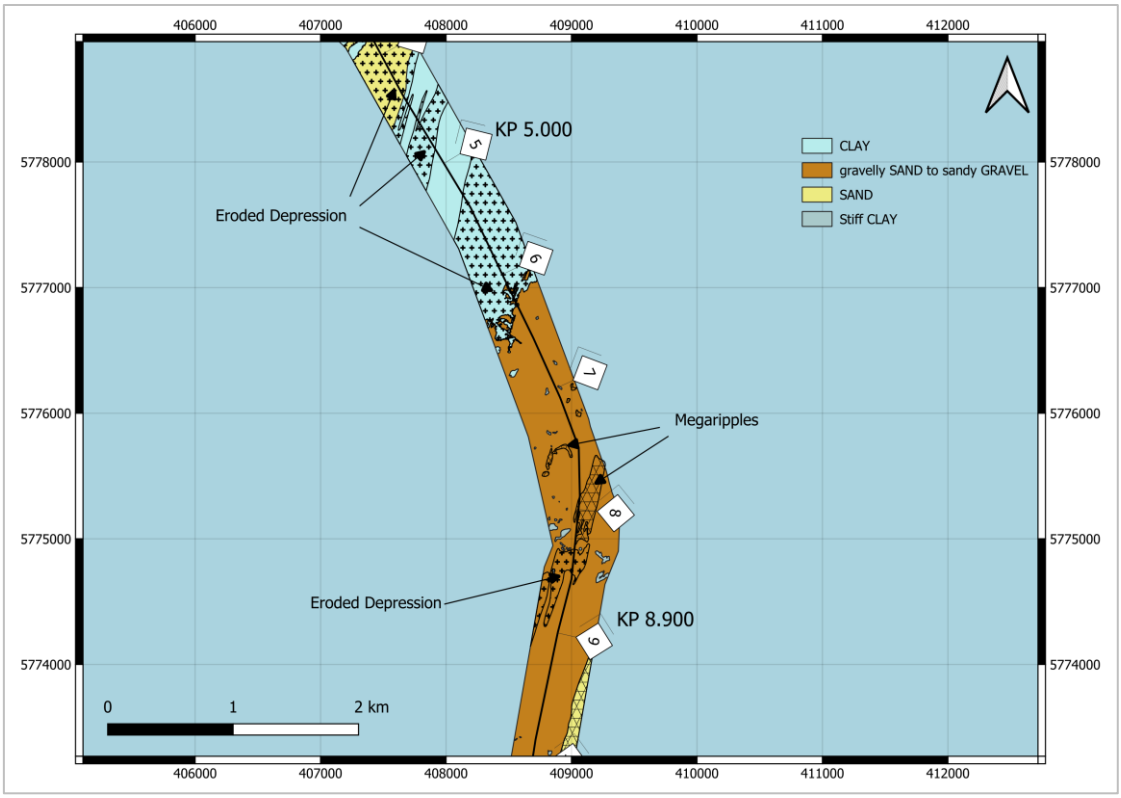

Figure 10-16: Overview of Seabed Geology and Features Block 01 Offshore KP 5.000 to KP 8.900

Table 10-11 Summary of Mobile Sediments in Block 01 Offshore

Feature	Start KP	End KP
Megaripples	3.452	3.500
Megaripples	3.532	3.536
Megaripples	3.556	3.580
Megaripples	7.893	8.018
Megaripples	8.229	8.264

10.3.3 Contacts and Anomalies

A total of 50 SSS (Side scan sonar) contacts and 224 magnetic anomalies were identified within the Block 01 Offshore survey corridor. These findings are summarized in Table 10-12 and Table 10-13.

Five SSS contacts are correlated with magnetic anomalies. Two are linked to boulders, one to debris, one to a potential cable, and one to a wreck. A correlation distance of 10 meters was used between MAG and SSS data. Notably, the wreck-related anomaly was 15 meters from its corresponding SSS contact.

Table 10-12 Summary Block 01 Offshore SSS Contacts

CLASSIFICATION	NUMBER
Boulder	40
Debris	8
Linear Debris	0
Wreck	2
Other	0
Total	50

Table 10-13: Summary Block 01 Offshore Magnetic Anomalies

CLASSIFICATION	NUMBER
Known wreck	0
Known cable	26 (2 CABLES)
Unknown cable	18 (1 Cable)
Linear debris of geological feature	8 (2 features)
Unclassified Discrete anomalies	170
Total	224

10.3.4 Shallow Geology

Between KP 3.000 and KP 5.972, the SAND unit ranging from 1.0 to 3.0 m in thickness overlies very stiff CLAY. From KP 5.972 to KP 7.456, the overlying SAND and GRAVEL thins to between 0.2 and 1.0 m. Beyond KP 7.456,

the granular sediments increase in thickness, reaching up to 7.6 m at KP 7.853, and continue to the end of Block 01 offshore at KP 8.900.

10.3.5 Geotechnical

Four geotechnical locations were undertaken by MMT within the offshore section of Block 01, consisting of three Vibrocorer (VC) locations and a single Cone Penetration Test (CPT) location. The locations are shown schematically below in Figure 10-17.

Figure 10-17: Location plan for Block 01 Offshore KP 3.000 to KP 8.900

With increasing KPs across the offshore section of the block, granular material has become the dominant soil type. Between KP 4.077 and KP 5.220 (locations VC-S6-003 and VC-S6-005), silty clay is interbedded with loose to medium-dense silty gravelly sand. At CPT-S6-004, shallow clay beds up to 3.12 m exhibited a maximum shear strength of 10 kPa, classifying the material as extremely low to very low strength. The clay bed between 4.06 m and 5.02 m presented shear strength values ranging from 44 kPa to 115 kPa, classifying it as medium to high strength. Extremely low to very low strength silty clay with intermediate plasticity was identified as the superficial deposit at both locations, with a thickness of 0.60 m to 0.86 m. A layer of firm peat was also encountered at VC-S6-005 between 1.74 m and 2.16 m.

At KP 8.850 (location VC-011), silty gravelly sand was recorded from the seabed to the base of the VC at 5.47 m, with the gravel component consisting of shell fragments.

10.3.5.1 Geotechnical Model

Figure 10-18 below presents the locations in the form of a geotechnical model; with relative density (DR), shear strength (Su), and soil classification plotted against depth in 0.50 m sections. Dr and Su values have been averaged for each half-meter section.

It can be observed from this section of the geotechnical model that Dr values within the granular strata are variable, with no clear correlation between depth and Dr. Average Dr values ranged between 15 % and 42 %. The average results throughout this KP range all fall within the loose to medium dense classification. Su values are only recorded in CPT-S6-004, where the cohesive strata encountered within the top 3.00 m of the location were classified as extremely low to low strength, with average values falling between 4 kPa and 10 kPa. The cohesive strata between 4.00 m and 5.00 m had average values between 76 kPa and 87 kPa, classifying the material as high strength.

KP (km)	4.707			5.220			8.850		
DCC (m)	-28.343			-13.341			-43.031		
ID CPT / VC	748-CPT-S6-004	748-CPT-S6-004		748-NAT-NB-VC-S6-005	748-NAT-NB-VC-S6-005	748-NAT-NB-VC-S6-005	748-NAT-NB-VC-011	748-NAT-NB-VC-011	748-NAT-NB-VC-011
Depth (m)	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**
0.00 - 0.50		4				4			8
0.50 - 1.00	34					4			8
1.00 - 1.50	29					8	15		9
1.50 - 2.00		10				3			9
2.00 - 2.50		10				8			8
2.50 - 3.00		10				8	42		8
3.00 - 3.50	19					8			8
3.50 - 4.00	21					8			8
4.00 - 4.50		76							8
4.50 - 5.00		87							8
5.00 - 5.50	35								8
5.50 - 6.00									

Figure 10-18: Geotechnical Model of Block 01 Offshore between KP 4.707 and KP 8.850

10.3.6 Geohazards, Seabed Index, and Trenching Suitability

Average seabed gradients along the route are less than 1°, indicating a very gentle slope. The maximum gradient of 33° is located between KP 3.500 and KP 4.800, corresponding to an area of eroded depressions. Mobile sediments in the form of megaripples were observed at several locations throughout this block.

Two wrecks were detected within the surveyed area at KP 3.299 and KP 4.767, located 284 m and 11.4 m to port of the RPL, respectively.

Two cable crossings were detected in Block 01 Offshore: UK–Netherlands 3 at KP 7.860 and Farland North at KP 8.371. Both were identified using magnetometer, SSS, and MBES data.

Three additional cables, Hermes 1 "North", UK–Netherlands 12, and UK–Netherlands 5; were not detected in the data but are expected to cross the RPL based on their database positions at KP 3.750, KP 5.879, and KP 6.864, respectively.

No pipelines were identified along the route.

The seabed index shows very low to low strength cohesive and very loose granular material forming the top 3.00 m of seabed within the geotechnical locations between VC-S6-003 (KP 4.077) and VC-S6-005 (KP 5.220). However, a layer of PEAT is recorded between 1.50 m and 2.00 m in VC-S6-005. VC-011 (KP 8.850) contains loose granular, low to medium strength cohesive soils overlying medium dense granular soils from a depth of 0.50 m BSF. The assigned Seabed Index for the locations in Block 01 Offshore are shown below in Table 10-14.

Table 10-14: Seabed Index for Block 01 Offshore

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (Depth in m)					
				Pen. (m)	Rec. (m)	Refusal Depth (m)	Depth to 10 MPa (Dense)	Depth to 20 MPa (V Dense)	0.5	1	1.5	2	2.5	3
3.000		NG	SBP						9	9	7	9	9	9
3.500		MMT	SBP						9	9	7	9	9	9
4.000		MMT	SBP						8	8	8	9	9	9
4.077	VC-S6- 003	MMT	VC	5.45	4.10				8	8	9	9	8	9
4.500		MMT	SBP						8	8	8	9	9	9
4.700	CPT-S6- 004	MMT	CPT			5.53			9	8	9	9	8	8
5.000		MMT	SBP						9	9	8	P	8	8
5.210	VC-S6- 005	MMT	VC	5.45	3.76				9	9	8	P	8	8
5.500		MMT	SBP						9	9	8	P	8	8
6.000		MMT	SBP						9	9	8	4	4	4
6.500		MMT	SBP						7	7	4	4	4	4
7.000		MMT	SBP						7	7	4	4	4	4
7.500		MMT	SBP						7	7	4	4	4	4
8.000		MMT	SBP						7	6	6	6	6	6
8.850	VC-011	MMT	VC	5.45	5.47				7	6	6	6	6	6

10.4 BLOCK 02 OFFSHORE KP 8.900 TO KP 33.000

Table 10-15: Alignment Sheets for Block 2 offshore KP 8.900 to KP 33.000

AS-5K-003 - AS-5K-011

10.4.1 Bathymetry and Morphology

Block 02 offshore begins at KP 8.900 with a depth of 18.54 meters and remains relatively flat until it ends at a depth of 21.83 meters at KP 33.000 (see Figure 10-19). The minimum and maximum depths recorded are 15.81 meters and 25.35 meters, respectively.

The average seabed gradients along the RPL are less than 1° (0.84° - very gentle according to gradient classification scheme). Ripples and megaripples exhibit slope up to a maximum of 15.98°, observed at KP 11.157 (see Figure 10-20).

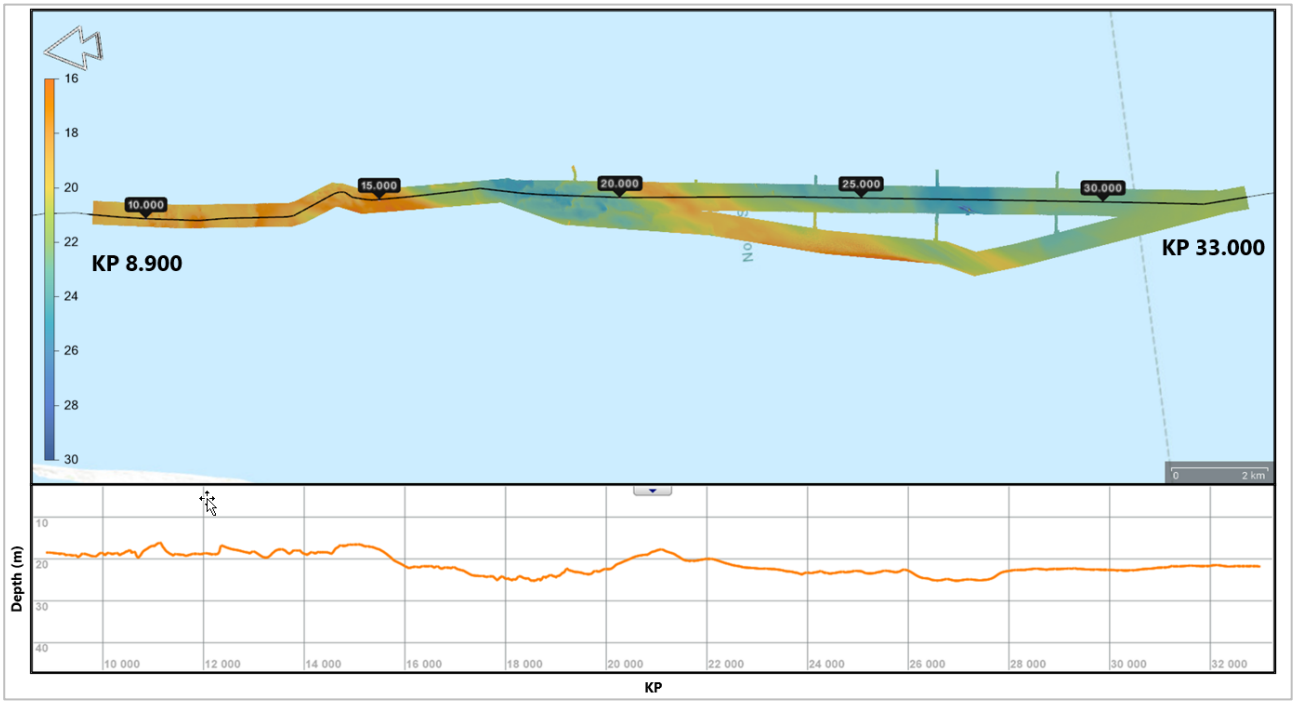

Figure 10-19: Overview of the Bathymetry in Block 02 between KP 8.900 and KP 33.000

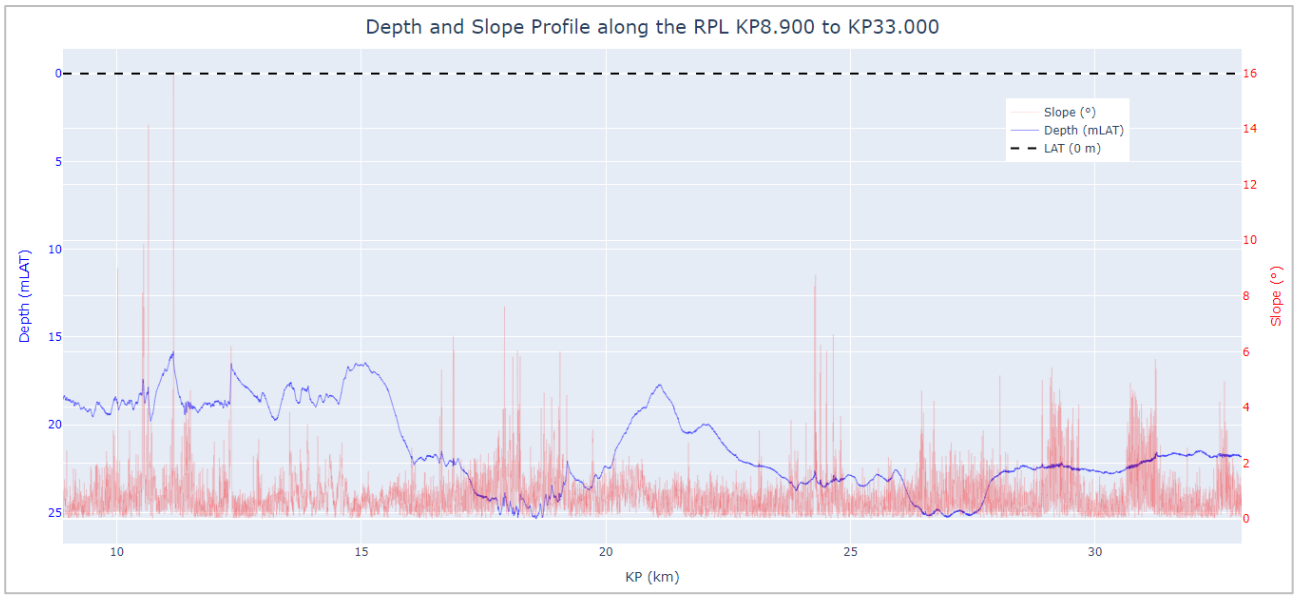

Figure 10-20: Block 02 between KP 8.900 and KP 33.000 Seabed Depth and Slope Profile

10.4.2 Surficial Geology and Seabed Features

The surficial geology in Block 02 is composed of gravelly SAND to sandy GRAVEL, SAND, CLAY, and stiff CLAY. From KP 8.900 to KP 11.542, and again from KP 12.345 to KP 33.000, the surficial geology predominantly consists of gravelly SAND to sandy GRAVEL. Where encountered in geotechnical locations, this sediment is described as loose to medium-dense silty gravelly SAND and very sandy GRAVEL.

Exposed CLAY appears along the route from KP 12.155 to KP 12.345, KP 12.770 to KP 12.911, and from KP 22.605 to KP 23.026. It is described in CPT_002 as low-strength sandy gravelly CLAY. Additionally, patches of stiff CLAY are observed along the RPL from KP 10.014 – KP 10.019, KP 10.523 – KP 10.553, KP 10.604 – KP 10.648, KP 16.855 – KP 16.897, KP 17.780 – KP 18.248, KP 18.855 – KP 18.874, KP 19.023 – KP 19.029, KP 19.054 – KP 19.061, and from KP 21.658 to KP 21.727, as described in VC/CPT-016.

Along the RPL, from KP 11.542 to KP 12.155, the surficial soil type primarily consists of SAND.

Notable seabed features along the RPL include areas of mottled seabed, observed from KP 11.318 to KP 11.542, KP 12.155 to KP 12.345, KP 12.774 to KP 12.911, KP 17.780 to KP 19.740, KP 21.419 to KP 23.206, and KP 32.490 to KP 32.878.

Ripples and megaripples are also present on this section of the route, a summary of their crossings with the RPL is provided in Table 10-16.

The route exhibits erosional feature between KP 23.270 – KP 24.038, KP 24.055 – KP 24.082, KP 24.106 – KP 24.250, KP 24.426 – KP 24.482, KP 24.554 – KP 24.627, KP 24.757 – KP 24.774, KP 24.873– KP 26.418, KP 26.541 – KP 26.647, KP 26.728 – KP 28.791, KP 28.830 – KP 28.905, and from KP 28.948 to KP 29.012, which lies within the SAND sediments. Figure 10-21 to Figure 10-25 illustrate the seabed sediments and features present in Block 02.

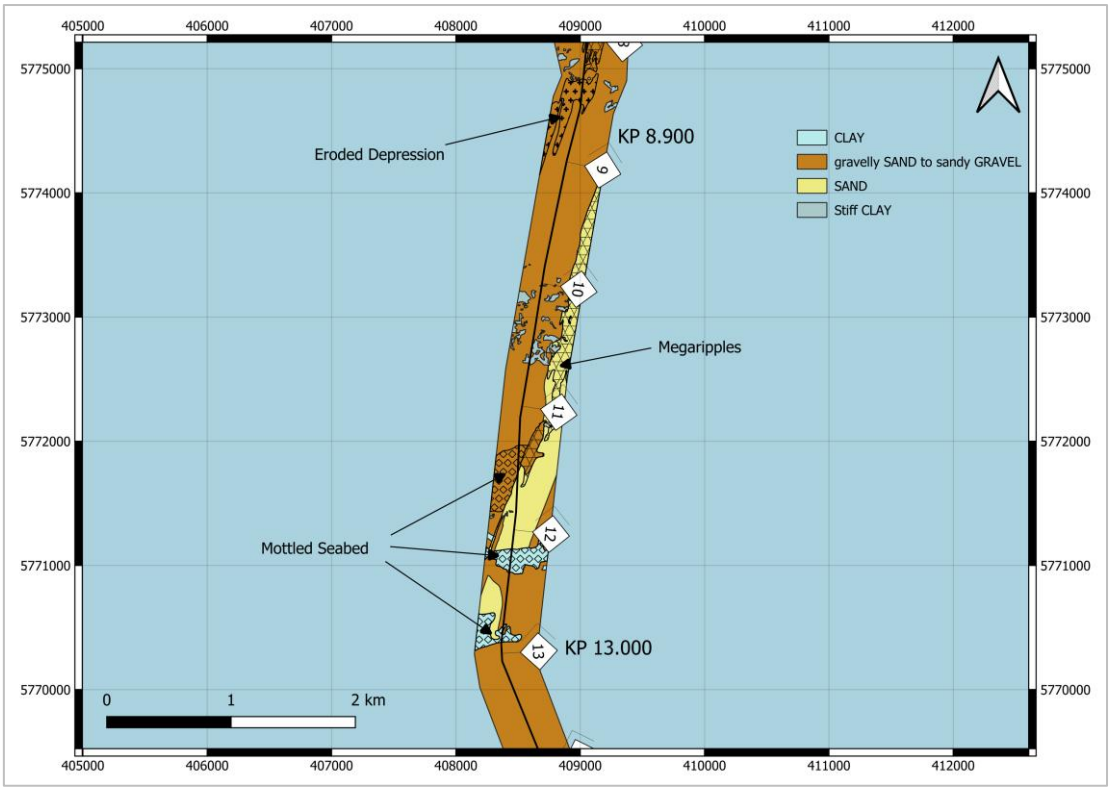

Figure 10-21: Overview of Seabed Geology and Features Block 2 between KP 8.900 and KP 13.000

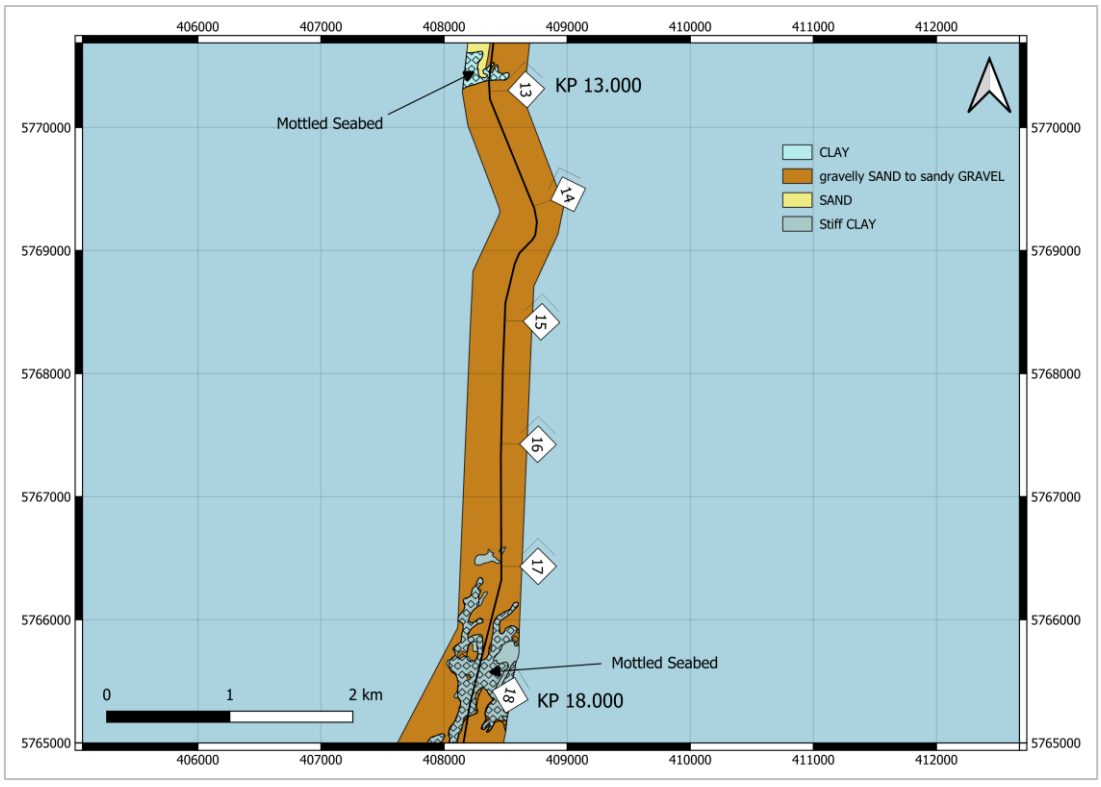

Figure 10-22: Overview of Seabed Geology and Features Block 2 between KP 13.000 and KP 18.000

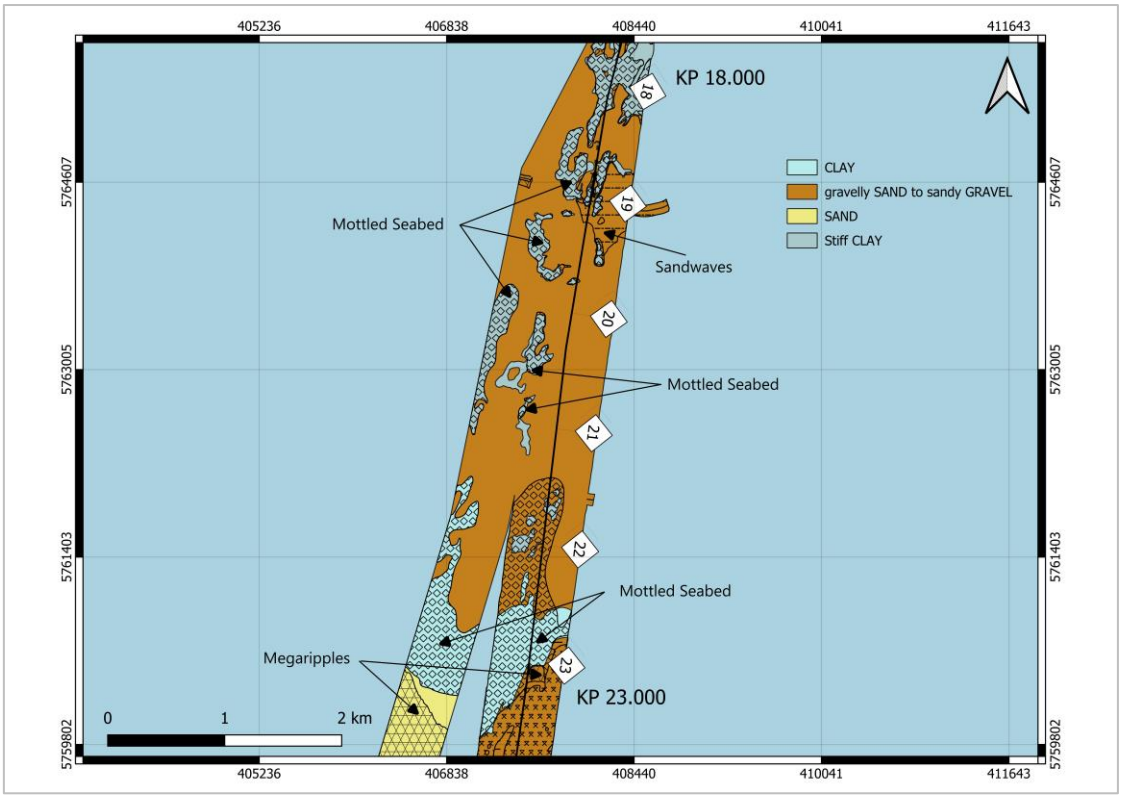

Figure 10-23: Overview of Seabed Geology and Features Block 2 between KP 18.000 and KP 23.000

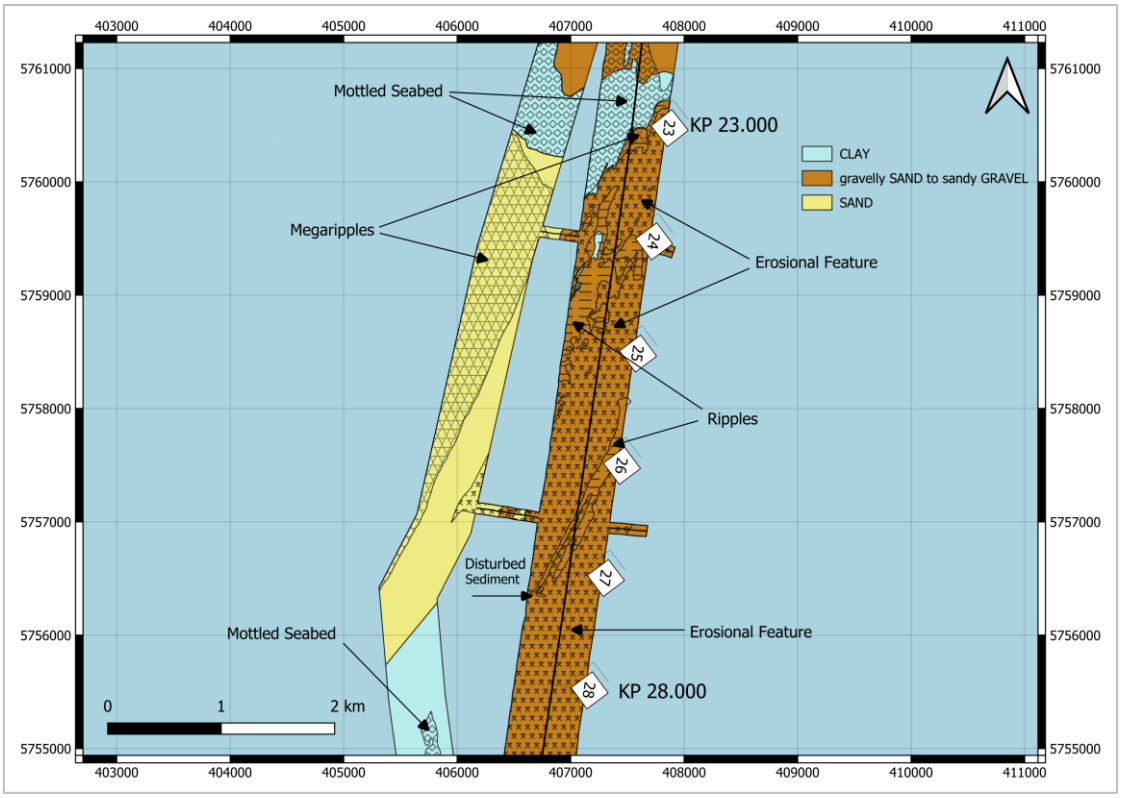

Figure 10-24: Overview of Seabed Geology and Features Block 2 between KP 23.000 and KP 28.000

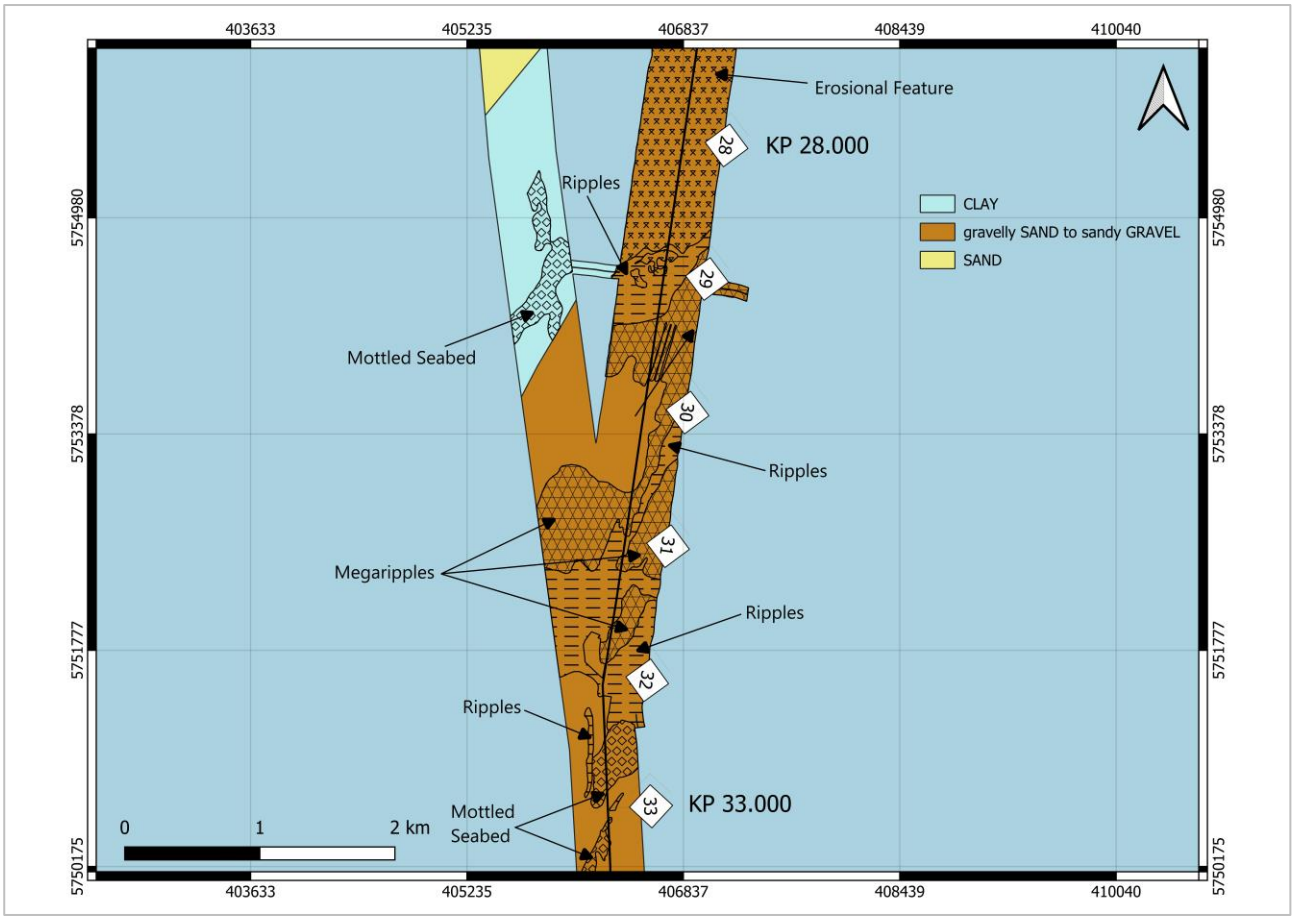

Figure 10-25: Overview of Seabed Geology and Features Block 2 between KP 28.000 and KP 33.000

Table 10-16 Summary of Mobile Sediments in Block 02

Feature	Start KP	End KP
Sandwaves	19.065	19.215
Ripples	23.206	23.270
Ripples	24.038	24.055
Ripples	24.082	24.106
Ripples	24.250	24.426
Ripples	24.482	24.554
Ripples	24.627	24.757
Ripples	24.774	24.873
Ripples	26.418	26.541
Ripples	26.647	26.728
Ripples	28.791	28.83
Ripples	28.905	28.948
Ripples	29.012	29.338
Megaripples	29.338	29.767
Megaripples	30.636	30.969
Ripples	30.969	31.117

Feature	Start KP	End KP
Megaripples	31.117	31.230
Ripples	31.230	31.635
Megaripples	31.635	31.927
Ripples	31.927	32.166

10.4.3 Contacts and Anomalies

A total of 391 SSS contacts and 1014 magnetic anomalies were identified within the Block 02 survey corridor. Summaries of these contacts and anomalies are presented in Table 10-17 and Table 10-18.

A total of 22 SSS contacts correlate with magnetic anomalies. Of these, 13 are linked to boulders, three to debris, one to linear debris, four to wrecks, and one to an anchor. A correlation distance of 10 meters was used between the MAG and SSS data. Notably, one wreck-related anomaly is 16 meters away.

Table 10-17: Summary Block 02 SSS Contacts

CLASSIFICATION	NUMBER
Boulder	349
Debris	29
Linear Debris	7
Wreck	5
Other	1
Total	391

Table 10-18: Summary Block 02 Magnetic Anomalies

CLASSIFICATION	NUMBER
Known wreck	1 (wreck)
Known cable	26 (2 cables)
Unknown cable	0
Linear debris of geological feature	32 (6 features)
Unclassified Discrete anomalies	955
Total	1014

10.4.4 Shallow Geology

The Granular sediments across Block 02 (Marine Holocene sediments), is interpreted a mixture of gravelly SAND to sandy GRAVEL, its thickness varies along the RPL from .1 m to 5.8 m below the seafloor (BSF) at KP 8.900.

Initially at KP 8.900, gravelly SAND unit measuring 5.8 m thick overlies very stiff CLAY. The SAND unit thins progressively to about 1 m at KP 10.800. Between KP 10.800 and KP 23.848, very stiff CLAY frequently at or

near the seabed, interspersed with sections of SAND alternating with GRAVEL up to 3 m thick (KP 14.800), along with occasional CLAY lenses. From KP 23.848 to KP 27.350, the SAND unit reaches a maximum thickness of 3.9 m at KP 25.954, but also thins to about 1 m in places, with associated gas blanking observed. Between KP 27.350 and the end of Block 02 at KP 33.000, very stiff CLAY (London CLAY) lies at or near the seabed (<0.2 m), overlain by a thin veneer of sandy CLAY to gravelly SAND. Caution is advised during laying and trenching operations in areas where the interpreted hard substrate is sub-cropping or outcropping.

Beneath Unit I, stiff CLAY (London CLAY Formation – Unit II) is present, with evidence of faulting. Seismic data suggests that Cretaceous Chalk bedrock lies beneath the London Clay (Roberts et al., 2018; E, G & Laban, 2022). The possible base of the London Clay Formation was identified using Innomar sub-bottom profiler (SBP) data and confirmed with Sparker data. However, the base of Unit II remains uncertain as it was not verified through geotechnical investigations.

The London CLAY Formation (Unit II) is characterized by faulting. These features were identified within the London CLAY Formation but do not appear to extend into the overlying younger units. The faults are visible as clear, discrete surfaces with reflector discontinuities. Fault displacement is generally less than 2 m, with the largest observed displacement reaching 5 m. These features are interpreted as soft-sediment deformation caused by compaction and dewatering, consistent with local references (Henriet et al., 1991).

Localized acoustic blanking, caused by diffuse shallow gas within 1.5 m BSF, obscures parts of the shallow geology. The proposed RPL crosses this acoustic blanking between KP 25.765 and KP 25.875.

Additionally, a channel feature extends across Block 02 from southwest to northeast, with depths reaching up to 4.5 m BSF at its centre. The proposed RPL crosses this feature between KP 26.823 and KP 27.274.

10.4.5 Geotechnical

14 geotechnical locations were undertaken within Block 02. MMT undertook 4 standalone CPT's, 3 standalone VC's and 3 co-located VC/CPT locations, whilst NEXTGEO undertook 4 co-located VC/CPT locations. The locations are shown schematically below in Figure 10-26, Figure 10-27 and Figure 10-28.

Some of MMT locations were excluded from the interpretation as they fall far away from the new RPL. These locations are listed in Table 10-19 for reference. The geological information from these locations was no longer suitable to the RPL, which had been re-routed for engineering purposes.

Table 10-19: Geotechnical Locations excluded from Block 02 Interpretation

Block	Location ID	Distance from RPL (m)
2	748-NAT-NB-VC-017	315
2	748-CPT-017	432
2	748-NAT-NB-VC-018	475
2	748-CPT-018	559

Block	Location ID	Distance from RPL (m)
2	748-NAT-NB-VC-019	728
2	748-CPT-019	727
2	748-NAT-NB-VC-020	849
2	748-CPT-020	995
2	748-NAT-NB-VC-021	1086
2	748-CPT-021	1176
2	748-NAT-NB-VC-022	1247
2	748-CPT-022	1250
2	748-NAT-NB-VC-023	1039
2	748-CPT-023	701
2	748-NAT-NB-VC-024A	465
2	748-CPT-024	240

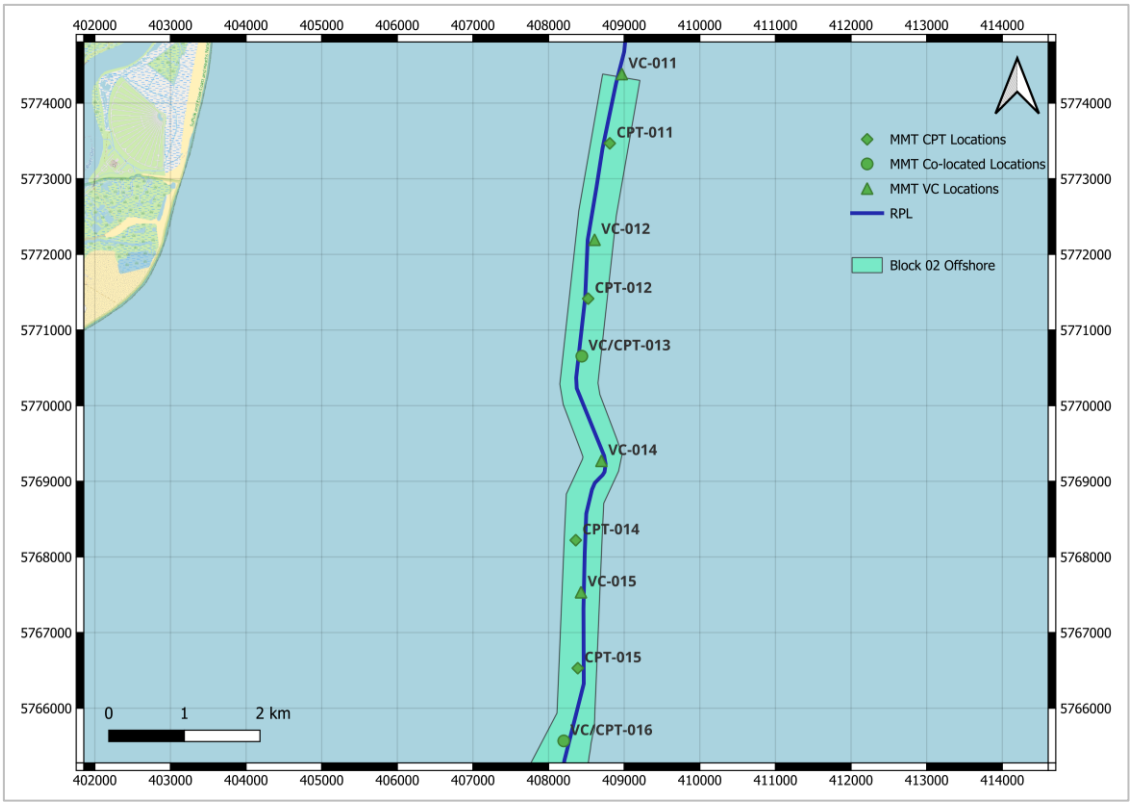

Figure 10-26: Location Plan for Block 02 between KP 8.900 and KP 17.906

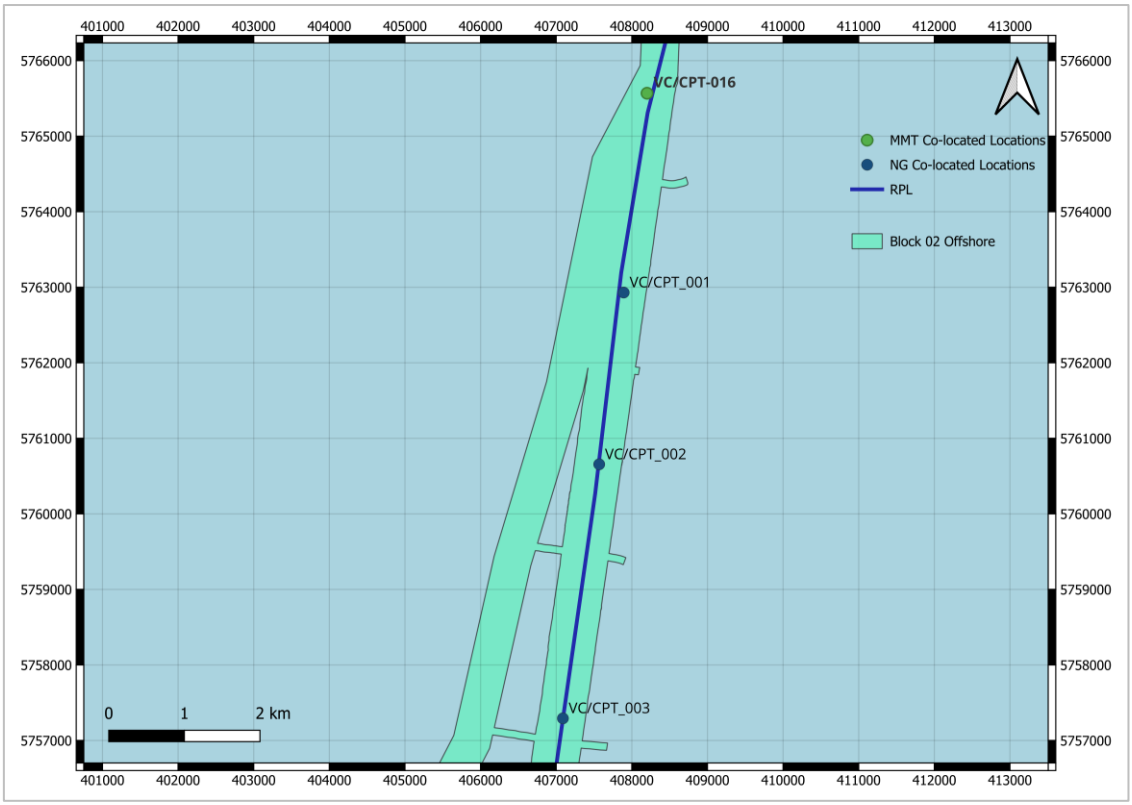

Figure 10-27: Location Plan for Block 02 between KP 17.906 and KP 26.250

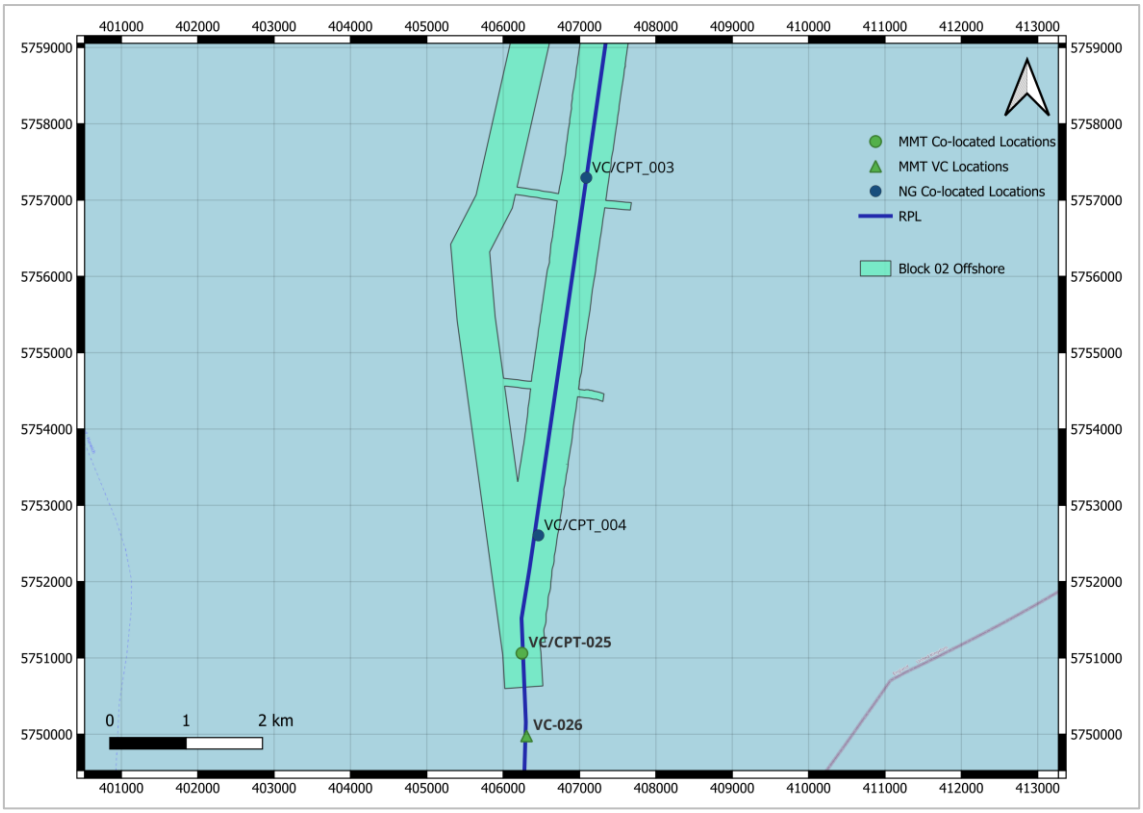

Figure 10-28: Location Plan for Block 02 between KP 26.250 and KP 32.544

At the start of Block 02 at CPT-011 (KP 9.783), silty gravelly SAND was recorded from the seabed to the base of the location at 5.28 m. Granular material of similar composition was again recorded from the seabed to a depth of 3.99 m in VC-012A (KP 11.076), however in this location the SAND was underlain by high to very high strength, very stiff slightly sandy silty CLAY. The CLAY was recorded as having a high to very high plasticity and contains fissures.

With increasing KP across the Block, CLAY becomes the dominant soil type and was recorded in all locations between KP 11.076 and KP 32.544. CLAY was located at the seabed in 4 geotechnical locations: MMT locations CPT-015 and CPT/VC-016 (KP 16.903 to KP 17.910) and in NextGeo locations VC/CPT_002 (KP 22.853) and VC/CPT_004 (KP 30.979).

Within the remainder of the locations in Block 02, the CLAY was overlain by granular material of varying thickness and composition. Sandy GRAVEL formed a medium bed at the surface between CPT-012 and VC/CPT-013 (KP 11.866 to 12.631) to a maximum depth of 0.28 m. GRAVEL was also recorded from the seabed to a depth of between 2.65 m and 2.85 m at NextGeo location VC/CPT_001 (KP 20.557). Further GRAVEL deposits were recorded overlaying the CLAY in NextGeo location VC/CPT_003, where the minimum depth of the CLAY was recorded at 4.95 m and 3.70 m. At this location, silty SAND and gravelly SAND was also present above the GRAVEL.

Between VC-014 and VC-015 (KP 14.085 and KP 15.900) and at co-located VC/CPT-025 (KP 32.544), gravelly SAND was recorded as the surficial deposit overlying the CLAY. This formed a thin surface bed at VC-015 and VC/CPT-025 but was recorded to a depth of 2.02 m and 2.88 m at VC-014 and CPT-014 respectively.

CPT penetration within this Block exceeded 5.00 m at all locations. VC recovery was lower, with notably shallow termination depths at VC_002 (KP 22.853) and VC_004 (KP 30.979), with recovery less than 1.85 m. The non-significant bump-over at VC_004_A (KP 30.979) also failed to achieve good recovery, achieving a depth of 1.05 m.

10.4.5.1 Geotechnical Model

Figure 10-29 and Figure 10-30 below present the locations in the form of a geotechnical model; with relative density (DR), shear strength (Su), and soil classification plotted against depth in 0.50 m sections. As can be observed from the geotechnical model, the CLAY throughout Block 02 was predominantly high to very high strength. Su values generally increased with depth in each location, with the lowest values occurring in the top 0.50 m where the CLAY formed the surficial deposits. Dr values showed no clear correlation with regards to depth or horizontal distribution within this Block. Notably, very dense material was encountered between 1.00 m and 2.50 m in CPT-014, and between 1.00 m and 1.50 m in VC-014. Very loose material with average Dr values between 1 % and 13 % was encountered from the seabed to a depth of 2.50 m in CPT_001.

KP (km)	9.782			11.076			11.866			12.631			14.085			15.216			15.900		
DCC (m)	-80.515			-89.745			-40.686			-42.233			46.984			124.998			37.870		
ID CPT / VC	748-CPT-011	748-CPT-011		748-NAT-NB-VC-012A	748-NAT-NB-VC-012A	748-NAT-NB-VC-012A	748-CPT-012	748-CPT-012		748-CPT-013	748-CPT-013	748-NAT-NB-VC-013A	748-NAT-NB-VC-014	748-NAT-NB-VC-014	748-NAT-NB-VC-014	748-CPT-014	748-CPT-014		748-NAT-NB-VC-015	748-NAT-NB-VC-015	748-NAT-NB-VC-015
Depth (m)	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**
0.00 - 0.50	66					9		53		30		7			8	37					8
0.50 - 1.00	81			29		9		72			58	2			8	76				84	2
1.00 - 1.50	81					9		84			67	2	100		8	100				125	2
1.50 - 2.00	75					9		89			82	2			8	94				89	2
2.00 - 2.50	68					9		104			94	2		115	2	98				163	2
2.50 - 3.00	61					9		108			95	2		78	2	84				180	2
3.00 - 3.50	65					9		111			109			157	2		97				
3.50 - 4.00	55					9		126			118			165	2		105				
4.00 - 4.50	51				188	2		130			119			147	2		119				
4.50 - 5.00	51				93	2		140			123						123				
5.00 - 5.50	51				178			149			129						123				
5.50 - 6.00																					

Figure 10-29: Geotechnical Model of Block 02 between KP 9.782 and KP 15.900

KP (km)	16.903			17.906			20.557			22.853			26.250			30.979			32.544		
DCC (m)	78.079			71.560			-62.863			-7.275			0.924			-51.313			13.609		
ID CPT / VC	748-CPT-015	748-CPT-015		748-CPT-016	748-CPT-016	748-NAT-NB-VC-016	CPT_001	CPT_001	VC_001	CPT_002	CPT_002	VC_002	CPT_003	CPT_003	VC_003	CPT_004	CPT_004	VC_004	748-CPT-025	748-CPT-025	748-NAT-NB-VC-025B
Depth (m)	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**
0.00 - 0.50		60			62	2	13		7		75	5	20		8		86	2		117	2
0.50 - 1.00		80			82	2	13		7		96	5	30		8		133	2		135	2
1.00 - 1.50		93			100	2	3		7		111	2	48		8		152	2		187	2
1.50 - 2.00		98			108	2	1		7		122	2	70		8		163			191	2
2.00 - 2.50		95			109	2	4		7		119		72		7		167			170	2
2.50 - 3.00		97			107	2		94	2		144		71		7		176			163	2
3.00 - 3.50		109			111	2		77	2		122		22		7		164			140	2
3.50 - 4.00		119			113	2		82	2		136			81	7		187			139	2
4.00 - 4.50		118			121	2		89			162			103	7		155			163	2
4.50 - 5.00		125			126	2		90			135			126	7		176			170	2
5.00 - 5.50		134			114			92			183			131	2		178			163	
5.50 - 6.00								91			163			146	2		201				

Figure 10-30: Geotechnical Model of Block 02 between KP 16.903 and KP 32.544

10.4.6 Geohazards, Seabed Index, and Trenching Suitability

Average seabed gradients along the route are less than 1°, indicating a very gentle slope. However, the maximum gradient reaches up to 23° between KP 11.300 and KP 11.700, corresponding to an area of mobile sediments. Ripples and megaripples were observed at many locations throughout this section.

Five wrecks were detected across the surveyed area at KP 18.681 with a DCC of 85.4 m to port, KP 21.864 with a DCC of 810.2 m to starboard, KP 24.244 with a DCC of 156.8 m to port, KP 27.226 with a DCC of 256.2 m to starboard, and KP 32.829 with a DCC of 178.2 m to port.

Two cables cross the RPL, East Anglia One (EA1) North at KP 13.369, detected using magnetometer, SSS, and MBES; and EA1 South at KP 13.765, detected with magnetometer only. No pipelines were identified along the route.

Two MAG linear features cross the RPL at KP 12.945 and KP 23.431, these has no corresponding SSS or MBES features, suggesting they may be buried.

Very stiff / high to very high strength cohesive CLAY is present at or near the seabed surface along much of the route.

Within Block 02, the seabed index shows that between CPT-011 (KP 9.783) and VC-012A (KP 11.076) the top 3.00 m of seabed is composed of dense granular soils. A change in soil type occurs from CPT-012 (KP 11.866) to VC-013A (KP 12.634), with the top 3.00 m of seabed recorded as high to very high strength cohesive soils.

The top 1.50 m of material in VC-014 (KP 14.085) is designated loose granular, low to medium strength cohesive, overlying high to very high strength cohesive. CPT-014 (KP 15.216) shows a variable top 3.00 m of seabed, with medium dense granular soil to 0.50 m, underlain by dense granular soil to 1.00 m. Very dense granular is then recorded between 1.00 m and 2.50 m, overlying high to very high strength cohesive material.

From VC-015 (KP 15.900) to VC-016 (KP 17.910), the seabed is composed of high to very high strength cohesive soil to a depth of 3.00 m. VC_001 (KP 20.557) and CPT_001 (KP 20.558) both contain very loose granular, low to medium strength cohesive soils to a depth of 2.50 m, overlying high to very high strength cohesive soil to 3.00 m.

High to very high strength cohesive soils form the top 3.00 m of seabed in CPT_002 (KP 22.853). Between VC_002 (KP 22.853) and VC_004_A (KP 30.979), loose granular, low to medium strength cohesive soil is recorded as the top 1.00 m of soil, overlying medium dense or dense granular soil.

Both VC_003 (KP 26.250) and CPT_003 (KP 26.250) contain loose granular, low to medium strength cohesive soil in the top 1.00 m of seabed, overlying medium dense granular soils to 1.50 m. Between 1.50 m and 3.00 m, dense granular material is recorded.

CPT_004 (KP 30.979) encountered high to very high strength cohesive soils from the seabed to 3.00 m. The same soil type was then encountered from the seabed to 3.00 m in both CPT-025 (KP 32.544) and VC-025B (KP 32.550).

The assigned Seabed Index for the locations in Block 02 are shown below in Table 10-20.

Table 10-20: Seabed Index for Block 02

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (Depth in m)					
				Pen. (m)	Rec. (m)	Refusal Depth (m)	Depth to10 MPa (Dense)	Depth to 20 MPa (V Dense)	0.5	1	1.5	2	2.5	3
9.000		MMT	SBP						7	6	6	6	6	6
9.354		MMT	SBP						7	6	6	6	6	6
9.783	CPT-011	MMT	CPT			5.28	0.45		5	5	5	5	5	5
10.358		MMT	SBP						5	5	5	5	5	5
10.857		MMT	SBP						5	5	5	5	5	5
11.075	VC-012A	MMT	VC	5.25	5.04				5	5	5	5	5	5
11.367		MMT	SBP						4	4	4	4	4	4
11.866	CPT-012	MMT	CPT			5.45	5.38		4	4	4	4	4	4
12.363		MMT	SBP						5	5	4	4	4	4
12.631	CPT-013	MMT	CPT			5.43			4	4	4	4	4	4
12.634	VC-013A	MMT	VC	5.01	2.98				4	4	4	4	4	4
12.863		MMT	SBP						3	4	4	4	4	4
13.378		MMT	SBP						7	3	4	4	4	4
13.878		MMT	SBP						7	7	3	3	3	3
14.084	VC-014	MMT	VC	5.43	4.60				7	7	7	4	4	4
14.436		MMT	SBP						6	5	3	3	3	4
14.907		MMT	SBP						6	5	3	3	3	3
15.216	CPT-014	MMT	CPT			5.40	0.80	2.76	6	5	3	3	3	4

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (Depth in m)					
				Pen. (m)	Rec. (m)	Refusal Depth (m)	Depth to10 MPa (Dense)	Depth to 20 MPa (V Dense)	0.5	1	1.5	2	2.5	3
15.407		MMT	SBP						6	5	4	4	4	4
15.900	VC-015	MMT	VC	5.16	2.74				4	4	4	4	4	4
16.405		MMT	SBP						4	4	4	4	4	4
16.903	CPT-015	MMT	CPT			5.43			4	4	4	4	4	4
17.420		MMT	SBP						4	4	4	4	4	4
17.907	CPT-016	MMT	CPT			5.41			4	4	4	4	4	4
17.910	VC-016	MMT	VC	5.40	5.02				4	4	4	4	4	4
18.000		NG	SBP						4	4	4	4	4	4
18.500		NG	SBP						4	4	4	4	4	4
19.000		NG	SBP						8	4	4	4	4	4
19.500		NG	SBP						8	4	4	4	4	4
20.000		NG	SBP						8	4	4	4	4	4
20.557	VC_001	NG	VC	4.00	3.85				8	8	8	8	8	4
20.558	CPT_001	NG	CPT			5.94			8	8	8	8	8	4
22.853	CPT_002	NG	CPT			5.76			4	4	4	4	4	4
22.853	VC_002	NG	VC	2.00	1.85				7	7	4	4		
23.000		NG	SBP						4	4	4	4	4	4
23.500		NG	SBP						4	4	4	4	4	4
24.000		NG	SBP						7	7	4	4	4	4

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (Depth in m)					
				Pen.	Rec.	Refusal Depth	Depth to10 MPa	Depth to 20 MPa	0.5	1	1.5	2	2.5	3
				(m)	(m)	(m)	(Dense)	(V Dense)						
25.500		NG	SBP						7	7	7	7	4	4
26.000		NG	SBP						7	7	7	7	7	7
26.250	VC_003	NG	VC	6.00	6.00				7	7	6	5	5	5
26.250	CPT_003	NG	CPT			5.82	1.79		7	7	6	5	5	5
26.500		NG	SBP						7	7	7	7	7	5
27.000		NG	SBP						9	9	9	8	8	7
27.500		NG	SBP						4	4	4	4	4	4
28.000		NG	SBP						7	4	4	4	4	4
28.500		NG	SBP						7	4	4	4	4	4
29.000		NG	SBP						7	4	4	4	4	4
29.500		NG	SBP						7	4	4	4	4	4
30.000		NG	SBP						7	4	4	4	4	4
30.500		NG	SBP						7	4	4	4	4	4
30.979	VC_004_A	NG	VC	2.50	1.05				7	7				
30.979	CPT_004	NG	CPT			6.13			4	4	4	4	4	4
30.980	VC_004	NG	VC	2.00	1.30				7	7	7			
31.500		MMT	SBP						4	4	4	4	4	4
32.000		MMT	SBP						4	4	4	4	4	4
32.544	CPT-025	MMT	CPT			5.29			4	4	4	4	4	4

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (Depth in m)					
				Pen. (m)	Rec. (m)	Refusal Depth (m)	Depth to10 MPa (Dense)	Depth to 20 MPa (V Dense)	0.5	1	1.5	2	2.5	3
32.550	VC-025B	MMT	VC	5.32	4.84				4	4	4	4	4	4
33.077		MMT	SBP						4	4	4	4	4	4

10.5 BLOCK 03 OFFSHORE KP 33.000 TO KP 63.000

Table 10-21: Alignment Sheets for Block 03 Offshore KP 33.000 to KP 63.000

AS-5K-011 - AS-5K-021

10.5.1 Bathymetry and Morphology

Block 03 commences at KP 33.000 with a depth of 21.83 meters and maintains a relatively flat profile. Between KP 47.160 and KP 48.650—the route's deepest point—gentle undulations are observed in the seabed. The seabed then rises to a final depth of 19.73 meters at KP 63.000. A minimum depth of 18.51 meters is recorded at KP 62.344, and a maximum depth of 46.42 meters at KP 47.132 (see Figure 10-31).

The average seabed gradients along the RPL are less than 2° (1.05° - gentle according to gradient classification scheme). The maximum slope of 20.05° occurs at KP 49.964, an area characterized by ripples and megaripples (see Figure 10-32). A band of ripples extends across the route at KP 54.772, and from KP 57.900 onwards, the seabed rises in a series of undulations ranging from 37 meters to 20 meters in depth. These wave-like formations have an average wavelength of 1 km and amplitudes ranging from 1 to 6 meters.

Figure 10-31: Overview of the Bathymetry in Block 03 between KP 33.000 and KP 63.000

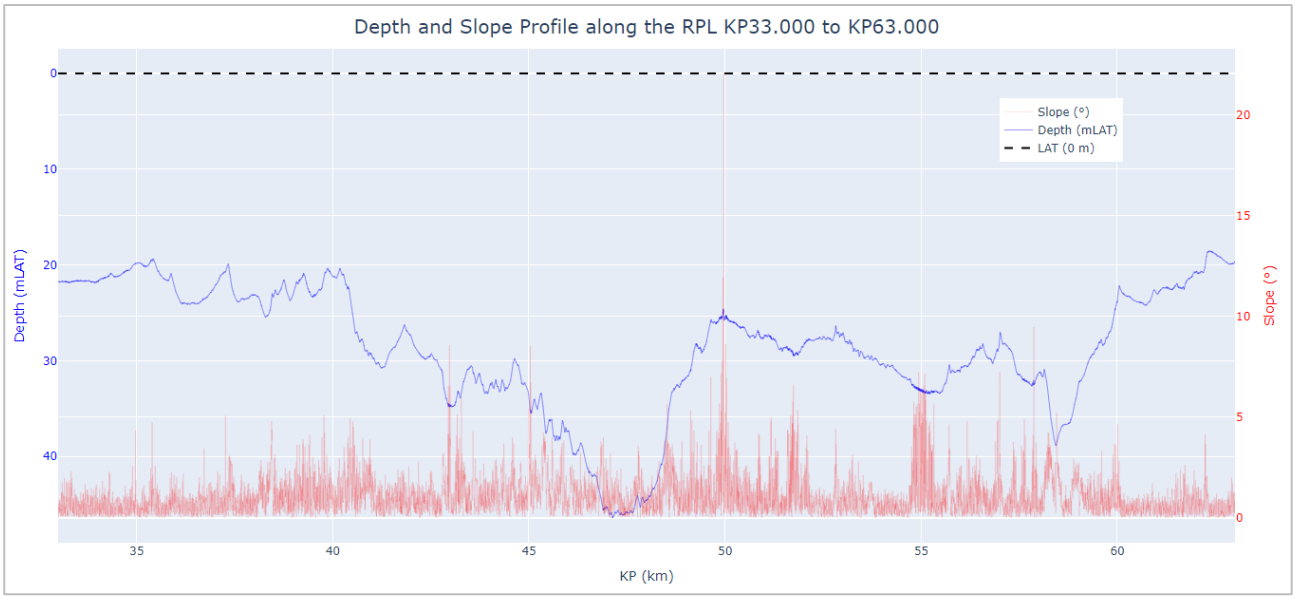

Figure 10-32: Block 03 between KP 33000 and KP 63.000 Seabed Depth and Slope Profile

10.5.2 Surficial Geology and Seabed Features

The surficial geology of Block 03 Offshore comprises a mix of seabed sediments, including gravelly SAND to sandy GRAVEL, CLAY, stiff CLAY, SILT, SAND and GRAVEL.

The seabed between KP 33.000 and KP 42.784 consists of gravelly SAND to sandy GRAVEL, with occasional patches of CLAY. These CLAY patches occur along the RPL between KP 39.369 and KP 39.421, KP 39.759 and KP 39.792, KP 40.345 and KP 40.360, and KP 40.395 and KP 40.413.

From KP 42.784 to KP 43.095, the seabed is composed of SAND. Between KP 43.095 and KP 47.972, the seabed is dominated by exposed stiff CLAY, with an intersection of gravelly SAND to sandy GRAVEL between KP 46.073 and KP 46.962. The stiff CLAY in this section was characterized in VC-034 as a high-strength, very stiff, silty CLAY.

Gravelly SAND to sandy GRAVEL reappears from KP 47.972 to KP 49.302 and again from KP 57.529 to KP 58.842. Geotechnical samples from these areas describe the soil as generally very loose to loose, gravelly CLAY or silty SAND. SAND is observed from KP 49.302 to KP 52.187 and again from KP 58.429 to KP 58.842.

Additional sections of gravelly SAND to sandy GRAVEL are noted from KP 52.187 to KP 54.761, KP 56.651 to KP 56.753, KP 59.877 to KP 60.019, and from KP 60.579 to the end of the block at KP 63.000. These areas also include isolated patches of stiff CLAY.

SILT is encountered between KP 54.761 and KP 55.328, while CLAY is present in multiple intervals, from KP 55.328 to KP 56.651, KP 56.753 to KP 57.529, KP 58.842 to KP 59.877, and KP 60.019 to KP 60.579.

Notable seabed features in Block 03 include a mottled seabed, crossing the RPL in multiple locations form KP 33.083 to KP 33.285, KP 39.369 to KP 39.421 and further along the route between KP 39.759 and KP 39.792, extending south-southwest and coinciding with a bed of gravelly SAND to sandy GRAVEL.

Beyond this section and continuing to the end of Block 03 at KP 63.000, the seabed is interspersed with various features, including mound-mud-lumps, scour, and anchor scars. In several locations, the RPL intersects these seabed features. Figure 10-33 to Figure 10-37 illustrate the seabed sediments and features present within Block 03.

Most of Block 03 lies within the Sunk Deep-Water Anchorage, which is divided into two designated zones (Sunk Inner and Sunk Outer). The cable route crosses this anchorage between approximately KP 34.698 and KP 59.425. The extent of the anchorage was not provided by the client; it was verified using publicly available UK Hydrographic Office data, as requested. Given that this is an official anchorage area used by deep-draught vessels awaiting entry to the Thames and Harwich ports, cable installation in this section should account for potential risks from anchoring activities. Measures such as burial to adequate depth, protection at crossing points, or consultation with the relevant maritime authorities should be considered to minimise future interaction. Figure 10-38 illustrate the extent of the anchorage area as extracted from the UK Hydrographic Office data.

Mobile sediments in the form of ripples, megaripples, sandwaves, and sandbanks are also present on this section of the route, a summary of their crossings with the RPL is provided in Table 10-22.

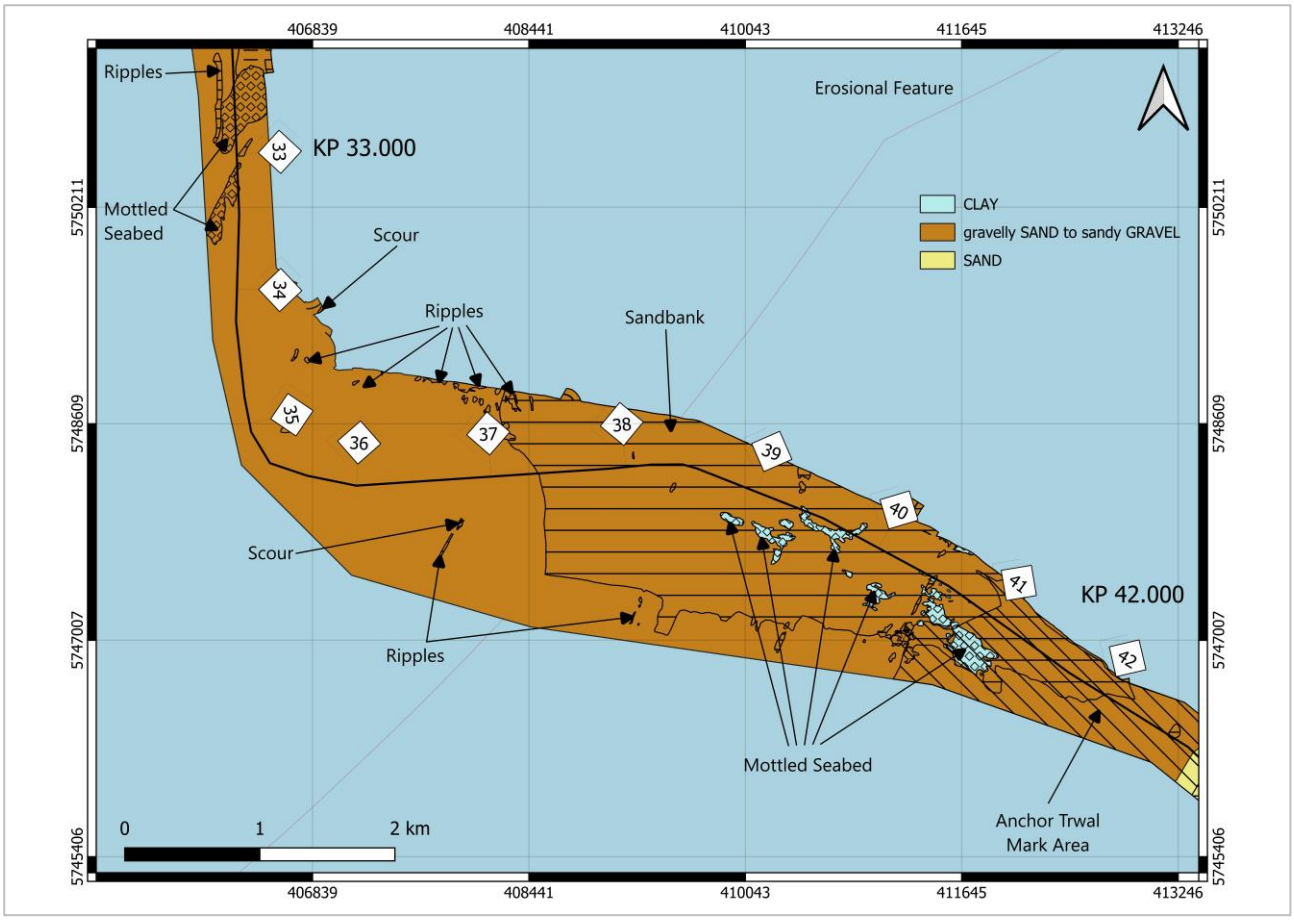

Figure 10-33: Overview of Seabed Geology and Features Block 03 between KP 33.000 and KP 42.000

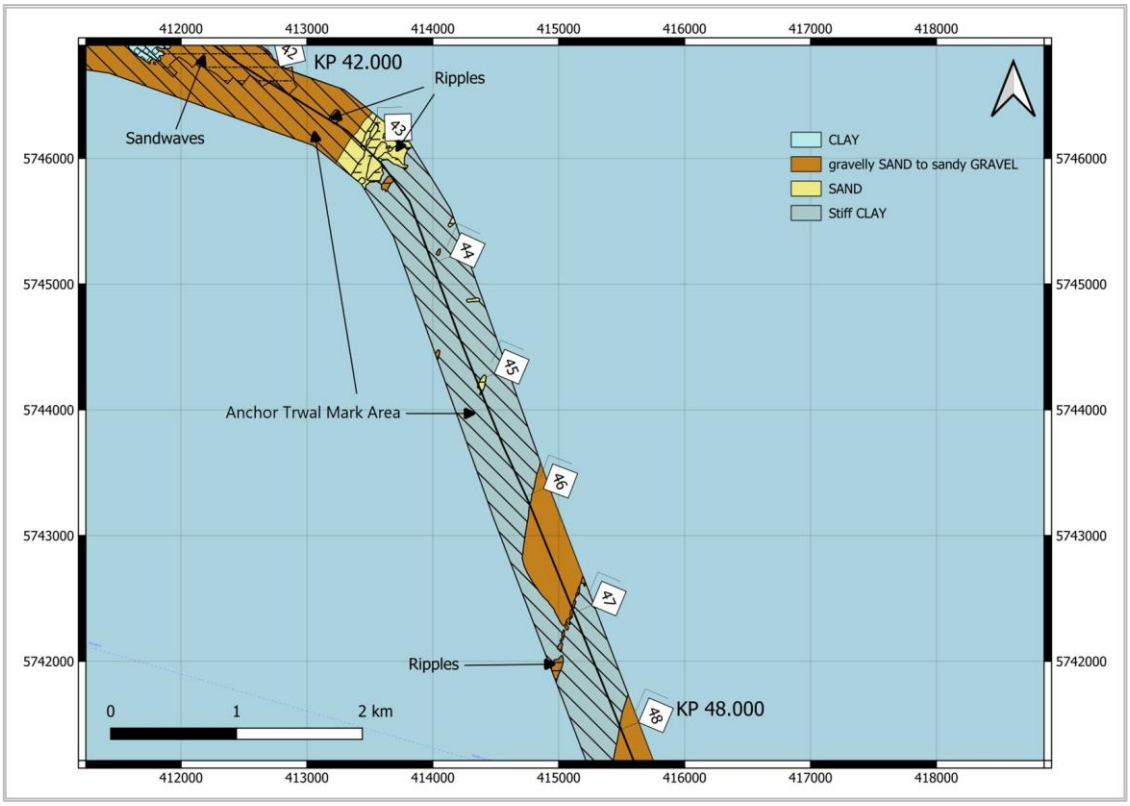

Figure 10-34: Overview of Seabed Geology and Features Block 03 between KP 42.000 and KP 48.000

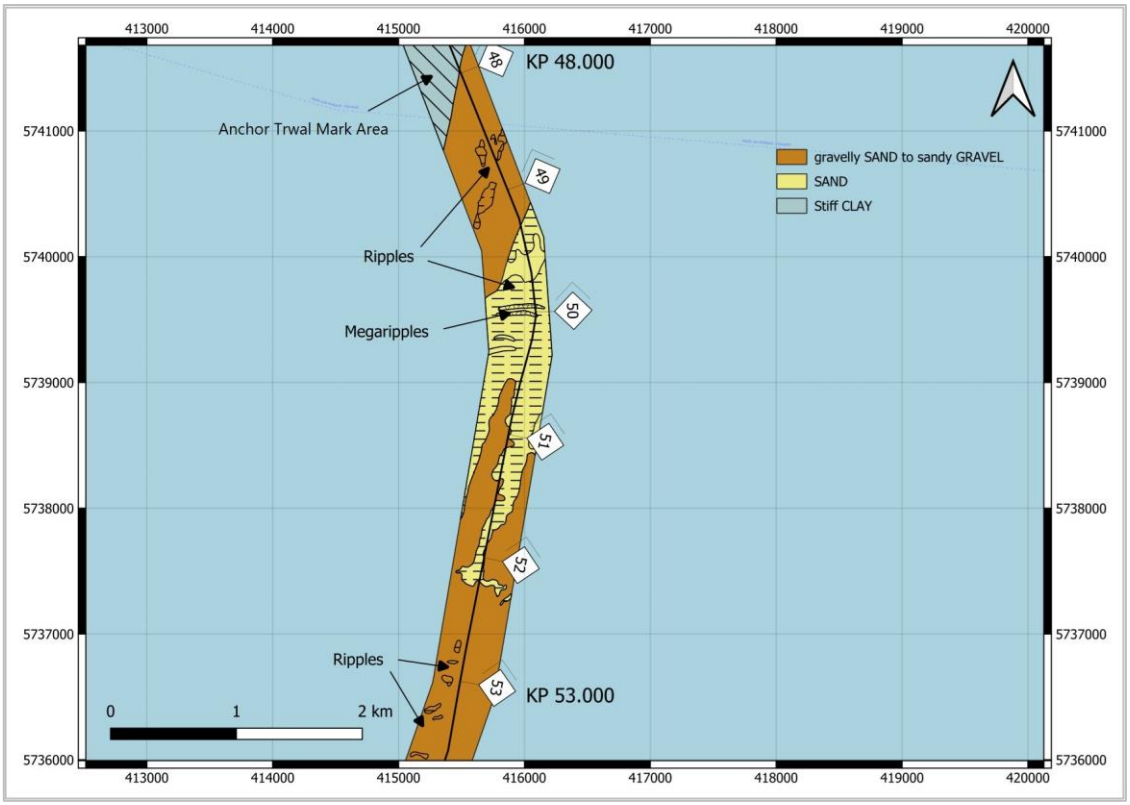

Figure 10-35: Overview of Seabed Geology and Features Block 03 between KP 48.000 and KP 53.000

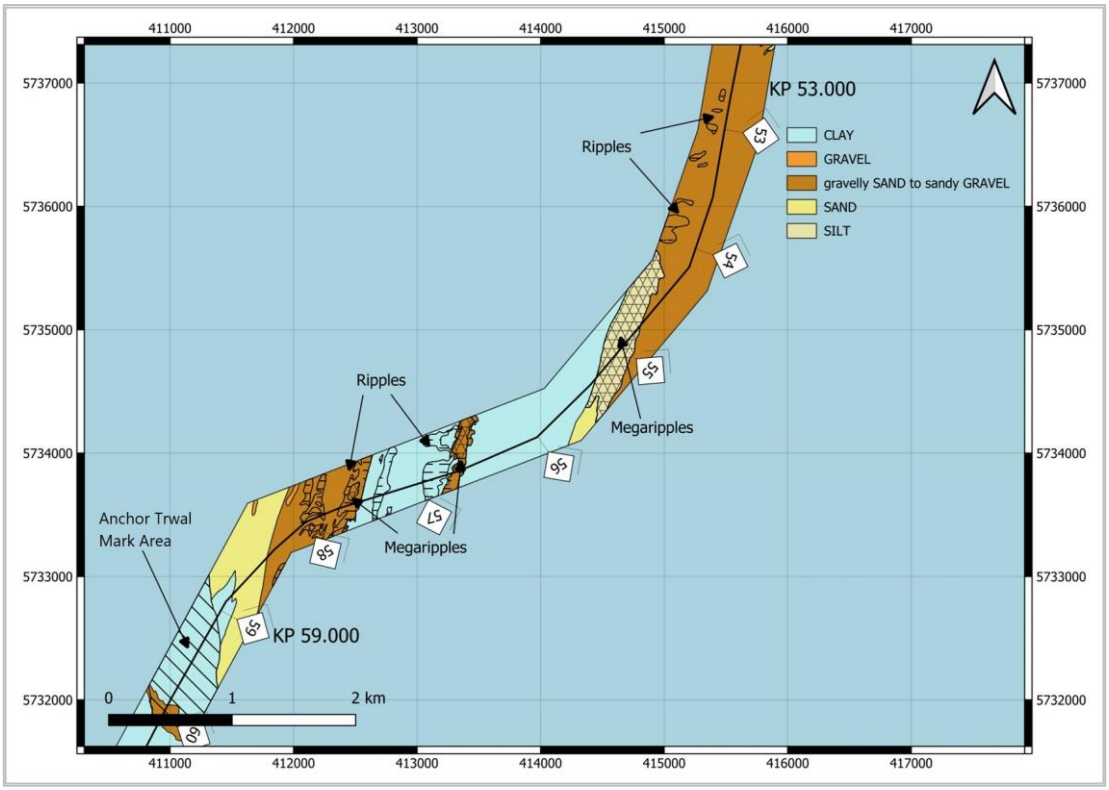

Figure 10-36: Overview of Seabed Geology and Features Block 03 between KP 53.000 and KP 59.000

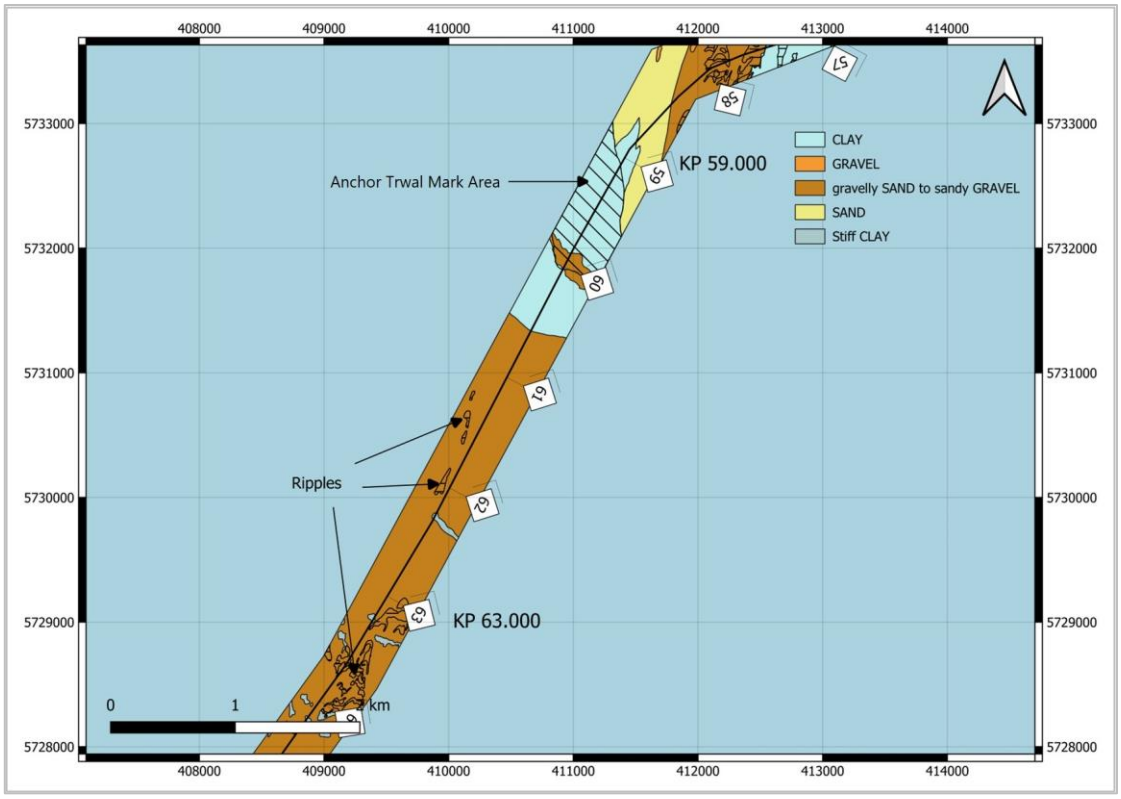

Figure 10-37: Overview of Seabed Geology and Features Block 03 between KP 59.000 and KP 63.000

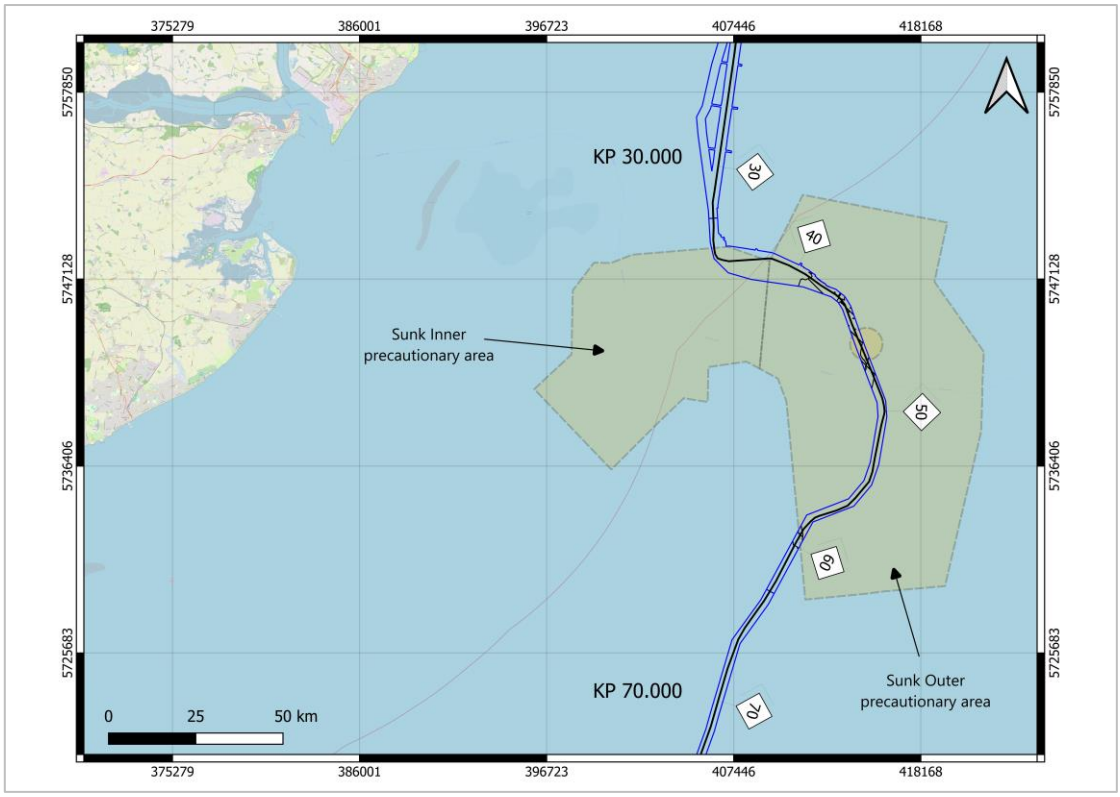

Figure 10-38: Overview of Sunk Deep Anchorage Area as Extracted from the UK Hydrographic Office data

Table 10-22 Summary of Mobile Sediments in Block 03

Feature	Start KP	End KP
Sandbank	37.349	39.369
Sandbank	39.421	39.759
Sandbank	39.792	40.448
Ripples	40.448	40.486
Sandbank	40.486	41.999
Ripples	42.587	42.611
Ripples	42.880	42.907
Ripples	42.929	43.008
Ripples	43.227	43.265
Ripples	45.030	45.069
Ripples	45.091	45.108
Ripples	49.302	49.533
Ripples	49.749	49.937
Megaripples	49.937	49.967
Ripples	49.967	50.017
Megaripples	50.017	50.038
Ripples	50.038	50.947
Ripples	51.110	51.369
Ripples	51.545	51.895
Ripples	51.999	52.187

Feature	Start KP	End KP
Megaripples	54.761	55.328
Ripples	56.651	56.754
Ripples	56.794	57.005
Ripples	57.333	57.418
Ripples	57.531	57.710
Ripples	57.835	57.875
Ripples	57.998	58.016

10.5.3 Contacts and Anomalies

A total of 721 SSS contacts and 680 magnetic anomalies were identified within the Block 03 survey corridor. These contacts and anomalies are summarized in Table 10-23 and Table 10-24.

A total of 37 SSS contacts correlate with magnetic anomalies. 18 of these correlations relate to boulders, 15 to debris, 2 to linear debris, and 2 to wrecks. A correlation distance of 10 meters was used between the MAG and SSS data.

Table 10-23: Summary Block 03 SSS Contacts

CLASSIFICATION	NUMBER
Boulder	638
Debris	68
Linear Debris	10
Wreck	3
Other	2
Total	721

Table 10-24: Summary Block 03 Magnetic Anomalies

CLASSIFICATION	NUMBER
Known wreck	1 (wreck)
Known cable	0
Unknown cable	0
Linear debris of geological feature	15 (4 features)
Unclassified Discrete anomalies	664
Total	680

10.5.4 Shallow Geology

In Block 03, between KP 33.000 and KP 56.892, very stiff CLAY is frequently present at or near the seabed (<0.2 m BSF), with interspersed sections of gravelly SAND to sandy GRAVEL up to 1 m thick. Caution is advised during laying and trenching operations in areas where the hard substrate is sub-cropping or outcropping.

From KP 56.892 to the end of Block 03 at KP 63.000, the granular sediments become thicker, reaching up to 2.8 m BSF in places overlying the very stiff CLAY, interpreted as the London CLAY Formation.

The possible base of the London Clay has been mapped using Innomar data between KP 35.593 and KP 38.030 in the western part of Block 03. Beyond this point, it dips rapidly and falls below the resolution limit of the data. The London Clay Formation (Unit II) displays the same characteristics described in Block 02.

10.5.5 Geotechnical

Twenty-five geotechnical locations were undertaken within Block 03. MMT conducted 9 standalone Cone Penetration Tests (CPTs), 10 standalone Vibratory Cone Tests (VCs), and 5 co-located VC/CPT locations. NextGeo undertook a single co-located VC/CPT location. The locations are shown schematically below in Figure 10-39, Figure 10-40 and Figure 10-41.

Some of MMT locations were excluded from the interpretation as they fall far away from the new RPL. These locations are listed in Table 10-25 for reference. The geological information from these locations was no longer suitable to the RPL, which had been re-routed for engineering purposes.

Table 10-25: Geotechnical Locations excluded from Block 03 Interpretation

Block	Location ID	Distance from RPL (m)
3	748-CPT-027	568
3	748-CPT-028	902
3	748-NAT-NB-VC-028	901
3	748-NAT-NB-VC-029	1073
3	748-CPT-029	789
3	748-NAT-NB-VC-030	413

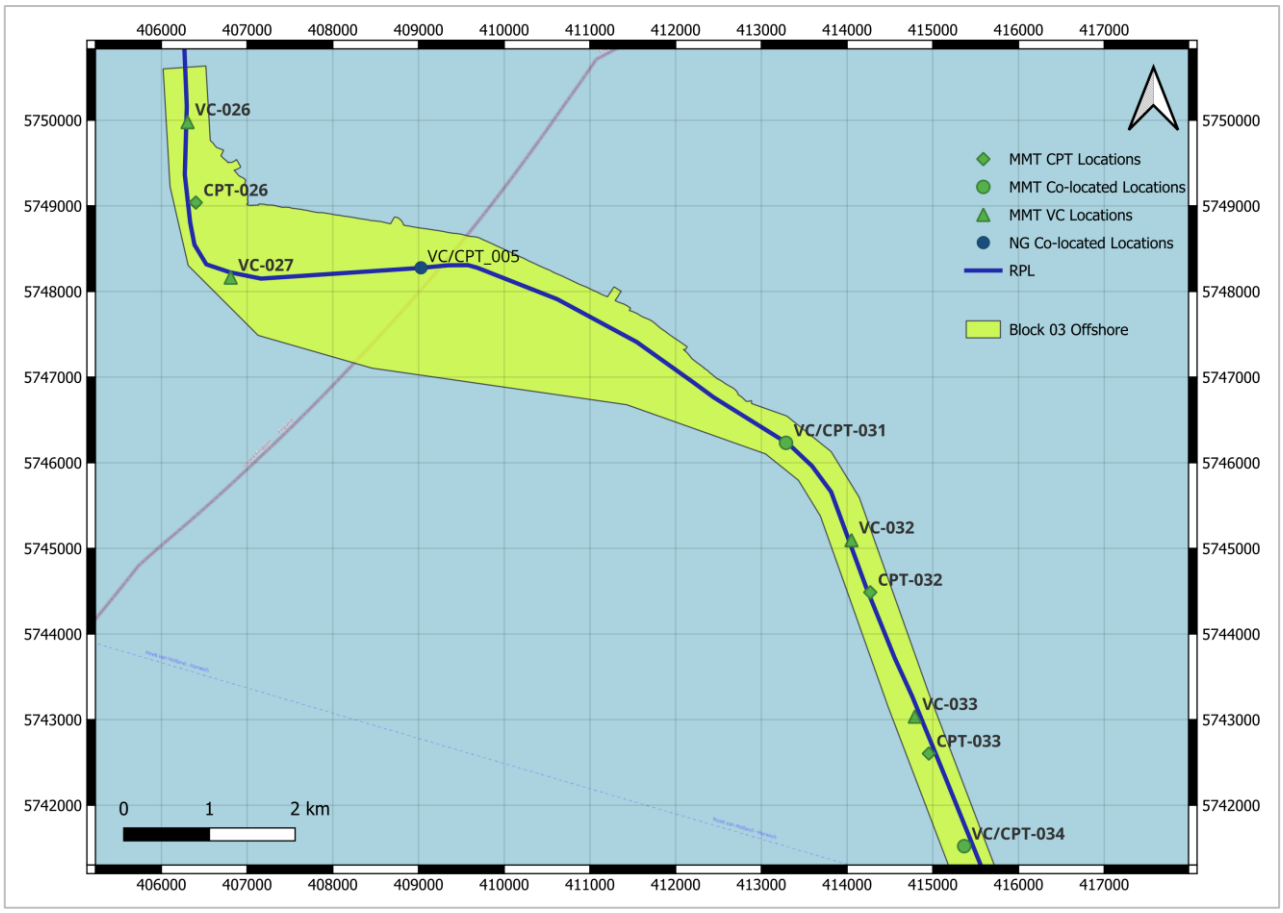

Figure 10-39: Location Plan for Block 03 between KP 33.000 and KP 47.892

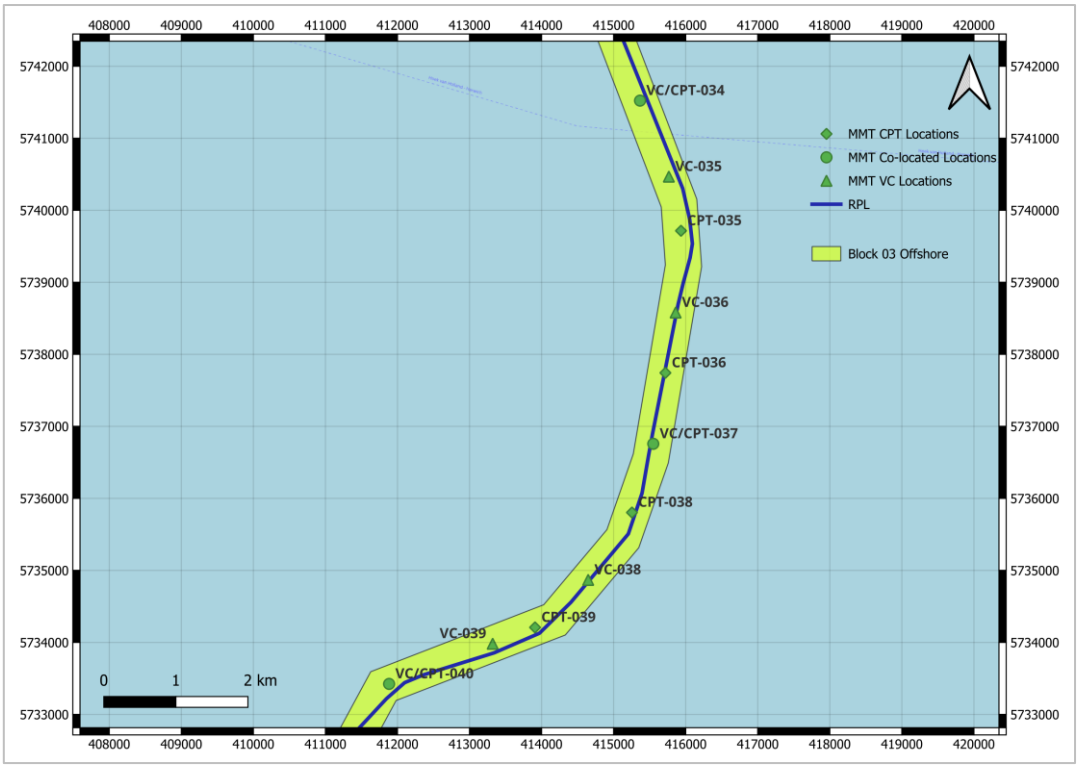

Figure 10-40: Location Plan for Block 03 between KP 47.892 and KP 58.117

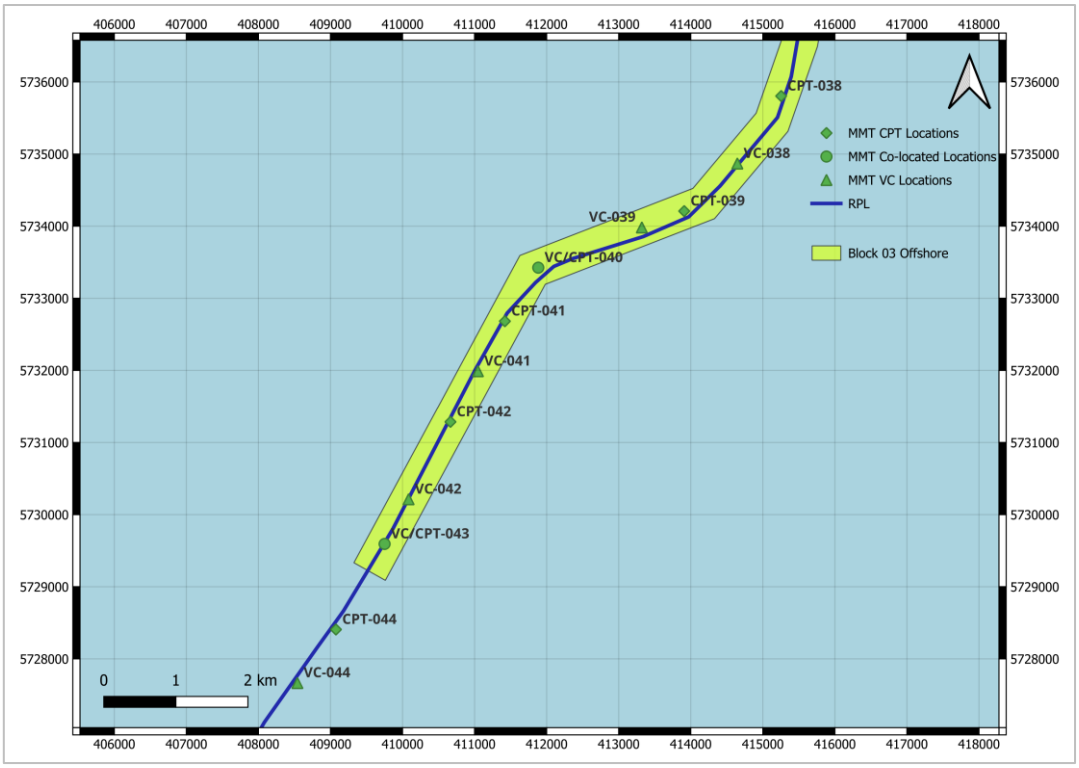

Figure 10-41: Location Plan for Block 03 between KP 55.003 and KP 63.000

The ground conditions within this Block are a continuation of those seen in Block 02, with the predominant soil type comprising high to very high strength very high plasticity fissured CLAY. CLAY was present at the surface or overlain by a thin bed of very loose to loose granular material (up to 0.50 m thick) in all but two locations in this section of the route, these locations were VC/CPT-040 (KP 58.177) and VC/CPT-043 (KP 62.542/KP 62.545). VC/CPT-040 exhibits a thick layer of GRAVEL from the seabed to a depth between 3.82 m and 4.60 m, which is underlain by high to very high strength slightly sandy silty CLAY. In the case of VC/CPT-043, GRAVEL forms a thin surface bed between 0.22 m and 0.44 m thick, overlaying medium dense to very dense silty gravelly SAND. The CLAY at this location was encountered at a minimum depth between 4.39 m in the CPT and 4.71 m in the VC.

CPT penetration within this Block exceeded 5.00 m at all locations. VC recovery was higher than in Block 02, with only a single location failing to achieve a recovery greater than 2.50 m, which was VC_005 and VC_005_A, with recovery totals of 2.10 m and 1.60 m respectively.

10.5.5.1 Geotechnical Model

Figure 10-42, Figure 10-43 and Figure 10-44 below present the locations in the form of a geotechnical model; with relative density (DR), shear strength (Su), and soil classification plotted against depth in 0.50 m sections.

As can be observed from the geotechnical model, this section of the route is predominantly comprised of high to very high strength CLAY which generally increases in Su with depth. Very low strength CLAY is present as within the top 0.50 m in two locations, CPT-039 and CPT-041. Where granular material occurs as the surficial soil type, average Dr values within the top 0.50 m range between 18 % and 27 %, classifying the soil as loose. In locations where granular soils extend to below 0.50 m, the density increased to medium dense to very dense, with the most significant increase noted in the top 2.00 m. Very dense conditions were recorded between 1.50 m and 4.00 m in CPT-043.

KP (km)	33.628			34.581			35.649			37.870			42.691			44.084			44.732		
DCC (m)	-14.253			-90.939			58.164			-1.187			4.163			-28.762			-22.260		
ID CPT / VC	748-NAT-NB-VC-026A	748-NAT-NB-VC-026A	748-NAT-NB-VC-026A	748-CPT-026	748-CPT-026		748-NAT-NB-VC-027A	748-NAT-NB-VC-027A	748-NAT-NB-VC-027A	CPT_005	CPT_005	VC_005	748-CPT-031	748-CPT-031	748-NAT-NB-VC-031	748-NAT-NB-VC-032	748-NAT-NB-VC-032	748-NAT-NB-VC-032	748-CPT-032	748-CPT-032	
Depth (m)	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**
0.00 - 0.50		131	2	18				119	2		65	2	19		7		109	2		48	
0.50 - 1.00		128	2		105			126	2		106	2		87	2		124	2		70	
1.00 - 1.50		127	2		107			157	2		122	2		100	2		108	2		88	
1.50 - 2.00		134	2		116			100	2		127	2		94	2		146	2		94	
2.00 - 2.50		86	2		116			154	2		137			103	2			2		102	
2.50 - 3.00		154	2		137				2		131			122	2		153	2		101	
3.00 - 3.50		162	2		118			154	2		147			118	2		175	2		112	
3.50 - 4.00		172	2		138			145	2		142			132	2		178	2		105	
4.00 - 4.50		183	2		159			157	2		152			132	2					116	
4.50 - 5.00		175	2		151			144	2		157			136	2					123	
5.00 - 5.50					156						161			147	2					119	
5.50 - 6.00											169										

Figure 10-42: Geotechnical Model of Block 03 between KP 33.628 and KP 44.732

KP (km)	46.273			46.734			47.892			49.021			49.829			51.008			56.033		
DCC (m)	61.156			72.776			96.576			117.251			137.222			11.864			98.025		
ID CPT / VC	748-NAT-NB-VC-033	748-NAT-NB-VC-033	748-NAT-NB-VC-033	748-CPT-033	748-CPT-033		748-CPT-034	748-CPT-034	748-NAT-NB-VC-034	748-NAT-NB-VC-035	748-NAT-NB-VC-035	748-NAT-NB-VC-035	748-CPT-035	748-CPT-035		748-NAT-NB-VC-036	748-NAT-NB-VC-036	748-NAT-NB-VC-036	748-CPT-039	748-CPT-039	
Depth (m)	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**
0.00 - 0.50		124	2	26				65	2			2	25				96	2		20	
0.50 - 1.00		152	2		111			88	2			2		64			83	2		91	
1.00 - 1.50		110	2		111			107	2		118	2		81			125	2		114	
1.50 - 2.00		186	2		121			114	2		98	2		87			110	2		127	
2.00 - 2.50		198	2		119			128	2		106	2		94			99	2		134	
2.50 - 3.00		212	2		114			149	2		152	2		100			127	2		141	
3.00 - 3.50					147			171	2		168	2		104			137	2		148	
3.50 - 4.00					162			187	2					107			142	2		155	
4.00 - 4.50					158			189						109						155	
4.50 - 5.00					175			193						109						159	
5.00 - 5.50					167			213						113						184	
5.50 - 6.00																				188	

Figure 10-43: Geotechnical Model of Block 03 between KP 46.273 and KP 56.033

KP (km)	56.662			58.177			59.033			59.821			60.620			61.841			62.542		
DCC (m)	124.376			129.375			-27.969			-42.317			-27.365			-4.935			-6.906		
ID CPT / VC	748-NAT-NB-VC-039	748-NAT-NB-VC-039	748-NAT-NB-VC-039	748-CPT-040	748-CPT-040	748-NAT-NB-VC-040	748-CPT-041	748-CPT-041		748-NAT-NB-VC-041	748-NAT-NB-VC-041	748-NAT-NB-VC-041	748-CPT-042	748-CPT-042		748-NAT-NB-VC-042	748-NAT-NB-VC-042	748-NAT-NB-VC-042	748-CPT-043	748-CPT-043	748-NAT-NB-VC-043
Depth (m)	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC
0.00 - 0.50		108	2	18		7		13			134	2		87			132	2	27		8
0.50 - 1.00		121	2	41		7		83			162	2	63				154	2	51		8
1.00 - 1.50		113	2	56		7		90			100	2	70				116	2	80		8
1.50 - 2.00		141	2	71		7		105			168	2	62				163	2	89		8
2.00 - 2.50		94	2	50		7		118			94	2	57				121	2	89		8
2.50 - 3.00		174	2	68		7		126			190	2		136			187	2	82		8
3.00 - 3.50		178	2	58		7		129			178	2		123			190	2	96		8
3.50 - 4.00				56		7		142			211	2		102					98		8
4.00 - 4.50				40				141			219	2		107					69		8
4.50 - 5.00				46				152			216	2		110						122	2
5.00 - 5.50					143			171						114						126	2
5.50 - 6.00								147													

Figure 10-44: Geotechnical Model of Block 03 between KP 56.662 and KP 62.542

10.5.6 Geohazards, Seabed Index, and Trenching Suitability

Average seabed gradients along the route are less than 1°, indicating a very gentle slope. A maximum gradient of 20° occurs at KP 49.978 and is associated with an area of megaripples. Mobile sediments in the form of ripples, megaripples, and sandwaves were observed at various locations throughout the section.

Three wrecks were identified across the surveyed area: at KP 34.133 with a DCC of 645.9 m to port, KP 36.759 with a DCC of 315.1 m to starboard, and KP 57.978 with a DCC of 310.7 m to starboard.

No cables or pipelines were expected within the survey corridor in Block 03, and none were identified in any dataset.

One linear debris crosses the RPL at KP 38.763 and KP 38.785.

Very stiff / high to very high strength cohesive CLAY is present at or near the seabed surface along much of the route.

The seabed index shows that between VC-026A (KP 33.628) and VC-039 (KP 56.661), the seabed is composed of high to very high strength cohesive soils to a depth of 3.00 m. A single occurrence of medium dense granular soil is encountered between 0.00 m and 0.50 m in VC_005_A (KP 37.867).

CPT-040 (KP 58.177) and VC-040 (KP 58.181) both contain loose granular, low to medium strength cohesive soils in the top 0.50 m of the location. This is underlain by medium dense granular material to 1.00 m, transitioning into dense granular soils to 3.00 m. Within VC-040, the granular soil between 2.00 m and 2.50 m is recorded as medium dense.

High to very high strength cohesive soils are recorded in CPT-041 (KP 59.033) and VC-041 (KP 59.821) from the seabed to a depth of 3.00 m. CPT-042 (KP 60.621) contains loose granular, low to medium strength cohesive soils in the top 0.50 m of the location. This is underlain by medium dense and dense granular material to 2.50 m, then high to very high strength cohesive soil to 3.00 m.

High to very high strength cohesive soils are encountered in VC-042 (KP 61.841) from the seabed to a depth of 3.00 m. Both VC-043 (KP 62.542) and CPT-043 (KP 62.545) contain loose granular, low to medium strength cohesive soils in the top 0.50 m of the location. This is underlain by dense granular material to 1.50 m, transitioning into very dense granular soils to 3.00 m.

The assigned Seabed Index for the locations in Block 03 are shown below in Table 10-26.

Table 10-26: Seabed Index for Block 03

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (depth in m)					
				Pen. (m)	Rec. (m)	Refusal Depth (m)	Depth to 10 MPa (Dense)	Depth to 20 MP (V Dense)	0.5	1	1.5	2	2.5	3
33.077		MMT	SBP						4	4	4	4	4	4
33.576		MMT	SBP						4	4	4	4	4	4
33.628	VC-026A	MMT	VC	5.06	4.76				4	4	4	4	4	4
34.075		MMT	SBP						4	4	4	4	4	4
34.581	CPT-026	MMT	CPT			5.42			4	4	4	4	4	4
35.132		MMT	SBP						4	4	4	4	4	4
35.648	VC-027A	MMT	VC	5.00	4.70				4	4	4	4	4	4
36.000		NG	SBP						4	4	4	4	4	4
36.500		NG	SBP						4	4	4	4	4	4
37.000		NG	SBP						4	4	4	4	4	4
37.500		NG	SBP						4	4	4	4	4	4
37.867	VC_005_A	NG	VC	2.00	1.60				6	4	4			
37.869	CPT_005	NG	CPT			6.16			4	4	4	4	4	4
37.869	VC_005	NG	VC	3.00	2.10				4	4	4	4		
38.000		NG	SBP						4	4	4	4	4	4
38.500		NG	SBP						4	4	4	4	4	4
39.000		NG	SBP						4	4	4	4	4	4
39.500		NG	SBP						4	4	4	4	4	4

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (depth in m)					
				Pen. (m)	Rec. (m)	Refusal Depth (m)	Depth to 10 MPa (Dense)	Depth to 20 MP (V Dense)	0.5	1	1.5	2	2.5	3
41.000		NG	SBP						4	4	4	4	4	4
41.500		NG	SBP						4	4	4	4	4	4
42.000		NG	SBP						4	4	4	4	4	4
42.312		MMT	SBP						4	4	4	4	4	4
42.686	VC-031	MMT	VC	5.00	3.73				4	4	4	4	4	4
42.690	CPT-031	MMT	CPT			5.41			4	4	4	4	4	4
42.806		MMT	SBP						4	4	4	4	4	4
43.300		MMT	SBP						4	4	4	4	4	4
43.797		MMT	SBP						4	4	4	4	4	4
44.084	VC-032	MMT	VC	4.62	4.07				4	4	4	4	4	4
44.297		MMT	SBP						4	4	4	4	4	4
44.733	CPT-032	MMT	CPT			5.42			4	4	4	4	4	4
44.798		MMT	SBP						4	4	4	4	4	4
45.297		MMT	SBP						4	4	4	4	4	4
45.795		MMT	SBP						4	4	4	4	4	4
46.273	VC-033	MMT	VC	4.60	2.66				4	4	4	4	4	4
46.297		MMT	SBP						4	4	4	4	4	4
46.734	CPT-033	MMT	CPT			5.41			4	4	4	4	4	4
46.796		MMT	SBP						4	4	4	4	4	4

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (depth in m)					
				Pen. (m)	Rec. (m)	Refusal Depth (m)	Depth to 10 MPa (Dense)	Depth to 20 MP (V Dense)	0.5	1	1.5	2	2.5	3
47.297		MMT	SBP						4	4	4	4	4	4
47.890	VC-034	MMT	VC	4.57	3.9				4	4	4	4	4	4
47.893	CPT-034	MMT	CPT			5.38			4	4	4	4	4	4
48.297		MMT	SBP						4	4	4	4	4	4
48.797		MMT	SBP						4	4	4	4	4	4
49.021	VC-035	MMT	VC	4.50	3.63				4	4	4	4	4	4
49.315		MMT	SBP						4	4	4	4	4	4
49.829	CPT-035	MMT	CPT			5.39			4	4	4	4	4	4
50.363		MMT	SBP						4	4	4	4	4	4
50.861		MMT	SBP						4	4	4	4	4	4
51.008	VC-036	MMT	VC	4.52	4.04				4	4	4	4	4	4
51.360		MMT	SBP						4	4	4	4	4	4
51.858	CPT-036	MMT	CPT			5.52			4	4	4	4	4	4
51.860		MMT	SBP						4	4	4	4	4	4
52.359		MMT	SBP						4	4	4	4	4	4
52.857	CPT-037	MMT	CPT			5.40			4	4	4	4	4	4
52.860	VC-037	MMT	VC	4.62	4.14				4	4	4	4	4	4
53.356		MMT	SBP						4	4	4	4	4	4
53.858	CPT-038	MMT	CPT			5.42			4	4	4	4	4	4

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (depth in m)					
				Pen. (m)	Rec. (m)	Refusal Depth (m)	Depth to 10 MPa (Dense)	Depth to 20 MP (V Dense)	0.5	1	1.5	2	2.5	3
53.860		MMT	SBP						4	4	4	4	4	4
54.373		MMT	SBP						4	4	4	4	4	4
54.873		MMT	SBP						4	4	4	4	4	4
55.003	VC-038	MMT	VC	4.37	4.00				4	4	4	4	4	4
55.373		MMT	SBP						4	4	4	4	4	4
55.861		MMT	SBP						4	4	4	4	4	4
56.032	CPT-039	MMT	CPT			5.54			4	4	4	4	4	4
56.386		MMT	SBP						4	4	4	4	4	4
56.662	VC-039	MMT	VC	4.02	3.39				4	4	4	4	4	4
56.898		MMT	SBP						4	4	4	4	4	4
57.397		MMT	SBP						7	6	5	4	4	4
57.891		MMT	SBP						7	6	5	5	4	4
58.177	CPT-040	MMT	CPT			5.47	1.35		7	6	5	5	5	5
58.181	VC-040	MMT	VC	5.23	4.04				7	6	5	5	6	5
58.341		MMT	SBP						7	6	4	4	4	4
58.819		MMT	SBP						4	4	4	4	4	4
59.034	CPT-041	MMT	CPT			5.55			4	4	4	4	4	4
59.322		MMT	SBP						4	4	4	4	4	4
59.821	VC-041	MMT	VC	5.27	4.80				4	4	4	4	4	4

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (depth in m)					
				Pen. (m)	Rec. (m)	Refusal Depth (m)	Depth to 10 MPa (Dense)	Depth to 20 MP (V Dense)	0.5	1	1.5	2	2.5	3
59.822		MMT	SBP						4	4	4	4	4	4
60.323		MMT	SBP						7	6	5	5	6	5
60.621	CPT-042	MMT	CPT			5.39	1.23		7	6	5	6	6	4
60.823		MMT	SBP						7	6	5	4	4	4
61.323		MMT	SBP						4	4	4	4	4	4
61.823		MMT	SBP						4	4	4	4	4	4
61.841	VC-042	MMT	VC	4.65	3.61				4	4	4	4	4	4
62.323		MMT	SBP						7	6	5	4	4	4
62.542	VC-043	MMT	VC	5.43	5.53				7	5	5	3	3	3
62.545	CPT-043	MMT	CPT			5.41	0.96	1.71	7	5	5	3	3	3
62.823		MMT	SBP						7	6	5	4	4	4

10.6 BLOCK 04 OFFSHORE KP 63.000 TO KP 104.400

Table 10-27: Alignment Sheets for Block 04 Offshore KP 63.000 to KP 104.400

AS-5K-020 - AS-5K-033

10.6.1 Bathymetry and Morphology

Bathymetric data from Block 04 reveal a gentle, relatively flat seabed surface, with depths ranging from 19.73 meters at KP 63.000 to 11.01 meters at KP 104.400. A minimum depth of 10.18 meters is recorded at KP 103.971, and a maximum depth of 26.19 meters at KP 75.513 (Figure 10-45).

The seabed slopes very gently northward along the RPL, with an average gradient of up to 1°. In areas characterized by megaripples, the maximum gradient reaches 20.08° at KP 82.453. The block contains several wrecks; however, none intersect the proposed route (see Figure 10-46).

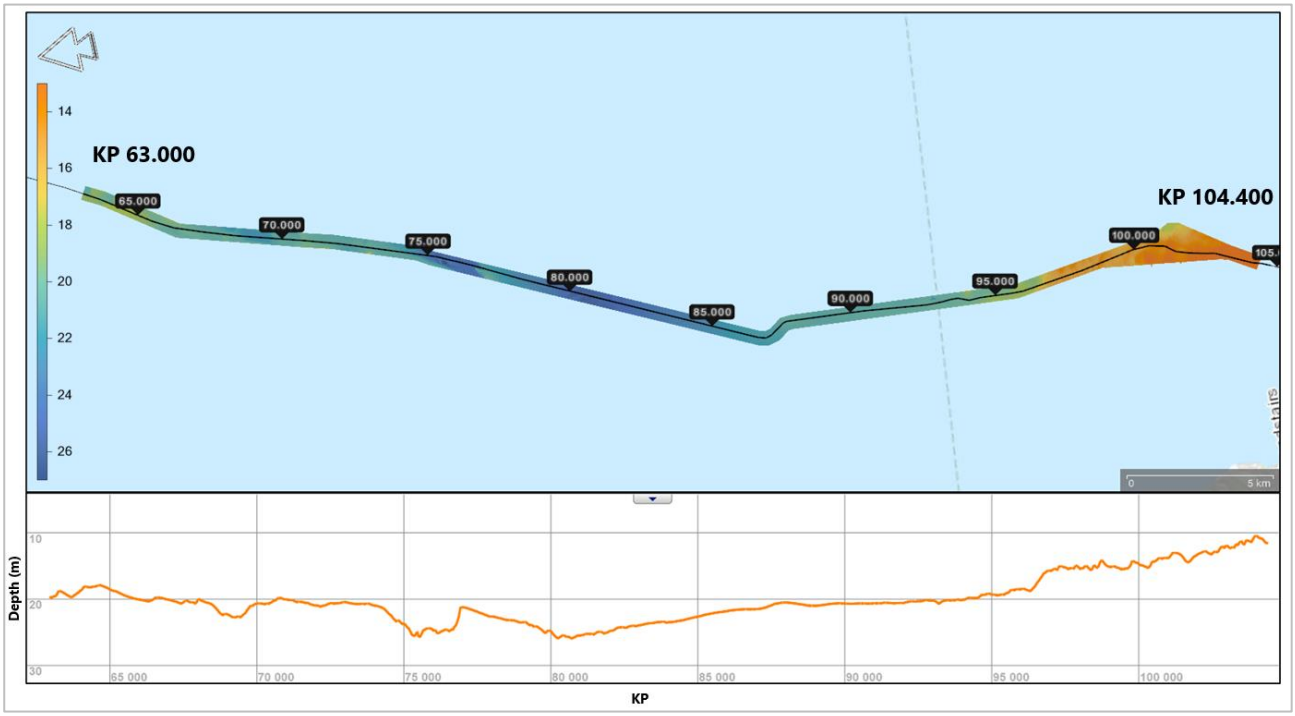

Figure 10-45: Overview of the Bathymetry in Block 04 between KP 63.000 and KP 104.400

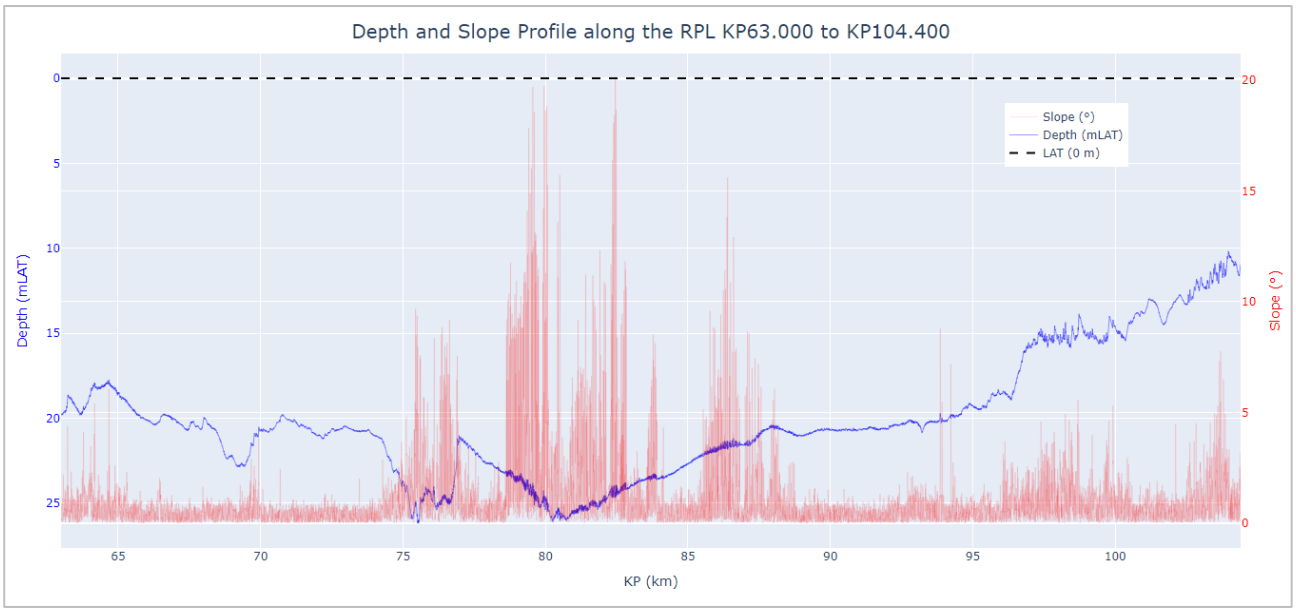

Figure 10-46: Block 04 between KP 63.000 and KP 104.000 Seabed Depth and Slope Profile

10.6.2 Surficial Geology and Seabed Features

The surficial geology throughout Block 04 Offshore is primarily SAND and gravelly SAND to sandy GRAVEL, CLAY, CHALK and stiff CLAY. Along this section of the route, gravelly SAND to sandy GRAVEL was encountered along the between around KP 63.000 to KP 81.555 and KP 96.390 to KP 104.400. Geotechnical investigations describe this area as loose to very loose gravelly silty SAND. SAND is recorded between KP 79.909 to KP 80.103, KP 80.400-80.528, KP 81.555-83.917 and KP 85.520-96.390. Intermittently, CLAY is present, described as extremely low to very low strength, slightly gravelly sandy silty clay within geotechnical locations.

CHALK was encountered at the surface ~540.3 m port of KP 100.954.

Erosional depression is present from KP 76.890 to KP 78.601, followed by stretches of megaripples observed between KP 78.601 and KP 79.768, KP 79.909 and KP 80.103, KP 80.404 and KP 80.528, KP 81.555 and KP 83.321, KP 83.554 and KP 83.920, KP 85.515 and KP 87.653, KP 87.888 and KP 88.198, and again from KP 95.941 to KP 96.372.

An occasional boulder fields were observed across the surveyed area, crossing the RPL between KP 94.219 and KP 94.285. Debris fields were also encountered within the surveyed area, with the closest located ~114 m southeast of KP 100.846.

A 5 m wide trench, approximately 20 cm deep, crosses the RPL from KP 102.120 to KP 102.125. It runs NW–SE across the full survey width. The trench appears to reflect seabed modifications, likely man-made, but cannot be linked to any known past activities. No cables or pipelines were identified at this location, only two low amplitude magnetic anomalies were detected close to it (Figure 10-55).

Other seabed features identified in this section include mottled seabed textures, mound clusters, and areas of disturbed sediment. Figure 10-47 and Figure 10-54 illustrates the seabed sediments and features present in Block 04 offshore.

Mobile sediments in the form of ripples, megaripples, sandwaves, and sandbank are also present on this section of the route, a summary of their crossings with the RPL is provided in Table 10-28.

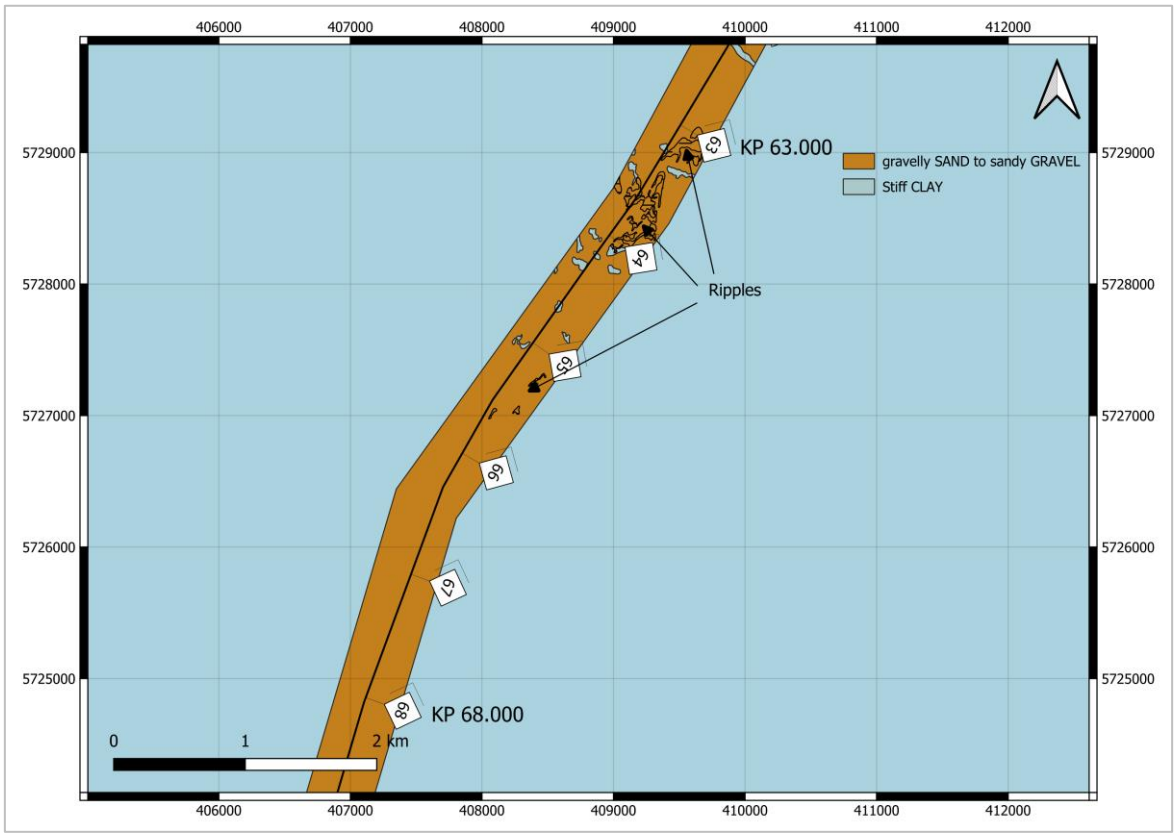

Figure 10-47: Overview of Seabed Geology and Features Block 04 between KP 63.000 and KP 68.000

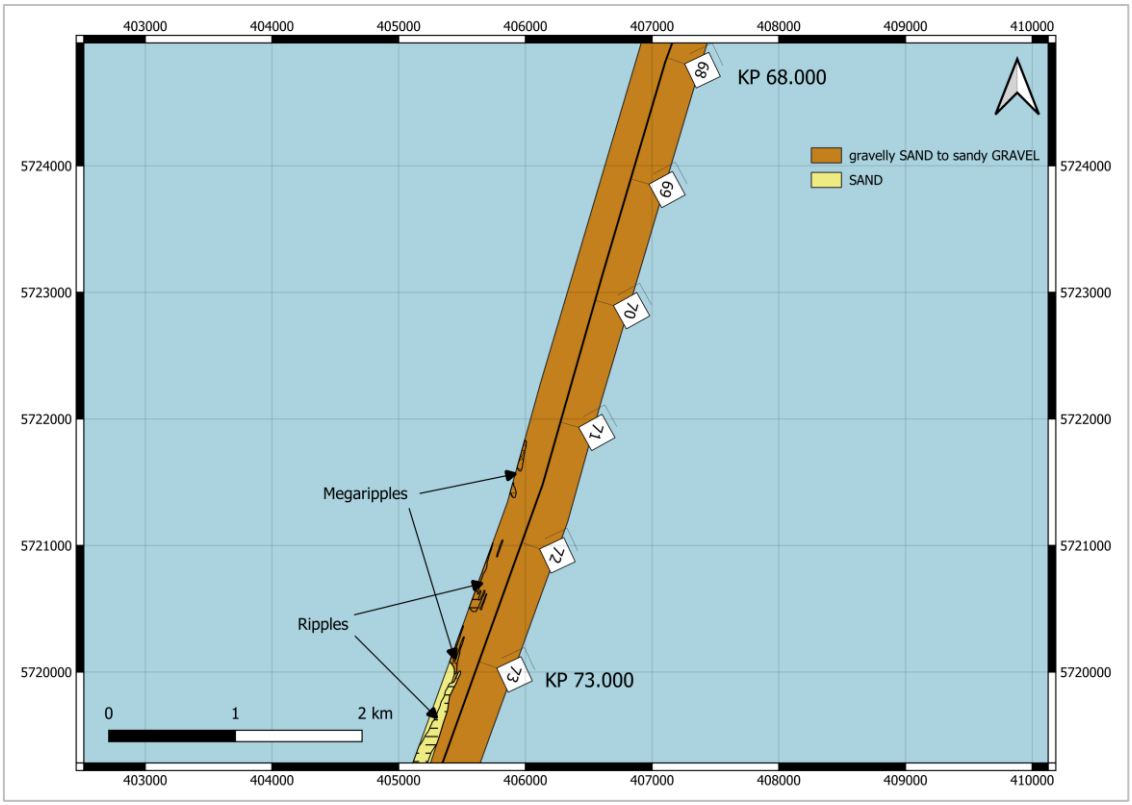

Figure 10-48: Overview of Seabed Geology and Features Block 04 between KP 68.000 and KP 73.400

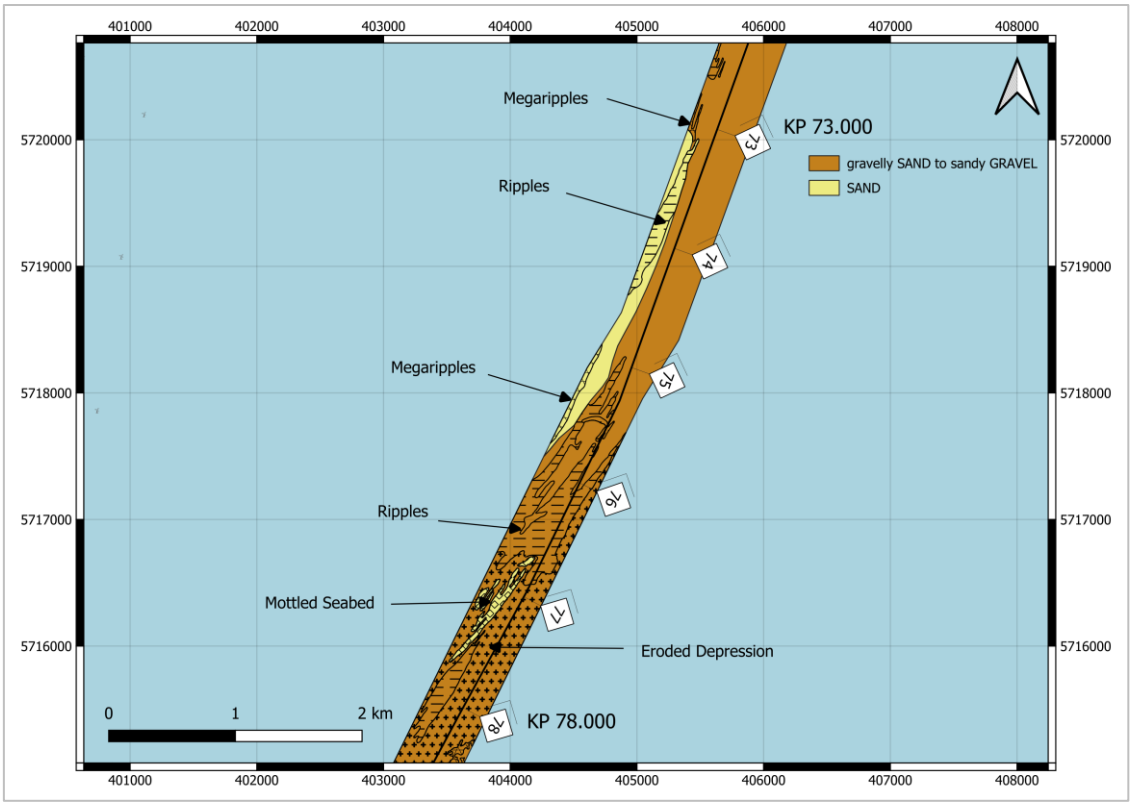

Figure 10-49: Overview of Seabed Geology and Features Block 04 between KP 73.000 and KP 78.000

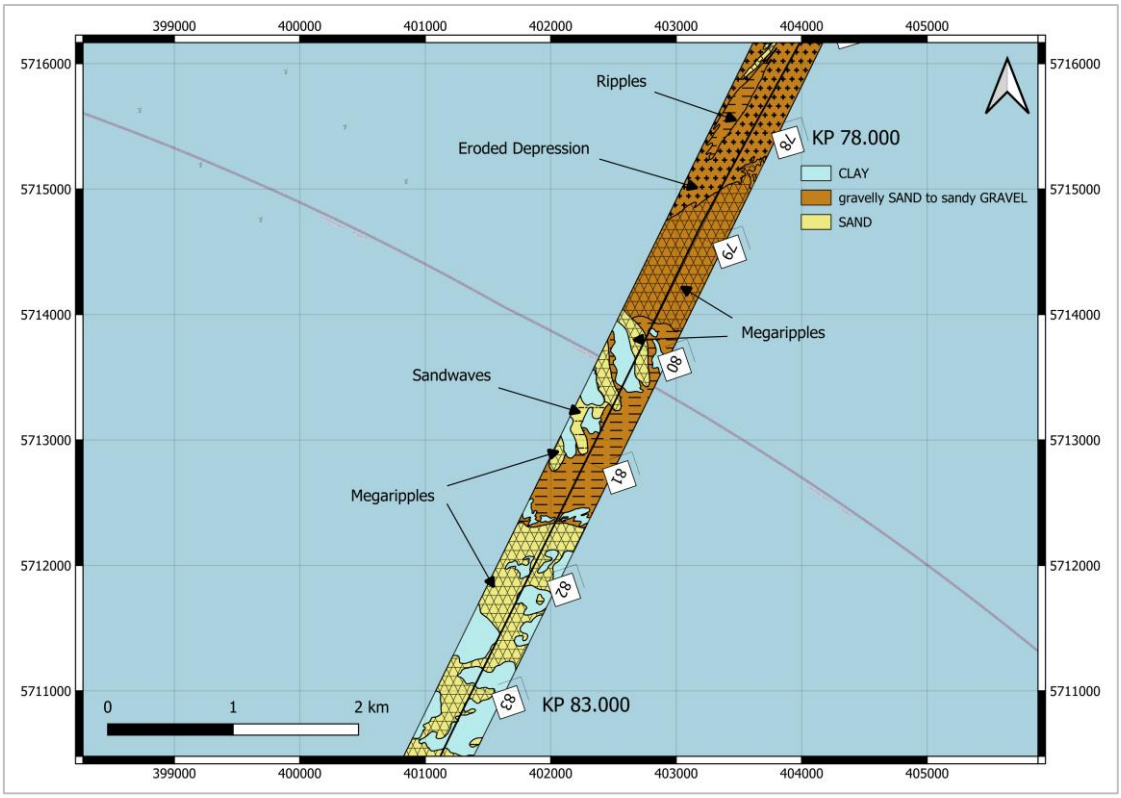

Figure 10-50: Overview of Seabed Geology and Features Block 04 between KP 78.000 and KP 83.000

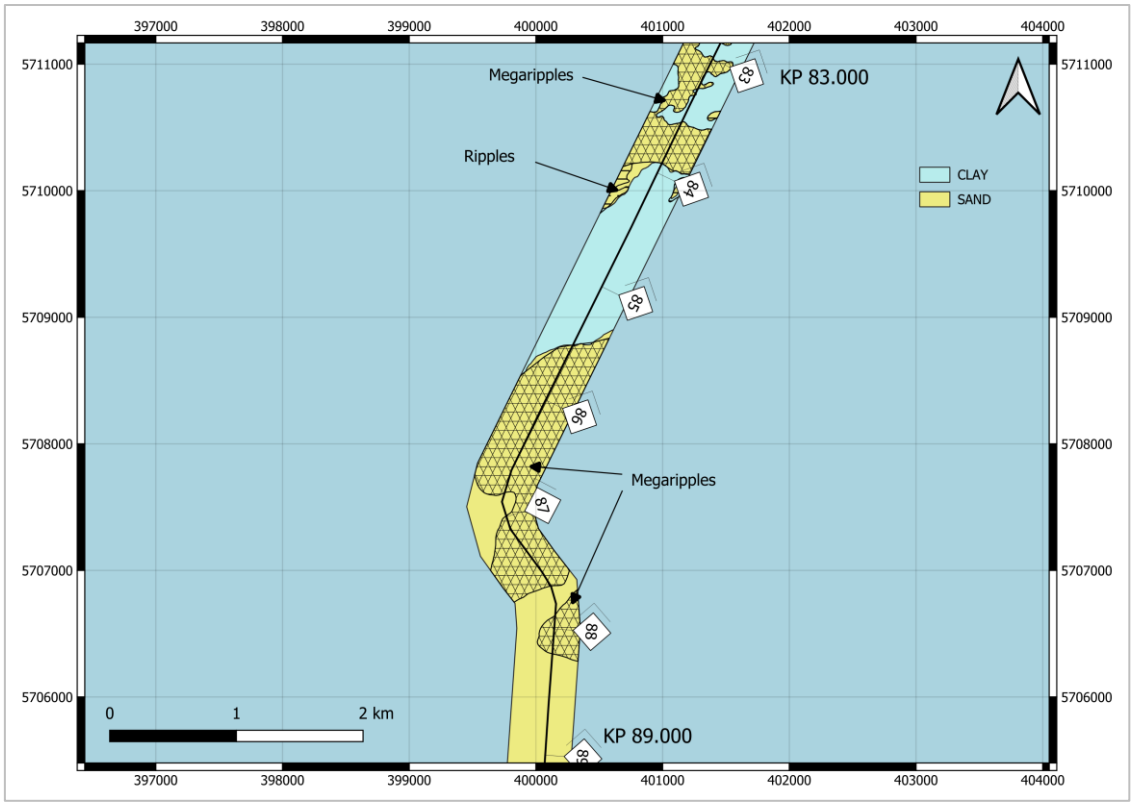

Figure 10-51: Overview of Seabed Geology and Features Block 04 between KP 83.000 and KP 89.000

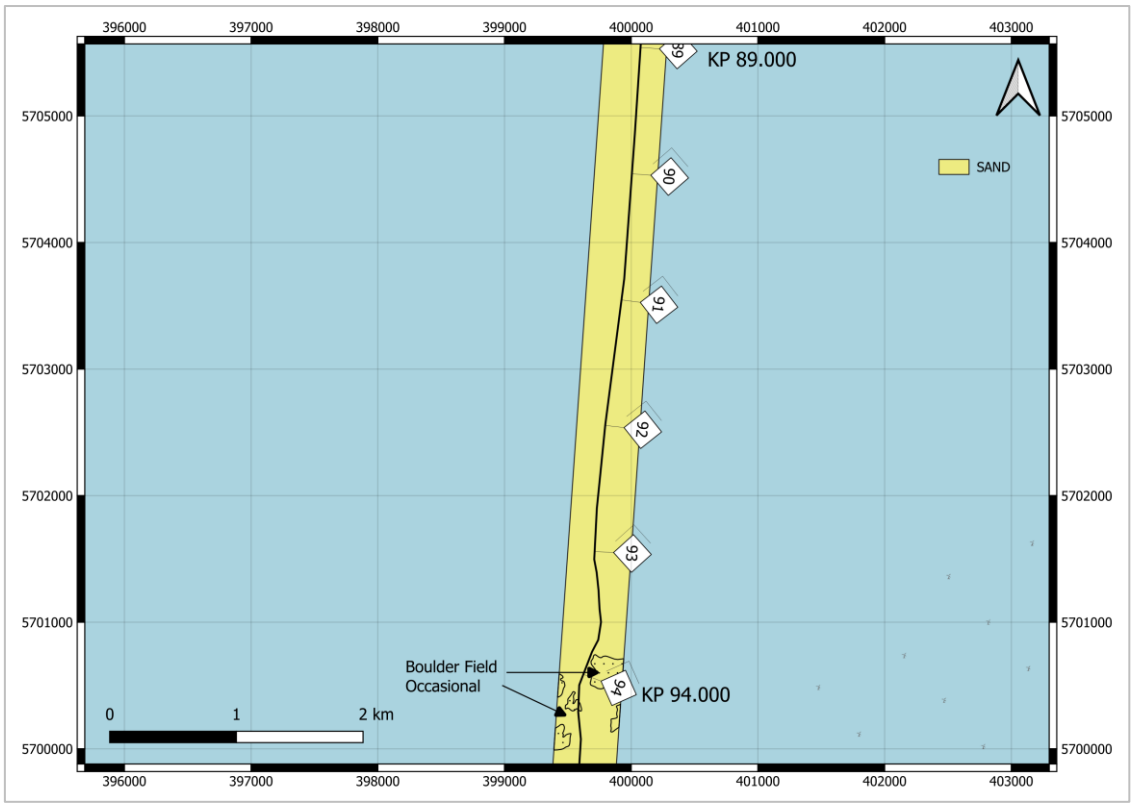

Figure 10-52: Overview of Seabed Geology and Features Block 04 between KP 89.000 and KP 94.000

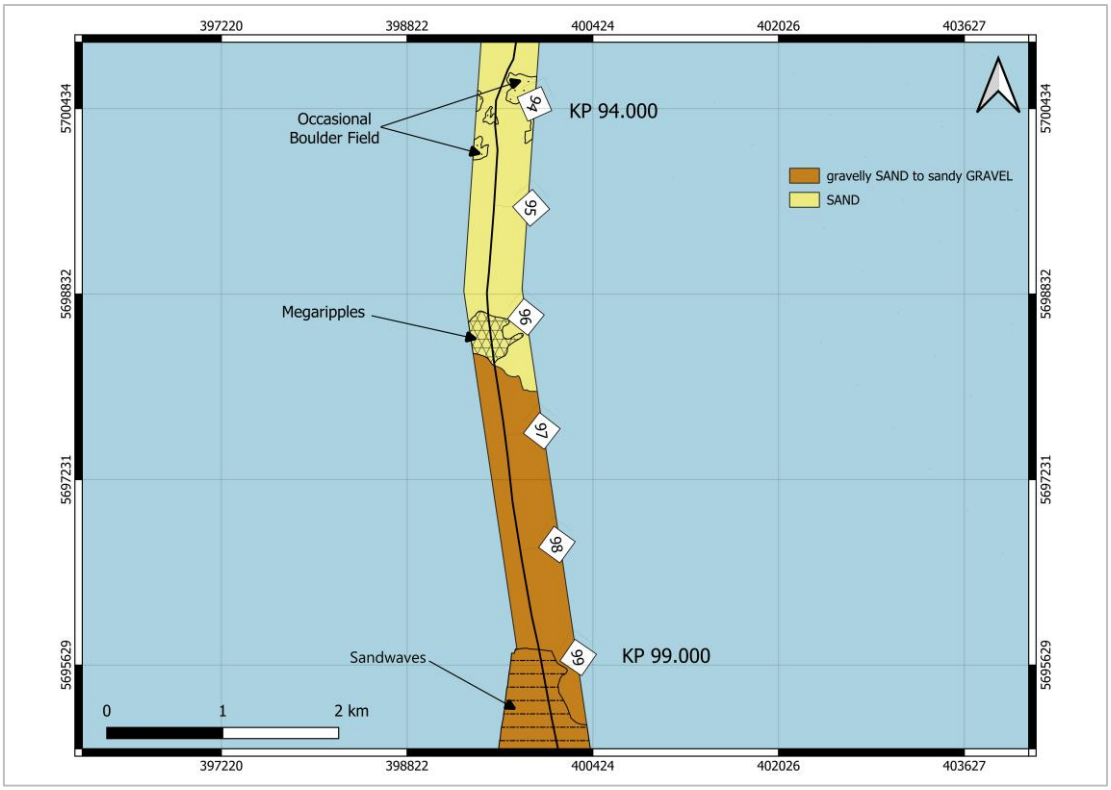

Figure 10-53: Overview of Seabed Geology and Features Block 04 between KP 94.000 and KP 99.000

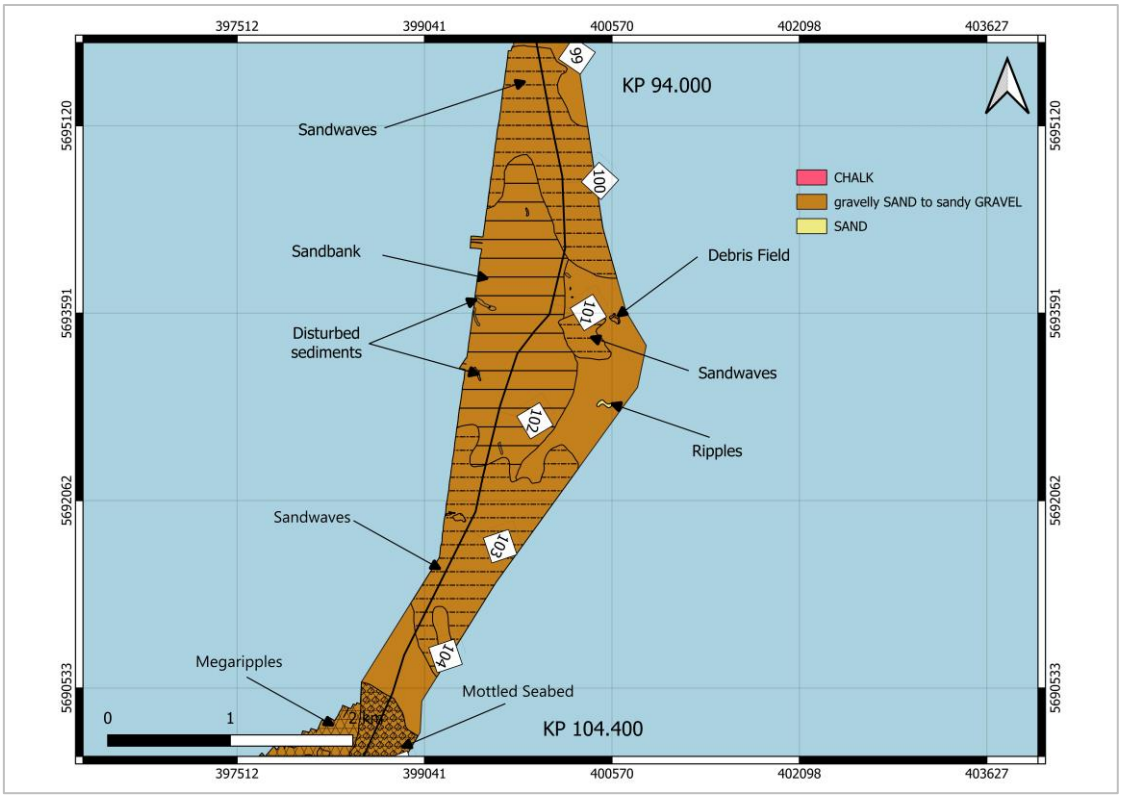

Figure 10-54: Overview of Seabed Geology and Features Block 04 between KP 99.000 and KP 104.400

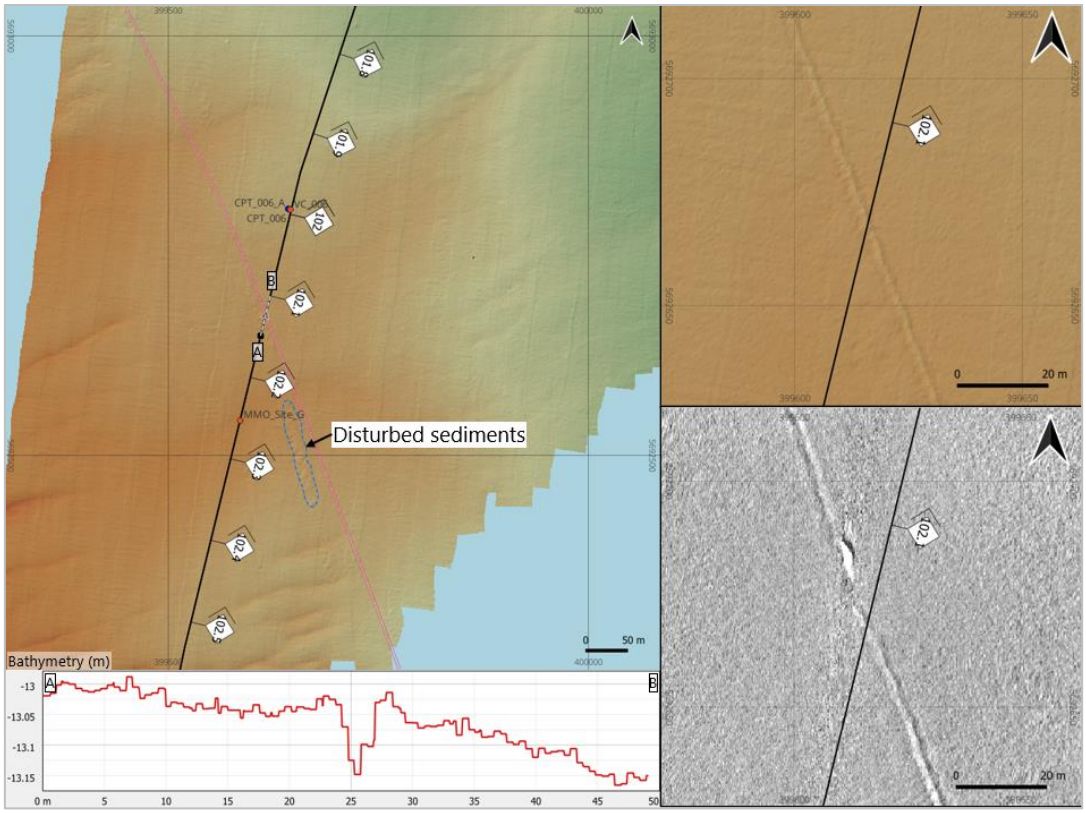

Figure 10-55: MBES & SSS Data Example Showing Trench in Block 04

Table 10-28 Summary of Mobile Sediments in Block 04

Feature	Start KP	End KP
Ripples	63.580	63.632
Ripples	63.677	63.759
Ripples	75.375	75.564
Ripples	75.670	75.793
Ripples	76.071	76.890
Megaripples	78.601	79.768
Ripples	79.768	79.826
Ripples	79.859	79.909
Megaripples	79.909	80.103
Ripples	80.343	80.404
Megaripples	80.404	80.528
Ripples	80.528	80.748
Ripples	80.750	81.555
Megaripples	81.555	82.000
Megaripples	82.012	82.142
Megaripples	82.259	82.555
Megaripples	82.560	82.853
Megaripples	82.992	83.131
Megaripples	83.196	83.264
Megaripples	83.30	83.321
Megaripples	83.554	83.92
Megaripples	85.515	86.804
Megaripples	86.992	87.653
Megaripples	87.888	88.198
Megaripples	95.941	96.372
Sandwaves	98.872	100.570
Sandbank	100.570	102.447
Sandwaves	102.447	103.942

10.6.3 Contacts and Anomalies

A total of 569 SSS contacts and 537 magnetic anomalies were identified within the Block 04 survey corridor. SSS contacts and magnetic anomalies are summarized in Table 10-29 and Table 10-30.

A total of 40 SSS contacts are correlating with magnetic anomalies. 15 of them are related with boulders, 13 related to debris, 7 related to linear debris, 4 related to wrecks, and one to a chain. A correlation distance of 10 m was used between MAG and SSS. One related to a wreck is 20 m away.

Table 10-29: Summary Block 04 SSS Contacts

CLASSIFICATION	NUMBER
Boulder	421
Debris	118
Linear Debris	15
Wreck	4
Other	11
Total	569

Table 10-30: Summary Block 04 Magnetic Anomalies

CLASSIFICATION	NUMBER
Known wreck	3 (wreck)
Known cable	16 (2 cable)
Unknown cable	0
Linear debris of geological feature	29 (8 features)
Unclassified Discrete anomalies	489
Total	537

10.6.4 Shallow Geology

From KP 63.000 to KP 74.080, very stiff CLAY is present at or near the seabed (0.2 m BSF), with occasional sections where SAND alternating with GRAVEL is 1-2 m thick. Thereafter, from KP 74.080 to KP 80.150, the SAND unit becomes consistently thicker than 1 m, reaching a maximum of 8 m at KP 78.401. Between KP 80.150 and KP 81.000, SAND is up to 0.8 m thick and overlies very dense SAND. Further along, from KP 81.000 to KP 86.945, SAND thickness varies between 1-7 m. Beyond this, from KP 86.945 to KP 93.600, SAND thickness ranges from 1 to 8 m and is underlain by SILT, with stiff CLAY occurring below approximately 8 m BSF.

Near KP 90.070, a gradual transition from SILT to soft CLAY is observed. This is followed by a change to a base of SAND unit around KP 92.326. Between KP 92.364 and KP 93.576, firm CLAY—interpreted as channel infill—overlies dense to very dense SAND. The base of the sand unit is not visible due to acoustic attenuation. Subsequently, between KP 93.576 and KP 96.520, a loose sand veneer up to 0.5 m thick overlies dense to very dense sand.

Starting at KP 92.880 and continuing to KP 94.620, top of CHALK appears initially at ~10 m BSF and gradually becomes shallower until it reaches the seabed (<0.2 m). From this point to KP 100.793, CHALK remains near the surface, with only rare and thin SAND deposits up to 1 m thick. From KP 100.793 to KP 102.468, granular sediments—composed of SAND and CLAY—increase in thickness and reach a maximum of 2.8 m overlying CHALK.

Beyond this, between KP 102.573 and KP 104.400, CHALK is again at or near the seabed (0.2 m BSF), interspersed with occasional alternating SAND and GRAVEL layers up to 1.4 m thick. Caution is advised during laying and trenching operations in areas where the hard CHALK substrate is sub-cropping or outcropping.

A channel feature crosses the corridor from southwest to northeast between KP 100.883 and KP 101.079. Within this section, the channel reaches depths of up to 2.7 m BSF.

10.6.5 Geotechnical

38 geotechnical locations were undertaken within Block 04. MMT undertook 14 standalone CPT's, 15 standalone VC's and 8 co-located VC/CPT locations. NextGeo undertook a single co-located VC/CPT location. The locations are shown schematically below in Figure 10-56 to Figure 10-60.

Some of MMT locations were excluded from the interpretation as they fall far away from the new RPL. These locations are listed in Table 10-31 for reference. The geological information from these locations was no longer suitable to the RPL, which had been re-routed for engineering purposes.

Table 10-31: Geotechnical Locations excluded from Block 04 Interpretation

Block	Location ID	Distance from RPL (m)
4	748-CPT-066	246
4	748-CPT-066A	242
4	748-NAT-NB-VC-066	541
4	748-CPT-067A	316
4	748-CPT-067	318
4	748-NAT-NB-VC-067	315
4	748-CPT-068A	202
4	748-CPT-068	204

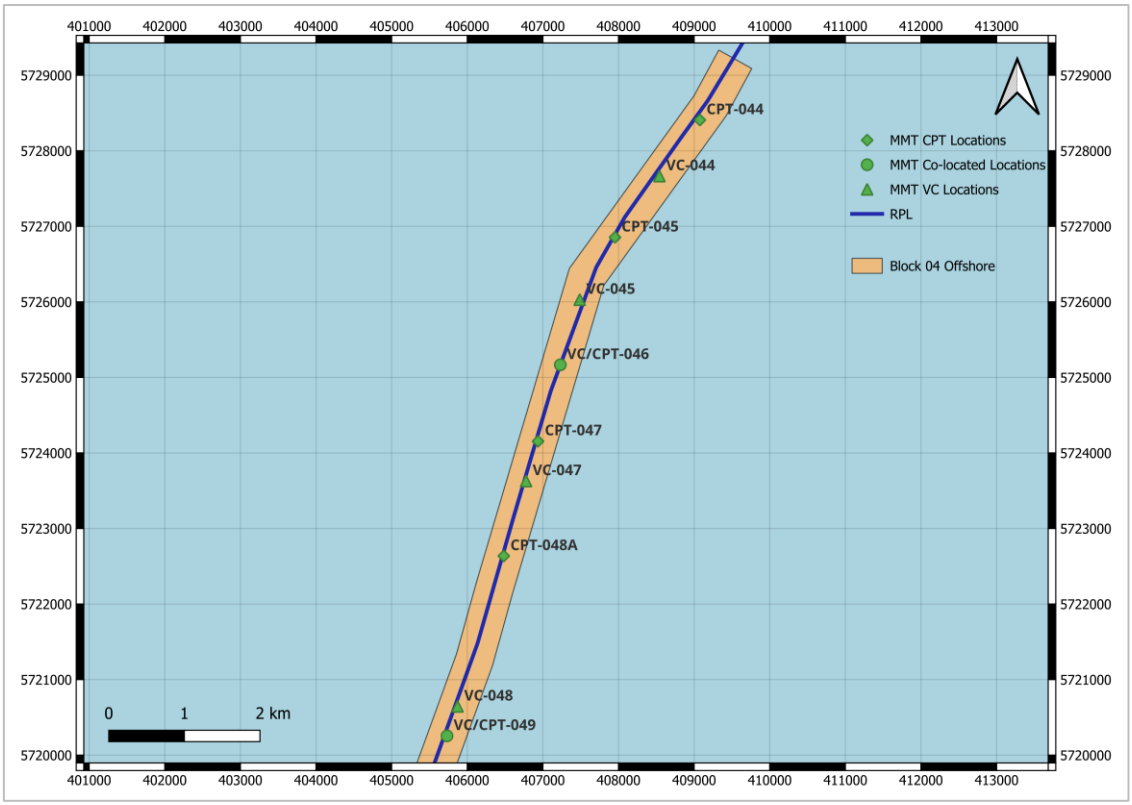

Figure 10-56: Location Plan for Block 04 between KP 63.000 and KP 72.803

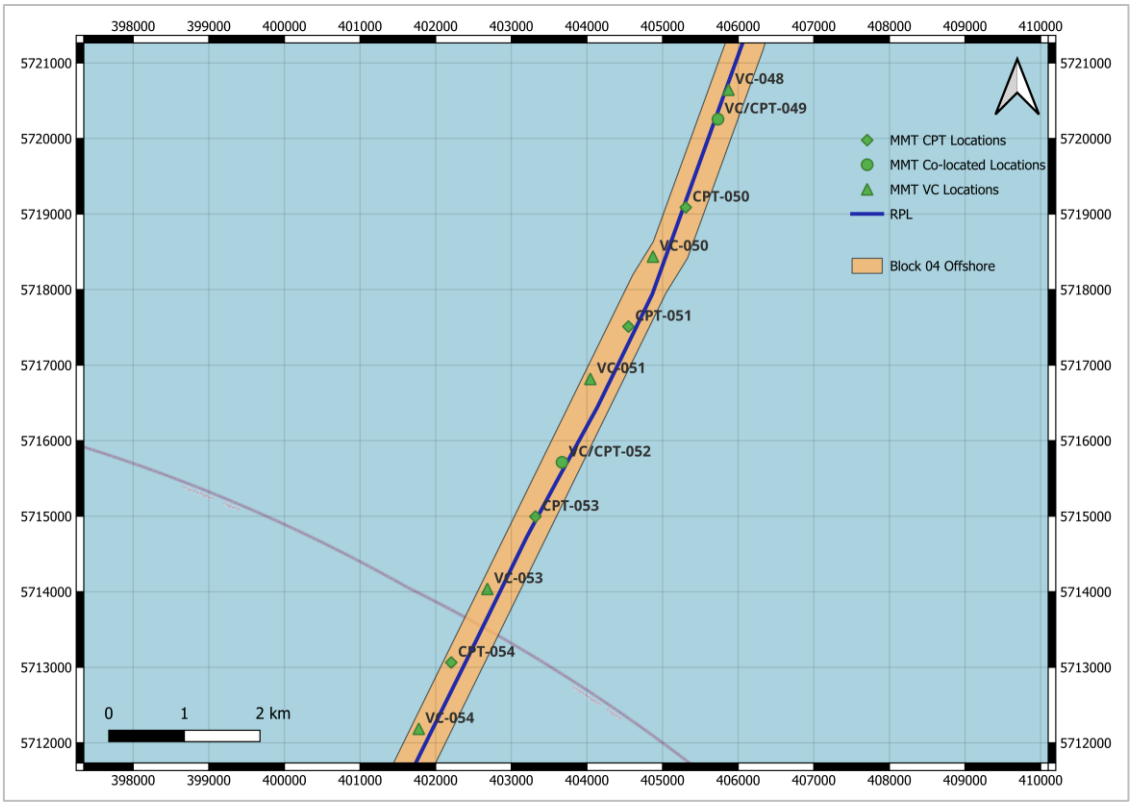

Figure 10-57: Location Plan for Block 04 between KP 72.803 and KP 81.803

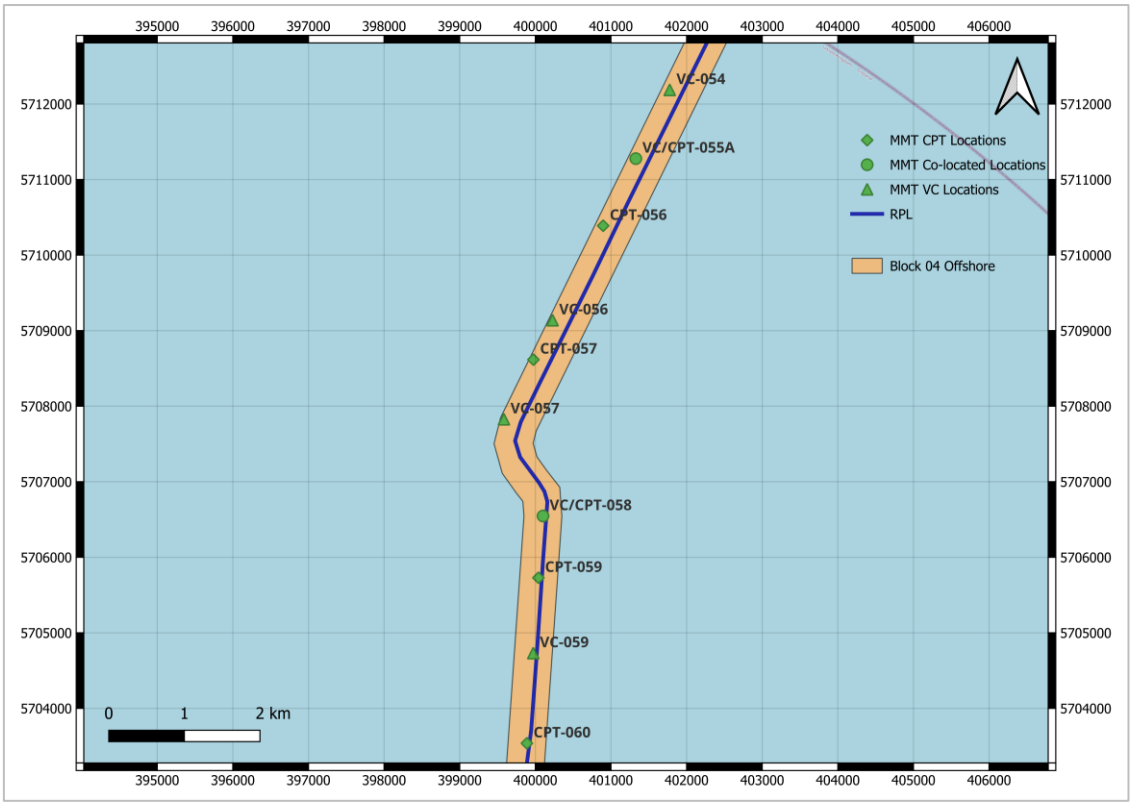

Figure 10-58: Location Plan for Block 04 between KP 81.803 and KP 91.012

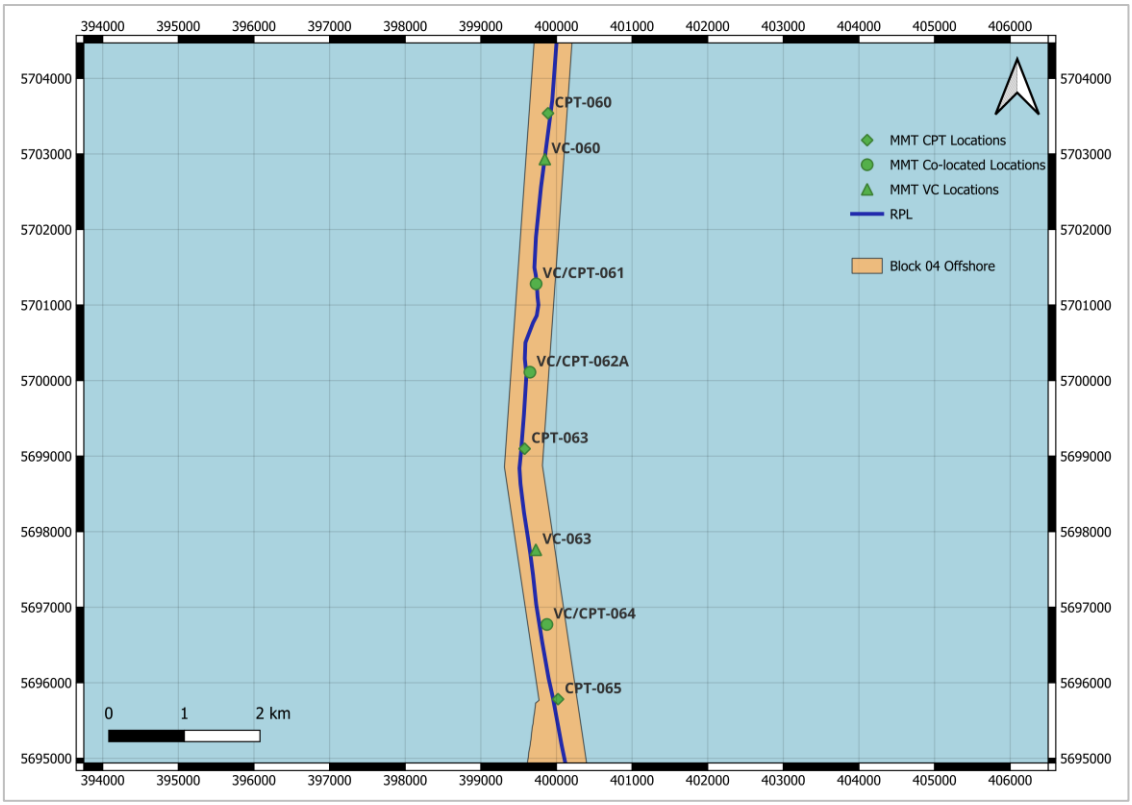

Figure 10-59: Location Plan for Block 04 between KP 91.012 and KP 98.862

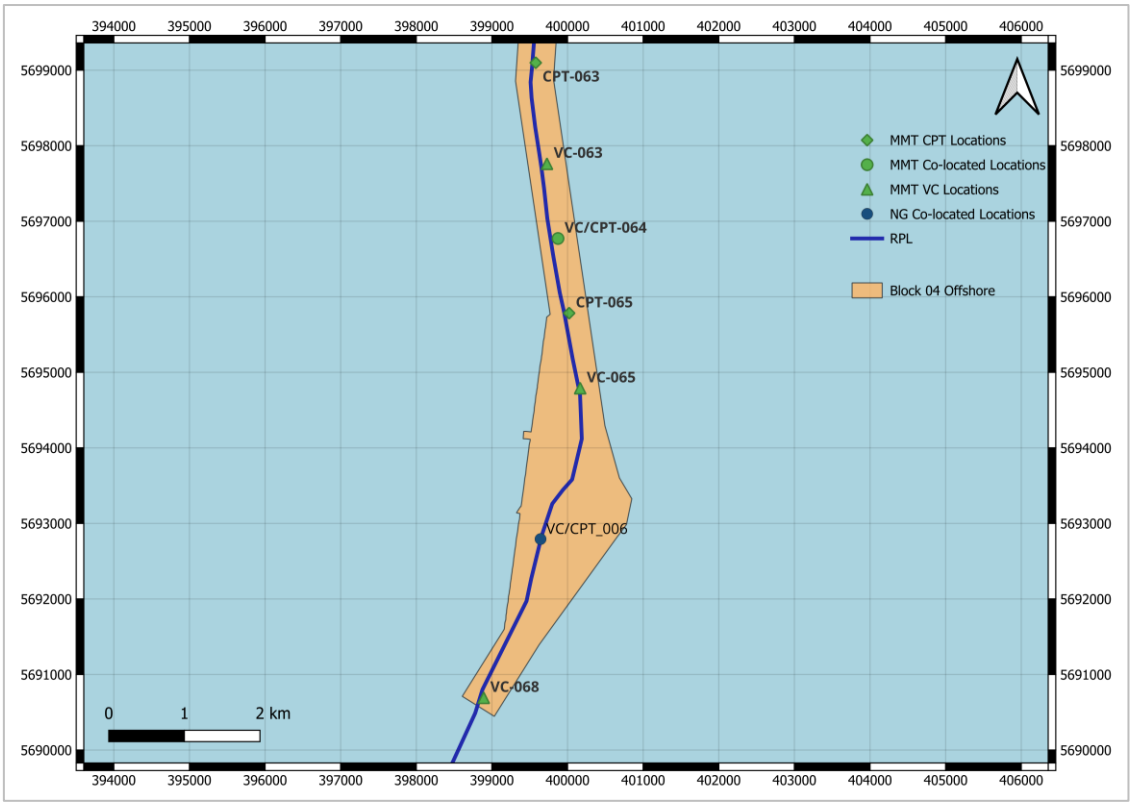

Figure 10-60: Location Plan for Block 04 between KP 95.496 and KP 104.400

The ground conditions within the first section of Block 04 between CPT-044 (KP 63.905) and VC/CPT-049 (KP 72.803) are a continuation of those seen in Block 03, with medium to very high strength fissured CLAY present beneath a medium bed (less than 0.50 m thick) of very loose to loose silty gravelly SAND.

A marked changed occurs from CPT-050 (KP 74.046) until VC/CPT-062 (KP 95.075), where granular material becomes the dominant soil type. The granular material comprises a mixture of silty SAND and silty gravelly SAND, which is predominantly very loose to medium dense, with no noticeable trend visible with regards to relative density and depth. In several locations, primarily between CPT-051 (KP 75.800) and VC-054 (KP 81.803), SAND occurs from the seabed to the base of the location, with a maximum depth of 5.55 m in CPT-054 (KP 80.827).

It is noticeable that the depth of the medium to very high strength CLAY unit has increased in comparison to previous Blocks. In many instances, this CLAY unit is not encountered until below 2.40 m. Where present at shallower depths, the CLAY is predominantly extremely low to low strength and forms thin beds between granular strata. CLAY is present as the surficial deposit between KP 82.817 and KP 83.803 (VC/CPT-055 to CPT-056), where it was recorded as being extremely low to very low strength with intermediate plasticity.

SILT occurs within 9 locations in Block 04. It predominantly occurs as beds no greater than 1.00 m in thickness, and at a depth greater than 1.20 m. Two distinct clusters of SILT are present, between VC/CPT-046 and CPT-047 (KP 67.666 to KP 68.722) and between VC-056 and VC-059 (KP 85.223 to KP 89.813). Within VC/CPT-058 (KP 87.994), SILT is recorded as being between 2.70 m and 3.67 m thick, with the base of the strata not encountered within the VC. The SILT is variable in composition throughout the Block and is described as both a granular and cohesive material. Where described as a granular material, the density is recorded as loose to medium dense. Where described as cohesive, the strength ranges between low and high.

At the end of Block 04, between CPT-063 and VC-068 (KP 95.496 to KP 104.243), CHALK was recorded, primarily situated beneath overlying granular soils of a thickness between 0.14 m and 2.18 m. Between KP 96.859 and KP 97.859 (VC-063 to VC-064) the CHALK outcropped at the surface.

Most of the CHALK recovered from the VC locations was described as CIRIA Grade Dc, meaning that the CHALK is structureless and clast dominated. A single occurrence of CIRIA Grade Dm CHALK was recorded between 3.91 m and 4.69 m at VC-068 (KP 104.243), with the material being described as a slightly sandy gravelly silt. In addition, 2 instances of CIRIA Grade C1 CHALK was described at VC-063 (KP 96.859) and VC-065 (KP 99.865), indicating that the CHALK contains discontinuities with an aperture > 3 mm and spacing > 600 mm. This soil type measured a highly variable relative density (Dr) between 5.0 – 98.9 %, which is representative of a very loose to very dense granular soil.

10.6.5.1 Geotechnical Model

Figure 10-61 to Figure 10-66 below present the locations in the form of a geotechnical model; with relative density (DR), shear strength (Su), and soil classification plotted against depth in 0.50 m sections.

As can be observed from the geotechnical model, Su values within the CLAY present between CPT-044 and CPT-049 are generally in the high to very high classification. The values also exhibit a trend of increasing Su

with depth. Notably, Su values for the cohesive soils present in CPT-059 are lower than within the rest of the Block, with average values in the range of 18 kPa to 23 kPa, classifying the soils as very low to low strength.

As mentioned in Section 10.6.4, granular material becomes the dominant soil type between CPT-050 and VC/CPT-062. The material is primarily loose to medium dense, with most locations exhibiting no correlation between Dr and depth. Areas of dense to very dense granular material are recorded between 1.00 m and 4.00 m in CPT-050, 2.00 m and 3.50 m in CPT-057 and 2.00 m and 4.00 m in CPT-060. Another notable feature is the medium dense to very dense granular material present between 0.00 m and 2.00 m in CPT_006_A. The granular material exhibited average Dr values between 35 % and 103 %.

Where structureless CHALK is present within CPT locations, Dr values are presented due to the gravelly composition of the material. The CHALK has average Dr values falling into the loose to medium dense classification, from 18 % to 50 %. There is no apparent relationship between depth and the Dr values within the CHALK.

KP (km)	63.905			64.820			65.824			66.769			67.668			68.722			69.271		
DCC (m)	-65.485			-60.332			-19.273			57.388			0.470			-26.380			-23.091		
ID CPT / VC	748-CPT-044	748-CPT-044		748-NAT-NB-VC-044	748-NAT-NB-VC-044	748-NAT-NB-VC-044	748-CPT-045	748-CPT-045		748-NAT-NB-VC-045	748-NAT-NB-VC-045	748-NAT-NB-VC-045	748-CPT-046	748-CPT-046	748-NAT-NB-VC-046A	748-CPT-047	748-CPT-047		748-NAT-NB-VC-047	748-NAT-NB-VC-047	748-NAT-NB-VC-047
Depth (m)	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**
0.00 - 0.50	35					8		32				2	18		8	14				129	2
0.50 - 1.00		75			75	2		51			90	2		80	2		76			126	2
1.00 - 1.50		86			100	2		68			135	2		106	2		82			116	2
1.50 - 2.00		92			103	2		93			122	2		97	2		90			153	2
2.00 - 2.50		94			145	2		96			124	2		96	2		102			92	2
2.50 - 3.00		104			140	2		107			145	2		92	2		104			153	2
3.00 - 3.50		108			173	2		99						87	2		100			175	2
3.50 - 4.00		105			163	2		97						93	2		102			186	2
4.00 - 4.50		110						102						95			114			191	2
4.50 - 5.00		114						111						105			113				
5.00 - 5.50		119						128						113			114				
5.50 - 6.00																					

Figure 10-61: Geotechnical Model of Block 04 between KP 63.905 and KP 69.271

KP (km)	70.307			72.389			72.803			74.046			74.805			75.800			76.643		
DCC (m)	-16.259			-33.055			-34.227			-28.146			159.682			96.292			246.955		
ID CPT / VC	748-CPT-048A	748-CPT-048A		748-NAT-NB-VC-048	748-NAT-NB-VC-048	748-NAT-NB-VC-048	748-CPT-049	748-CPT-049	748-NAT-NB-VC-049	748-CPT-050	748-CPT-050		748-NAT-NB-VC-050	748-NAT-NB-VC-050	748-NAT-NB-VC-050	748-CPT-051	748-CPT-051		748-NAT-NB-VC-051	748-NAT-NB-VC-051	748-NAT-NB-VC-051
Depth (m)	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC
0.00 - 0.50	16				96	2		48	2	33					8	38					8
0.50 - 1.00		77			111	2		59	2	57					8	59					9
1.00 - 1.50		84			135	2		73	2	69			75		8	53					9
1.50 - 2.00		89			81	2		92	2	57					8	58					8
2.00 - 2.50		87			128	2		92	2	95			80		8	56					8
2.50 - 3.00		96			112	2		114	2	108					8	37					8
3.00 - 3.50		95			172	2		137	2	90					5	27					8
3.50 - 4.00		107			167	2		112		73					5	49					8
4.00 - 4.50		104			172	2		102		55					9	49					8
4.50 - 5.00		108						107			77					49					
5.00 - 5.50		119						102			78					56					
5.50 - 6.00																					

Figure 10-62: Geotechnical Model of Block 04 between KP 70.307 and KP 76.643

KP (km)	77.804			78.603			79.741			80.826			81.803			82.817			83.803		
DCC (m)	59.200			27.031			166.596			168.533			165.097			164.091			163.165		
ID CPT / VC	748-CPT-052	748-CPT-052	748-NAT-NB-VC-052	748-CPT-053	748-CPT-053		748-NAT-NB-VC-053	748-NAT-NB-VC-053	748-NAT-NB-VC-053	748-CPT-054	748-CPT-054		748-NAT-NB-VC-054	748-NAT-NB-VC-054	748-NAT-NB-VC-054	748-CPT-055A	748-CPT-055A	748-NAT-NB-VC-055A	748-CPT-056	748-CPT-056	
Depth (m)	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC
0.00 - 0.50	23		8	28					8	24					8		5	4		4	
0.50 - 1.00	22		8	16					8	32					8	34		9		7	
1.00 - 1.50	22		8	23					8	40			92		9	55		9	55		
1.50 - 2.00	31		8	21			80		8	48					9	50		9	61		
2.00 - 2.50	25		8	17					8	45					9	52		9	60		
2.50 - 3.00	23		8		9				8	43					9	58		9	52		
3.00 - 3.50	26		8	15					8	38					9	51		9	56		
3.50 - 4.00	20		8	14					9	46			69		9	50		9	49		
4.00 - 4.50	30		8		9				9	46					9	47		9	47		
4.50 - 5.00	27		8		8				9	45					9	56			47		
5.00 - 5.50	26		8						9	40									50		
5.50 - 6.00										37									58		

Figure 10-63: Geotechnical Model of Block 04 between KP 77.804 and KP 83.803

KP (km)	85.223			85.803			86.646			87.994			88.813			89.813			91.012		
DCC (m)	216.440			211.622			223.578			47.500			45.428			47.130			33.525		
ID CPT / VC	748-NAT-NB-VC-056	748-NAT-NB-VC-056	748-NAT-NB-VC-056	748-CPT-057	748-CPT-057		748-NAT-NB-VC-057	748-NAT-NB-VC-057	748-NAT-NB-VC-057	748-CPT-058	748-CPT-058	748-NAT-NB-VC-058	748-CPT-059	748-CPT-059		748-NAT-NB-VC-059	748-NAT-NB-VC-059	748-NAT-NB-VC-059	748-CPT-060	748-CPT-060	
Depth (m)	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC
0.00 - 0.50			8	14					9	15		9	21					9	16		
0.50 - 1.00			8	16					9	18		9	21			77		8	17		
1.00 - 1.50			8	16					9	17		9	23					8	15		
1.50 - 2.00			9	51					8		5	8	24					8	16		
2.00 - 2.50			9	69			34		9	21		9	28	22				9	75		
2.50 - 3.00	94		6	71				83	9	14		9	21	22				9	95		
3.00 - 3.50			9	69				78	2	14		9	23	23				9	93		
3.50 - 4.00			9	47				106	2	15		9		18				9	74		
4.00 - 4.50		101	2		41			144	2	14		9		18				9		76	
4.50 - 5.00		116	2		36					13		9		21				9		71	
5.00 - 5.50		113	2		40					14		9		20				9		64	
5.50 - 6.00					70															73	

Figure 10-64: Geotechnical Model of Block 04 between KP 85.223 and KP 91.012

KP (km)	91.619			93.280			95.075			95.496			96.859			97.860			98.862		
DCC (m)	-2.889			7.623			-39.147			-44.553			-80.051			-97.953			-63.896		
ID CPT / VC	748-NAT-NB-VC-060	748-NAT-NB-VC-060	748-NAT-NB-VC-060	748-CPT-061	748-CPT-061	748-NAT-NB-VC-061	748-CPT-062A	748-CPT-062A	748-NAT-NB-VC-062A	748-CPT-063	748-CPT-063		748-NAT-NB-VC-063	748-NAT-NB-VC-063	748-NAT-NB-VC-063	748-CPT-064	748-CPT-064	748-NAT-NB-VC-064	748-CPT-065	748-CPT-065	
Depth (m)	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC
0.00 - 0.50			9	8		9	68		9	39					1	43		1	27		
0.50 - 1.00			9		9	4			9	45					1	50		1	36		
1.00 - 1.50			9		17	5			9	46					1	44		1	32		
1.50 - 2.00			9		24	5			9	54					1	49		1	35		
2.00 - 2.50			9		22	5			9	83					1	42		1	39		
2.50 - 3.00			9		29	5			9	72					1	40		1	42		
3.00 - 3.50			9		58	9			8	63					1	38		1	39		
3.50 - 4.00			9	68		9			8	55					1	37		1	38		
4.00 - 4.50			4	75		9				59					1	45		1	36		
4.50 - 5.00		10	4	78						53						46		1	37		
5.00 - 5.50			9		125					56						46			37		
5.50 - 6.00				54																	

Figure 10-65: Geotechnical Model of Block 04 between KP 91.619 and KP 98.862

KP (km)	99.865			101.990			104.243		
DCC (m)	-18.931			4.289			-47.374		
ID CPT / VC	748-NAT-NB-VC-065	748-NAT-NB-VC-065	748-NAT-NB-VC-065	CPT_006_A	CPT_006_A	VC_006	748-NAT-NB-VC-068	748-NAT-NB-VC-068	748-NAT-NB-VC-068
Depth (m)	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**	**DR**	**Su**	**VC**
0.00 - 0.50			7	35		8			7
0.50 - 1.00			7	103		7			7
1.00 - 1.50			1	88		7			1
1.50 - 2.00			1	83		1			1
2.00 - 2.50			1	33		1			1
2.50 - 3.00			1	20		1			1
3.00 - 3.50			1	18		1			1
3.50 - 4.00			1	18		1			1
4.00 - 4.50			1	19		1			1
4.50 - 5.00			1	22		1			
5.00 - 5.50				30		1			
5.50 - 6.00				34					

Figure 10-66:Geotechnical Model of Block 04 between KP 99.865 and KP 104.243

10.6.6 Geohazards, Seabed Index, and Trenching Suitability

Average seabed gradients along the route are up to 1°, indicating very gentle slopes. The maximum gradient of 25° occurs in areas where ripples and megaripples are present. Mobile sediments in the form of ripples, megaripples, and sandwaves were observed at several locations throughout the section.

Four wrecks were identified along the route. Three are intact, the *Saidieh* at KP 92.792 (212.3 m to port), *Laurl Coin* at KP 93.593 (104.4 m to starboard), and an unknown wreck at KP 94.188 (288.8 m to port). A substantial debris field associated with the *Selma* was also observed at KP 100.99, located 553 m to port.

Two cable crossings were detected in Block 04: BritNed at KP 87.308 and Mercator at KP 90.633. Both were identified using the magnetometer.

Seven additional cables, Kentishknock Lightship-Kingsgate(a), (b), (c), Rembrandt 2, Hermes 2 "South", Dumpton Gap-Middelkerke(a), and UK–Belgium 1; were not detected in the data but are expected to cross the RPL based on their database positions at KP 69.946, KP 70.470, KP 87.003, KP 94.244, KP 96.165, KP 103.528, and KP 103.652, respectively.

Three MAG linear features cross the RPL at KP 63.718, KP 78.827 and KP 90.633, these has no corresponding SSS or MBES features, suggesting they may be buried.

Two Additional linear debris, cross the RPL at KP 93.682, KP 94.312 and KP 94.375, these has no corresponding SSS or MBES features, suggesting they may be buried.

Very stiff / high to very high strength cohesive CLAY and CHALK are present at or near the seabed surface across extensive sections of the route.

The seabed index shows that between CPT-044 (KP 63.905) and VC-045 (KP 66.769), high to very high strength cohesive soils are encountered from the seabed to a depth of 3.00 m. VC-044 (KP 64.820) does however contain loose granular, low to medium strength cohesive soils in the top 0.50 m of the location.

Both VC-046A (KP 67.666) and CPT-046 (KP 67.668) contain loose granular, low to medium strength cohesive soils to a depth of 2.00 m, underlain by high to very high strength cohesive soil to 3.00 m.

High to very high strength cohesive soils again become the dominant soil type between CPT-047 (KP 68.722) and VC-049 (KP 72.804), being recorded from the seabed to a depth of 3.00 m in all locations apart from CPT-048 (KP 70.307), where very dense granular soil is encountered to a depth of 0.50 m.

Medium dense to dense granular material is encountered between the seabed and 2.00 m within CPT-050 (KP 74.046), underlain by very dense granular soil to 3.00 m. VC-050 (KP 74.805) and CPT-051 (KP 75.800) both contain medium dense granular material to 2.50 m, with loose granular, low to medium strength cohesive soils underlying this soil type to a depth of 3.00 m. VC-051 (KP 76.643) contains loose granular, low to medium strength cohesive soils to a depth of 1.50 m, underlain by medium dense granular material.

Loose granular, low to medium strength cohesive soils are recorded from the seabed to 3.00 m between CPT-052 (KP 77.804) and VC-053 (KP 79.741). CPT-054 (KP 80.827) and VC-054 (KP 81.803) both contain loose

granular, low to medium strength cohesive soils to depths of 1.00 m and 0.50 m respectively, overlaying medium dense granular material to 3.00 m.

Both CPT-055A (KP 82.817) and VC-055A (KP 82.817) encountered very loose granular, low strength cohesive soils to 0.50 m, overlaying medium dense granular material to 2.00 m, transitioning to dense granular to a depth of 3.00 m. CPT-056 (KP 83.803) encountered very loose granular, low strength cohesive soils to 0.50 m, overlaying alternating medium dense and dense granular material to a depth of 3.00 m.

The seabed index indicates that the soil types between VC-056 (KP 85.223) and VC-062A (KP 95.075) are predominantly loose to very loose granular, low to medium strength cohesive, with a section of medium dense to dense granular soil encountered between 2.00 m and 3.00 m in CPT-060 (KP 91.012) and VC-060 (KP 91.619).

Bedrock is encountered between CPT-063 (KP 95.496) and VC-068 (KP 104.243), at depth ranges beginning between 0.00 m and 2.00 m. The bedrock is overlain by variable granular or cohesive deposits.

The assigned Seabed Index for the locations in Block 04 are shown below in Table 10-32.

Table 10-32: Seabed Index for Block 04

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (Depth in m)					
				Pen. (m)	Rec. (m)	Refusal Depth (m)	Depth to 10 MPa (Dense)	Depth to 20 MPa (V Dense)	0.5	1	1.5	2	2.5	3
63.322		MMT	SBP						4	4	4	4	4	4
63.816		MMT	SBP						4	4	4	4	4	4
63.904	CPT-044	MMT	CPT			5.38			4	4	4	4	4	4
64.317		MMT	SBP						4	4	4	4	4	4
64.820	VC-044	MMT	VC	4.88	3.77				7	4	4	4	4	4
65.317		MMT	SBP						7	6	4	4	4	4
65.824	CPT-045	MMT	CPT			5.38			4	4	4	4	4	4
66.312		MMT	SBP						4	4	4	4	4	4
66.770	VC-045	MMT	VC	5.23	3.17				4	4	4	4	4	4
66.806		MMT	SBP						4	4	4	4	4	4
67.305		MMT	SBP						7	4	4	4	4	4
67.666	VC-046A	MMT	VC	4.80	3.96				7	7	7	7	4	4
67.668	CPT-046	MMT	CPT			5.41			7	7	7	7	4	4
67.804		MMT	SBP						7	4	4	4	4	4
68.305		MMT	SBP						4	4	4	4	4	4
68.723	CPT-047	MMT	CPT			5.48			4	4	4	4	4	4
68.805		MMT	SBP						4	4	4	4	4	4
69.271	VC-047	MMT	VC	5.23	4.72				4	4	4	4	4	4

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (Depth in m)					
				Pen. (m)	Rec. (m)	Refusal Depth (m)	Depth to 10 MPa (Dense)	Depth to 20 MPa (V Dense)	0.5	1	1.5	2	2.5	3
69.305		MMT	SBP						4	4	4	4	4	4
69.805		MMT	SBP						4	4	4	4	4	4
70.304	CPT-048	MMT	CPT			0.45	0.41	0.43	3					
70.307	CPT- 48A	MMT	CPT			5.40			4	4	4	4	4	4
70.805		MMT	SBP						4	4	4	4	4	4
71.305		MMT	SBP						4	4	4	4	4	4
71.803		MMT	SBP						7	4	4	4	4	4
72.303		MMT	SBP						7	4	4	4	4	4
72.389	VC-048	MMT	VC	5.20	4.63				4	4	4	4	4	4
72.803	CPT-049	MMT	CPT			5.40	2.67		4	4	4	4	4	4
72.804	VC-049	MMT	VC	5.18	3.37				4	4	4	4	4	4
73.303		MMT	SBP						6	4	4	4	4	4
73.803		MMT	SBP						4	4	4	4	4	4
74.046	CPT-050	MMT	CPT			5.38	0.97	2.09	6	5	6	5	3	3
74.303		MMT	SBP						6	5	6	4	4	4
74.836	VC-050	MMT	VC	5.00	4.39				6	6	6	6	6	7
75.301		MMT	SBP						6	6	6	4	4	4
75.800	CPT-051	MMT	CPT			5.42	3.78		6	6	6	6	6	7
76.301		MMT	SBP						6	6	6	6	6	7

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (Depth in m)					
				Pen.	Rec.	Refusal Depth	Depth to 10 MPa	Depth to 20 MPa	0.5	1	1.5	2	2.5	3
				(m)	(m)	(m)	(Dense)	(V Dense)						
76.643	VC-051	MMT	VC	5.25	4.48				7	7	7	6	6	6
76.801		MMT	SBP						7	7	7	6	6	6
77.306		MMT	SBP						7	7	7	6	6	6
77.804	CPT-052	MMT	CPT			5.42			7	7	7	7	7	7
77.804	VC-052	MMT	VC	5.45	5.29				7	7	7	7	7	7
78.304		MMT	SBP						7	7	7	7	7	7
78.603	CPT-053	MMT	CPT			5.43			7	7	7	7	7	7
78.804		MMT	SBP						7	7	7	7	7	7
79.303		MMT	SBP						7	7	7	7	7	7
79.741	VC-053	MMT	VC	5.45	5.53				7	7	7	7	7	7
80.303		MMT	SBP						7	7	4	4	4	4
80.826	CPT-054	MMT	CPT			5.55			7	7	6	6	6	6
81.303		MMT	SBP						7	6	6	6	6	6
81.802	VC-054	MMT	VC	5.30	5.06				7	6	6	6	6	6
82.303		MMT	SBP						7	6	6	6	6	6
82.816	CPT- 55A	MMT	CPT			5.28	2.47		8	6	6	6	5	5
82.817	VC-055A	MMT	VC	5.30	4.41				8	6	6	6	5	5
83.303		MMT	SBP						8	6	6	6	5	5
83.804	CPT-056	MMT	CPT			5.58	1.42		8	6	5	6	5	6

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (Depth in m)					
				Pen.	Rec.	Refusal Depth	Depth to 10 MPa	Depth to 20 MPa	0.5	1	1.5	2	2.5	3
				(m)	(m)	(m)	(Dense)	(V Dense)						
84.303		MMT	SBP						8	6	5	6	5	6
84.803		MMT	SBP						8	6	5	6	5	6
85.221	VC-056	MMT	VC	5.2	5.53				7	7	6	6	6	6
85.303		MMT	SBP						7	7	6	6	6	6
85.802	CPT-057	MMT	CPT			5.55	1.96		8	8	8	5	5	5
86.303		MMT	SBP						7	7	7	7	7	7
86.655	VC-057	MMT	VC	5.25	4.41				7	7	7	7	7	4
86.800		MMT	SBP						7	7	7	7	7	7
87.270		MMT	SBP						7	7	7	7	7	7
87.787		MMT	SBP						7	7	7	7	7	7
87.993	VC-058	MMT	VC	5.45	5.53				7	7	8	7	7	7
87.994	CPT-058	MMT	CPT			5.40			7	7	7	8	7	7
88.311	SBP	MMT	SBP						7	7	7	7	7	7
88.814	CPT-059	MMT	CPT			5.41			7	7	7	7	7	7
89.311	SBP	MMT	SBP						7	7	7	7	7	7
89.813	VC-059	MMT	VC	5.45	5.53				7	7	7	7	7	7
90.811		MMT	SBP						8	8	3	3	3	3
91.012	CPT-060	MMT	CPT			5.64	2.14	2.30	8	8	8	6	3	3
91.313		MMT	SBP						8	8	8	6	6	3

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (Depth in m)					
				Pen. (m)	Rec. (m)	Refusal Depth (m)	Depth to 10 MPa (Dense)	Depth to 20 MPa (V Dense)	0.5	1	1.5	2	2.5	3
91.619	VC-060	MMT	VC	5.45	5.55				7	7	7	6	6	6
91.812		MMT	SBP						8	8	7	7	7	7
92.312		MMT	SBP						8	8	7	7	7	7
92.814		MMT	SBP						8	8	7	7	7	7
93.277	VC-061	MMT	VC	4.12	4.27				8	8	7	7	7	7
93.279	CPT-061	MMT	CPT			5.53	3.55	4.31	8	8	7	7	7	7
93.829		MMT	SBP						8	8	7	7	7	7
94.356		MMT	SBP						5	5	5	5	5	5
94.488	CPT- 062A	MMT	CPT			0.55	0.38	0.43	2					
94.494	CPT-062	MMT	CPT			0.67	0.42	0.47	2					
94.847		MMT	SBP						5	5	5	5	5	5
95.075	VC-062A	MMT	VC	4.04	4.00				7	7	6	6	6	6
95.346		MMT	SBP						7	7	7	5	5	5
95.496	CPT-063	MMT	CPT			5.22	1.94	2.09	7	7	7	1	1	1
95.853		MMT	SBP						7	7	7	5	5	5
96.360		MMT	SBP						7	7	7	5	5	5
96.859	VC-063	MMT	VC	5.25	4.55				1	1	1	1	1	1
97.356		MMT	SBP						1	1	1	1	1	1
97.859	VC-064	MMT	VC	5.24	5.14				1	1	1	1	1	1

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (Depth in m)					
				Pen.	Rec.	Refusal Depth	Depth to 10 MPa	Depth to 20 MPa	0.5	1	1.5	2	2.5	3
				(m)	(m)	(m)	(Dense)	(V Dense)						
97.861	CPT-064	MMT	CPT			5.22			1	1	1	1	1	1
98.362		MMT	SBP						1	1	1	1	1	1
98.862	CPT-065	MMT	CPT			5.37			6	1	1	1	1	1
99.362		MMT	SBP						1	1	1	1	1	1
99.865	VC-065	MMT	VC	5.43	5.05				6	1	1	1	1	1
100.000		NG	SBP						6	6	1	1	1	1
100.500		NG	SBP						6	6	1	1	1	1
101.000		NG	SBP						8	8	7	7	7	5
101.500		NG	SBP						8	5	5	5	1	1
101.994	CPT_006_A	NG	CPT			6.18	0.47	0.80	8	5	5	5	1	1
101.995	VC_006	NG	VC	6.00	5.30				8	5	5	1	1	1
101.995	CPT_006	NG	CPT			1.57	0.53	0.81	8	5	5			
102.500		NG	SBP						8	1	1	1	1	1
103.000		NG	SBP						8	1	1	1	1	1
103.546		MMT	SBP						1	1	1	1	1	1
104.044		MMT	SBP						6	1	1	1	1	1
104.243	VC-068	MMT	VC	5.20	4.69				6	1	1	1	1	1

10.7 BLOCK 05 OFFSHORE KP 104.400 TO KP 114.200

Table 10-33: Alignment Sheets for Block 05 offshore KP 104.400 to KP 114.200

AS-5K-033 - AS-5K-036

10.7.1 Bathymetry and Morphology

Bathymetry data from Block 05 reveal a gently sloping, relatively flat seabed surface, with depths ranging from 11.01 meters at KP 104.400 to 4.91 meters at KP 114.200. The maximum depth along the route is 12.65 meters, recorded at KP 108.665, while the minimum depth along the route is 4.81 meters, recorded at KP 114.185. Several areas of megaripples and sand waves are present within the block, crossing the RPL (see Figure 10-67).

The maximum observed slope along the RPL is 29.37°, recorded at KP 108.198 at the edge of a sand wave. The seabed slopes gently northward, with an average gradient of up to 3.04° (see Figure 10-68).

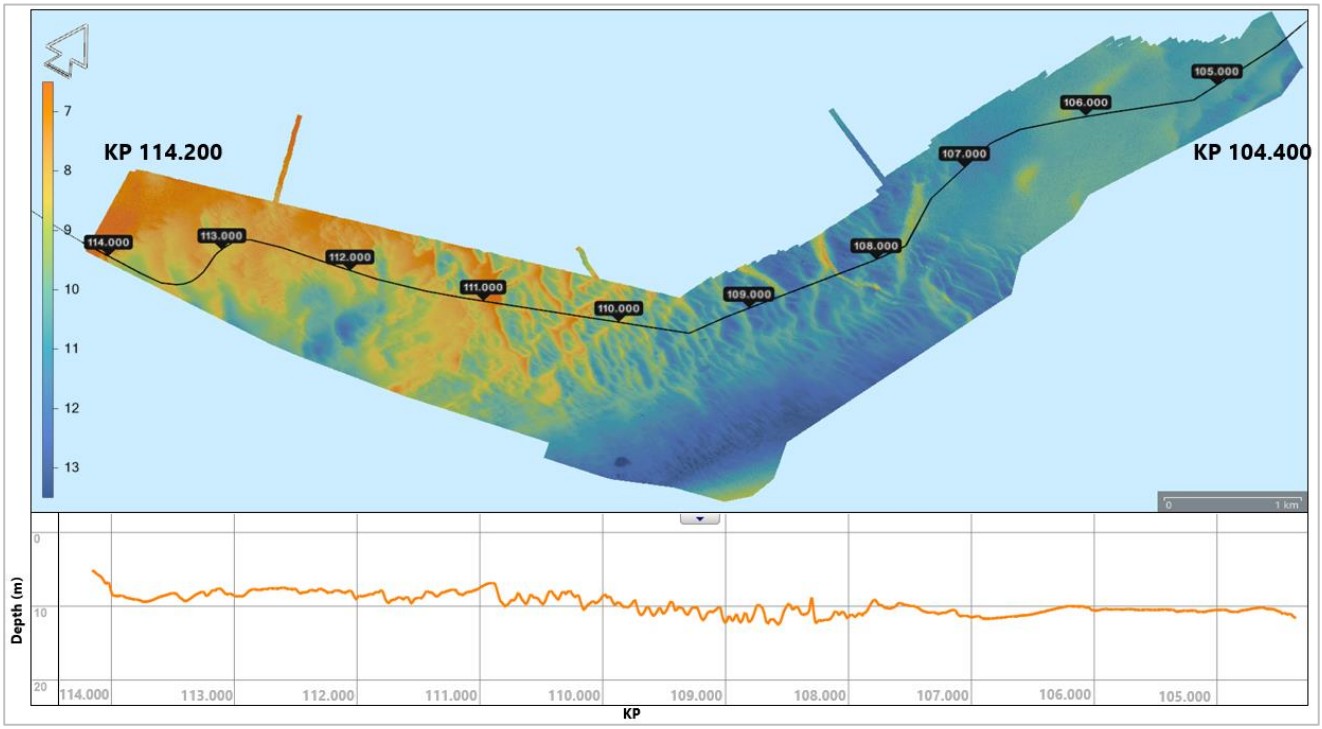

Figure 10-67: Overview of the Bathymetry in Block 05 Offshore KP 104.400 to KP 114.200

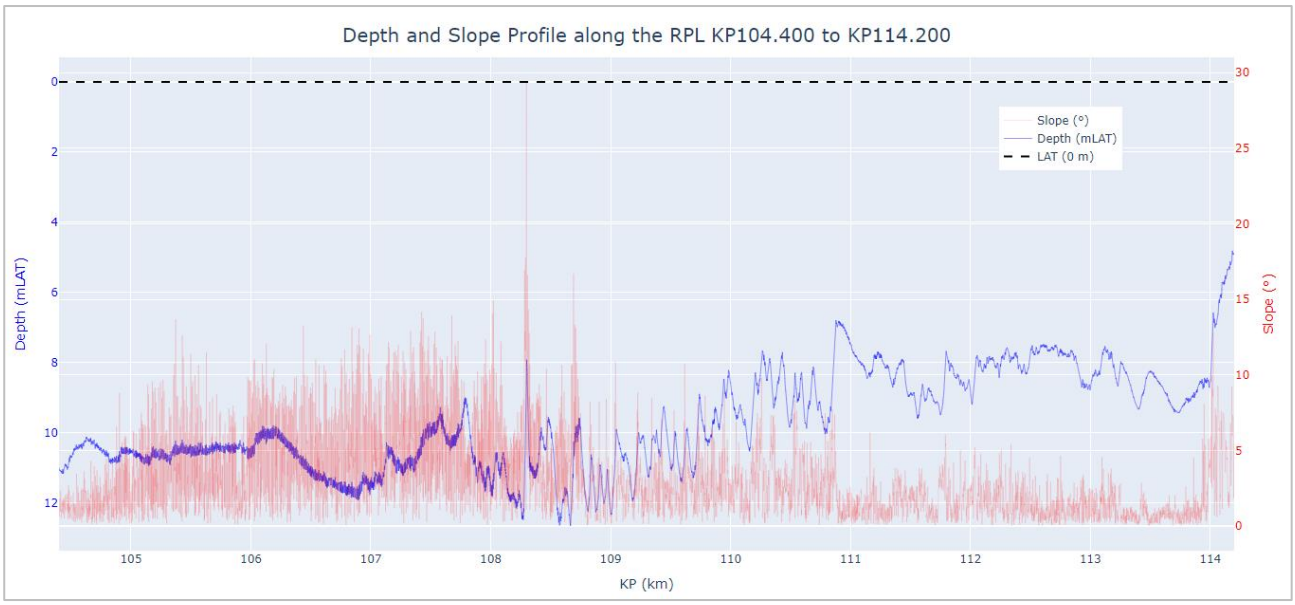

Figure 10-68: Block 05 Offshore KP 104.400 to KP 114.200 Seabed Depth and Slope Profile

10.7.2 Surficial Geology and Seabed Features

The surficial geology within Block 05 Offshore is predominantly gravelly SAND to sandy GRAVEL, with occurrences of GRAVEL, stiff CLAY and CHALK. Very coarse sediment is recorded in the south-western section of the block, where the RPL crosses this material between KP 113.454 and KP 113.733.

GRAVEL deposits are mainly encountered along the RPL between KP 107.125 and KP 107.189, KP 107.406 and KP 107.448, KP 108.259 and KP 108.423, KP 108.470 and KP 108.540, KP 108.565 and KP 108.755, KP 108.817 and KP 108.851, KP 108.892 and KP 108.904, KP 108.940 and KP 108.970, and from KP 109.042 to KP 109.072.

Seabed features encountered within this block include areas with occasional and numerous boulders. The RPL cross areas of a boulder field between KP 107.122 – KP 107.137, KP 107.723 – KP 107.920, KP 108.407 – KP 108.487, KP 108.589 – KP 108.640, KP 108.742 – KP 108.781, KP 108.809 – KP 108.846, and again from KP 108.859 to KP 110.757

Debris fields and three mattress locations were also encountered within the surveyed area. Another notable feature observed was the hummocky seabed, crossing the RPL around KP 110.860 to KP 113.208.

Isolated depressions are scattered throughout the Block 05, with the closest located ~193 m southeast of KP 111.674.

Mobile sediments in the form of ripples, megaripples, and sandwaves are also present on this section of the route, a summary of their crossings with the RPL is provided in Table 10-34.

Mottled seabed was encountered along the RPL from KP 104.502 to KP 105.520. Figure 10-69 and Figure 10-70 illustrates the seabed sediments and features present in Block 05 offshore.

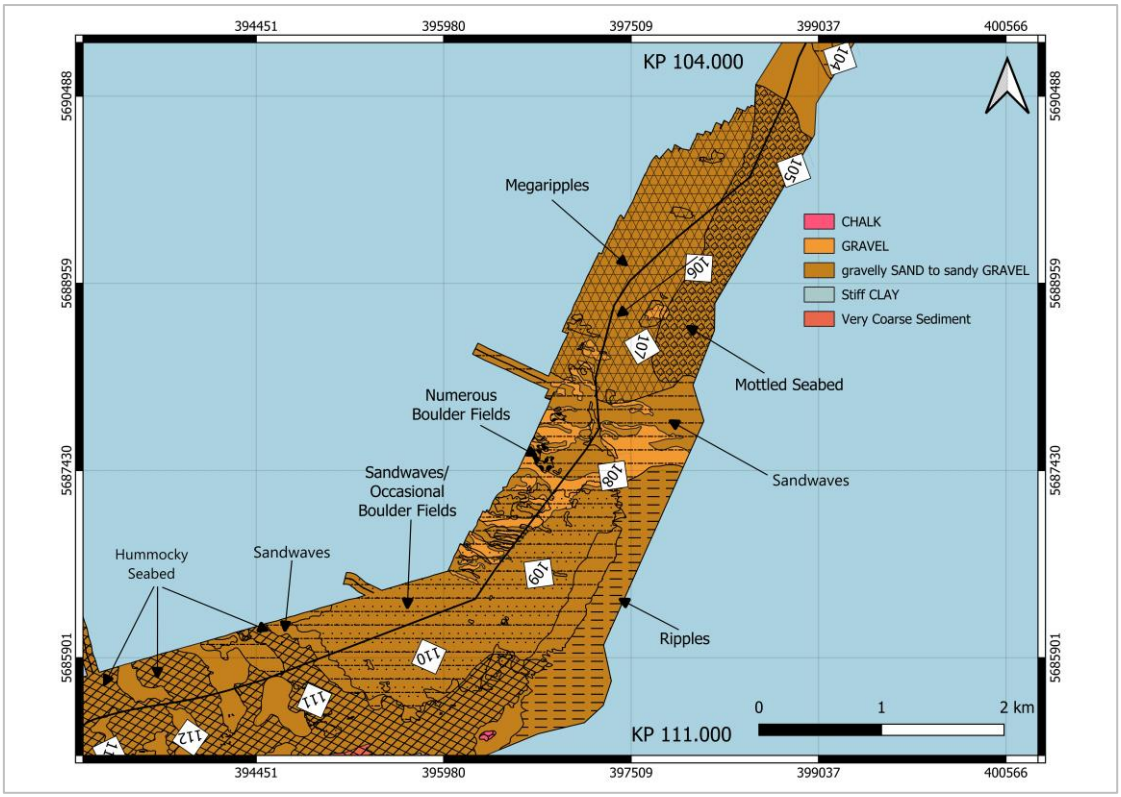

Figure 10-69: Overview of Seabed Geology and Features Block 05 Offshore between KP 104.000 and KP 111.000

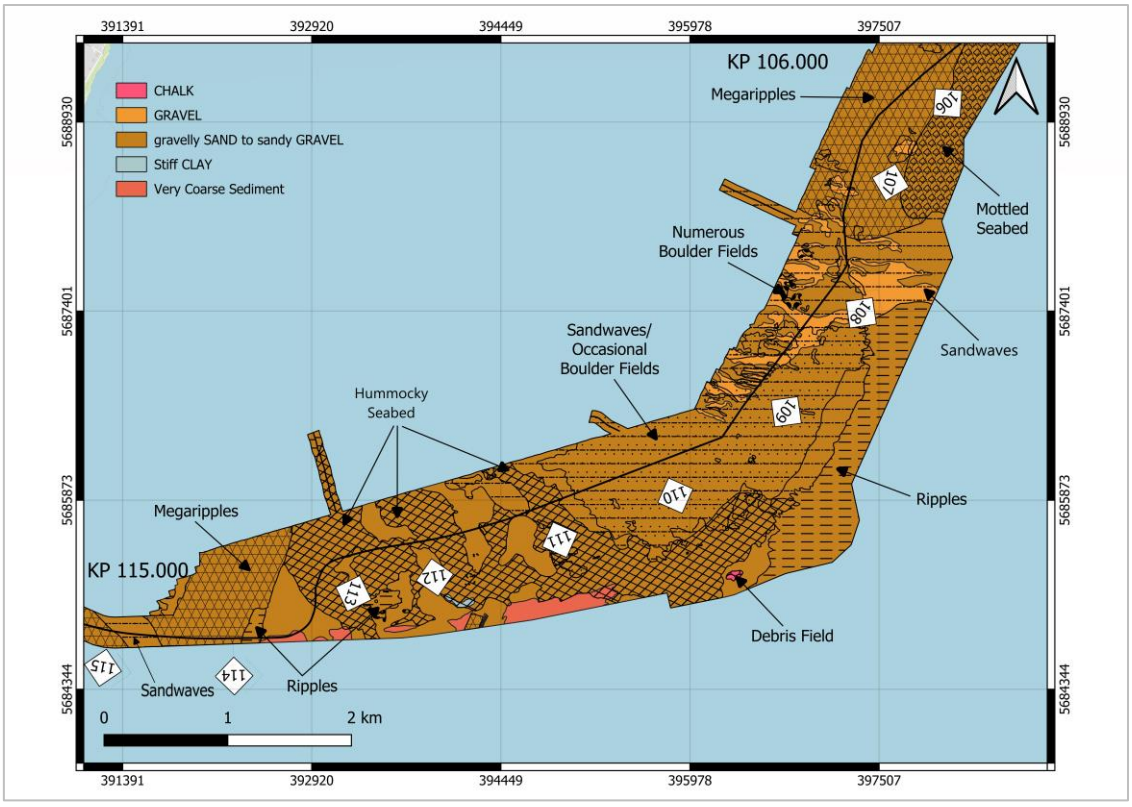

Figure 10-70: Overview of Seabed Geology and Features Block 05 Offshore between KP 106.00 and KP 115.000

Table 10-34 Summary of Mobile Sediments in Block 05 Offshore

Feature	Start KP	End KP
Megaripples	104.502	107.513
Sandwaves	107.513	110.86
Sandwaves	111.147	111.192
Sandwaves	111.239	111.243
Ripples	113.771	113.930
Megaripples	113.930	114.200

10.7.3 Contacts and Anomalies

A total of 400 SSS contacts and 1437 magnetic anomalies were identified within the Block 05 Offshore survey corridor. SSS contacts and magnetic anomalies are summarized in Table 10-35 and Table 10-36.

A total of 51 SSS contacts are correlating with magnetic anomalies. 4 of them are related with boulders, 35 related to debris, 6 related to linear debris, 2 related to chains and 4 related to wrecks. A correlation distance of 10 m was used between MAG and SSS. One related to a wreck is 12.8 m away.

Table 10-35: Summary Block 05 Offshore SSS Contacts

CLASSIFICATION	NUMBER
Boulder	168
Debris	156
Linear Debris	26
Wreck	7
Other	43
Total	400

Table 10-36: Summary Block 05 Offshore Magnetic Anomalies

CLASSIFICATION	NUMBER
Known wreck	2 polygons (2 wrecks)
Known cable	2 polygons, 8 anomalies (4 cables)
Unknown cable	0
Linear debris of geological feature	19 (7 features)
Unclassified Discrete anomalies	1410
Total	1437

10.7.4 Shallow Geology

From KP 104.400 to KP 108.800 SAND and GRAVEL range in thickness from approximately 0.5 to 2.2 m overlies CHALK. Between KP 108.800 and KP 114.000, CHALK is at or near the seabed (0.2 m BSF), with only minor SAND

and GRAVEL deposits, generally no more than 1 m thick. Between KP 114.000 and the end of Block 05 at KP 114.200, SAND and GRAVEL deposits increase in thickness reaching up to 4 m thick.

Two channels extend across the southwestern part of Block 05. The RPL crosses these features between KP 111.402 – KP 111.587 and KP 113.217 – KP 113.311, where channel depths reach of up to 4.7 m BSF.

Beneath the Holocene sediments, CHALK is present and has been identified as Upper Cretaceous CHALK, based on the BGS offshore index. Caution is advised during laying and trenching operations in areas where the interpreted hard substrate is sub-cropping or outcropping.

10.7.5 Geotechnical

Four geotechnical locations were undertaken within the offshore section of Block 05. MMT undertook a single co-located VC/CPT location, whilst NextGeo undertook three co-located VC/CPT locations. The locations are shown schematically below in Figure 10-71.

Some of MMT locations were excluded from the interpretation as they fall far away from the new RPL. These locations are listed in Table 10-37 for reference. The geological information from these locations was no longer suitable to the RPL, which had been re-routed for engineering purposes.

Table 10-37: Geotechnical Locations excluded from Block 05 OFS Interpretation

Block	Location ID	Distance from RPL (m)
5 OFS	748-CPT-069	136
5 OFS	748-NAT-NB-VC-069	326
5 OFS	748-CPT-070	513
5 OFS	748-NAT-NB-VC-070A	518
5 OFS	748-CPT-070A	515
5 OFS	748-CPT-071	755
5 OFS	748-NAT-NB-VC-071A	1149
5 OFS	748-CPT-072	989
5 OFS	748-NAT-NB-VC-073	679
5 OFS	748-CPT-073	681

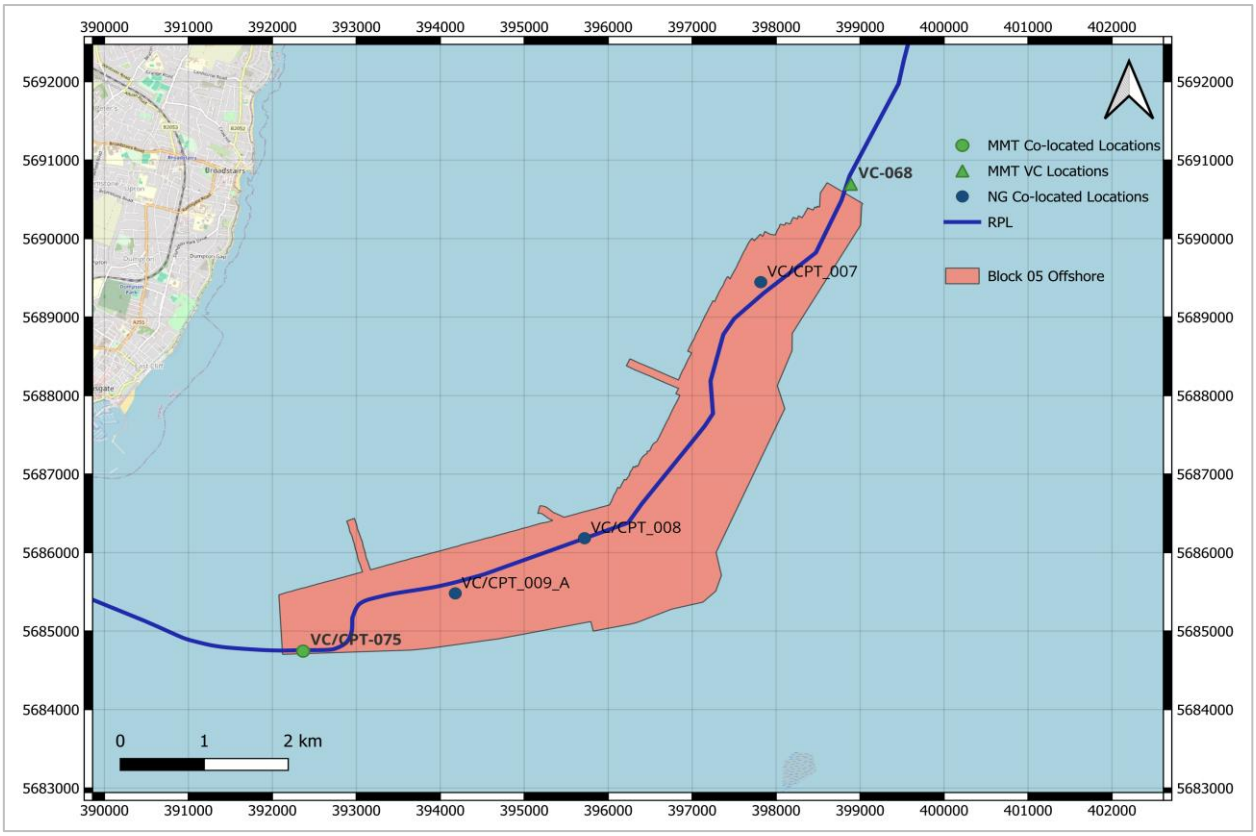

Figure 10-71: Location Plan for Block 05 Offshore between KP 104.400 and KP 114.200

The ground conditions between VC/CPT_007 and VC/CPT_009_A (KP 105.950 to KP 111.709) are a continuation of those seen in Block 04. The surficial deposits of granular material remain, measuring 1.60 m thick at VC/CPT_007, and decreasing in thickness along the KP to 0.15 m at VC_009_A. The granular material is comprised of a mixture gravelly SAND and sandy GRAVEL, with a high variation in relative density from very loose to very dense. This soil type again overlays CIRIA Grade Dc CHALK, which was recorded to a maximum depth of 6.14 m at the base of CPT_007.

The final geotechnical location within Block 05 is VC/CPT_075 (KP 113.920). The surficial deposits comprise very gravelly SAND to a maximum depth between 0.43 m and 0.60 m. The granular strata are underlain by high to very high strength silty sandy CLAY.

10.7.5.1 Geotechnical Model

Figure 10-72 below presents the locations in the form of a geotechnical model; with relative density (DR), shear strength (Su), and soil classification plotted against depth in 0.50 m sections.

As mentioned in Section 10.7.4 the ground conditions between VC/CPT_007 and VC/CPT_009_A are a continuation of those seen in Block 04, with the CHALK returning Dr values within the very loose to medium dense classification, with a range between 5 % and 63 %. Dense to very dense granular deposits are recorded between 0.00 m and 1.50 m in CPT_007, which is comparable to the ground conditions observed in CPT_006_A.

High to very high strength CLAY is encountered in CPT-075, where the Su values increase in depth from 102 kPa between 1.00 m and 1.50 m, to 273 kPa between 5.00 m and 5.50 m.

KP (km)	105.950			110.034			111.709			113.920		
DCC (m)	129.502			2.161			-135.724			-11.749		
ID CPT / VC	CPT_007	CPT_007	VC_007	CPT_008_B	CPT_008_B	VC_008	CPT_009_A	CPT_009_A	VC_009_A	748-CPT-075A	748-CPT-075A	748-NAT-NB-VC-075
Depth (m)	DR	Su	VC	DR	Su	VC	DR	Su	VC	DR	Su	VC
0.00 - 0.50	90		8	59		8	44		1	49		8
0.50 - 1.00	95		8	37		1	21		1	46		2
1.00 - 1.50	81		7	27		1	19		1		102	2
1.50 - 2.00	38		1	25		1	24		1		131	2
2.00 - 2.50	32		1	15		1	13		1		178	2
2.50 - 3.00	39		1	23		1	7		1		176	2
3.00 - 3.50	54		1	18		1	8		1		202	2
3.50 - 4.00	48		1	18		1	10		1		183	
4.00 - 4.50	48		1	14			13		1		186	
4.50 - 5.00	54		1	10			5		1		238	
5.00 - 5.50	49		1	14			9		1		273	
5.50 - 6.00	63			37			23					

Figure 10-72: Geotechnical Model of Block 05 Offshore between KP 105.950 and KP 113.920

10.7.6 Geohazards, Seabed Index, and Trenching Suitability

Average seabed gradients along the route are less than 1°, indicating very gentle slopes. The maximum gradient of 31° occurs at KP 108.334 and corresponds to the edge of a sandwave area. Mobile sediments in the form of ripples, megaripples, and sandwaves were observed at multiple locations throughout the section.

Seven wrecks were identified across the surveyed area. These include the *HMS Arctic Trapper* at KP 108.479 (186.5 m to starboard), *Rydal Force* at KP 109.479 (297 m to port), *Bravore* at KP 109.778 (1091.4 m to port), and four unknown wrecks at KP 110.075 (770.1 m to port), KP 111.247 (532.1 m to port), KP 111.589 (533.8 m to port), and KP 113.181 (96.4 m to port).

Four cable crossings were detected in Block 05 Offshore: Pan European Crossing (PEC) at KP 104.586, Thanet (North) at KP 107.593, Thanet (South) at KP 107.645, and Nemo Link at KP 113.108

Four additional cables, Dumpton Gap-Middelkerke(b), Tangerine, Dumpton Gap-N. Goodwin Lightship, and Dumpton Gap-Borkum; were not detected in the data but are expected to cross the RPL based on their database positions at KP 105.044, KP 106.747, KP 107.576, and KP 108.502, respectively.

One linear debris crosses the RPL at KP 108.658.

Very stiff / high to very high strength cohesive CLAY and CHALK are present at or near the seabed surface across extensive sections of the route.

The seabed index shows that the predominant soil type within this Block is bedrock. The bedrock occurs from a minimum depth of 0.00 m, but in most cases is overlain by medium dense to very dense granular soils. In the case of VC-075 (KP 113.921), no bedrock is encountered, and instead high to very high strength cohesive material is recorded from 0.50 m to 3.00 m, overlain by medium dense granular soils.

The assigned Seabed Index for the locations in Block 05 Offshore are shown below in Table 10-38.

Table 10-38: Seabed Index for Block 05 Offshore

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (Depth in m)					
				Pen.	Rec.	Refusal Depth	Depth to 10 MPa	Depth to 20 MPa	0.5	1	1.5	2	2.5	3
				(m)	(m)	(m)	(Dense)	(V Dense)						
104.540		MMT	SBP						6	1	1	1	1	1
105.000		NG	SBP						6	6	1	1	1	1
105.500		NG	SBP						6	6	1	1	1	1
105.947	VC_007	NG	VC	6.00	5.70				3	3	5	1	1	1
105.950	CPT_007	NG	CPT			6.14	0.29	0.36	3	3	5	1	1	1
106.500		NG	SBP						3	5	1	1	1	1
107.000		NG	SBP						3	1	1	1	1	1
107.500		NG	SBP						3	3	5	1	1	1
108.000		NG	SBP						3	5	1	1	1	1
108.500		NG	SBP						3	5	1	1	1	1
109.000		NG	SBP						3	1	1	1	1	1
109.500		NG	SBP						3	1	1	1	1	1
110.034	VC_008	NG	VC	6.00	4.10				6	1	1	1	1	1
110.034	CPT_008_B	NG	CPT			5.89			6	6	1	1	1	1
110.036	CPT_008	NG	CPT			0.73	0.14		6					
110.039	CPT_008_A	NG	CPT			5.67	2.50		6	6	1	1	1	1
110.500		NG	SBP						1	1	1	1	1	1
111.000		NG	SBP						6	1	1	1	1	1
111.500		NG	SBP						6	7	7	9	1	1
111.709	VC_009_A	NG	VC	6.00	5.70				1	1	1	1	1	1
111.710	CPT_009_A	NG	CPT			6.00			6	1	1	1	1	1

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (Depth in m)					
				Pen.	Rec.	Refusal Depth	Depth to 10 MPa	Depth to 20 MPa	0.5	1	1.5	2	2.5	3
				(m)	(m)	(m)	(Dense)	(V Dense)						
112.000		NG	SBP						1	1	1	1	1	1
112.500		NG	SBP						1	1	1	1	1	1
113.000		NG	SBP						1	1	1	1	1	1
113.500		NG	SBP						6	6	4	4	4	4
113.923	VC-075	MMT	VC	5	3.26				6	4	4	4	4	4

10.8 BLOCK 05 NEARSHORE KP 114.200 TO KP 119.700

Table 10-39: Alignment Sheets for Block 05 Nearshore KP 114.200 to KP 119.700

AS-5K-036 - AS-5K-038

10.8.1 Bathymetry and Morphology

Bathymetry data from Block 05 nearshore reveals a gently sloping, relatively flat seabed surface, ranging in depth from 4.91 meters at KP 114.200 to -2.30 meters at KP 119.700. The maximum depth within the block is 8.45 meters, recorded at KP 114.648 and coinciding with the base of a sandwave area. Several areas of megaripples and sand waves are present within the block, crossing the RPL. (See Figure 10-73).

The maximum observed gradient along the RPL is 18.48°, recorded at KP 117.378 within an area of megaripples. The seabed gradient along the route is gentle shoaling towards the landfall, with an average gradient 2.13°. (See Figure 10-74).

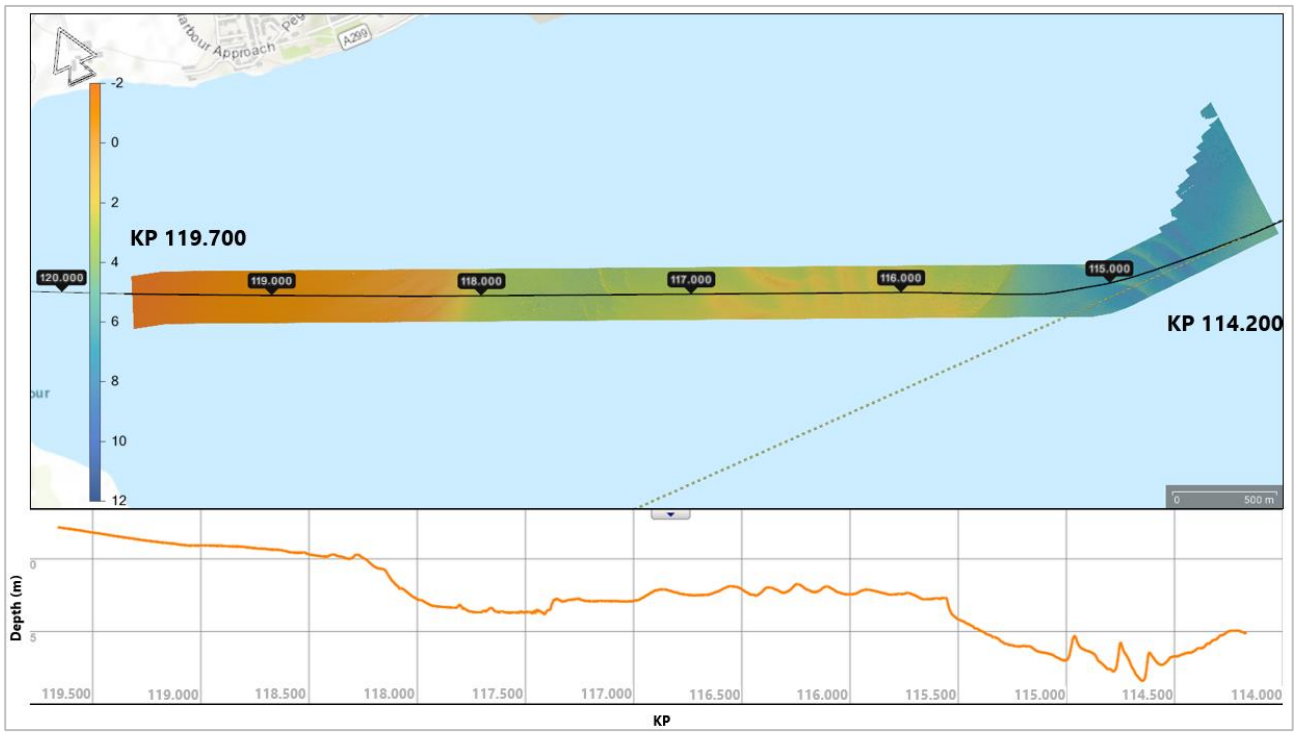

Figure 10-73: Overview of the Bathymetry in Block 05 Nearshore KP 114.200 to KP 119.700

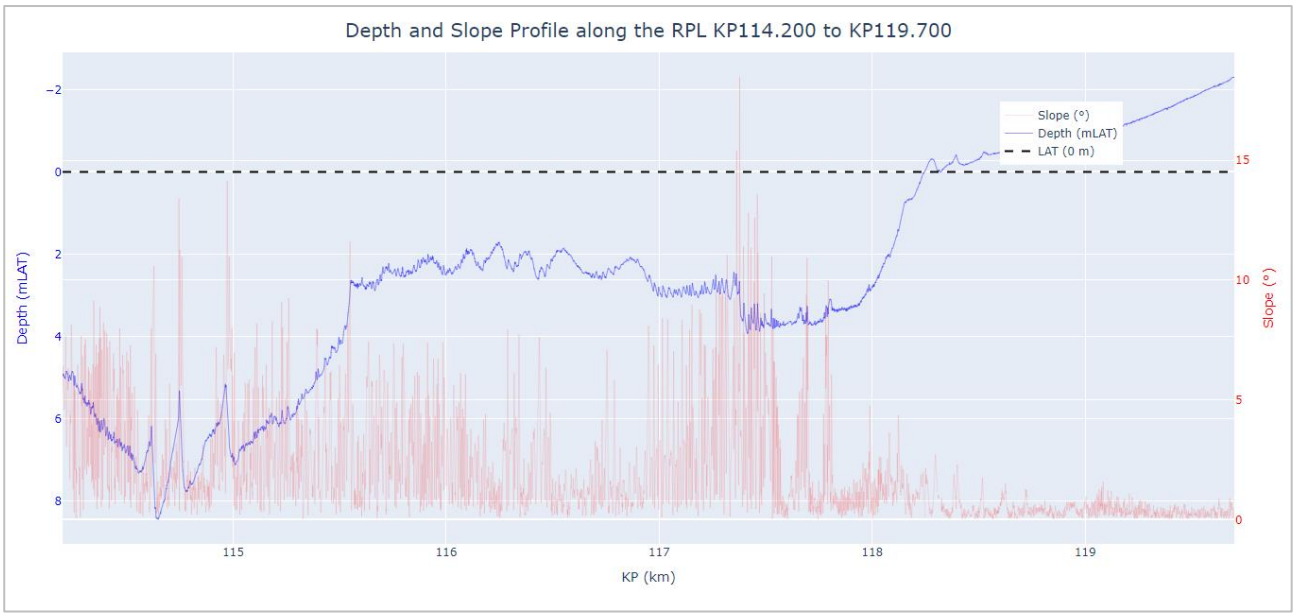

Figure 10-74: Block 05 Nearshore KP 114.200 to KP 119.700 Seabed Depth and Slope Profile

10.8.2 Surficial Geology and Seabed Features

The surficial geology within Block 05 Nearshore is predominantly characterized by gravelly SAND to sandy GRAVEL. The survey route passes through an area of stiff CLAY outcrops at KP 117.649 and KP 117.704, KP 117.777 to KP 117.821, and from KP 117.987 to KP 118.040. The route crosses an area of GRAVEL from KP 118.040 to KP 118.085.

Mobile sediments in the form of ripples, megaripples, and sandwaves are also present on this section of the route, a summary of their crossings with the RPL is provided in Table 10-40.

Figure 10-75 illustrates the seabed sediments and features present in Block 05 nearshore.

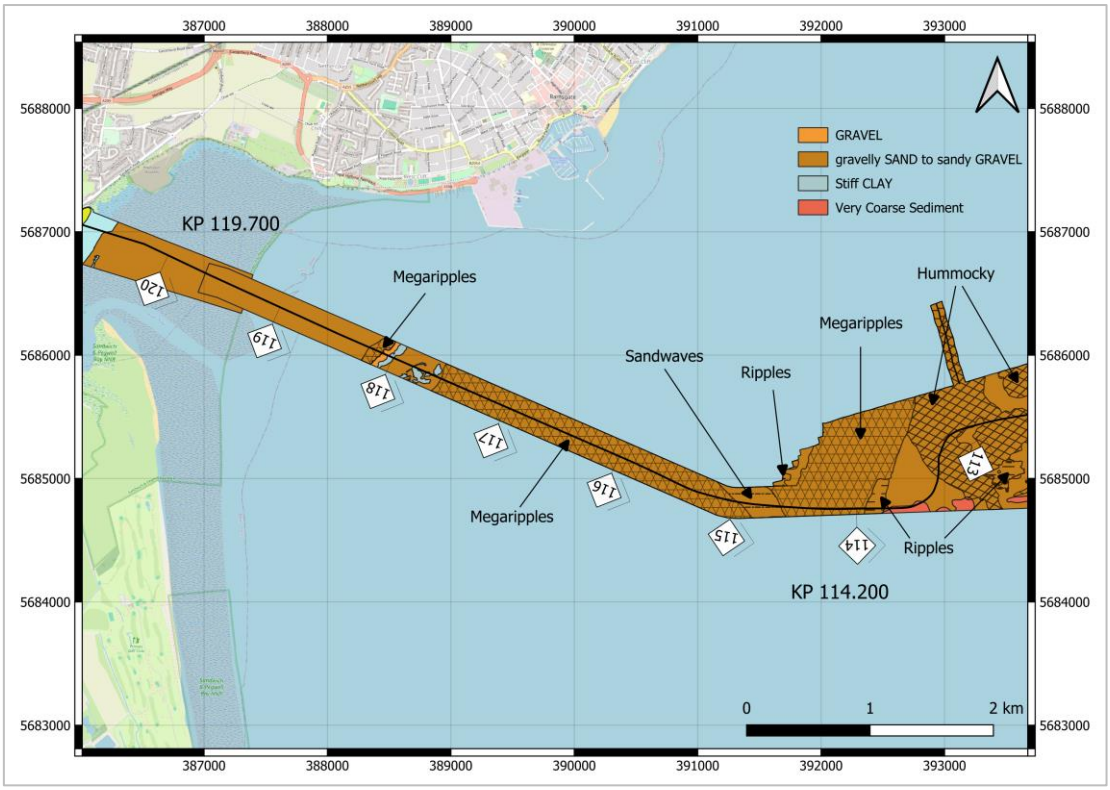

Figure 10-75: Overview of Seabed Geology and Features Block 05 Nearshore between KP 114.200 and KP 119.700

Table 10-40 Summary of Mobile Sediments in Block 05 Nearshore

Feature	Start KP	End KP
Megaripples	114.200	114.615
Sandwaves	114.615	114.975
Megaripples	114.975	117.572
Megaripples	118.085	118.205

10.8.3 Contacts and Anomalies

A total of 26 SSS contacts and 231 magnetic anomalies were identified within the Block 05 Nearshore survey corridor. SSS contacts and magnetic anomalies are summarized in Table 10-41 and Table 10-42

Nine SSS contacts are correlating with magnetic anomalies. 2 of them are related with boulders, 7 related to debris. A correlation distance of 10 m was used between MAG and SSS.

Table 10-41: Summary Block 05 Nearshore SSS Contacts

CLASSIFICATION	NUMBER
Boulder	13
Debris	13
Linear Debris	0
Wreck	0
Other	0
Total	26

Table 10-42: Summary Block 05 Nearshore Magnetic Anomalies

CLASSIFICATION	NUMBER
Known wreck	0
Known cable	1 polygon (1 cable)
Unknown cable	0
Linear debris of geological feature	3
Unclassified Discrete anomalies	228
Total	231

10.8.4 Shallow Geology

Between KP 114.200 and KP 119.458, SAND units ranging from 1 to 4 m in thickness overlie very stiff CLAY. Between KP 117.383 and KP 118.080, the very stiff CLAY is at or near the seabed surface, occurring at depths less than 1 m. Beyond to KP 119.700, the SAND layer remains approximately 2 m thick and continues to overlie very stiff CLAY.

10.8.5 Geotechnical

No geotechnical locations were undertaken within the nearshore section of Block 05.

10.8.6 Geohazards, Seabed Index, and Trenching Suitability

Average seabed gradients along the route are less than 1°, indicating very gentle slopes. The maximum gradient of 20° occurs at KP 117.417 and corresponds to an area of megaripples. Mobile sediments in the form of ripples, megaripples, and sandwaves were observed at various locations throughout the section.

No wrecks were identified along the route, and no cables or pipelines were detected crossing the proposed corridor.

Very stiff / high to very high strength cohesive CLAY and CHALK are present at or near the seabed surface across extensive sections of the route.

The assigned Seabed Index for the locations in Block 05 Nearshore are shown below in Table 10-43.

Table 10-43: Seabed Index for Block 05 Nearshore

Route KP	Location	Surveyed by	Type	Coring		Cone Penetration Testing			Seabed Index (Depth in m)					
				Pen. (m)	Rec. (m)	Refusal Depth (m)	Depth to 10 MPa (Dense)	Depth to 20 MPa (V Dense)	0.5	1	1.5	2	2.5	3
114.397		MMT	SBP						6	6	6	4	4	4
114.895		MMT	SBP						6	6	6	4	4	4
115.392		MMT	SBP						6	6	6	4	4	4
115.892		MMT	SBP						6	6	6	6	6	6
116.392		MMT	SBP						6	6	6	6	4	4
116.892		MMT	SBP						6	6	6	6	4	4
117.392		MMT	SBP						6	6	4	4	4	4
117.892		MMT	SBP						6	4	4	4	4	4
118.392		MMT	SBP						6	6	6	6	6	4
118.892		MMT	SBP						6	6	6	6	4	4
119.392		MMT	SBP						6	6	6	6	4	4
119.668		MMT	SBP						6	6	6	6	4	4

10.9 PEGWELL BAY LANDFALL KP 119.323 TO KP 121.382

Table 10-44: Alignment Sheets for Pegwell Bay Landfall KP 119.323 to KP 121.417

AS-5K-037 - AS-5K-038

10.9.1 Bathymetry (UAV Photogrammetry / Lidar)

The Pegwell Bay landfall begins at a height of 1.43 meters above LAT at KP 119.323, gradually shoaling to 8.59 m above LAT at KP 121.382. See Figure 10-76

Average slope along the route is less than 1° (0.41° - very gentle according to gradient classification scheme) from KP 119.323 to KP 120.628. However, gradients become moderate, with an average gradient of 5°. The maximum slope of 36.76° is located at KP 121.266, corresponding to the edge of a potentially rocky outcrop structure. See Figure 10-77.

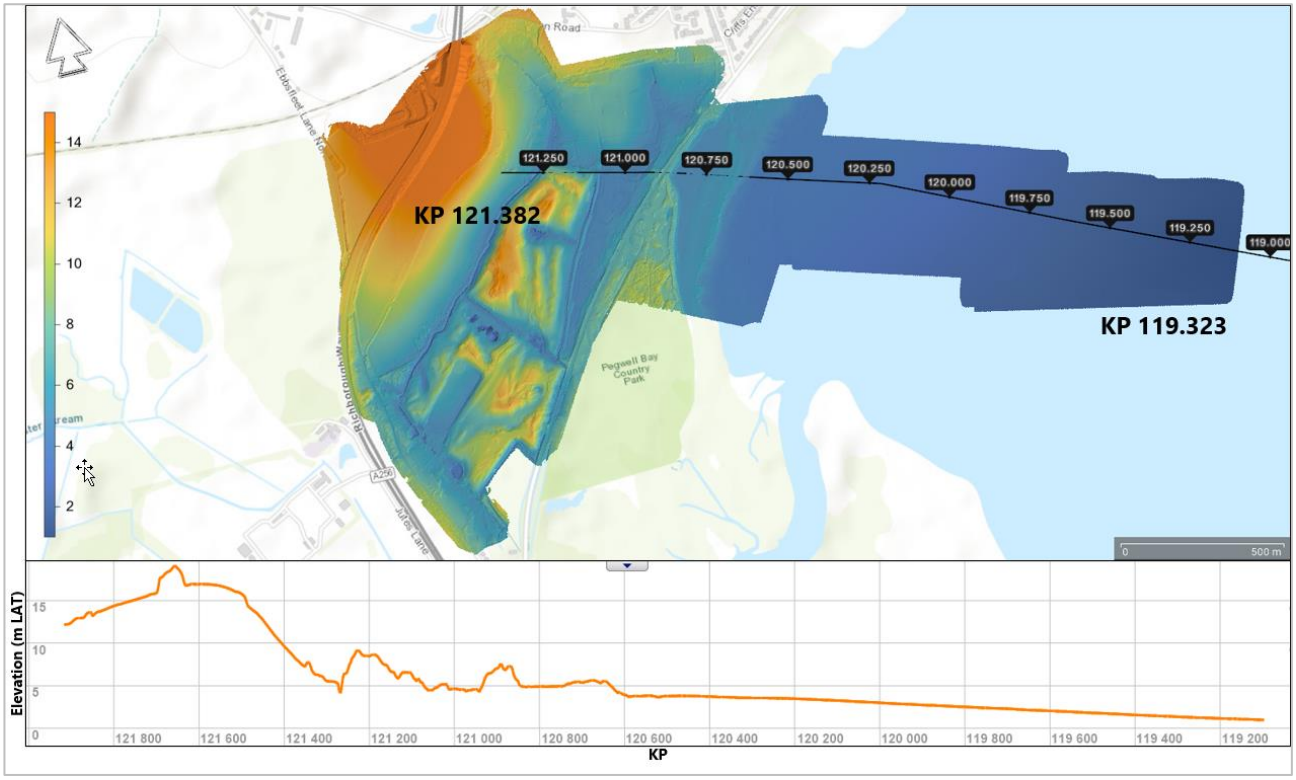

Figure 10-76: Overview of the Lidar Bathymetry in Pegwell Landfall KP 119.323 to KP 121.417

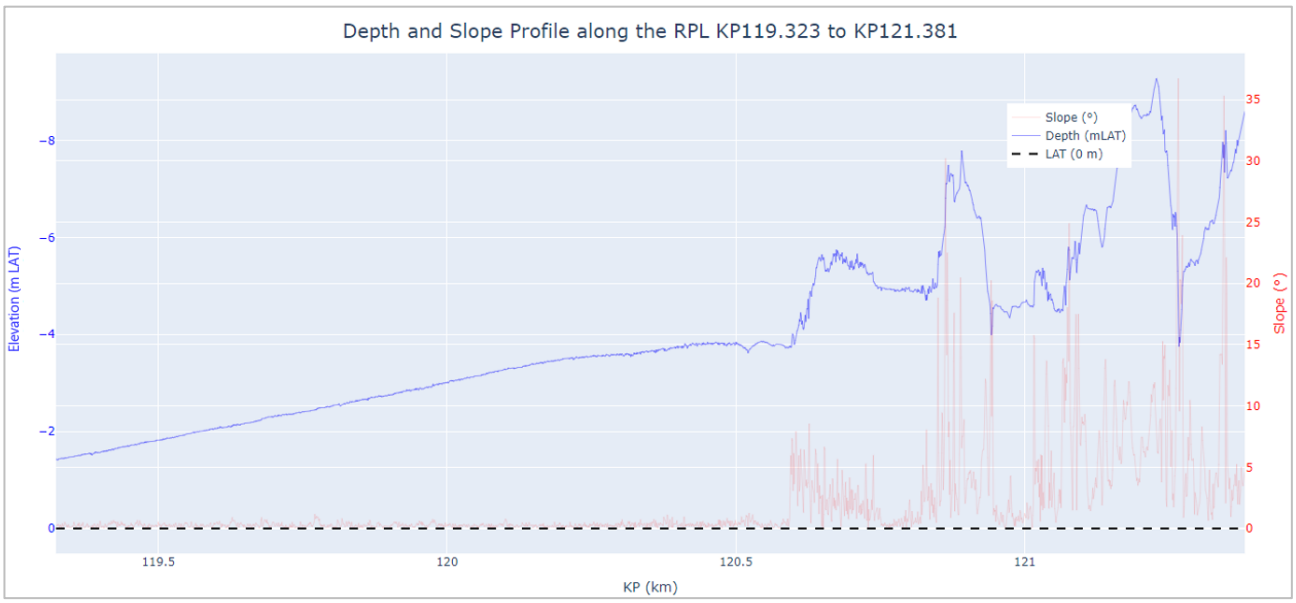

Figure 10-77: Pegwell Landfall KP 119.323 to KP 121.417 Elevation and Slope Profile

10.9.2 Surficial Geology and Seabed Features

The Pegwell Bay Landfall is comprised primarily of gravelly SAND to sandy GRAVEL, with CLAY and SAND (a Pleistocene-age deposit). These sediments were deposited within the near-shore environment and encompass a range of sands, silty clays, and flint-rich gravels. The seabed is relatively flat, exhibiting no readily noticeable features. Figure 10-78 illustrates the seabed sediments present at Pegwell Bay.

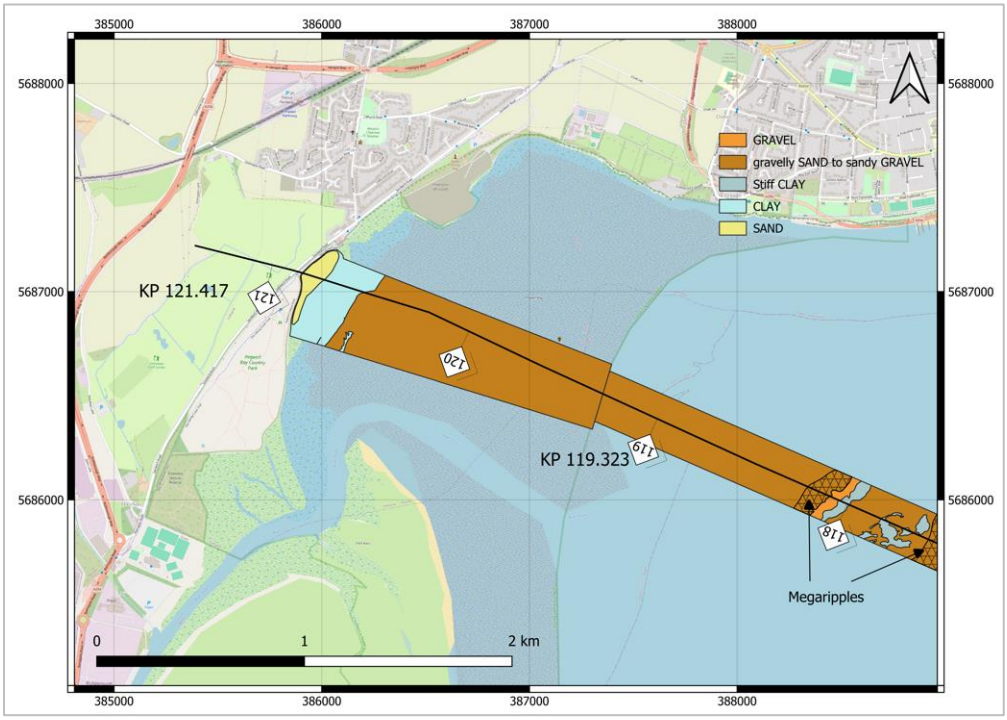

Figure 10-78: Overview of Seabed Geology and Features Pegwell Landfall KP 119.323 to KP 121.417

10.9.3 Contacts and Anomalies (Walked / UAV Magnetometer)

A total of 143 magnetic anomalies were identified within the walked magnetometer data at the Pegwell Bay. Magnetic anomalies are summarized in Table 10-45.

Table 10-45: Summary Pegwell Bay Landfall Walked Magnetic Contacts

CLASSIFICATION	NUMBER
Geology	5
Made Ground	15
Infrastructure	8
Pipeline	3
Unknown	112
Total	143

A total of 191 magnetic anomalies were identified within the UAV magnetometer data at the Pegwell Bay. Magnetic anomalies are summarized in Table 10-46.

Table 10-46: Summary Pegwell Bay Landfall UAV Magnetic Anomalies

CLASSIFICATION	NUMBER
Linear/Possible pipeline	5
Tyre	1
Unknown	185
Total	191

10.9.4 Shallow Geology (P-Wave Seismic Refraction)

In the areas covering the golf courses and Spanton's Fields, the uppermost layer shows a low velocity of 0.4 km/s (Layer 1a), which likely reflects dry, man-made ground in the golf courses and unsaturated shallow soils in Spanton's Fields. Beneath this, two deeper layers with velocities of 1.65 km/s (Layer 2) and 2.35 km/s (Layer 3) were identified. These are interpreted as representing the saturated sediments of the Thanet Formation and the underlying Chalk, respectively.

Layer thicknesses vary considerably across the golf course area, primarily due to irregular artificial topography. The top of Layer 2 ranges from 12.8 m above LAT to 0.7 m below LAT, while the top of the Chalk lies between 1.6 m above LAT and 11.0 m below LAT.

In the intertidal zone, identifying discrete layers is more challenging due to gradual velocity transitions throughout the dataset. To assist with interpretation, existing Innomar data from nearshore surveys were integrated. A velocity of 1.2 km/s correlated well with this data and is thought to represent partially saturated sands and gravels found in the intertidal and saltmarsh regions.

For Nearshore shore areas, the same velocity layers 1.65 km/s for Layer 2 and 2.35 km/s for Layer 3—were used to model the deeper subsurface. These layers are again associated with the saturated Thanet Formation and the underlying Chalk. Here, the top of Layer 2 ranges from 3.8 m above LAT to 2.7 m below LAT, while the Chalk surface deepens eastward, lying between 1.4 m and 22.7 m below LAT.

Table 10-47: Pegwell Bay Layer Boundary Interpretation

Interpretation	P-wave velocity (km/s)	Possible Lithology
Layer 1a	0.4	(Golf courses & Spantons) Dry made Ground & unsaturated shallow soils
Layer 1b	1.2	(Intertidal/Saltmarsh) Possible unsaturated shallow soils
Layer 2	1.65	Likely imaging a combination of saturated clays/silts including the Thanet Formation
Layer 3	2.35	Newhaven Chalk Formation

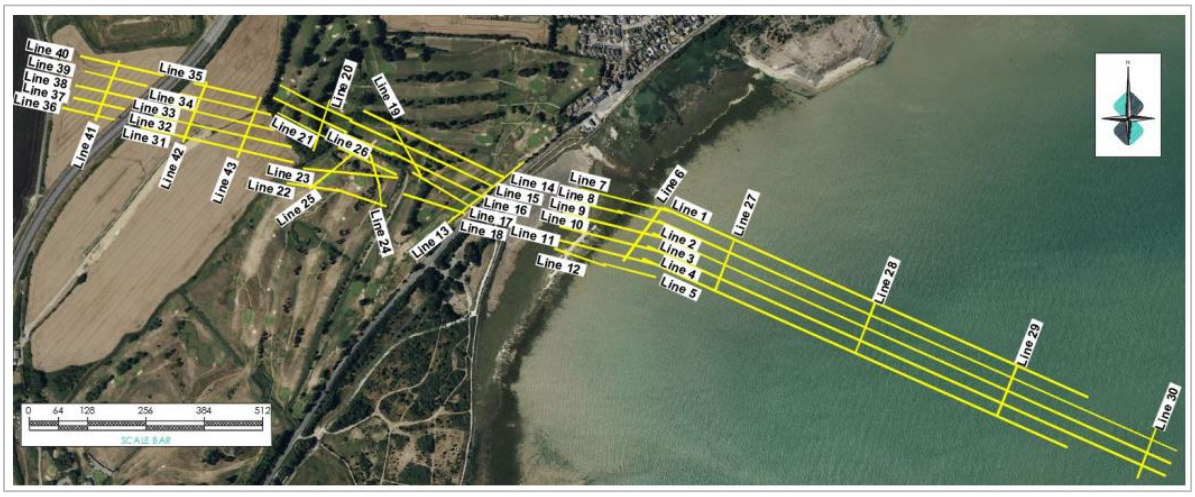

Figure 10-79: Pegwell Bay Seismic Refraction Line Plan

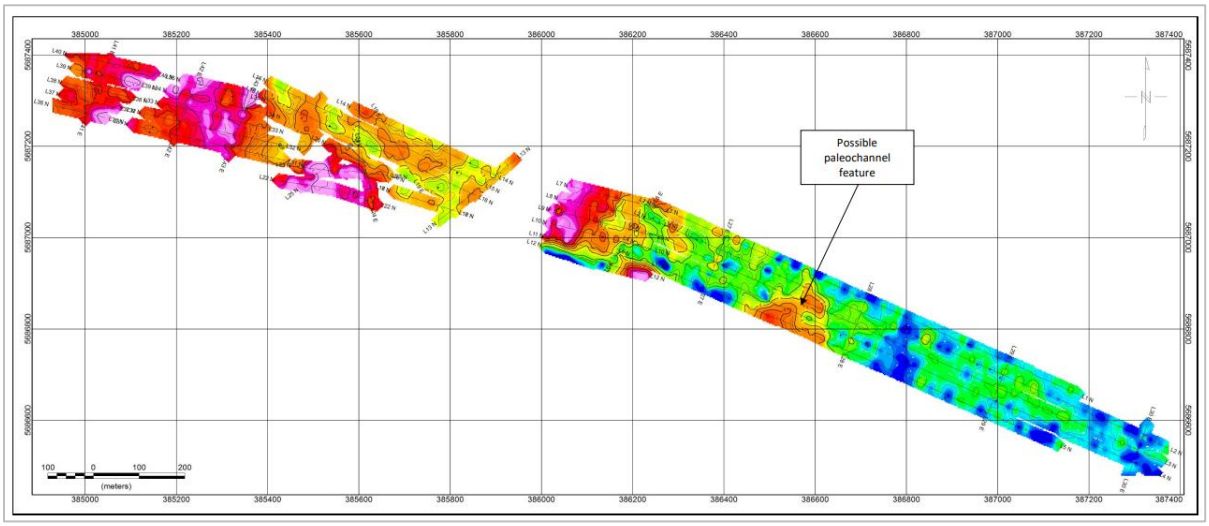

Figure 10-80: Isopach Diagram for Layers 1a (Onshore Area) and 1b (Beach and Offshore Area)

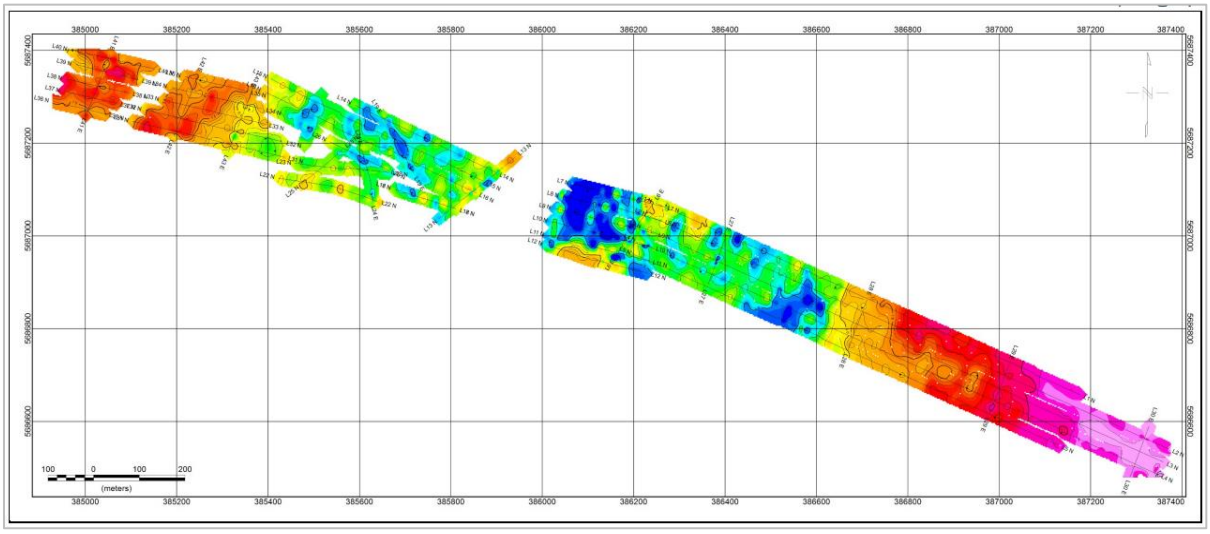

Figure 10-81: Isopach Diagram for Layer 2 (whole site)

10.9.5 Geotechnical

Five cable percussive boreholes with rotary follow-on were undertaken by SSL along the new RPL alignment within the Pegwell Bay landfall, these were RedP-BH-6 to RedP-BH-10. The locations are shown schematically below in Figure 10-82.

Some of SSL locations were excluded from the interpretation as they fall far away from the new RPL. These locations are listed in Table 10-48 for reference. The geological information from these locations was no longer suitable to the RPL, which had been re-routed for engineering purposes.

Table 10-48: Geotechnical Locations excluded from Pegwell Bay Landfall Interpretation

Location ID	Distance from RPL (m)	Reason for Exclusion
R22-BH101	999	Not suitable for re-route RPL
R22-BH102	864	Not suitable for re-route RPL
R22-BH103	1118	Not suitable for re-route RPL
R22-BH104	1005	Not suitable for re-route RPL
R22-BH105	806	Not suitable for re-route RPL
R22-BH106	998	Not suitable for re-route RPL
R22-BH106A	997	Not suitable for re-route RPL
R22-BH203	313	Not suitable for re-route RPL
R22-BH204	333	Not suitable for re-route RPL
R22-BH205	1168	Not suitable for re-route RPL
R22-BH501	811	Not suitable for re-route RPL
R22-BH502	1295	Not suitable for re-route RPL

Location ID	Distance from RPL (m)	Reason for Exclusion
R22-CPT101	996	Not suitable for re-route RPL
R22-CPT102	858	Not suitable for re-route RPL
R22-CPT103	1128	Not suitable for re-route RPL
R22-CPT104	1006	Not suitable for re-route RPL
R22-CPT105	810	Not suitable for re-route RPL
R22-CPT106	999	Not suitable for re-route RPL
R22-CPT107	995	Not suitable for re-route RPL
R22-CPT108	1170	Not suitable for re-route RPL
R22-CPT109	900	Not suitable for re-route RPL
R22-CPT110	866	Not suitable for re-route RPL
R22-CPT111	852	Not suitable for re-route RPL
R22-TP101	899	Not suitable for re-route RPL
R22-TP102	1005	Not suitable for re-route RPL
R22-TP103	1072	Not suitable for re-route RPL
R22-TP104	965	Not suitable for re-route RPL
R22-TP105	815	Not suitable for re-route RPL
R22-TP106	1114	Not suitable for re-route RPL
R22-TP107	991	Not suitable for re-route RPL
R22-TP201	42	Not suitable for re-route RPL
R22-TP202	161	Not suitable for re-route RPL
R22-TP203	342	Not suitable for re-route RPL
R22-TP204	580	Not suitable for re-route RPL
R22-TP205	859	Not suitable for re-route RPL
R22-TP405	654	Not suitable for re-route RPL
R22-TP501	477	Not suitable for re-route RPL
R22-TP502	443	Not suitable for re-route RPL
R22-TP503	788	Not suitable for re-route RPL
R22-TP503A	789	Not suitable for re-route RPL
R22-TP504	767	Not suitable for re-route RPL
R22-TP505	705	Not suitable for re-route RPL

Location ID	Distance from RPL (m)	Reason for Exclusion
R22-TP506	663	Not suitable for re-route RPL
R22-TP508	1116	Not suitable for re-route RPL
R22-TP510	932	Not suitable for re-route RPL
RedP-BH-11	12	Not suitable for re-route RPL

Figure 10-82 Location Plan for Pegwell Bay landfall between KP 119.323 to KP 121.382

RedP-BH-7 (KP 120.900) encountered 1.10 m of made ground at the surface, comprising CLAY with a mix of anthropogenic inclusions. Very soft to soft slightly sandy clayey SILT is recorded underlying the made ground to a depth of 1.75 m, transitioning into soft slightly sandy silty CLAY to 5.90 m. A bed of coarse flint GRAVEL is then present from 5.90 m to 6.10 m, at which point the cable percussive hole was stopped, with the borehole continued using rotary techniques. Sample recovery was poor between 6.10 m and 11.11 m, with the only material recovered being flint GRAVEL between 8.05 m and 8.18 m identified as the Bullhead Beds, and structureless CHALK composed of slightly sandy silty angular to subangular GRAVEL between 8.18 m and 8.50 m. Structureless CHALK composed of slightly sandy silty angular to subangular GRAVEL and COBBLES is encountered from 11.11 m to 12.48 m, transitioning to very weak to weak medium to high density CHALK to the base of the location at 31.00 m.

RedP-BH-6 (KP 121.110) encountered made ground from the surface to a depth of 3.70 m, comprised of a mixture of SAND, CLAY and SILT with anthropogenic inclusions. Soft silty CLAY is then recorded from the base of the made ground to 4.60 m, transitioning to firm slightly sandy clayey SILT to 6.00 m, at which point the SILT becomes stiff to 8.00 m. A layer of firm sandy SILT is present between 8.00 m to 8.42 m, overlying silty SAND to 8.74 m, and a layer of GRAVEL to 8.87 m. Very weak medium density CHALK is then encountered to a depth of 18.00 m, becoming medium to high density from 18.00 m to 23.77 m. From 23.77 m to the base of the hole at 30.50 m, the CHALK becomes weak and high density.

A 1.70 m thick layer of made ground is encountered at the surface of RedP-BH-9 (KP 121.120), comprised of predominantly CLAY and SILT with anthropogenic inclusions. A layer of concrete is also present between 0.80 m and 0.90 m. Very soft to soft CLAY is recorded underlying the made ground to a depth of 4.40 m, which is described as containing amorphous peat between 1.70 m and 2.40 m, and between 3.70 m and 4.40 m.

Firm SILT is then recorded to a depth of 8.00 m, becoming very stiff to 8.38 m. A bed of silty SAND is encountered from 8.38 m to 8.80 m, overlying CHALK to a depth of 30.50 m.

RedP-BH-10 (KP 121.240) encountered a thick layer of made ground to a depth of 10.00 m, comprising predominantly CLAY with some SAND, SILT and a BOULDER of concrete from 9.40 m to 9.80 m. Natural cohesive material was recorded from the base of the made ground to 17.17 m, which increased in shear strength with depth. CHALK is again encountered in this borehole location, from 17.33 m to the base of the hole at 41.00 m.

RedP-BH-8 (KP 121.340) encountered topsoil to 0.25 m, comprising stiff slightly gravelly slightly sandy organic clayey SILT. Stiff to very stiff CLAY and SILT is recorded from the base of the topsoil to a depth of 7.88 m, underlain by silty fine SAND to 9.50 m. A deposit of extremely weak to very weak sandy SILTSTONE recovered as slightly gravelly sandy SILT is encountered from 9.50 m to 9.80 m, underlain by a bed of flint GRAVEL to 9.97 m. CHALK is then encountered from 9.97 m to a depth of 26.00 m.

Table 10-49 below displays the depths at which cable percussive and rotary drilling was undertaken to in each borehole location. Table 10-50 shows the depths at which groundwater was encountered during the drilling of each borehole location. Table 10-51 summarises the depths at which each geological unit was encountered in each borehole location.

Table 10-49 Depths of Cable Percussion and Rotary Drilling in Pegwell Bay Landfall

Location ID	Cable Percussion maximum depth (m)	Rotary Drilling maximum depth (m)
RedP-BH-7	6.10	31.00
RedP-BH-6	8.45	30.50
RedP-BH-9	8.45	30.50
RedP-BH-10	15.45	41.00
RedP-BH-8	7.50	26.00

Table 10-50 Water Strike Depths in Pegwell Bay Landfall

Location ID	Groundwater strike depth (m)	Groundwater depth after 20 minutes (m)
RedP-BH-7	6.00	4.30
RedP-BH-6	3.00 / 6.80	2.80 / 6.70
RedP-BH-9	5.50	5.40
RedP-BH-10	5.35 (seepage)	N/A
RedP-BH-8	6.50	6.20

Table 10-51 Summary of Depths of Geological Formations in Pegwell Bay Landfall

Geological Formation	Location ID's and Depth (m) Formation				
	KP 120.900	KP 121.110	KP 121.120	KP 121.240	KP 121.340
	RedP-BH-7	RedP-BH-6	RedP-BH-9	RedP-BH-10	RedP-BH-8
Made Ground/Topsoil	0.00-1.10	0.00-3.70	0.00-1.70	0.00-10.00	0.00-0.25
Tidal flat deposits	1.10-5.90	3.70-6.00	1.70-8.00	10.00-14.40	0.25-7.50
Thanet Formation	-	6.00-8.74	8.00-8.80	14.40-16.00	7.50-7.62
Bullhead Bed	8.05-8.18	8.74-8.87	-	17.17-17.33	9.80-9.97
Newhaven Chalk Formation	11.11-23.20	8.87-23.77	8.80-24.50	17.33-32.20	9.97-22.33
Seaford Chalk Formation	23.20-31.00	23.77-30.50	24.50-30.50	32.20-41.00	22.33-26.00

10.9.5.1 Geotechnical Model

Figure 10-84 below presents the upper 6.00 m of the locations in the form of a geotechnical model; with the shear strength (Su), relative density (Dr) and soil classification plotted against depth in 0.50 m sections. Su and Dr values have been averaged for each half-meter section. The Su values have been taken from triaxial tests undertaken within the cohesive strata, and the Dr values from a correlation between SPT N-value and relative density as given by Gibbs & Holtz (1951). In the case of RedP-BH-8 (KP 121.340) and RedP-BH-9 (KP 121.120), in-situ vane tests were undertaken within the shallow cohesive strata. These results have been averaged and included in the geotechnical model.

As can be observed from the geotechnical model, a significant thickness of made ground is present overlying cohesive strata. The cohesive material in both RedP-BH-7 (KP 120.900) and RedP-BH-6 (KP 121.110) is classified as very low to low strength. The strength tests undertaken within RedP-BH-8 returned values classifying the material as high strength.

KP (km)	120.900			121.110			121.120			121.240			121.340		
DCC (m)	14.100			-44.200			-97.600			-81.000			-38.700		
ID BH	RedP-BH-7	RedP-BH-7	RedP-BH-7	RedP-BH-6	RedP-BH-6	RedP-BH-6	RedP-BH-9	RedP-BH-9	RedP-BH-9	RedP-BH-10	RedP-BH-10	RedP-BH-10	RedP-BH-8	RedP-BH-8	RedP-BH-8
Depth (m)	**DR**	**Su**	**BH**	**DR**	**Su**	**BH**	**DR**	**Su**	**BH**	**DR**	**Su**	**BH**	**DR**	**Su**	**BH**
0.0 - 0.5	Made Ground			Made Ground			Made Ground			Made Ground			Made Ground		
0.5 - 1.0														118	2
1.0 - 1.5			4											115	2
1.5 - 2.0		24	4						4						2
2.0 - 2.5			4						4					95	2
2.5 - 3.0			4						4						2
3.0 - 3.5			4						4						2
3.5 - 4.0		9	4						4						2
4.0 - 4.5			4		28	4			4					112	2
4.5 - 5.0			4			4			4						2
5.0 - 5.5			4			4			4						2
5.5 - 6.0		9	4			5			4						2

Figure 10-83 Geotechnical Model of Pegwell Bay landfall between KP 120.900 and KP 121.340

10.9.6 Geohazards

Three cables, Nemo onshore 1, Nemo onshore 2, and Thanet onshore; were not detected in the data but are expected to cross the RPL based on their database positions at KP 120.860, KP 120.861, and KP 120.885, respectively.

The top of Newhaven Chalk formation was seen along the route, ranging between 1.6 m above LAT to 11.0 m below LAT.

10.9.6.1 Geotechnical Model

Figure 10-84 below presents the upper 6.00 m of the locations in the form of a geotechnical model; with the shear strength (Su), relative density (Dr) and soil classification plotted against depth in 0.50 m sections. Su and Dr values have been averaged for each half-meter section. The Su values have been taken from triaxial tests undertaken within the cohesive strata, and the Dr values from a correlation between SPT N-value and relative density as given by Gibbs & Holtz (1951). In the case of RedP-BH-8 (KP 121.340) and RedP-BH-9 (KP 121.120), in-situ vane tests were undertaken within the shallow cohesive strata. These results have been averaged and included in the geotechnical model.

As can be observed from the geotechnical model, a significant thickness of made ground is present overlying cohesive strata. The cohesive material in both RedP-BH-7 (KP 120.900) and RedP-BH-6 (KP 121.110) is classified as very low to low strength. The strength tests undertaken within RedP-BH-8 returned values classifying the material as high strength.

KP (km)	120.900			121.110			121.120			121.240			121.340		
DCC (m)	14.100			-44.200			-97.600			-81.000			-38.700		
ID BH	RedP-BH-7	RedP-BH-7	RedP-BH-7	RedP-BH-6	RedP-BH-6	RedP-BH-6	RedP-BH-9	RedP-BH-9	RedP-BH-9	RedP-BH-10	RedP-BH-10	RedP-BH-10	RedP-BH-8	RedP-BH-8	RedP-BH-8
Depth (m)	**DR**	**Su**	**BH**	**DR**	**Su**	**BH**	**DR**	**Su**	**BH**	**DR**	**Su**	**BH**	**DR**	**Su**	**BH**
0.0 - 0.5	Made Ground			Made Ground			Made Ground			Made Ground			Made Ground		
0.5 - 1.0														118	2
1.0 - 1.5			4											115	2
1.5 - 2.0		24	4						4						2
2.0 - 2.5			4						4					95	2
2.5 - 3.0			4						4						2
3.0 - 3.5			4						4						2
3.5 - 4.0		9	4						4						2
4.0 - 4.5			4		28	4			4					112	2
4.5 - 5.0			4			4			4						2
5.0 - 5.5			4			4			4						2
5.5 - 6.0		9	4			5			4						2

Figure 10-84 Geotechnical Model of Pegwell Bay landfall between KP 120.900 and KP 121.340

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